Tank Waste Remediation System Decisions and Risk Assessment

M. E. Johnson

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EXECUTIVE SUMMARY

The U.S. Department of Energy is faced with several challenges in executing the remediation of tank wastes (includes cesium and strontium capsules) at the Hanford Site. Key decisions are necessary to establish the tank waste remediation mission scope, requirements, or selection of technical solutions for accomplishing the identified mission. The U.S. Department of Energy is initiating a dialogue with the local Indian Nations, the public, and other effected stakeholder groups to discuss these decisions and develop a consensus basis for proceeding with remediating the Hanford Site tank wastes.

This document provides information on each of these key decisions. Each decision is described, alternative solutions discussed, and information available or necessary for evaluating alternative solutions identified. In order to proceed with the development and execution of the tank waste remediation program, the U.S. Department of Energy has adopted a planning basis for several of these decisions, until a more formal basis is established. The technical and programmatic risks (uncertainty and qualitative impacts) derived from proceeding with the planning basis for each decision is discussed. The planning basis adopted for these decisions is embodied in the Tank Waste Remediation System (TWRS) program baseline, which is detailed in the TWRS Program Multi-Year Work Plan (WHC 1994a).

1.0 INTRODUCTION

The Tank Waste Remediation System (TWRS) mission is to store, treat, and immobilize the highly radioactive Hanford Site tank wastes and encapsulated cesium and strontium materials in an environmentally sound, safe, and cost effective manner. Additionally, the TWRS conducts, as part of this mission, resolution of safety issues associated with the wastes within the 177 underground radioactive waste tanks.

Systems engineering principles are being applied to determine the functions and establish requirements necessary for accomplishing the TWRS mission (DOE 1994 draft). This systematic evaluation of the TWRS program has identified key decisions that must be executed to establish mission scope, determine requirements, or select a technical solution for accomplishing identified functions and requirements.

Key decisions identified through the systematic evaluation of the TWRS mission are presented in this document. Potential alternative solutions to each decision are discussed. After discussion and evaluation of each decision with effected stakeholder groups, the U.S. Department of Energy (DOE) will select a solution from the identified alternatives for implementation. In order to proceed with the development and execution of the tank waste remediation program, the DOE has adopted a planning basis for several of these decisions, until a formal basis is established. The planning bases adopted by the DOE is continuing to be discussed with stakeholder groups to establish consensus for proceeding with proposed actions. Technical and programmatic risks associated with the planning basis adopted by the DOE are discussed.

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2.0 SUMMARY OF PROGRAM DECISIONS

A preliminary list of decisions effecting the technical requirements, and/or scope of the TWRS has been prepared from information contained in the *Tank Waste Remediation System Functions and Requirements* document (DOE 1994a draft). These preliminary decisions, alternative solutions, and planning basis adopted by the DOE are listed in Table 2-1. Figure 2-1 graphically depicts the relationships between each decision and alternative solutions. The logical relationships between decisions identified in Figure 2-1 do not imply relative importance of each decision.

The methodology for conducting decisions and detailed discussion of each decision are provided in Sections 3.0 and 4.0, respectively. For each decision, a series of alternative solutions have been proposed (Section 4.0). Information on each alternative solution needs to be developed in terms of the decision criteria in order to select a solution for each decision.

The solution selected for each decision will influence the scope and detailed plans of the TWRS program. Development of information on each alternative solution, selection of a solution for each decision, and the influences on the detailed plans of the TWRS program are identified in Figure 2-2. Figure 2-2 reflects integration of the identified decisions with the schedules developed for execution of the TWRS program (WHC 1994a).

In order to proceed with the development and execution of the TWRS Program, a planning basis has been adopted for each of these decisions. There are several significant uncertainties in the TWRS Program derived from adopting a planning basis in lieu of having a formal basis for each decision. These major uncertainties are discussed below. Other sources of program uncertainties are derived from the preliminary nature of the program definition and include; the accuracy of the program cost and durations for conducting tasks (i.e. schedule), maturity and development of technologies necessary to execute the TWRS mission, definition of actions necessary for resolution of safety issues associated with storage of tank wastes. These TWRS Program uncertainties are discussed in the *Tank Waste Remediation System Program Multi-Year Work Plan* (WHC 1994a) and the *Tank Waste Remediation System Integrated Technology Plan* (DOE 1994b draft).

2.1 SUMMARY OF SIGNIFICANT PROGRAM UNCERTAINTIES

Program uncertainties exist because a lack of information is available to make decisions. The TWRS Program technical uncertainties addressed in this section are those derived from adopting a planning basis for each program decision in lieu of having the necessary information to conduct a formal decision.

2.1.1 Tank Waste Characteristics

The principle set of information needed to conduct many of the decisions identified in Table 2-1 is the accurate determination of the physical and chemical properties of the Hanford Site radioactive tank wastes. An understanding of the tank waste properties is essential to identifying and resolving safety issues associated with safe storage of wastes within the underground tanks. Knowledge of tank waste properties is necessary for development of the technical approach for processing, immobilizing, and safely disposing of tank wastes.

It is uncertain at this time whether all tank safety issues have been identified because each tank has not been characterized to the extent needed for determination of physical and chemical properties. Additionally, the effectiveness of proposed waste retrieval strategies, waste separations processes, and waste immobilization processes is uncertain due to the lack of tank waste properties information. The resolution of these uncertainties may result in revision to the TWRS Program technical strategy, cost and schedule duration.

The U.S. Department of Energy and its contractors are focusing resources to accomplishing sampling of all 177 radioactive underground waste storage tanks by February 1997 (WHC 1994a). A methodology (data quality objectives process) is being used to ensure the needed tank waste physical and chemical properties information, identified by each TWRS Program element, is obtained in a timely manner to support program decisions. Through successful execution of this plan to obtain the needed tank waste physical and chemical properties information, the availability of tank waste properties information to support decisions can be managed to a low level of risk.

