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Replacement of the Cross-Site Transfer System Interface Analysis

R. J. Kidder
Westinghouse Hanford Company, Richland, WA 99352
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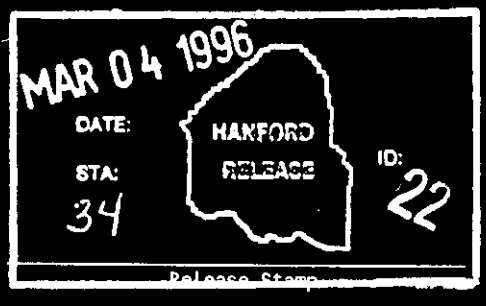
Abstract: This document provides the RCSTS interface analysis for interface with the existing tank farms (AWF, DST, SST).



Chris Willingham 3-4-96
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REPLACEMENT OF THE CROSS-SITE TRANSFER SYSTEM INTERFACE ANALYSIS

March 1996

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CONTENTS

LIST OF TABLES

LIST OF TERMS

AC	Administrative Control
ASA	Accelerated Safety Analysis
AWF	Aging Waste Facility
DCRT	Double-contained receiver tank
DST	Double-shell tank
FSAR	Final safety analysis report
HEPA	High-efficiency particulate air (filter)
IOSR	Interim Operational Safety Requirements
LCO	Limiting Condition for Operation
LCS	Limiting Control Setting
PRV	Pressure relief valve
PSAR	Preliminary safety analysis report
RCSTS	Replacement of the Cross-Site Transfer System
SL	Safety Limit
SST	Single-shell tank
TBD	To be determined
TSR	Technical Safety Requirement
WHC	Westinghouse Hanford Company

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RCSTS INTERFACE ANALYSIS

This document summarizes comparisons of interfaces between the Project W-058, Replacement of the Cross-Site Transfer System (RCSTS), and the existing tank farm facilities. The safety bases for the tanks farms and the draft tank farm SAR Chapter 3 and Interim Operational Safety Requirements (IOSRs) were compared to the Preliminary Safety Analysis Report (PSAR) WHC-SD-W058-PSAR-001 (WHC 1995a), *Replacement of the Cross-Site Transfer System Preliminary Safety Analysis Report*. This analysis provides an overview of the results. This document is issued as a project document to support the TWRS Systems Engineering interface control document, and will be incorporated into the RCSTS FSAR.

The RCSTS interface boundary with the 200 East tank farms is at the existing 244-A Lift Station in the 200 East Area. Overpressurization of existing transfer piping is not analyzed in the present tank farm safety analyzes as a major hazard to the tank farm transfer system from transfer line blockage caused by slurry transfers or valve closure. Overpressurization of the existing 200 East Area transfer piping system is not analyzed in the RCSTS PSAR (WHC 1995a). This accident will be analyzed in the Tank Farms Final Safety Analysis Report (FSAR) or the Tank Farm Interim Safety Basis WHC-SD-WM-ISB-001 (WHC 1995b), *Hanford Tank Farm Facilities Interim Safety Basis* (ISB), for cross-site and tank farm transfers. Technical Safety Requirements (TSRs) or IOSRs will be developed as required for existing applicable piping systems. The RCSTS PSAR provides TSRs for overpressuriztion of the existing transfer system interface at the 244-A Lift Station only.

Also, the RCSTS PSAR (WHC 1995a) interface with the present tank farm safety analyzes and methodology provides overly conservative results from pool release models which produce high released volumes of airborne hazardous materials to the onsite and offsite receptors. The RCSTS PSAR has established an open item in Section 9.6.5 (WHC 1995a) states that Section 9.4.2 presents a pool release model that seems to yield overly conservative results. The model should be reviewed to assure an appropriate level of conservatism is used in the Tank Farm FSAR or Tank Farm ISB (WHC 1995b). This is an issue for all existing pool release models which analyzed resuspension of pooled liquids.

1.0 SAFETY BASIS INTERFACES

The Tank Farm ISB (WHC 1995b), Chapter 6.0, Interim Safety Basis Requirements, provides the base documents for the authorization basis for safe operation of the tank farm facilities. The RCSTS PSAR was reviewed against the referenced authorization basis documents to analyze the interfaces with the tank farm facilities. The following documents were utilized for this interface review.

- WHC-SD-WM-OSR-004 (WHC 1995c), *Aging Waste Facility Interim Operational Safety Requirements*,
- WHC-SD-WM-OSR-016 (WHC 1995d), *Double Shell Tank Farm Interim Operational Safety Requirements*,

- WHC-SD-WM-OSR-005 (WHC 1995e), *Single Shell Waste Tank Interim Operational Safety Requirements.*

1.1 Other Interfaces

These interface documents are documents that were utilized for the TSR derivations and the safety analysis accident methodology in the RCSTS PSAR (WHC 1995a). These documents represent the latest assumptions for tank farm operating parameters and safety analysis accident methodology.

- WHC-SD-WM-OSR-018 (WHC 1995f), *Tank Farms Interim Operational Safety Requirements* (Draft),

- WHC-SD-WM-SAR-065 (WHC 1995g), *Interim Chapter 3.0 Hazard and Accident Analysis* (Draft).

