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7. Abstract

The Mission Analysis Report describes the requirements and constraints associated with the Transfer Waste Function as necessary to support the Manage Tank Waste, Retrieve Waste, and Process Tank Waste Functions described in WHC-SD-WM-FRD-020, *Tank Waste Remediation System (TWRS) Functions and Requirements Document* and DOE-RL 92-60, Revision 1, *TWRS Functions and Requirements Document*, March 1994. It further assesses the ability of the "initial state" (or current cross-site transfer system) to meet the requirements and constraints.

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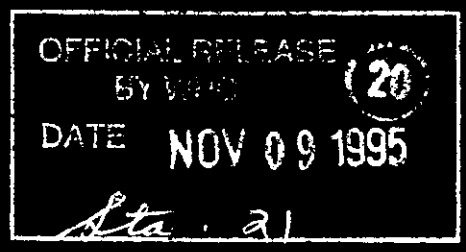

MISSION ANALYSIS
FOR CROSS-SITE WASTE TRANSFERS

Prepared for

Westinghouse Hanford Company
Project W-058
Replacement of Cross-Site Transfer System
WHC-SD-W058-MAR-001, Rev. 0

November 7, 1995

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MISSION ANALYSIS FOR CROSS-SITE WASTE TRANSFERS

Table of Contents

MISSION ANALYSIS FOR CROSS-SITE WASTE TRANSFERS

1.0 INTRODUCTION/PURPOSE

A Mission Analysis has been performed on the Transfer Waste Function as it applies to transferring waste from the 200 West to 200 East Areas. This report of that Analysis will describe the requirements and constraints associated with the Transfer Waste Function as necessary to support the Manage Tank Waste, Retrieve Tank Waste, and Process Tank Waste Functions described in the draft Westinghouse Hanford Company (WHC) document WHC-SD-WM-FRD-020, *Tank Waste Remediation System (TWRS) Functions and Requirements Document*. It will address the customer needs, describe the boundaries and interfaces, and identify overall areas of risk. This analysis will also identify the current problems associated with the initial state of the Transfer Waste System and describe the acceptable end state and the life cycle of transfer activities. The Transfer Tank Waste Function includes requirements associated with movement of waste within the various tank farms, as well as from 200 West to the 200 East Areas (cross-site). The Mission Analysis will review only the requirements/ constraints for the cross-site portion of the Function. The term Cross-Site Transfer System (CSTS) will be used universally to describe a method of moving waste from the 200 West to the 200 East Areas. The analysis considered only those activities, events, and facilities that are in the current planning base and are necessary to achieve the TWRS Site Mission.

2.0 BACKGROUND

The mission of the TWRS is to store, treat, and immobilize high level radioactive waste in a safe environmentally compliant, and cost-effective manner. The TWRS mission includes interim storage, retrieval, pretreatment, immobilization, disposal, and ultimate tank/facility closure. TWRS must remediate tank waste stored in Hanford's single-shell and double-shell tanks (SSTs and DSTs) and associated miscellaneous underground storage tanks (MUSTs) to an environmentally acceptable form that will pose no significant threat to present or future generations. The TWRS mission must also accommodate current and future "newly generated" tank waste. These challenges must be met in a time of declining budgets and increasing regulatory requirements.

Approximately 65 percent of the waste stored in SSTs is in the 200 West Area [see Appendix 1 (Ref 1)]. SSTs have only one barrier between the waste and the environment, and if that barrier were to be breached, a leak to the environment would occur. SSTs have leaked in the past and currently there are 67 tanks that are known to be leaking (Ref 1). Appendix 2 depicts the number of tanks that have been

confirmed as leaking by the year in which they were identified. One of the activities that is currently ongoing within the TWRS is the interim stabilization program under which the liquid waste stored in the SSTs is removed from the tanks (thereby significantly reducing the likelihood of a leak), and transferred to DSTs. There are 28 DSTs located in the 200 Area, with only three of the 28 located in 200 West Area. Of those three, only one currently has available storage capacity and that tank (Tank 102-SY) is planned to be used as a staging tank for all near term transfer purposes. Since the SST waste must be transferred to DSTs in accordance with Tri-Party Agreement (TPA) milestones, the majority of the liquid waste in the SSTs in the 200 West Area must be transferred to DSTs in the 200 East Area, located six miles to the east, for treatment and immobilization. The solid waste contained within the SSTs is planned to be mobilized into a slurry and 200 West Area wastes are to be transferred to the 200 East Area for eventual processing and disposal. The transfer function is a vital step that bridges the gap between waste stored or generated in the 200 West Area and the storage, treatment, and immobilization functions that will take place in the 200 East Area.