2.1.2 Disposition of Hanford Tank Wastes (Decision 4.2)

The disposition of wastes contained in the double-shell tanks, single-shell tanks and the encapsulated cesium and strontium materials was previously evaluated in the *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (DOE 1988). The record of decision was to package the capsules to meet the waste acceptance specifications for the commercial geological repository and transport the capsules to the repository for disposal. The double-shell tank wastes were to be separated into a low-activity and high-activity fraction. The low-activity fraction was to be converted to a cementitious grout and disposed at the Hanford Site. The high-activity fraction was to be incorporated into a glass matrix and disposed in a geological repository. No decision was reached on the disposition of the

wastes contained in the single-shell tanks, partially due to a lack of tank waste characteristics information.

Subsequent to the issuance of the record of decision for the Hanford tank wastes, the U.S. Department of Energy entered into the Hanford Federal Facility Agreement and Consent Order (Ecology 1994). This agreement ensures the environmental impacts associated with past and present activities at the Hanford Site are thoroughly investigated and appropriate response actions taken as necessary to protect the public health, welfare, and the environment. This agreement specifically requires at a minimum retrieval of 99 percent of the wastes contained in the single-shell tanks, pretreatment of these wastes and the double-shell tank wastes to separate the wastes into a low-activity and high-activity fraction, and vitrification of both waste fractions.

The National Environmental Policy Act (NEPA) evaluation has not been conducted for the actions proposed in the Hanford Federal Facility Agreement and Consent Order for disposition of the tank wastes. An environmental impact statement (EIS) addressing the proposed actions for single-shell tank wastes and the modifications to the record of decision for the double-shell tank wastes is scheduled to be completed October 1996 (WHC 1994a). The TWRS Program is based upon the actions proposed in the Hanford Federal Facility Agreement and Consent Order for disposition of the tank wastes. The NEPA evaluation could significantly change scope of the TWRS Program.

The U.S. Department of Energy is managing the uncertainty associated with the TWRS NEPA evaluation in a manner which will minimize impacts to the program. The TWRS program is not scheduled to engage in the detailed design of any major facility needed for treatment and disposal of Hanford tank wastes until completion of the TWRS EIS in order to reduce financial exposure. Organizations which participated in the development of the Hanford Federal Facility Agreement and Consent Order are continuing to be actively involved in the TWRS EIS. Their continued support will ensure a consensus is reached on the proposed actions for disposition of the tank wastes.

2.1.3 NRC Determines Classification of Single-Shell Tank Waste (Decision 4.2.3.c)

For the double-shell tanks, the U.S. Nuclear Regulatory Commission (NRC) has ruled that incidental waste (low-level waste resulting from high-level waste processing) may be disposed of onsite if certain conditions are complied with (Bernero 1993). The TWRS Program planning basis assumes the NRC will reach a similar decision after reviewing characterization data and processing plans for single-shell tank (SST) wastes. If the NRC determines SST wastes should be treated as HLW, significant revision to the TWRS Program would be necessary.

The U.S. Department of Energy will initiate a dialogue with the U.S. Nuclear Regulatory Commission concerning the classification of Hanford Site single-shell tank wastes. The U.S. Department of Energy will provide tank waste characterization information and proposed disposition of the single-shell tank wastes, consistent with the TWRS EIS, to the U.S. Nuclear Regulatory Commission, in order to facilitate their determination of the waste classification. The final exposure will be minimized by targeting

determination of the single-shell tank waste classification by July 1996, before major single-shell tank waste retrieval and TWRS treatment facility acquisitions are planned.

2.1.4 Determine Waste Separations Process (Decision 4.2.2.1)

The determination of the single-shell tank waste classification may effect the strategy for processing tank wastes (decision 4.2.2), which is to separation these wastes into a low-level and a high-level / transuranic waste fractions. If the low-level waste fraction derived from proposed pretreatment processing of single-shell tank wastes is not determined to be incidental from the treatment and disposal of high-level waste, the decision to separate tank wastes into fractions would need to be revisited. Determination of a suitable waste separation process is predicated upon the assumption that the low-level waste fraction derived from proposed pretreatment processing of single-shell tank wastes is classified as incidental waste.

The degree to which the tank wastes are separated into fractions will establish program cost, schedule and technical scope for the waste pretreatment, low-level waste vitrification and high-level waste vitrification program elements. The selected waste separations processes will establish the volume and radionuclide content of the low-level and a high-level / transuranic waste fractions. As a planning basis, the U.S. Department of Energy has selected relatively simple technologies for separations processing of tank wastes. The waste separations processes selected include separation of sludges/solids from supernatants, washing and leaching of select components from the sludges/solids (high-level waste fraction) in order to reduce the volume of the vitrified high-level waste fraction. Cesium would be removed from the tank waste supernatants and wash / leach solutions prior to vitrifying these low-level wastes. Some supernatants contain excessive concentrations of strontium and transuranic elements, which would also be removed prior to vitrifying these low-level wastes. Collectively, these waste separations processes are referred to as minimum separations.

The major uncertainties with pursuing this waste separations strategy are whether the resultant volume of vitrified high-level waste will be acceptable to the geological repository and whether the resultant vitrified low-level waste will meet environmental performance requirements. The U.S. Department of Energy is evaluating the impacts of various waste separations approaches to the high-level waste repository. A determination of the acceptability of the volume of vitrified high-level waste resulting from each waste separations processes is anticipated to be available from the U.S. Department of Energy, Office of Civilian Radioactive Waste Management in fiscal year 1995. A preliminary environmental performance assessment of low-level waste form resulting from the minimum waste separations processes is being conducted and will be available in early fiscal year 1995. Together, these evaluations will reduce the uncertainties associated with pursuing the minimum separations processes.