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

1.2 Interface Analysis Criteria

This interface analysis utilized the above authorization bases and interface documents to establish the criteria for acceptable and compatible interfaces with the tank farm facilities and safety analyzes. The Tank Farm IOSRs (WHC 1995c, WHC 1995d, WHC 1995e, WHC 1995f) were compared to the RCSTS limits (safety limits, limiting condition for operations, administrative controls, design and operating parameters). The tank farm final safety analysis (WHC 1995g) assumptions and methodology were compared to the RCSTS PSAR accident analysis (WHC 1995a). A review of the Washington administrative code (WAC 173-303) part B permit to ensure interface compliance by the RCSTS PSAR disposal mission.

2.0 IOSR INTERFACES

The Aging Waste Facility (AWF), Double-Shell Tank Farm Facility (DST), Single-Shell Waste Tanks (SST), and the Tank Farm IOSRs were compared to the RCSTS PSAR technical safety requirements (WHC 1995a) to evaluate any impacts to the IOSRs from the RCSTS interface and the RCSTS TSRs defined in Section 2.0.1 through 2.0.4.

2.0.1 Safety Limits

The following safety limit (SL) is identified by Chapter 9 (WHC 1995a) for the piping downstream of the 244-A lift station, which is outside the boundary of the RCSTS. This SL does not apply to the RCSTS. The applicable Limiting Control Setting (LCS) actuation point value that protects this SL will be combined with the respective Limiting Condition for Operations (LCOs) identified in Section 2.0.2 as part of operability of the systems, in accordance with Section 20.1.2 (WHC 1995a).

- The primary piping pressure shall be $\leq$ 1,600 kPa (230 psig).

Overpressurization of the existing 200 East Area transfer piping system is not analyzed in this Preliminary Safety Analysis Report. This accident will be analyzed in the Tank Farms Final Safety Analysis Report. TSRs or IOSRs will be developed as required for applicable piping systems. See also open item in Section 9.6.5 (pool release model). (WHC 1995a)

2.0.2 Limiting Conditions for Operation and Surveillance Requirements

The following LCOs are identified for the RCSTs (WHC 1995a).

- Operable high-efficiency particulate air (HEPA) filter designed such that 90% of the air goes through it for sprays in the diversion box.
- Operable pressure relief valve (PRV) and rupture disk on primary slurry transfer line [in the 244-A lift station].

Surveillance requirements will be based on final RCSTS design and will be included in the final TSRs.

2.0.3 Administrative Controls

The AC programs and provisions required to ensure the safe RCSTS operation are summarized in items A through N (WHC 1995a).

A. Occurrence Reporting. A program shall be established, implemented, and maintained for occurrence reporting of events and conditions that may involve safety, health, quality, safeguards, security, or environmental implications. It is the policy of WHC to encourage a positive attitude toward reporting occurrences. It is also important that occurrences be consistently reported to assure that both DOE and WHC line management are kept fully and currently informed of the following events that may:

1. Affect the health and safety of the public
2. Seriously impact the intended purpose of DOE facilities
3. Have a noticeable adverse effect on the environment
4. Endanger the health and safety of workers.

B. Organization. This AC requires that lines of authority, responsibility, and communication be established and defined for the highest management levels through intermediate levels to, and including, all safety and operating organization positions. These relationships will be documented and updated, as appropriate, in the form of (1) organization charts, (2) functional descriptions of departmental responsibilities and relationships, and (3) job descriptions for key personnel positions. They may also be documented and updated in equivalent forms of documentation.

Those individuals who train the operating staff and those who carry out safety and quality assurance functions may report to the facility manager. However, they will have sufficient organizational freedom to ensure independence from operating pressures. The facility manager will be responsible for safe operation within the facility.

Safe operation will include, as necessary, interface requirements with other onsite organizations and facilities. Organizational responsibilities are further discussed in Chapter 17 (WHC 1995a). The number of certified shift managers, operators, and support personnel will be adequate to operate and support the facility safely. Minimum staffing will be included in the final TSR document based on the final analysis of operation of the RCSTS.

C. Procedures. This AC program requires that approved and controlled procedures be provided, as necessary, to facilitate safe operation of the RCSTS. Procedures are discussed in greater detail in Chapter 18 (WHC 1995a). These types of procedures include the following:

- Startup, normal operation, and shutdown of facility systems and equipment
- Independent verification of value position
- Abnormal and emergency
- Alarm response
- Routine maintenance, inspection, calibration, and functional testing
- Equipment control (e.g., lock and tag)
- TSR compliance program procedures.

D. Nuclear Criticality Safety. A program is not required to prevent an accidental criticality in the RCSTS. Chapter 10 (WHC 1995a) provides the basis for not requiring a nuclear criticality safety program.

E. Waste Inventory Concentration Control. A program shall be established, implemented, and maintained to ensure that the radiological and toxicological waste inventory concentrations, used in the accident analysis, will not be exceeded without additional safety analysis. The worst case RCSTS radiological and toxicological waste inventory concentrations are found in Chapter 8, Tables 8.1-1 and 8.1-3 (WHC 1995a). These waste inventory concentrations are used for all DBAs addressed in Chapter 9 (WHC 1995a). Maintaining the inventory concentration control keeps the RCSTS within the analyzed boundaries.