An existing underground pipeline [existing cross-site transfer system (ECSTS)] has been used to transfer liquid wastes from 200 West to 200 East Area for the past 40 years. The ECSTS is at (or beyond) the end of its original design life, and four out of the six lines are out of service and unavailable to perform this function due to prior leaks and/or plugging that block the lines. The two remaining unplugged lines do not meet the current regulatory requirements for waste transfer. The Washington State Department of Ecology (Ecology) is allowing continued use of the ECSTS contingent upon a demonstrated program toward a replacement system. In addition, the piping was not designed to operate within the parameters expected to be required for slurry transfers at the currently anticipated dilution ratios. Any replacement system for the ECSTS must be designed and constructed in full compliance with the current regulatory requirements and provide a full range of functions that would support liquid and slurry transfers.

Rail tanker cars and trailer tanker trucks have been used successfully in the past at the Hanford Site to transfer low-level waste cross site. The existing surface vehicle and loading/unloading facilities do not meet current regulatory requirements. Any use of a surface transportation method to perform the transfer function will require additional loading/unloading facilities and vehicles that would have to be designed and constructed in order to comply with current regulatory requirements for the transfer of high-level waste. Further, surface transfer methods could not support the ability to transfer the volumes necessary to make an emergency transfer in the event of a DST leak in the SY Farm (Staging Tanks).

U.S. Department of Energy, Richland Operations Office (DOE-RL) document DOE-RL 92-60, Revision 1, *TWRS Functions and Requirement Document*, March 1994 (Ref 2) provides upper-level requirements associated with current operations and future TWRS activities. A current revision is being developed (proposed document number is WHC-

SD-WM-FRD-020, but this document has not been completed and has not received DOE-RL approval) that will provide additional information for the mission analysis since the Transfer Function and Requirements are developed more fully. The requirements of both the current F&RDs and the draft revision will be referred to within this analysis.

3.0 MISSION AND NEED

3.1 Mission

Provide a safe, reliable, cost-effective system for the transfer of high-level radioactive/mixed waste (liquid and slurry) from the 200 West Area to the 200 East Area in support of the appropriate Manage, Retrieve, and Process Waste Functions defined in the document WHC-SD-WM-FRD-020, *TWRS Functions and Requirements*. This system shall be compliant with environmental, regulatory, and U.S. Department of Energy (DOE) requirements, and will be capable of supporting the current and future TWRS activities.

3.2 Problem Statement

There is currently no method of transferring high-level radioactive and mixed-tank waste from the 200 West Area to the 200 East Area which is compliant with the safety and regulatory requirements and which meets the currently identified and future mission and operational constraints. The current system (ECSTS) is non-compliant and has exceeded its original design life, is unreliable, is not supportive of future mission needs, and has been found to be very labor intensive to operate. Figure 1 depicts the types and volumes of waste requiring transfer, the program these transfers support, and the timing for these transfers.

The requirements of each major element of the TWRS program formed the basis for the problem statement. These requirements are summarized below.

3.2.1 Manage Tank Waste

The Manage Tank Function requires safe, reliable, cost-effective, and compliant capability to transfer liquid and slurry wastes cross-site between now and the year 2028. Up until the year 2005, the predominance of waste transfers associated with this function will be liquid from the SST stabilization process. After the year 2005, the newly generated wastes from the Plutonium Finishing Plant (PFP), T-plant, and the 222-S Labs will produce the majority of liquids requiring cross-site transfer.

3.2.2 Retrieve Tank Waste

The Retrieve Tank Waste function requires a safe, reliable, cost-effective, and compliant transfer system. The predominance of waste transfers associated with this function are to be slurry transfers produced from sluicing of SSTs.

3.2.3 Process Tank Waste

The Process Tank Waste function includes pretreatment and vitrification processes. The pretreatment process will create a secondary, high-level waste stream that will require transfer to the aging waste DSTs in the 200 East Area for storage prior to the final immobilization and disposal.