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2 DETERMINE DISPOSITION OF HANFORD TANK WASTE</p> <p>A strategic alternative for treatment and disposal of Hanford tank waste is selected.</p>	<p>a. Continued Storage (i.e Do Nothing).</p> <p>b. Retrieve "all waste" from all Hanford radioactive tanks.</p> <p>c. Retrieve some waste and dispose the remainder in situ.</p> <p>d. In situ dispose of all tank waste.</p>	<p>Retrieval of all tank waste was adopted in December 1991 by U.S. DOE as the planning basis for the TWRS (<u>Secretary Decision Concerning the Tank Waste Remediation System, Hanford Site</u>, U.S. DOE Assistant Secretary for the Environmental Restoration and Waste Management memorandum to Manager, DOE Field Office, Richland Washington).</p>	<p>This strategy is reflected in the Hanford Federal Facility Agreement and Consent Order.</p> <p>Currently, the TWRS program is developing and evaluating alternative technologies and facility concepts for treating tank waste for disposal. The TWRS program is not scheduled to engage in the detailed design of any major facility needed for treatment and disposal of Hanford tank wastes until after the completion of the environmental impact statement. Therefore, the financial exposure is low. Schedule risks arise if the TWRS EIS record of decision is delayed past September 1996 of it is significantly different than the planning basis adopted by the U.S. DOE.</p>
<p>4.2.1 DETERMINE TANK WASTE MANAGEMENT STRATEGY</p> <p>A strategy is needed for managing Hanford Site tank wastes until these wastes are removed from the tank system, treated, disposed, and the tank system is closed.</p>	<p>a. Compliant and safe operating system.</p>	<p>The DOE will continue compliant and safe operation of the tank system. Components which must remain operational for an extended period of time and are necessary to support tank waste remediation actions will be replaced or upgraded to a condition that complies with current codes and regulations.</p>	<p>Efficient use of the public resources and demonstration of accomplishments is necessary to sustain public trust in the DOE's remediation of the Hanford Site. Without public confidence, funding for remediation of the Hanford Site is in doubt.</p> <p>The DOE is pursuing a graded approach for restoration of the tank system to compliant conditions. Identified deficiencies will be corrected expeditiously and cost effectively. Tank waste remediation activities will be conducted as the next priority, with emphasis on demonstration of progress toward clean up.</p> <p>This approach will ensure that the risk to the public, workers and environment remains low through continued maintenance of the tank system. Since the graded approach to restoration of the tank system is integrated with tank waste remediation actions, the schedule and cost impacts to the TWRS Program are being managed and remain low. Impacts to the baseline program would only occur if additional tank system deficiencies are discovered or the scope of currently identified upgrades changes.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.1.a DETERMINE DOUBLE-SHELL STORAGE SPACE REQUIRED TO SUPPORT TWRS ACTIVITIES</p> <p>The strategy for acceptance of new waste and management of existing waste in the Hanford Site double-shell tanks is established.</p>	<p>a. Accept no new waste into the double-shell tank system.</p> <p>b. Develop alternative storage methods.</p> <p>c. Consolidate wastes.</p> <p>d. Build new double-shell tanks.</p>	<p>As a planning basis, waste consolidation and construction of two new double-shell tanks has been adopted, based upon projections of tank space utilization and quantity of new tank waste generated from decontamination of previously used waste management facilities (WHC 1994b). An option to construct additional DSTs will be reviewed by September 1995.</p>	<p>The major uncertainty with pursuing waste consolidation and construction of new double-shell tanks, is the new tanks will not be required or not required in the time frame which the tanks are operational. Resources will have been expended which could have been directed toward other Hanford Site remediation activities. The source of this uncertainty is the assumptions used to project sources of radioactive liquid wastes requiring storage in the double-shell tank system.</p> <p>Compounding this uncertainty is risks associated with not providing sufficient double-shell tank storage space to allow timely stabilization of single-shell tanks or passive mitigation of tank waste safety issues. Delays to conducting stabilization of single-shell tanks could result in additional inadvertent leakage of radioactive liquids into the soil column. Delays to the passive mitigation of safety issues would require continued use of active mitigation systems (e.g. mixer pumps).</p> <p>The assumptions used to project sources of radioactive liquid wastes requiring storage in the double-shell tank system are being reviewed by stakeholder groups (e.g., DNFSB, Washington Department of Ecology) to reach consensus. The planning basis adopted by the U.S. DOE allows for the earliest possible stabilization of single-shell tanks, decontamination of older facilities and passive mitigation of tank waste safety issues. This approach represents the lowest environmental and safety risks, and does not commit funds for construction of new double-shell tanks until requirements for these tanks have been established. The environmental and safety risks would continue to be moderate, while the financial exposure could be reduced through confirmation of the need for these tanks.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.1.b DETERMINE SINGLE-SHELL TANK STORAGE CONCEPT</p> <p>The strategy for management of waste contained within single-shell tanks must be determined to establish TWRS requirements and determine programmatic scope, cost and schedule needs.</p>	<p>a. Seal SSTs until retrieval of waste.</p> <p>b. Continue current SSTs operating and storage plans.</p> <p>c. Perform major upgrades to SSTs.</p> <p>note: all alternatives would complete interim stabilization of SSTs to reduce impacts from potential tank leakage.</p>	<p>Continuation of current operating and storage plans for the single-shell tanks has been incorporated in the program. This is in accordance with DOE Order 5820.2A, <u>Radioactive Waste Management, High-Level Waste</u> and Washington state administrative codes.</p>	<p>Sixty-seven of the 149 single-shell tanks are suspected or have leaked radioactive solutions into the environment. Continued storage of waste within these tanks increases the likelihood that future leakage of radioactive solutions into the environment will occur.</p> <p>Stabilization of single-shell tanks is being conducted to remove liquids from these older underground storage tanks and is scheduled to be completed by September 2000. Removal of liquids from the single-shell tanks may influence waste mobilization concept selection, but the reduction in environmental risks from preventing radioactive solution leak is far more beneficial. Stakeholder groups participated in the development of this alternative, which is embodied in the Hanford Federal Facility Agreement and Consent Order. The likelihood of a change in this management approach is low.