F. Excavation. A program shall be established, implemented, and maintained to manage excavation activities in areas of active waste transfers, to prevent waste leaked to the surface from an excavation accident. Program key elements are as follows.

- Planning of excavation activities
- Requirements for excavation permits

- A system of permanently installed, closely spaced, readily seen, surface and subsurface markers or enclosures (e.g., fence) markers that locate the presence of waste transfer pipelines, which are involved in active waste transfers. This System is required to prevent the excavation accident.

G. Diversion Box and Vent Station Entry Doors and Penetrations. A program shall be established, implemented and maintained to ensure that the diversion box and vent station entry doors are properly closed, sealed, and locked, and that the penetration covers are properly installed and secured prior to waste transfers for RCSTS so as to assure confinement during transfers.

H. Corrosion Control. A program shall be established, implemented and maintained to control transfer system piping corrosion to ensure the piping design life is achieved. Program key elements are as follows.

- Chemistry control for OH^-, NO_3^-, NO_2^-
- Flushing after each waste transfer
- Periodic pressure tests of the piping
- Requirements for dry air or purge gas in piping encasements.

I. Exhaust Filtration. A program shall be established, implemented, and maintained for HEPA filters to ensure confinement integrity under high humidity and liquid aerosol conditions. The program will include periodic verifications that HEPA filters maintain a nominal particulate removal efficiency of > 90% upon installation and periodically thereafter at specified frequencies.

J. Ball Valve and Riser Cap. A program shall be established, implemented and maintained to assure that the ball valves on the test risers are closed and that the riser cap is tightly attached prior to waste transfer so as to prevent releases to the atmosphere during transfer. This AC is not required for the present design which has deleted the above ground risers.

K. Flush System. A program shall be established, implemented, and maintained to assure that the cover is securely and properly on the enclosure pit at all times (except for the period of time that the spool piece is being installed or removed or manual valve being opened or closed). A program shall be established, implemented, and maintained to assure that the spool piece is removed or manual valve closed when the flush system is not in use. This AC is not required for the present design which has deleted the spool piece and separate enclosure.

L. Material Balance. A program shall be established, implemented and maintained to assure that a material balance (including a check of receiving tank or sending tank level and change in level) is performed in such a way that the results are complete, reviewed, and approved every two hours.

M. Seismic Shutdown. A program shall be established, implemented, and maintained to assure that the transfer and booster pump can be shutdown IMMEDIATELY (defined as starting shutdown procedures as soon as possible and continuing to work towards shutdown until it is completed) after a seismic event.

N. Protection Against Flammable Gas Buildup. The RCSTS shall be flushed immediately should the transfer pump or booster pump fail such that waste remains within the RCSTS for more than TBD days. Just prior to flushing (for this purpose), the RCSTS shall be isolated from the tank transfer pumps.

2.0.4 Design Features

The following design features, if altered or modified, can adversely affect RCSTS safety.

- The transfer system piping (both primary and encasement), diversion box, and vent station are designed to withstand a 0.20 g seismic event.
- Primary piping is 304L stainless steel, Schedule 40, is designed for the maximum deadhead pressure of the booster pumps 11,550 kPa (1,675 psi), is designed for water hammer, and provides for corrosion and erosion control.
- The pH in flush tank and flush system piping is maintained at a value no greater than 12.
- Radioactive materials are contained either within piping, pits, or diversion boxes.
- Piping and pits will be shielded by earth, concrete plugs, or cover blocks to provide radiation protection.
- A leak detection system in the field run encasement piping to detect leaks from the primary pipe.
- The RCSTS is comprised of a primary pipe and a large diameter, concentric, encasement pipe to provide protection against the release to the environment.
- Backflow into the flush system is prevented by two pneumatic valves, a pressure switch located between the two valves, and a check valve. The present design has deleted the design feature for pneumatic valves.
- The encasement pipe is protected against corrosion due to interactions with the soil.
- An encasement pipe rupture disk must be provided and designed such that if the encasement pipe fills, more than 80% of the liquid flow from the encasement pipe will flow through the rupture disk (leaving, at most, 20% of flow into the soil column).

2.1 AWF IOSR INTERFACES

The IOSR WHC-SD-WM-OSR-004 (WHC 1995c), *Aging Waste Facility Interim Operational Safety Requirements*, was compared to the RCSTS PSAR (WHC 1995a). The AWF IOSRs were compared to the RCSTS limits and administrative controls in Table 2.1-1, 2.1-2, and 2.1-3. The RCSTS limits (Table 2.1-1 and 2.1-2) do not reduce the margin of safety as defined in the basis for the AWF IOSRs. However, the AWF will require a new IOSR, and compensatory measure (required by a compliance implementation plan (WHC-IP-0842) for over pressurization from cross-site and tank farm transfers. The RCSTS administrative controls are compatible with the AWF administrative controls with no interface issues (Table 2.1-3).

The RCSTS PSAR requires safety limits for primary transfer piping pressure at the 200 East Area interface. SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping (Section 2.0.1); limiting conditions for operable HEPAs at new pits, and operable PRV and rupture disk at the 200 East Area interface. The PRV and rupture disk LCO will prevent over pressurization of the existing 200 East Area transfer piping (See Section 2.0.2).