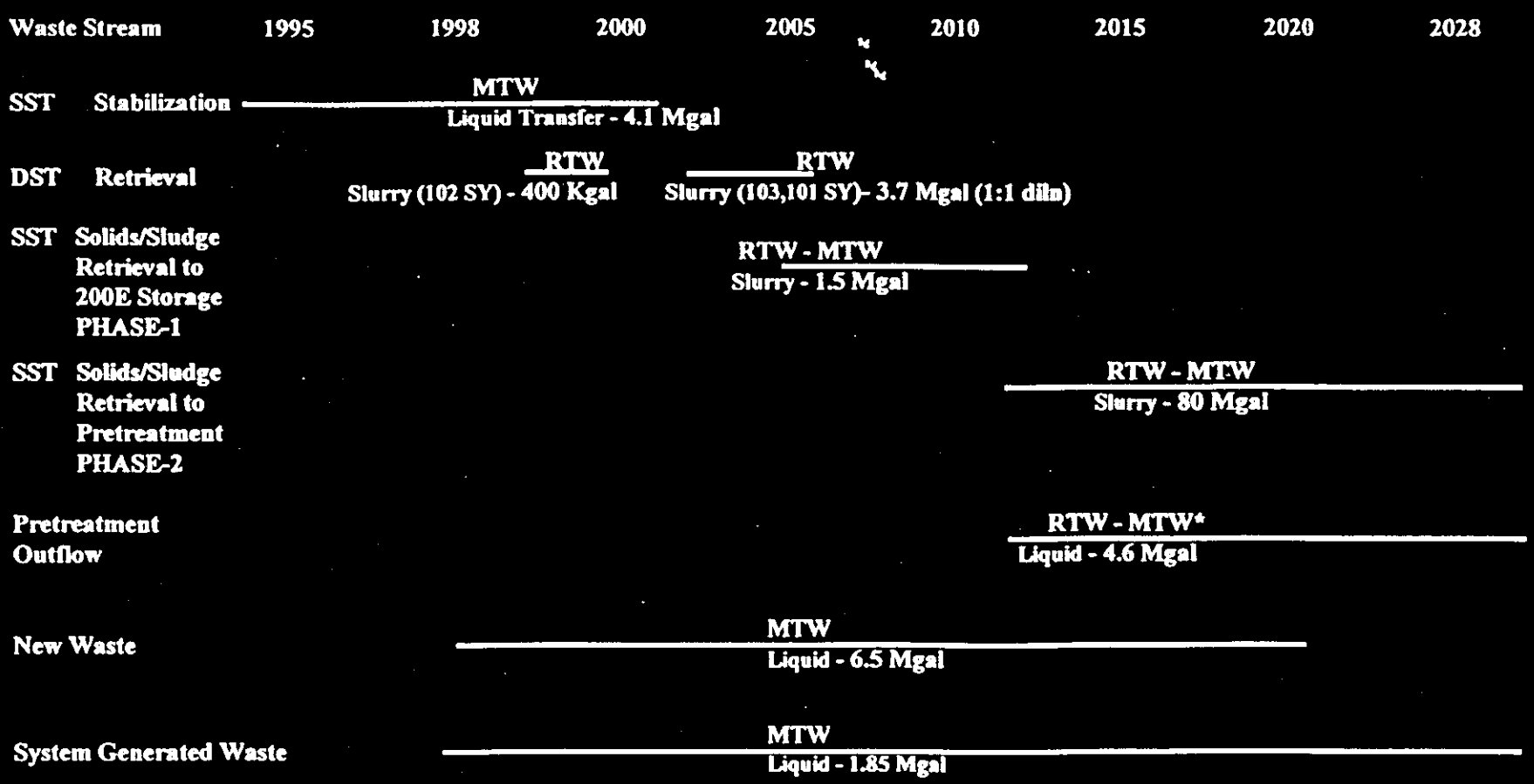
A safe, reliable, cost effective compliance system to support these transfers is required. The vitrification process will require transfer capability for input and output streams. The quantities and routings of these transfers are uncertain at this time, however, cross-site transfer capabilities should consider these needs to the extent possible so as to not preclude support.

3.3 Boundaries and Interfaces

The Cross-Site Transfer System shall be capable of receiving waste from the SY Tank Farm (Tank 102-SY is currently designated as the staging tank for waste transfers) in the 200 West Area and delivering it to a location from which it can be routed to a suitable tank in the 200 East DST storage system. The cross-site Transfer Function itself begins at the SY Tank Farm in the 200 West Area (currently Tank 102-SY) and ends at the DSTs in the 200 East Area. The actual point of connection in 200 West and 200 East Area will be dependent on the architecture chosen for the transfer function. Capability to connect to a future process waste facility in the 200 East Area shall not be precluded. All system boundaries must be consistent with the overall TWRS mission.

Activities with which the Cross-Site Transfer Function must interface include: 1) the current Tank Farm operations salt well pumping activity, as well as the newly generated waste from PFP, T Plant and 222-S Labs, in the Manage Tank Waste Function; 2) planned retrieval activities assigned to the Retrieve Tank Waste Functions; and 3) the Input/Output Stream requirements associated with the Process Tank Waste activity. A time-phased representation of these major interfaces is shown in Figure 1. The timing of the interfaces was taken from WHC-SR-WM-ER-029, Rev. 21, *Operational Waste Volume Projection* (Ref 4). The acceptable end state must accommodate these interfaces. Figure 2 depicts the physical locations of existing tanks and facilities involved with these functions.