</p> <p>Sealing the SST until retrieval of waste or upgrading these tanks would be time consuming and probably not cost effective for the environmental and safety risk reduction obtained. Retrieval of waste from SSTs is scheduled to commence by December 2003.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.1.c DETERMINE CAPSULE INTERIM STORAGE CONFIGURATION</p> <p>Select a configuration for interim storage of cesium and strontium capsules which supports interim storage of the existing capsules until completion of capsule disposition.</p>	<p>a. Continue Interim Storage in WESF.</p> <p>b. New "Wet" Storage Facility.</p> <p>c. New "Dry" Storage Facility.</p>	<p>Interim storage of capsules in the Waste Encapsulation and Storage Facility (WESF) will be continued. The WESF facility is compliant with applicable state, federal, and local regulations.</p>	<p>Long term primary container integrity may be required until the capsules are dispositioned. Interim storage configuration criteria should be developed to maintain the capsule primary container integrity throughout the interim storage time frame.</p> <p>The impacts from the uncertainty in the interim storage configuration of the capsules are considered relatively low at this time. Sufficient time exists to determine the interim storage configuration and incorporate design features in either the capsule overpack or HLW/TRU immobilization facilities, if necessary.</p> <p>Constructing a new dry or wet storage facility may allow the shutdown of the WESF. However, storage of capsules in WESF is fully compliant with existing regulations. There may be increased risk to workers and the environment by moving the capsules to a new facility, since handling of the capsules is involved. A cost reduction may occur if the life cycle cost of a new facility were less than the operating costs for WESF. An analysis of alternative storage methods is being conducted to evaluate these alternatives (milestone M-33-00).</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.1.d DETERMINE FUNCTIONAL RESPONSIBILITY FOR MISCELLANEOUS UNDERGROUND STORAGE TANKS</p> <p>There are approximately 50 miscellaneous underground storage tanks located in the 200 Area of the Hanford Site which potentially contain waste similar to other TWRS tank waste. These miscellaneous underground storage tanks were previously used in association with processing of defense wastes. A decision is needed whether the remediation of the waste is within the TWRS scope.</p>	<p>a. Remediation of the miscellaneous underground radioactive waste storage tanks is assigned to the TWRS.</p> <p>b. Remediation of the miscellaneous underground radioactive waste storage tanks is assigned to another Hanford Site program.</p>	<p>TWRS has assumed programmatic responsibility for remediating the waste contained in the miscellaneous underground storage tanks.</p> <p>Additionally, TWRS has assumed as a planning basis that retrieval of waste from the miscellaneous underground storage tanks will be the preferred alternative identified in the closure plan for these tanks.</p>	<p>A closure plan needs to be prepared addressing the proposed disposition of the miscellaneous underground storage tanks and wastes contained therein.</p> <p>The closure plan review will not effect programmatic responsibility for dispositioning the miscellaneous underground storage tanks and associated wastes. However, activities required for dispositioning these wastes will be defined in the closure plan and any associated NEPA actions.</p> <p>These activities need to be conducted regardless of the programmatic responsibility for these tanks. Therefore, TWRS is proactively reducing the risk to completion of the Hanford Site mission by conducting these activities. Since disposition of these tanks will not be conducted for a number of years, assessment of the safety and environmental conditions of these tanks is also being conducted to assess these risks, which are presently considered low.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.2 DETERMINE PROCESS FOR OBTAINING TANK WASTE CHARACTERIZATION INFORMATION</p> <p>A methodology is selected for obtaining and analyzing the physical and chemical properties (i.e., characterization information) of the Hanford Site tank waste.</p>	<p>a. Use existing tank waste characterization information.</p> <p>b. Obtain and analyze tank waste samples.</p> <p>c. Analyze tank waste in situ.</p> <p>d. Where appropriate, use existing tank waste characterization, obtain and analyze tank waste samples, and analyze tank waste samples in situ.</p>	<p>A methodology for obtaining tank waste characterization information was evaluated during the fourth amendment to the Hanford Federal Facility Agreement and Consent Order (Ecology 1994).</p> <p>The alternative selected for obtaining tank waste characterization information is where appropriate to utilize historical information, obtain and analyze samples of tank waste, and analyze tank waste in situ to obtain necessary information.</p>	<p>Timely availability of tank waste characterization information is necessary to determine the disposition of tank waste (decision 4.2), resolve safety issues with storage of tank waste, obtain NRC concurrence on the disposition of single-shell tank waste (decision 4.2.3.c), and select strategies / processes for waste mobilization (decision 4.2.1.3) and waste processing (decisions 4.2.2, 4.2.2.a, and 4.2.2.2.a).</p> <p>The DOE, Richland Field Office, has developed a plan for obtaining the necessary tank waste physical and chemical properties information in a timely manner (DOE 1994). The availability of tank waste characterization information is highly important to conducting interfacing decision. Through successful execution of the tank waste characterization plan, the availability of tank waste characterization information to support decisions can be managed at a low level of risk.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.3 DETERMINE WASTE RETRIEVAL STRATEGY</p> <p>A strategy is selected for developing, testing and deploying waste mobilizing systems for waste contained in single-shell, double-shell and miscellaneous underground waste tanks. A method is selected for retrieval of cesium and strontium capsules from the interim storage facility.</p>	<p>a. Use Existing Waste Retrieval Technologies. High velocity jets or streams of fluid would be used to hydraulically mobilize waste within SSTs, DSTs and MUSTs. Subsurface barriers would be evaluated to determine effectiveness and could be deployed in combination with retrieval of wastes from tanks of questionable structural integrity.</p> <p>A manual manipulator would be used to grasp the capsules and remove them from the storage racks.