The RCSTS PSAR also requires the following ACs which directly interface with the AWF. These and other ACs are addressed in Section 2.0.3.

- Material balance AC program which will monitor changes to the receiving tank levels,
- Pit cover AC program which will control cover installations during transfers,
- Exhaust filtration AC program which will control the HEPA filter efficiency, and
- AC procedures which will control the transferred waste temperatures, solids contents, radiological and chemical concentrations, and the transfer pressures for safe operation of the RCSTS and the receiving AWF tank.

The RCSTS design eliminates the need for cathodic protection of the new transfer system.

Table 2.1-1 AWF Safety Limit Comparisons

Safety Limit[a]	SL	RCSTS Limit
2.1 Primary Tank Maximum Waste Level	≤ 370 inches	AC[b]
2.2 Primary Tank Maximum Waste Temperature	≤ 350° F	≤ 200° F[c]
2.3 Primary Tank Minimum Vapor Space Pressure	≥ -6 inches	None[d]
2.4 Primary Tank Maximum Vapor Space Pressure	≤ 60 inches	None[d,e]

a. WHC-SD-WM-OSR-004, Rev 1B
b. RCSTS material balancing AC program will control changes to receiving tank levels.
c. This is not an SL. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
d. No waste storage tanks.
e. RCSTS SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping.

Table 2.1-2 AWF Limiting Condition for Operations Comparisons

Limiting Condition for Operation[a]	LCO	RCSTS Limit
3.1 Waste Level monitoring System (Tanks)	Operable	None[b]
	≤ 364 inches	AC[c]
3.2 Temperature Monitoring System (Tanks)	≤ 300° F	≤ 200° F[d]
3.3 Pressure Monitoring System (Tanks)	≥ -4 inches	None[b]
	> 0 inches	None[b]
3.4 Exhaust Ventilation System (Tanks)	Operable	None[b]
3.4.3 Primary Tank Exhaust Ventilation Filter Radiation	< 200 mrem	None[e,f]
3.5 Leak detection Systems (Tanks)	Operable	None[b]
3.6 Tank Farm Piping Systems	Operable	Operable[g]
3.6.3 COB, Pit, and Box Covers	Covers on during Transfers	Covers on during Transfers[h]
3.6.4 Transfer Line Encasement Leak Detection Pit Instrumentation (AY-101-B, AZ-101/102)	Operable	Operable
3.7 Support Systems	Operable	Operable

a. WHC-SD-WM-OSR-004, Rev 1B
b. No waste storage tanks.
c. RCSTS material balancing AC program will control changes to receiving tank levels.
d. This is not an LCO. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
e. Pits provided with passive ventilation with HEPA filter AC for verification of efficiency.
f. Operable HEPA filters in new pits.
g. RCSTS LCOs for operable PRV at the 200 East Area interface
h. This is not an LCO. RCSTS AC for covers installed during transfers.

Table 2.1-3. AWF Administrative Control Comparisons

Administrative Control[a]	AC	RCSTS AC
5.4 OSR Violations	Occurrence reporting	Occurrence reporting
5.5 Reporting Requirements	Occurrence reporting	Occurrence reporting
5.6 Revisions to the OSRs	DOE approval required	TSR Program
5.7 Waiver of the OSRs	DOE approval required	Organization/Procedures
5.8 Organization	Organization/Function	Organization/Function
5.9 Facility Support and Reviews	Independent Reviews	Organization/Function
5.10 Audit Requirements	Records/Retention	Organization/Function
5.11 Unreviewed Safety Questions	USQ Process	Organization/Function
5.12 Nuclear Criticality	Criticality Prevention	None[b]
5.13 Radiation Protection	Protection Requirements	Procedures/Design features
5.14 Effluent Monitoring and Sampling	Monitoring/Sampling	Procedures
5.15 Watch List Tanks	Sampling/Studies/ Monitoring	None[c]
5.16 Sampling	Sampling/Verification	Inventory concentration control
5.17 Corrosion Control	Sampling/Verification	Verification/Flushing/ Pressure testing/ Encasement control
5.18 Compatibility	Sampling/Verification	Inventory concentration control/Verification
5.19 Heat Loads (Tanks)	Limit loads	None[c]
5.20 Hydrostatic Loads (Tanks)	Limit loads	None[c]
5.21 Spare Tankage	Tank capacity limits	Material balance
5.23 Tank and Transfer Line Leakage	Operation restriction	Procedures/Design features[d]
5.24 Permit Program for Excavation	Permit	Program/Permit
5.25 Cathodic Protection	Protect transfer lines	None[e]
5.26 Integrity Assessment	Assess barriers	Periodic testing
5.27 Compliance Implementation Plan	OSR implementation	TSR Program
5.28 Concrete Tank Temperature	Limit temperature	None[c]
5.29 Flammable Gases (Tanks)	Ventilation/Work controls	Flushing/Isolation
5.30 Waste Transfer Restrictions	No SST transfers	None[f]

a. WHC-SD-WM-OSR-004, Rev 1B
b. Nuclear criticality program is not required for the RCSTS. Further analysis is required prior to operation to confirm criticality requirements for configurations.
c. No waste storage tanks.
d. RCSTS procedures control leak alarm responses.
e. RCSTS transfer line insulation barrier design eliminates the need for cathodic protection.
f. Transfers controlled by AWF and DST IOSR for waste transfer restrictions.