Figure 1 - CSTS ACTIVITIES/TIME LINE and VOLUME



Functions: MTW - Manage Tank Waste, RTW - Retrieve Tank Waste, PW - Process Waste

* May not require CSTS use.

Volumes extracted from Operational Waste Volume Projection, rev. 21, unless otherwise noted, and subdivided to determine portion requiring use of CSTS.

3.4 Initial State

For purposes of the Mission Analysis, the initial state was defined in terms of the ability of the existing site infrastructure to fulfill the current, short-term and long-term requirements of the Transfer Function, including compliance with safety and regulatory requirements. Short term shall be defined as 1995-2005 and long term as 2005-2028.

The ECSTS consists of six, three-inch, schedule 10S pipes contained in a reinforced concrete encasement. This encasement is in the form of a channel shaped lower portion that contains all six lines situated adjacent to each other in a horizontal plane. A concrete cap covers the top of the encasement and a caulking material is used between cap pieces to seal the encasement from moisture intrusion. The concrete is coated with a minimum of four coats of a moisture proofing material. The piping is not heat traced, insulated, or coated.

One of the existing pipes was pressure tested in the spring of 1995 and subsequently used for a transfer of 430,000 gallons of liquid waste from 200 West to 200 East Area. The status of the second available ECSTS pipe is not known at this time. A pressure test is scheduled for the spring of 1996. It has been the past practice to perform a pressure test to verify piping integrity prior to each transfer. In one recent test, it took over one year to plan, obtain the appropriate approvals, assemble the inspectors/viewers, conduct the test, and submit the reports necessary to accomplish the recent transfers. An analysis of the ECSTS from a reliability perspective was performed (G. A. Coles, 1995-Risk and Reliability Information About the Cross-Site Transfer System-GAC-8M400-95-002). This analysis concluded that even with the second line pressure tested and available, a reliability of only approximately 16 percent over the next ten-year period could be expected.

The ECSTS has leak detection capability at the end points of the six-mile pipeline and depends on a level alarm for the leak detection function. This alarm system does not meet current Washington State or DOE requirements. There is no secondary containment in the current regulatory sense and there is no method to test the integrity of the concrete conduit. Thus, under the current state, leaks to the environment could occur and go undetected for the period of time it took the waste to reach the leak detectors or until the mass balancing procedure utilized during transfers to monitor waste flow could detect a loss of material. This condition is unacceptable to regulatory requirements for extended operations. Ecology is allowing the use of the ECSTS until the Replacement CSTS (RCSTS) is available in 1998, provided continued progress is made toward this end.

Railroad cars or container trucks have been used to transport the waste at the Hanford Site in the past. Surface transportation vehicles must comply with the U.S. Department of Transportation (DOT) standards or WHC requirements. There is currently no compliant vehicle for the transport of high-level waste available.

Surface transport would require a loading facility in 200 West Area that complies with appropriate regulations. Also, additional underground transfer piping from Tank 102-SY to the station would be required. The unloading station in the 200 East Area (204 AR Vault) is not designed for receipt of slurry wastes. The DOT qualified railroad tankers are not shielded and ALARA considerations may cause problems for this method of surface transfer when high-level waste is being moved.

Container trucks hold 1,000 gallons of waste while the non-shielded railroad cars hold a nominal 20,000 gallons. High-level waste will significantly reduce the amount of waste that can be carried at any one time by rail cars due to exposure considerations. Unloading the tanker cars has required a three-shift effort in the past. The loading/unloading connection and disconnection currently requires a hands-on operation, thus, increasing worker exposure. The capability of the tanks on surface vehicles to contain the gas generated by the waste while in transit requires investigation.

The initial state provides a non-compliant system of low reliability which does not support all near-term needs and is unacceptable for long-term mission support.

4.0 ACCEPTABLE SYSTEM DESCRIPTION

4.1 Acceptable End State

The acceptable end state must provide a transfer system which is reliable, cost effective to design, construct, and operate, compliant with safety and environmental criteria, and which supports the transfer of high-level radioactive waste in liquid and slurry form from 200 West to 200 East Area for the duration of the TWRS mission. The method(s) of transfer must meet the Manage, Retrieve, and Process Tank Waste requirements from the present to 2028 (when final closure activities are scheduled to be completed).