</p> <p>b. Use Existing Waste Retrieval Technologies, Transition to Enhanced Technologies or Alternatives. Subsurface barriers would be evaluated to determine effectiveness and could be deployed in combination with retrieval of wastes from tanks of questionable structural integrity. Initially, existing waste retrieval technologies (e.g., sluicers and mixer pumps) would be developed and demonstrated for retrieval of tank wastes. Enhancements and alternative technologies to these previously demonstrated retrieval technologies would be developed and tested as back up systems and would be deployed if economically, environmentally, or otherwise superior.</p> <p>c. Use Alternative Technologies Only. Alternative technologies would be evaluated, tested, and demonstrated prior to selecting a technology for deployment.</p>	<p>A combination of mechanical (i.e. long reach arm) and hydraulic (i.e. sluicing) waste retrieval processes has been adopted for retrieval of high heat waste from tank 241-C-106. These processes will be demonstrated in 1997 and 2003, respectively. A hydraulic process (i.e. mixer pumps) has been adopted for retrieval of waste in tanks 241-AZ-101, 241-SY-101, and 241-SY-103. This process will be demonstrated in 1997 for tank 241-AZ-101 and in 1998 for tanks 241-SY-101 and 241-SY-103. It is assumed mechanical and hydraulic processes or enhancements to these technologies will be used for retrieval of waste from other single-shell tanks, double-shell tanks, and miscellaneous underground storage tanks.</p> <p>Subsurface barriers will be evaluated for effectiveness, but it is assumed that these will not be deployed.</p> <p>Retrieval of capsules from the interim storage facility is assumed to be conducted using the manual manipulator technique.</p>	<p>The availability of tank waste characterization information will impact the selection of tank waste retrieval systems. Complete characterization of tank wastes is scheduled to be completed by 1999. However, the U.S. Department of Energy is striving to complete tank waste characterization of watch list tanks by October 1995 (DOE/RL 94-0001), and all tanks by February 1997 per Secretary of Energy's safety initiative. Given this, tank waste characterization information should be available in a timely manner to support the selection of a waste retrieval strategy and this risk is considered low.</p> <p>The major program impacts from proceeding with the waste retrieval strategy is derived from the uncertainty whether these concepts will achieve the closure requirements and achieve the schedule goals negotiated in the Hanford Federal Facility Agreement and Consent Order (Ecology 1994).</p> <p>Full scale demonstration of the sluicing waste retrieval process is planned approximately six years prior to initiating the large scale retrieval of single-shell tank wastes in 2003. Through early demonstration of sluicing, the viability of this technology can be assessed and corrections to the retrieval strategy made if necessary. Initial follow-on SST waste retrieval will need to be based upon sluicing or enhancements, since an arm based system will not be demonstrated until 2003.</p> <p>However, development and regulatory approval of a closure plan for SSTs is not planned until 2006 (milestone M-45-06-T02). This schedule does not allow for revision of the retrieval strategy without adversely impacting program cost and schedule. The risk to the program schedule and cost baseline is high. This risk is being managed through development of a SST closure work plan, describing the work integration process for closure and status of work. This work plan serves as road map for the regulatory process.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.4 DETERMINE WASTE TRANSFER MECHANISM</p> <p>Mechanisms for transfer of tank wastes and encapsulated cesium and strontium for storage, treatment and disposal need to be selected to establish system requirements.</p>	<p>a. Transfer lines. b. Tanker vehicle. c. Shielded cask. d. Solid waste container. e. Pneumatic transfer. f. Multiple modes of transfer.</p>	<p>Consistent with the current design of the waste storage tanks and the planning assumption to use hydraulic methods for retrieval of tank wastes, pipelines are planned to be used for the transfer of retrieved single-shell and double-shell tank wastes to processing facilities. Waste transfer facilities supporting pipeline transport of waste will be needed.</p> <p>A method for transfer of wastes retrieved from MUSTs has not been established.</p> <p>Receipt of new waste into the tank system is planned to continue using current methods; pipelines and tanker vehicle.</p> <p>Capsules are planned to be transported using a shielded cask.</p>	<p>Failure to integrate the design of the waste retrieval, transfer, storage, and processing systems could lead to a high risk to successful completion of the tank waste remediation mission.</p> <p>The existing tank waste storage system is designed to receive and store liquid slurries of wastes. Given that the tank waste storage system will continue to be used, the waste transfer and retrieve mechanisms will need to condition wastes for storage in the existing tanks. Integration between the waste retrieval and transfer functions is necessary to establish interface conditions and ensure waste is properly conditioned for receipt into the storage and process facilities.</p> <p>Design of capsules and miscellaneous tank materials transportation systems will need to be coordinated with the design of the process facilities, which will disposition these materials.</p> <p>Through using systems engineering principles, integration of these functions can be successfully achieved. Therefore, the risk to achieving the program goals is considered low.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.1.5 DETERMINE WASTE CONCENTRATION MECHANISM</p> <p>A process needs to be selected for reducing the volume of radioactive liquid wastes requiring storage in the Hanford Site underground radioactive liquid waste tank system. (Volume reduction is planned only for dilute wastes and would not be conducted if a safety issue would arise with storage of the resultant concentrated waste.)</p>	<p>a. Manage tank system without concentration of tank waste.</p> <p>b. Evaporation.</p> <p>c. Selective precipitation.</p> <p>d. Reverse osmosis.</p> <p>e. Ion exchange.</p> <p>f. Crystallization.</p>	<p>Evaporation of tank waste using the existing 242-A evaporator was selected as the method for concentration of tank wastes. The 242-A evaporator meets regulatory requirements and was recently upgraded (project B-534) resulting in a planned life extension of ~10 years.</p>	<p>Concentration of tank wastes is necessary to manage the available waste storage capacity to achieve mitigation of tank safety issues (e.g., dilution of tank 241-SY-101 waste), terminal clean out of excess facilities, and stabilization of single-shell tanks. These tasks result in the reduction of environmental and safety risks. Failure to successfully manage the inventory of tanks wastes will result in the increase of environmental and safety risks.</p> <p>The existing 242-A evaporator has been designed to operate in conjunction with the existing double-shell tanks for management of the waste storage system. This evaporator can be operated to reduce the volume of wastes requiring storage, while maintaining the conditions for safe storage of tank wastes. Continued use of this evaporator is critical to provide the waste storage space necessary for mitigation of tank safety issues, terminal clean out of excess facilities, and stabilization of single-shell tanks. The evaporator represents a means to reduce the environmental and safety risks associated with these items.</p>