2.2 DST IOSR interfaces

The IOSR WHC-SD-WM-OSR-016 (WHC 1995e), *Double Shell Tank Farm Interim Operational Safety Requirements*, was compared to the RCSTS PSAR (WHC 1995a). The DST IOSRs were compared to the RCSTS limits and administrative controls in Table 2.2-1, 2.2-2, and 2.2-3. The RCSTS limits (Table 2.2-1 and 2.2-2) do not reduce the margin of safety as defined in the basis for the DST IOSRs. However, the DST will require a new IOSR, and compensatory measure (required by a compliance implementation plan (WHC-IP-0842) for over pressurization from cross-site and tank farm transfers. The RCSTS administrative controls are compatible with the DST administrative controls with no interface issues (Table 2.1-3).

The RCSTS PSAR requires safety limits for primary transfer piping pressure at the 200 East Area interface. SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping (Section 2.0.1); limiting conditions for operable HEPAs at new pits, and operable PRV and rupture disk at the 200 East Area interface. The PRV and rupture disk LCO will prevent over pressurization of the existing 200 East Area transfer piping (See Section 2.0.2).

The RCSTS PSAR also requires the following ACs which directly interface with the DST. These and other ACs are addressed in Section 2.0.3.

- Material balance AC program which will monitor changes to the receiving tank levels,
- Pit cover AC program which will control cover installations during transfers,
- Exhaust filtration AC program which will control the HEPA filter efficiency, and
- AC procedures which will control the transferred waste temperatures, solids contents, radiological and chemical concentrations, and the transfer pressures for safe operation of the RCSTS and the receiving DST tank.

The RCSTS design eliminates the need for cathodic protection of the new transfer system.

Table 2.2-1. DST Safety Limit Comparisons

Safety Limit[a]	SL	RCSTS Limit
2.1 Primary Tank Maximum Waste Level	≤ 422 inches	AC[b]
2.2 Primary Tank Maximum Waste Temperature	≤ 350° F (AN, AW) ≤ 250° F (SY) ≤ 210° F (AP)	≤ 200° F[c]
2.3 Primary Tank Minimum Vapor Space Pressure	≥ 12 inches (AP) ≥ -6 inches (AN, AW, SY)	None[d,e]
2.4 Primary Tank Maximum Vapor Space Pressure	≤ 60 inches	None[d,e]

a. WHC-SD-WM-OSR-016, Rev 0B
b. RCSTS material balancing AC program will control changes to receiving tank levels.
c. This is not an SL. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
d. No waste storage tanks.
e. RCSTS SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping.

Table 2.2-2. DST Limiting Condition for Operations Comparisons

Limiting Condition for Operation[a]	LCO	RCSTS Limit
3.1 Waste Level monitoring System (Tanks)	Operable	None[b]
	≤ 416 inches ≤ 410 in (102-AW)	AC[c]
3.2 Temperature Monitoring System (Tanks)	≤ 200° F (AN,AW,SY) ≤ 180° F (AP)	≤ 200° F[d]
3.3 Pressure Monitoring System (Tanks)	≥ -4 inches (Low)	None[b]
	> 0 inches (High)	None[b]
3.4 Exhaust Ventilation System (Tanks)	Operable	None[b]
3.4.3 Primary Tank Exhaust Ventilation Filter Radiation	< 200 mrem (HEPA)	None[e,f]
	< 100 mrem (Housing)	None[e]
3.5 Leak detection Systems (Tanks)	Operable	None[b]
3.6 Tank Farm Piping Systems	Operable	Operable[g]
3.6.3 COB, Pit, and Box Covers	Covers on during Transfers	Covers on during Transfers[h]

a. WHC-SD-WM-OSR-016, Rev 0B
b. No waste storage tanks.
c. RCSTS material balancing AC program will control changes to receiving tank levels.
d. This is not an LCO. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
e. RCSTS pits provided with passive ventilation with HEPA filter AC for verification of efficiency.
f. Operable HEPA filters in new pits.
g. RCSTS LCOs for operable PRV at the 200 East Area interface.
h. This is not an LCO. RCSTS AC for covers installed during transfers.