4.2 Constraints and Requirements

4.2.1 TWRS Operational Constraints

The needs of the customers were identified through interviews with individuals representing: Operations Management (East and West), Waste Volume Projections, Environmental Compliance, Waste Retrieval, Programs, Operations Engineering, and Retrieval Projects Management, and through document review. The major needs identified during those interviews are summarized below, and for purposes of Mission Analysis, are considered to be constraints.

- A compliant system that will allow the slurry transfer of Tank 102-SY in 1998 is required to support the interim stabilization milestones and overall waste management planning.

- A more reliable leak detection system is required. The current system detects moisture as a result of water intrusion into the diversion boxes and sets off the alarms stopping the transfer.

- The instrumentation required to monitor the transfer function must be qualified to and remain operational in the Hanford Site environmental conditions.

- A reliable cross-site transfer system which is not subject to a single point failure limiting the ability to transfer waste is required.

- A loading/unloading system and the associated supporting transfer lines from the SY tanks that will allow the loading of the surface transfer vehicle to be in compliance with the current regulations is required if surface transfer is considered. In addition, a compliant facility will be required in the 200 East Area. Sufficient transfer vehicles to effect timely waste volume movement must also be provided.

4.2.2 Primary Constraints and Requirements From Systems Engineering

The higher level requirements presented in this Mission Analysis are driven by the TWRS mission and WHC document WHC-SD-WM-FRD-020, *TWRS Functions and Requirements Document*. Both the approved F&RD and the current draft revision of the F&RD have been used to establish the most applicable requirements for the transfer function. The functions requiring support from the transfer of waste include Manage Tank Waste, Retrieve Tank Waste, Process Waste, and Transfer Waste. The Requirements necessary to achieve those functions are found in WHC-SD-WM-FRD-020, *TWRS Functions and Requirements Document*.

It has been assumed that Manage, Retrieve, and Process Waste Functions will provide requirements for transfer of wastes (i.e., quantities, specific actions, etc.), but that the Transfer Waste Function will actually provide the requirements that will affect waste transfers. The requirements for the Transfer Function are described below in conjunction with the time line depicted within Figure 1. This figure demonstrates the relationship between the primary operational activities associated with the Manage, Retrieve, and Process Waste Functions and the time frames during which these activities must occur. The time frames were taken from WHC document WHC-SD-WM-ER-29, Revision 21, *Operational Waste Volume Projection Report*. This figure also identifies the approximate volumes to be transferred as part of each function based on WHC-SD-WM-ER-29.

The following paragraphs provide the correlation of Operational Activities and the primary functions of the F&R documents, along with the relative timing of these activities based on Figure 1. In some cases, a particular Operational Activity may involve more than one Function and Requirements (e.g., 4.2.2.2 DST Retrieval). In those cases, both functional requirements were addressed for completeness.

4.2.2.1 SST Stabilization

The Manage Tank Waste Function in the proposed revision for the TWRS F&RDs states that:

> "Manage Tank Waste will be limited to the storage of waste prior to retrieval for processing: waste characterization, transfer of supernatant for the resolution of safety issues, organization of tank space, volume reduction, ***interim stabilization***,..." (Emphasis added)

During most SST waste management stabilization processes, the predominance of waste requiring transfer will be liquid. Until 1998, the ECSTS and the pumps currently available will be used to accomplish the transfers provided the lines remain useable.

4.2.2.2 DST Retrieval

The Manage Tank Waste function in the current TWRS F&RDs states that:

> "***Remove tank waste from*** SST, ***DSTs*** and miscellaneous tanks, and remove the cesium and strontium capsules from storage for transfer to other facilities. Wastes to be removed from the tanks include liquid, salt cake, sludges, slurries, and solids (e.g., failed equipment, concrete, rocks, lead bricks, samarium balls, and cobalt slugs). Solids will be removed only to the extent necessary to prevent interference with the retrieval of the wastes or as required to allow completion of closure activities."

The Retrieve Tank Waste function in the proposed revision to the TWRS F&RDs states that:

> "The ***removal of wastes (i.e., liquid, salt cake, sludges,*** in-tank hardware, and discrete sources) from underground storage tanks (USTs) and the transfer of these wastes to the Process Waste function. Wastes will be removed to the extent required for turnover of the tanks for closure.

> This function does not include the removal of previously retrieved waste from the DSTs (see the Store In-Process Waste function). This function also includes treatment/preparation of liquid, gaseous and solid waste generated during retrieval of tank wastes."

Both documents are referenced here to allow the transfer waste requirements to be traceable to the current TWRS documentation, and to identify where these same requirements will reside upon approval of the proposed revisions.