<p>4.2.2 DETERMINE WASTE PROCESSING STRATEGY</p> <p>A strategy must be selected for processing the Hanford tank waste for disposal. The decision to select a waste processing strategy is predicated upon selecting retrieval of "all waste" from all Hanford radioactive tanks (or the majority of waste) as the preferred alternative for the decision <u>Determine Disposition of Hanford Tank Waste</u>.</p>	<p>a. Immobilize all of the tank waste for offsite disposal.</p> <p>b. Separate tank waste into fractions for onsite and offsite disposal.</p> <p>c. Treat tank waste to an intermediate waste form.</p>	<p>Separation of Hanford tank waste into a low-activity and a high-activity fractions has been adopted as the planning basis for the TWRS based upon concurrence of stakeholders as reflected in the fourth amendment of the Hanford Federal Facility Agreement and Consent Order.</p>	<p>The TWRS program is developing and evaluating alternative technologies for separating tank waste into fractions for immobilization and disposal. The TWRS program is not scheduled to be engaged in the detailed design of any major facility needed for tank waste separations until after the completion of the TWRS environmental impact statement. Therefore, the financial exposure is low. Schedule risks arise if the environmental impact statement record of decision is delayed past September 1996 or it is different than the planning basis.</p> <p>These risks can be mitigated by continued involvement of the public and stakeholder groups throughout the preparation of the TWRS environmental impact statement.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.a DETERMINE DISPOSITION OF TRANSURANIC TANK WASTE</p> <p>A reference approach for disposition of Hanford tank waste that may be designated as transuranic waste (instead of high-level waste) is selected, defining the waste form criteria that will be imposed.</p>	<p>a. Dispose in HLW Repository.</p> <p>b. Dispose in the Waste Isolation Pilot Plant (WIPP).</p> <p>c. Disposition Unacceptable in either the WIPP or HLW Repositories.</p>	<p>For planning purposes, any TRU tank waste which may exist at Hanford is assumed to be disposed in the HLW repository.</p> <p>This assumption reflects an interpretation of the decisions for geologic disposal of DST waste documented in the HDW-EIS (DOE 1988).</p>	<p>Planning documents for the DOE complex indicate Hanford PFP and NCRW tank wastes are considered TRU and are not currently included in estimates of defense materials expected to be disposed of in the HLW repository (DOE 1992b). Other tank wastes may also actually be classified as TRU waste. A review of processing history, waste storage practices, and chemical composition of suspected tank wastes needs to be conducted to establish whether or not these wastes are TRU.</p> <p>If the TRU tank waste disposition is different than that for HLW, the immobilized TRU tank waste must be manufactured in a campaign or process system which is separate from the HLW tank waste. The segregation of TRU tank waste could potentially lengthen tank waste processing duration and increase total program costs.</p> <p>Fortunately, the conceptual design of the tank waste immobilization facility is not scheduled to be completed until March 1998. This decision can be resolved in the intervening three years to reduce the program risk to an acceptably low level.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.b DETERMINE ACCEPTABILITY OF ALTERNATIVE CONTAINERS FOR HLW REPOSITORY</p> <p>A reference waste package container must be selected for disposal of Hanford waste in the HLW repository.</p>	<p>a. DWP Standard Canister.</p> <p>b. Spent Nuclear Fuel Canister.</p> <p>c. Large Canister/Cask.</p>	<p>Current program planning cost estimates are based on using the spent nuclear fuel canister for containing the immobilized HLW.</p>	<p>The HLW container size selection impacts: design of components in the HLW/TRU immobilization and container interim storage facilities. The repository disposal fee is directly related to the container design and quantity produced.</p> <p>The time required to establish an alternative to the standard HLW package may result in this decision being on the critical path for initiating facility conceptual design.</p> <p>The DOE-OCRWM is presently conducting an evaluation of an alternative waste package, the multi-purpose canister (MPC). The MPC would provide a larger container volume for spent nuclear fuel elements or defense wastes. The decision to proceed with the procurement of MPCs is scheduled to be made in mid-1997 by the DOE-OCRWM (DOE-OCRWM 1994b). This is one year prior to completing the conceptual design for the HLW/TRU immobilization facility, thereby providing sufficient time to resolve this issue. Timely resolution of this issue will reduce the program risk to an acceptably low level.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.c DETERMINE DISPOSITION OF Cs/Sr CAPSULES</p> <p>The disposition of the encapsulated cesium chloride and strontium fluoride salts needs to be established.</p>	<p>a. Overpack/ship capsules to HLW repository.</p> <p>b. Reprocess capsules and blend with tank wastes for immobilization.</p> <p>c. Embed Capsules in Glass, then ship to the HLW repository.</p>	<p>The record of decision for the HDW-EIS directs that cesium and strontium capsules be disposed of in a geologic repository (DOE 1988). For the purposes of impact evaluation at the Hanford Site in the HDW-EIS, it was assumed that capsules could be overpacked in canisters such that repository waste acceptance criteria could be met.</p>	<p>Uncertainty exists as to whether the current cesium and strontium chemical form can comply with repository criteria when overpacked. Independent of the waste form acceptance, the potential exists for alternatives to the overpacking alternative to be more economically attractive. If the capsules are not transferred to the repository, design of alternative disposition processes is needed. The alternative capsule disposition designs need to be completed before March 1998 to avoid impacting the conceptual design schedules for HLW pretreatment and vitrification facilities.</p> <p>Re-evaluation of capsule disposition alternatives is planned to be conducted by the TWRS HLW program. This study will be completed by August 1995 and will determine whether or not the HLW repository can accept the capsules. The schedule risks are considered low, since re-evaluation of the capsule disposition alternatives will be completed two years prior to completion of conceptual design for the HLW pretreatment and vitrification facilities.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.1 DETERMINE WASTE SEPARATIONS PROCESS</p> <p>A reference processing approach is selected for separating Hanford tank waste into a low-activity and high-activity fractions for disposal.