Table 2.2-3. DST Administrative Control Comparisons

Administrative Control[a]	AC	RCSTS AC
5.4 OSR Violations	Occurrence reporting	Occurrence reporting
5.5 Reporting Requirements	Occurrence reporting	Occurrence reporting
5.6 Revisions to the OSRs	DOE approval required	TSR Program
5.7 Waiver of the OSRs	DOE approval required	Organization/Procedures
5.8 Organization	Organization/Function	Organization/Function
5.9 Facility Support and Reviews	Independent reviews	Organization/Function
5.10 Audit Requirements	Records/Retention	Organization/Function
5.11 Unreviewed Safety Questions	USQ process	Organization/Function
5.12 Nuclear Criticality	Criticality prevention	None[b]
5.13 Radiation Protection	Protection requirements	Procedures/Design features
5.14 Effluent Monitoring and Sampling	Monitoring/Sampling	Procedures
5.15 Watch List Tanks	Sampling/Studies/ Monitoring	None[c]
5.16 Sampling	Sampling/Verification	Inventory concentration control
5.17 Corrosion Control	Sampling/Verification	Verification/Flushing/ Pressure testing/ Encasement control
5.18 Compatibility	Sampling/Verification	Inventory concentration control/Verification
5.19 Heat Loads (Tanks)	Limit loads	None[c]
5.20 Hydrostatic Loads (Tanks)	limit loads	None[c]
5.21 Spare Tankage	Tank capacity limits	Material balance
5.23 Tank and Transfer Line Leakage	Operation restriction	Procedures/Design features[d]
5.24 Permit Program for Excavation	Permit	Program/Permit
5.25 Cathodic Protection	Protect transfer lines	None[e]
5.26 Integrity Assessment	Assess barriers	Periodic testing
5.27 Compliance Implementation Plan	OSR implementation	TSR Program
5.28 Concrete Tank Temperature	Limit temperature	None[c]
5.29 Flammable Gases (Tanks)	Ventilation/Work controls	Flushing/Isolation
5.30 Waste Transfer Restrictions	No SST transfers	None[f]

a. WHC-SD-WM-OSR-016, Rev OB
b. Nuclear criticality program is not required for the RCSTS. Further analysis is required prior to operation to confirm criticality requirements for configurations.
c. No waste storage tanks.
d. RCSTS AC procedures control leak alarm responses.
e. RCSTS transfer line insulation barrier design eliminates the need for cathodic protection.
f. Transfers controlled by AWF and DST IOSR for waste transfer restrictions.

2.3 SST IOSR Interfaces

The SST IOSR WHC-SD-WM-OSR-005 (WHC 1995e), *Single Shell Waste Tank Interim Operational Safety Requirements*, were not compared to the RCSTS PSAR (WHC 1995a). The SST waste will be transferred only to DST or AWF staging tanks prior to any cross-site transfers.

2.4 Tank Farms IOSR interfaces

The IOSR WHC-SD-WM-OSR-018 (WHC 1995f), *Tank Farms Interim Operational Safety Requirements*, was compared to the RCSTS PSAR (WHC 1995a). The Tank Farms IOSRs were compared to the RCSTS limits and administrative controls in Table 2.4-1, 2.4-2, and 2.4-3. The RCSTS limits (Table 2.4-1 and 2.4-2) do not reduce the margin of safety as defined in the basis for the Tank Farms IOSRs. However, the Tank Farms will require a new IOSR, and compensatory measure (required by a compliance implementation plan (WHC-IP-0842) for over pressurization from cross-site and tank farm transfers. The RCSTS administrative controls are compatible with the Tank Farms administrative controls with no interface issues (Table 2.1-3).

The RCSTS PSAR requires safety limits for primary transfer piping pressure at the 200 East Area interface. SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping (Section 2.0.1); limiting conditions for operable HEPAs at new pits, and operable PRV and rupture disk at the 200 East Area interface. The PRV and rupture disk LCO will prevent over pressurization of the existing 200 East Area transfer piping (See Section 2.0.2).

The RCSTS PSAR also requires the following ACs which directly interface with the Tank Farms. These and other ACs are addressed in Section 2.0.3.

- Material balance AC program which will monitor changes to the receiving tank levels,
- Pit cover AC program which will control cover installations during transfers,
- AC procedures which will control the transferred waste temperatures, solids contents, radiological and chemical concentrations, and the transfer pressures for safe operation of the RCSTS and the receiving tank farm tanks.

The RCSTS design eliminates the need for cathodic protection of the transfer system, and provides double encased transfer lines.

Table 2.4-1. Tank Farm Safety Limit Comparisons

Safety Limit[a]	SL/LCS	RCSTS Limit
2.1 Safety Limits and Limiting Control Settings	None[a]	AC[b] ≤ 200° F[c] SL[d]

a. WHC-SD-WM-OSR-018, Rev 0 (Draft)
b. RCSTS material balancing AC program will control changes to receiving tank levels.
c. This is not an SL. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
d. RCSTS SL for primary piping pressure shall be ≤230 psig to protect the existing 200 East Area transfer piping.

Table 2.4-2. Tank Farm Limiting Condition for Operations Comparisons

Limiting Condition for Operation[a]	LCO	RCSTS Limit
3.1.1 AWF/DST Primary Tank Maximum Waste Level	≤ 364 inches (AWF) ≤ 416 inches (DST) ≤ 410 in (102-AW)	AC[b]
3.1.2 SST Maximum Waste Level (Tanks)	≤ 359 in.(A,AX,SX) ≤ 275 in.(BY,S) ≤ 183 in.(BX,C,T,U)	AC[b]
3.2.1 AWF Maximum Waste Temperature (Tanks)	Operable	None[c]
	≤ 230° F (Sludge)	≤ 200° F[d]
	≤ 200° F (Liquids)	
3.2.2 SST Maximum Sludge Temperature (Tanks)	Operable	None[c]
	≤ Base Line Values (230° F)	≤ 200° F[d]
3.2.3 DST Maximum Waste Temperature (Tanks)	Operable	None[c]
	≤ 200° F (AN,AW,SY) ≤ 180° F (AP)	≤ 200° F[d]
3.3.1 AWF/DST Minimum Vapor Space Pressure (Tanks)	Operable	None[c,e]
	≥ -4 inches	None[c]
3.3.2 SST Minimum Vapor Space Pressure (Tanks)	Operable	None[c]
	≥ -10 inches	None[c]