Beginning in 1998, the solids and sludge in Tank 102-SY will be mobilized into a slurry and removed and transferred to the 200 East Area. The means to affect this transfer must be provided, since the existing system does not have the capability. The DST waste in Tanks 101 SY and 103 SY will be removed and transferred to the 200 East Area beginning in 2003 (Ref 4).

4.2.2.3 Phase 1 Retrieval (SST Solids/Sludge Retrieval to 200 East Storage)

The Retrieve Tank Waste function in the current TWRS F&R states that:

> "***Remove tank waste from SST,*** DSTs and miscellaneous tanks, and remove the cesium and strontium capsules from storage for transfer to other facilities. Wastes to be removed from the tanks include liquid, salt cake, sludges, slurries, and solids (e.g., failed equipment, concrete, rocks, lead bricks, samarium balls, and cobalt slugs). Solids will be removed only to the extent necessary to prevent interference with the retrieval of the wastes or as required to allow completion of closure activities."

Phase 1 of the SST solid waste retrieval will begin in 2002 and end in approximately 2005 and will require that the capability to perform a slurry waste transfer through qualified system from 200 West to 200 East Area be available.

4.2.2.4 Phase 2 Retrieval (SST Solids/Sludge Retrieval to Waste Processing in 200 East)

The Retrieve Tank Waste function in the current TWRS F&RDs states that:

> "***Remove tank waste from SST,*** DSTs and miscellaneous tanks, and remove the cesium and strontium capsules from storage

> for transfer to other facilities. Wastes to be removed from the tanks include liquid, salt cake, sludges, slurries, and solids (e.g., failed equipment, concrete, rocks, lead bricks, samarium balls, and cobalt slugs). Solids will be removed only to the extent necessary to prevent interference with the retrieval of the wastes or as required to allow completion of closure activities."

Phase 2 of the SST solid waste retrieval will begin in 2005 (Ref 4) and will require that the capability to perform a slurry waste transfer through a qualified system to transfer the waste from 200 West to 200 East Area be available.

4.2.2.5 Pretreatment Out Flow

The Process Waste function defined in the current TWRS F&RDs states that:

> ***Process tank waste (including DST waste, SST waste***, miscellaneous underground storage tanks that contain high-level waste, and cesium/strontium capsules (is required), for disposal. ***This includes in-process waste transfer*** and storage, any pretreatment (if required), immobilization of low-level wastes, immobilization and certification of high-level wastes for acceptance into the Civilian Radioactive Waste Management System (CRWMS). Also included is the treatment/preparation of the gaseous/liquid effluent and solid wastes generated during the processing of tank waste. Wastes excluded from processing by this function are the underground storage tanks and support structures, production reactors fuels, radioactive materials at reactors, disposal facilities, transfer lines, cribs, ponds, and ditches.

It is unknown at this time as to exactly what role the CSTS will play, if any, in the waste processing activities. A high-level waste stream will be generated as a result of processing pretreatment activities that will have to be transferred to the aging waste DSTs in the 200 East Area. Any architecture that is chosen for the transfer function should evaluate and not preclude the ability to transfer this waste stream to the "aging waste" DSTs.

4.2.2.6 New Waste/System Generated Waste

The Manage Tank Waste Function defined in the current TWRS F&RDs states that:

> "Manage existing tank waste (e.g., waste contained in DSTs; SST, and miscellaneous tanks), ***new tank waste from site level interfaces (e.g., facility operations, D&D, ER), and in-process waste (e.g., pretreated HLW, pretreated LLW, partially pretreated waste)*** from TWRS." (emphasis added)

The CSTS must be capable of transferring the new waste generated as a result of 200 West Area facility operations, D&D, and terminal clean out.

4.2.3 External

4.2.3.1 The Tri-Party Agreement (TPA)

The TPA was signed by DOE, Ecology, and the U.S. Environmental Protection Agency to govern waste management and cleanup of the Hanford Site and was renegotiated in 1994. The solutions for the final disposition of the radioactive, hazardous, and mixed wastes must comply with Federal and Washington State environmental laws and regulations, and be within the context of the TPA. Permanent solutions to tank waste risks are a major goal of the agreement. As part of this agreement to monitor progress and to ensure that progress is being made to reduce the risks, enforceable milestones have been developed that are considered to be very important. Failure to meet these milestones can result in severe penalties.

There are three significant enforceable milestones that require that the previously discussed capabilities of the transfer system be available:

- M-43-07 - *Complete Project W-058, "Replacement of Cross-Site Transfer System," by February 28, 1998.*

  Although this refers to the RCSTS, it would appear that any acceptable environmentally compliant method of transfer may suffice. If a method of transfer other than the RCSTS is utilized, negotiations with Washington State with regard to the meaning of the M-43-07 milestone must occur.