</p>	<p>a. Minimum separations.</p> <p>b. Minimize immobilized high-level / transuranic (HLW/TRU) waste volume.</p>	<p>Separation of Hanford tank waste into a low-activity and a high-activity fractions using the minimum separations approach has been adopted as the planning basis for the TWRS. The fourth amendment of the Hanford Federal Facility Agreement and Consent Order (Ecology 1994) incorporates this approach and directs validation of the minimum separation process alternative (milestone M-50-03).</p> <p>The proposed minimum separations reference flowsheet includes separation of sludges/solids from supernatants, leaching of Al Cr, and PO, from sludges/solids, washing of sludges/solids, and separation of cesium from the supernatants and wash solutions. Supernatant solutions which contain TRU and Sr in excess of the LLW immobilization process specification would be treated by a heat digestion process to precipitate TRU and Sr (WHC 1994b).</p>	<p>HLW geological repository volume limitations have not been established, thus uncertainty exists as to the acceptability of either alternative process for separation of tank waste.</p> <p>The minimum separations approach represents the lowest life-cycle cost, but could produce an unacceptable quantity of immobilized HLW (WHC 1993d). The minimize immobilized waste volume approach has the potential to produce a much smaller volume of immobilized waste, but this technology requires extensive development.</p> <p>The DOE-OCRWM is preparing an advanced conceptual design (ACD) for the geological repository. The ACD will lead to improved definition of the technical impacts and repository disposal fee associated with these alternative waste separation processes. Additionally, DOE-OCRWM is evaluating use of a MPC would could result in significant reduction of disposal fee, which in turn could lessening the impacts of proceeding with the minimum separation process (DOE 1994b).</p> <p>Limits for acceptable radionuclides concentrations and volume of immobilized low-level waste have not been established. Therefore, uncertainty exists as to the acceptability of either alternative process for separation of tank waste.</p> <p>The limits for acceptable radionuclides in the low-activity solution can be understood by conducting a parametric evaluation of radionuclide separations versus low-level waste system performance. Once the inter-relationship between the pretreatment process and the low-level waste disposal system environmental performance is understood, management of this uncertainty can be achieved.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.1.1 DETERMINE HLW AND LLW SEPARATIONS FACILITIES CONCEPTS</p> <p>a. The facility concept for pretreatment of Hanford tank waste supernatants (i.e., LLW Pretreatment) is selected.</p> <p>b. The facility concept for pretreatment of Hanford tank waste sludges/solids (i.e. HLW pretreatment) is selected.</p>	<p>a. LLW Pretreatment</p> <p>i. Stand alone supernate pretreatment facility concept consisting of either dispersed modules, a centralized pretreatment facility, or modules in a centralized configuration.</p> <p>ii. Supernate pretreatment function combined with low-level waste vitrification.</p> <p>iii. Supernate pretreatment function combined with high-level waste vitrification.</p> <p>iv. Supernate pretreatment function combined with both LLW & HLW vitrification.</p> <p>b. HLW Pretreatment</p> <p>i. In-tank pretreatment of sludges/solids.</p> <p>ii. Out-of-tank (i.e. in a facility) pretreatment of sludges/solids.</p>	<p>a. LLW Pretreatment</p> <p>A stand alone supernate pretreatment facility concept with centralized pretreatment components has been reflected in the TWRS planning basis.</p> <p>WHC has recommended design and construction of a common, centralized facility for supernate pretreatment and low-level waste vitrification. The HLW vitrification function will be located near the other functions and will be serviced by the same support utilities (WHC 1994d).</p> <p>b. HLW Pretreatment</p> <p>In-tank pretreatment of sludges/solids has been reflected in the TWRS planning basis.</p>	<p>a. LLW Pretreatment</p> <p>Additional radionuclides (e.g. technetium or strontium) may need to be separated from the Hanford tank wastes to achieve a lightly shielded low-level waste vitrification facility or achieve the desired environmental performance of the low-level waste disposal system. Production scale deployment of technetium and strontium separation processes may not be achievable in all candidate facility concepts (e.g. dispersed supernate pretreatment modules).</p> <p>The WHC recommended facility concept mitigates these concerns by incorporating design features to reserve the capability to add additional cesium and/or strontium removal processes for operational reasons, or technetium removal to meet the low-level waste form performance requirements.</p> <p>b. HLW Pretreatment</p> <p>The design of the existing double-shell tanks may not be suitable for the pretreatment of sludges/solids. The required separations of waste components to produce a reasonable quantity of immobilized HLW/TRU waste may not be achievable in double-shell tanks.</p> <p>A review is being conducted of in-tank sludge washing conducted at the West Valley Demonstration Process, Savannah River Site, and at BNFL facilities in the United Kingdom. This technical review will be completed by March 1995 and a report issued. BNFL and WHC will review this report and recommended to the DOE/RL whether or not sludge washing should be conducted in existing double-shell tanks or specially designed facilities.</p> <p>This technical evaluation of in-tank sludge washing will be completed in a timely manner, thus allowing sufficient time to incorporate recommendations into the program baseline, without significant schedule impacts.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.2.a DETERMINE HLW/TRU WASTE IMMOBILIZATION PROCESS</p> <p>A reference waste form and immobilization process for producing the waste form proposed for offsite disposal in a geologic repository is selected.</p>	<p>a. Ceramic Manufacture.</p> <p>b. Waste Calcination.</p> <p>c. Vittrification.</p>	<p>Vitrification to produce a glass HLW product has been selected for program development (DOE 1990). A process decision for TRU waste product is pending. For planning purposes, vitrification is also assumed for TRU tank waste.</p>	<p>Program activities are based on the process selection issue for HLW being closed, with a vitrification process representing the selected alternative. Therefore, the primary uncertainty remains within the disposition process selected for TRU tank waste.</p> <p>The waste acceptance criteria for the WIPP repository and the HLW repository are based upon fundamentally similar federal regulations. A cursory review of the waste acceptance criteria for both repositories indicates a TRU tank waste glass formulation could be demonstrated to meet either criteria. Dialogue with the DOE-AL and DOE-OCRWM needs to be established to determine if the a vitrified waste form is acceptable for TRU tank waste.</p>