a. WHC-SD-WM-OSR-018, Rev 0 (Draft)
b. RCSTS material balancing AC program will control changes to receiving tank levels.
c. No waste storage tanks.
d. This is not an LCO. RCSTS AC procedures will control operating temperatures. The RCSTS is designed for ≤ 200° F (Heat loss 20° F) which limits high heat transfers.
e. RCSTS LCOs for operable PRV at the 200 East Area interface, and operable HEPA filters in new pits.

Table 2.4-3. Tank Farm Administrative Control Comparisons

Administrative Control[a]	AC	RCSTS AC
5.4 IOSR Violations	Occurrence reporting	Occurrence reporting
5.5 Occurrence Reporting	Occurrence reporting	Occurrence reporting
5.6 Organization	Organization/Function	Organization/Function
5.7 Procedures	Procedures	Procedures
5.8 Nuclear Criticality	Prevention/Verification/ Training	None[b]
5.9 Source Inventory Control	Verification/Analysis	Inventory concentration control program
5.10 Flammable Gases	Verification/Controls	Flushing/Isolation
5.11 Waste Tank Organic Safety	Verification/Controls	None[c]
5.12 Dome Load	Load limits	None[c]
5.13 Heat Loads (Tanks)	Limit heat loads	Procedures[c,d]
5.14 Concrete Temperature Variance (Tanks)	limit temperature variances	None[c]
5.15 AWF Tank Waste Solids	Limit solids	Procedures[c,e]
5.16 Sludge Temperature Distribution (Tanks)	Volume Control/ Verification	None[c]
5.17 Transfer System Covers	Verification/Work controls	Verification/Procedures
5.18 Transfer Line Leakage	SST Leak Volume Controls	Procedures/Design[f]
5.19 Exhaust Filtration	Verification	Verification[g]

a. WHC-SD-WM-OSR-018, Rev 0 (Draft)
b. Nuclear criticality program is not required for the RCSTS. Further analysis is required prior to operation to confirm criticality requirements for configurations.
c. No waste storage tanks.
d. RCSTS AC procedures will control operating temperatures. The RCSTS is designed to operate at ≤ 200° F (Heat loss 20° F).
e. The RCSTS is designed for waste transfers of ≤ 30% solids which limits solids transfers.
f. Leak volume controls are for SST single-encased waste transfer systems during transfers, and the RCSTS is designed as a double-encased waste transfer system. RCSTS AC procedures control leak alarm responses.
g. RCSTS AC for verification of HEPA efficiency, and LCO for HEPA operability in new pits during waste transfers.

3.0 CHAPTER 3.0 INTERFACES

The tank farm final safety analysis (ASA) WHC-SD-WM-SAR-065 (WHC 1995g), *Interim Chapter 3.0 Hazard and Accident Analysis*, was reviewed for the creation of new or modified accidents from those previously analyzed in the ASA from the RCSTS PSAR interface, and compare the analysis operation assumptions of the existing tank farm with the new RCSTS. The ASA selected three separate waste transfer accident scenarios for detailed analysis.

- SST farms single-encased pipeline leaks and breaks
- Tank farm waste transfer system spray releases
- DST/AWF waste transfer process piping excavation accident.

In the SST farms, waste transfers into SSTs are prohibited. Furthermore, efforts continue to remove the remaining pumpable liquid waste from the SSTs in order to minimize the volume of waste liquid that is available to drain from them in case of tank leaks. Waste transfers from the SSTs will use either existing pipelines or newly installed overground waste transfer piping and therefore the RCSTS will not be used in conjunction with SSTs.

Tank farm waste transfer systems contain pressurized fluids during waste transfer operations. The pressurized fluids potentially could develop into pressurized spray releases. Analyses were performed to consider the effects of a liquid spray release from a potential breach of waste confinement piping or equipment in an SST pump pit, DCRT pump pit, or a valve pit. The results also are considered applicable to the DST/AWF and cross-country transfer line (RCSTS) waste transfer facilities. Two accident scenarios were considered for the spray release analysis.

- The first was a spray release accident in a valve pit of a salt well jet pump system within the SST farms during a waste transfer operation from an SST to a DCRT. The RCSTS operations are not involved in this operation and therefore do not change the accident scenario.

- The second accident was a leak occurring in a double contained receiver tank (DCRT) pump pit within the tank farms during a liquid waste transfer from the DCRT to the DST farms or while pumping liquid waste into or out of a receiver tank. The tank farms operating DCRTs are enveloped by the analysis. The potential dose consequences demonstrated that spray release accidents that could occur with cover blocks not in place are not acceptable. Radiological dose consequences well in excess of the RAGs for extremely unlikely accidents were calculated for onsite personnel. The transfer system flow rate is not used in the calculations of these dose consequences. This provides a technical basis for the conclusion that controls are necessary to provide assurance that cover blocks are in place during waste transfers. The existing administrative controls make it beyond extremely unlikely that a cover block will not be in place should a spray leak develop (WHC 1995g).