- M-41-00 - *Complete Single-Shell Tank Interim Stabilization by September 30, 2000.*

  This is important since many of the SSTs are leaking, some new leaks begin each year, the design life of these tanks has been

exceeded, and there is no double containment to meet Resource Conservation and Recovery Act (RCRA) requirements. While the milestone includes SSTs in both the 200 West and 200 East Areas, a significant number of the tanks identified with target dates are located within the 200 West Area. The mobilization and slurry transfer of the solid wastes of Tank 102-SY is currently on the critical path to achieving this milestone. Transfer capabilities discussed in Section 4.2.2.2 are required.

- M-45-05 - *Retrieve Waste from All Remaining Single-Shell Tanks by September 30, 2018.*

  This is important as part of the overall goal to find and proceed with permanent solutions to reduce risks associated with the tank wastes. The transfer system capabilities discussed are required.

4.2.3.2 Washington Administrative Code (WAC 173-303-640) *Dangerous Waste Regulations*

This section of the WAC defines the requirements for tanks and ancillary equipment (e.g., piping) containing dangerous wastes.

"Ancillary equipment must be:

Provided with secondary containment (e.g. trench, jacketing, double-walled piping).

Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, ground water, or surface water at any time during the use of the tank system; and capable of detecting and collecting releases and accumulated liquids until the collected material is removed.

Constructed or lined with materials that are compatible with the waste(s) to be placed in the tank system and must have sufficient strength and thickness to prevent failure owing to pressure gradients, physical contact with the waste to which it is exposed, ...

Placed on a foundation or base capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement, compression or uplift.

> Provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of dangerous waste or accumulated liquid in the secondary containment system with twenty-four hours, or at the earliest practicable time ...
>
> Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment within twenty-four hours, or in as timely manner as is possible to prevent harm to human health and the environment, ... "

4.2.3.3 DOE Orders

The DOE Orders provide specific requirements regarding dangerous wastes. DOE Order 5820.2A, *Radioactive Waste Management* requires:

> "All new high-level waste handling, transfer, and storage facilities (e.g., tanks, bins, pipelines, and capsules) shall be doubly contained.
>
> Secondary containment systems shall be capable of containing liquids that leak into them from the primary system and shall be equipped with transfer capability to retrieve the leaked liquid.
>
> Leak detection systems shall be designed and operated so that they will detect the failure of the primary containment boundary, the occurrence of waste release, or accumulated liquid in the secondary containment system.
>
> Singly contained pipelines may be used routinely for liquid waste that has a total radioactive concentration of less that 0.05Ci/gal. They may be used on a temporary basis for higher activity waste if appropriate design and administrative controls are in place to mitigate adverse effects from a pipeline failure.
>
> For emergency situations involving liquid high level waste, spare capacity with adequate heat dissipation capability shall be maintained to receive the largest volume of liquid contained in any one tank. Adequate transfer pipelines also shall be maintained in operational condition. Interconnected tank farms with adequate transfer capabilities and spare capacity may be

considered as a single tank farm for purposes of this requirement."

4.2.4 Risk

There are technical, programmatic, and environmental risks associated with the Transfer Waste Function. The technical risks appear to be minor if a new system is installed. Systems architecture will not significantly change the technical risks since the technology of transferring waste on site in underground pipelines or via surface vehicles has been practiced in the past, although in both cases, methods utilized previously were non-compliant with current regulations. The compliance with new regulations introduces a minor complication but should not significantly increase the technical risk. Significant technical risks are associated with the existing system if total mission support is attempted due to the age of the ECSTS and its original design features.

A primary programmatic risk is the failure to meet the TPA Milestone M-41-00 date of September 2000 for the Stabilization of the SSTs. The current document, WHC-SD-WM-ER-029, Rev. 21, *Operational Waste Volume Projection Report*, cites 1998 as the date when a slurry transfer will occur from Tank 102-SY. The transfer at this date is required in order to remove the non-complexed TRU waste from Tank 102-SY, such that the tank can be used for the transfers of complexed waste from 200 West Area SSTs. No transfer system is available to meet the anticipated requirements.

Another significant programmatic risk is the potential inability to support the retrieval/disposal functions with an adequate system. This could significantly increase costs and impact other TPA milestones.

The environmental risk will be lowered from the present state when a compliant system which supports all functions is developed.