The ASA analysis considered an excavation accident to be the bounding accident for DST/AWF and cross-country transfer facilities pipeline leaks and breaks, because failure of the primary piping from causes such as corrosion are expected to be detected and mitigated by existing design features. An excavation accident could result in a direct release of waste to the soil surface should a transfer be in process when the accident occurred. Two different accident scenarios were considered.

- The first was an AWF pipeline break occurring during a waste transfer between aging waste tanks.
- The second analysis was for a DST pipeline break occurring during a waste transfer between DSTs. Pipeline breaks of the existing cross-site waste transfer line, as well as excavation accidents in the SST farms, are also enveloped by this analysis.

The volume of the waste liquid released varied between the two accidents. The AWF waste transfer pumps are capable of pumping at a flow rate of 965 L/min (255 gal/min) while the DST pumps and the cross-country waste transfer line pumps have lower rated flow, with a maximum flow rate of ≈380 L/min (≈100 gal/min). These flow rates were used to predict volumes of waste releases from both the AWF and DST farms in case of pipeline breaks caused by excavation accidents. Accident consequences were calculated using the AWF pump flow rates since they are significantly higher than the DST or cross-country pump flow rates. The AWF accident scenario was considered to be a worst-case event, and therefore bounds the RCSTS excavation accident consequences.

Overpressurization of the existing 200 East Area transfer piping system is not analyzed in the RCSTS PSAR (WHC 1995a) or the ASA analysis (WHC 1995g). This accident will be analyzed in the Tank Farms FSAR or ISB (WHC 1995b) for cross-site and tank farm transfers. Technical Safety Requirements (TSRs) or IOSRs will be developed as required for existing applicable piping systems.

Also an open item in Section 9.6.5 (WHC 1995a) states that Section 9.4.2 presents a pool release model that seems to yield overly conservative results. The model should be reviewed to assure an appropriate level of conservatism is used in the Tank Farm FSAR or ISB (WHC 1995b).

4.0 DISPOSAL MISSION INTERFACE

The RCSTS decommissioning plan will interface as part of the Hanford Site double-shell tank system WAC 173-303 permit conditions (WHC 1995a). Closure of the RCSTS is not planned for at least 40 years. The closure plan, included in the WAC 173-303 Part B permit application, will be updated as necessary over the life of the RCSTS as new decommissioning technologies are developed.

In addition to the Part B permit application, a decommissioning plan will be developed before the system is operational. This plan will list the buildings to be decontaminated and decommissioned, the anticipated waste generation from decontamination and decommissioning activities, and the disposal plans for all waste streams resulting from those activities.

At the close of RCSTS decommissioning, the buildings and their foundations will have been removed. Any waste remaining at closure will be isolated from precipitation, erosion, and human and animal intrusion by contaminant migration barriers, fencing, warning signs, surveillance, and maintenance procedures governed by the *Resource Conservation and Recovery Act of 1976*.

At the end of the decommissioning project, there will be no loose surface soil contamination or any soil contamination greater than that allowed by *Environmental Compliance* (WHC-CM-7-5) within 30 cm (1 ft) of final grade. Any residual soil contamination greater than WHC-CM-7-5 criteria is to remain below 30 cm (1 ft) from final grade. The level and extent of remaining contamination will be documented in the final reports for the decommissioning project.

5.0 REFERENCES

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

WHC 1995a, *Replacement of the Cross-Site Transfer System Preliminary Safety Analysis Report*, WHC-SD-W058-PSAR-001, Rev 1, Westinghouse Hanford Company, Richland, Washington.

WHC 1995b, *Hanford Tank Farm Facilities Interim Safety Basis*, WHC-SD-WM-ISB-001, Rev 0I, Westinghouse Hanford Company, Richland, Washington.

WHC 1995c, *Aging Waste Facility Interim Operational Safety Requirements*, WHC-SD-WM-OSR-004, Rev 1B, Westinghouse Hanford Company, Richland, Washington.

WHC 1995d, *Double Shell Tank Farm Interim Operational Safety Requirements*, WHC-SD-WM-OSR-016, Rev 0B, Westinghouse Hanford Company, Richland, Washington.

WHC 1995e, *Single Shell Waste Tank Interim Operational Safety Requirements*, WHC-SD-WM-OSR-005, Rev 0B, Westinghouse Hanford Company, Richland, Washington.

WHC 1995f, *Tank Farms Interim Operational Safety Requirements*, WHC-SD-WM-OSR-018, Rev 0 (Draft), Westinghouse Hanford Company, Richland, Washington.

WHC 1995g, *Interim Chapter 3.0 Hazard and Accident Analysis*, WHC-SD-WM-SAR-065, Rev 0 (Draft), Westinghouse Hanford Company, Richland, Washington.

WHC-IP-0842, *TWRS Administration*, Westinghouse Hanford Company, Richland, Washington.

WHC-CM-7-5, *Environmental Compliance*, Westinghouse Hanford Company, Richland, Washington.

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