4.3 Life-Cycle

The life cycle for an environmentally compliant system to achieve the Transfer Function begins at the conceptual design phase after the architecture has been identified through the use of trade studies. Final design, construction, acceptance testing, and preoperational testing leads to the Operational Readiness Review and declaration of readiness to operate. Operation will begin in 1998 when the first slurry from Tank 102-SY requires transfer to 200 East Area. Operational requirements continue until the D&D of the system after the terminal clean-out operations of all tanks and facilities within 200 West Area. The cycle includes: Design, Procurement, Construction, Operation (Manage, Retrieve, Process Tank Waste, and support facility cleanup), and D&D.

5.0 SUMMARY

The major risks are associated with lack of action. The current condition is unacceptable for long-term efforts, and increases health, environmental, and programmatic risks due to the lack of reliability and compliance.

This Mission Analysis determines that a safe, reliable, compliant transfer system is required to support the TWRS Mission. This system must be capable of supporting liquid and slurry transfers from the 200 West to the 200 East areas from 1998 until the final closure and D&D of all tanks and facilities located in the 200 West Area.

The operational constraints and functional requirements necessary to accomplish this effort are well defined at the upper level.

6.0 REFERENCES

1.) Westinghouse Hanford Company (WHC) document WHC-EP-0182-87, *Waste Tank Summary Report*, Hanlon, June 30, 1995.

2.) U.S. Department of Energy (DOE) document DOE-RL 92-60, Revision 1, *TWRS Functions and Requirements Document*, March 1994.

3.) Westinghouse Hanford Company (WHC) document WHC-SD-WM-FRD-020, *Tank Waste Remediation System (TWRS) Functions and Requirements Document*, DRAFT.

3.) Westinghouse Hanford Company (WHC) document WHC-SR-WM-ER-029, Rev. 21, *Operational Waste Volume Projection*.

APPENDIX 1
WASTE VOLUME IN 200 WEST SST

200 West SST Tank Farms	
T	2022
TY	638
TX	7009
U	3550
S	5510
SX	4425
	23154 (Kgal) Total West Area Waste

200 East SST Tank Farms	
BY	4680
B	2057
BX	1501
C	2122
AX	906
A	1537
	12803 (Kgal) Total East Area Waste

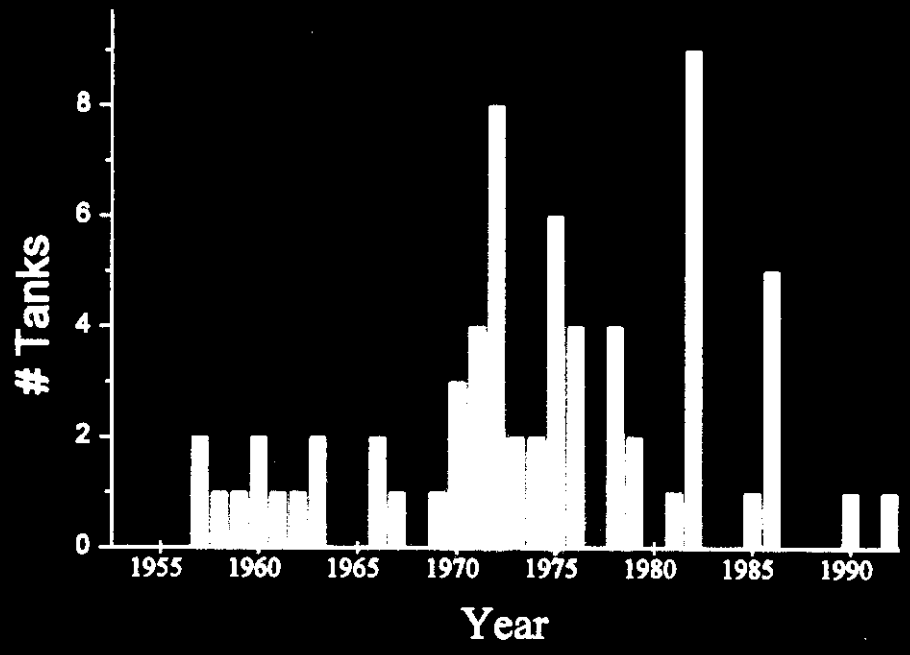
35957 (Kgal) Total SST Waste

64.39 % of Total SST Waste in West Area Farms

Reference: Westinghouse Hanford Company, WHC-EP-0182-87, *Waste Tank Summary Report*, Hanlon, June 30, 1995

APPENDIX 2

NUMBER OF LEAKING SST BY YEAR



Reference: Westinghouse Hanford Company, WHC-EP-0182-87, *Waste Tank Summary Report*, Hanlon, June 30, 1995, Table E, "Inventory and Status."

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