<p>4.2.2.2.b DETERMINE WHETHER TRU & HLW CAN BE PROCESSED IN THE SAME PLANT</p> <p>An implementation strategy is selected for the HLW and TRU tank waste that determines whether a single plant will be developed to immobilize both waste types.</p>	<p>a. Separate Facilities.</p> <p>b. Combined TRU/HLW Facility.</p>	<p>For planning purposes, the TWRS HLW Program has assumed that both HLW and TRU tank waste can be processed in the same facility without segregating the TRU tank waste from HLW.</p>	<p>If a single facility is not used to treat both HLW and TRU waste there is risk to achieving the estimated cost profile and schedule. The risk of significant program cost increases could be mitigated to a large extent if any segregated processing requirements for TRU tank waste were addressed by an equipment change out implementation strategy rather than using separate facilities. Uncertainty with this issue could be reduced by establishing the classification of suspected TRU tank wastes.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.2.c DETERMINE HLW VITRIFICATION FACILITY CONCEPT</p> <p>Alternatives exist for developing the TWRS disposal system as individual facilities supporting pretreatment, LLW immobilization, and HLW vitrification, or combining these systems in groups. A concept for the HLW facility grouping is selected by this decision.</p>	<p>a. Stand alone HLW immobilization facility.</p> <p>b. HLW vitrification function combined with supernate pretreatment.</p> <p>c. HLW vitrification function combined with low-level waste vitrification.</p> <p>d. HLW vitrification function combined with both LLW & supernate pretreatment.</p>	<p>The TWRS HLW Program is based on a stand alone HLW Vitrification facility.</p> <p>WRC has recommended design and construction of a common, centralized facility for supernate pretreatment and low-level waste vitrification. The HLW vitrification function will be located near the other functions and will be serviced by the same support utilities (WRC 1994d).</p>	<p>Each alternative facility concept was evaluated and determined to uphold stakeholders' values.</p> <p>Reduced construction and operating costs which may be achieved by combination of the HLW vitrification with other functions were evaluated to verify that the resultant construction cost profile does not exceed projected available funding during the construction period. The funding profile for combined pretreatment and LLW vitrification facility with a separate HLW facility was found to be the most favorable and does not exceed the projected available funding. Additional cost reductions may be achievable after further evaluation of concepts for combining LLW and HLW vitrification facility, or conversion near the end of LLW processing one of the LLW lines to serve as the HLW vitrification process.</p>
<p>4.2.2.3 DETERMINE CAPSULE OVERPACK FACILITY CONCEPT</p> <p>A reference facility concept for implementing the capsule overpack capabilities needs to be selected.</p>	<p>a. Combine with HLW Vitrification.</p> <p>b. Combine with Pretreatment Facility.</p> <p>c. Separate Capsule Facility.</p> <p>d. Combine with IHLW/ITRU Interim Storage Facility.</p>	<p>Current planning assumptions are based on combining the cesium and strontium overpack systems into the HLW Vitrification facility.</p>	<p>Optimization of facility costs may be achievable by combining the capsule overpack function with a facility other than HLW vitrification. An evaluation of each alternative facility concept will be completed by December 1996, before design is initiated on the pretreatment, HLW, or immobilized HLW/TRU waste interim storage facilities. Therefore, an opportunity exists to optimize the program costs.</p>
<p>4.2.2.4 DETERMINE IHLW/ITRU CONTAINER FACILITY CONCEPT</p> <p>A reference facility concept for temporary onsite storage of immobilized HLW and TRU waste in containers is selected.</p>	<p>a. Enclosed Facility.</p> <p>b. Open Facility (Casks on Pad).</p>	<p>No decision has been made on the storage facility configuration.</p>	<p>The selected immobilized HLW / TRU waste container size may impact the viability of enclosed facility concepts for waste container storage.</p> <p>One method of mitigating the uncertainty in the container storage configuration is to base planning on the open facility configuration, assuming the canister produced from HLW immobilization can be overpacked within the DOE-OCRWM proposed multipurpose canister. This approach would reduce the impact of canister size on storage facility concept selection. However, the overall program costs for storage could be increased if the multipurpose canister was not ultimately selected for use.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.2.6 DETERMINE OVERPACKED Cs/Sr CAPSULE INTERIM STORAGE FACILITY CONCEPT</p> <p>A reference facility concept for temporary onsite storage of overpacked cesium and strontium capsules is selected.</p>	<p>a. Combine with capsule interim storage facility.</p> <p>b. Combine with capsule overpack facility.</p> <p>c. Combine with IHLW/ITRU waste interim storage facility.</p> <p>d. A separate overpacked capsules interim storage facility.</p>	<p>The program baseline schedule and cost estimates are based upon the inclusion of the interim storage facility into the IHLW/ITRU waste interim storage facility.</p>	<p>Optimization of facility costs may be achievable by combining the overpacked capsule interim storage function with a facility other than IHLW/ITRU waste interim storage facility. An evaluation of each alternative facility concept will be completed March 1997, before design is initiated on facilities. Therefore, an opportunity exists to optimize the program costs.</p>
<p>4.2.3 DETERMINE SYSTEM GENERATED WASTE DISPOSAL STRATEGY</p> <p>A decision is needed whether the treatment and disposition of system generated waste (e.g., low-activity fraction of tank waste, gaseous effluents, liquid effluents, and solid waste) & excess facilities is part of the TWRS scope. If treatment and disposition of system generated waste & excess facilities is not part of the TWRS scope, then this scope needs to be assigned to other Hanford Site program.</p>	<p>a. Treatment of TWRS system generated waste conducted by TWRS program.</p> <p>b. Treatment of TWRS system generated waste conducted by other Hanford Site programs.</p>	<p>Programmatic responsibility for treatment of system generated waste & excess facilities has been assumed to be assigned to TWRS.</p> <p>Programmatic responsibility for the final disposition of immobilized low-level waste is assigned to the TWRS.</p> <p>Final disposition of other system generated wastes and excess facilities is assigned to Hanford Site functions Manage Aqueous Waste (liquid effluents), Remedy Solid Waste (solid waste), Deactivate Facilities (excess facilities), and Remedy/Restore Sites, Facilities, and Ground Water (SSTs, DSTs and MUSTs).</p>	<p>The TWRS program technical scope, cost estimate and schedule have been defined assuming programmatic responsibility for treatment of system generated waste & excess facilities. Closure of the immobilized low-level waste sites has also been included in the scope of the TWRS program. If a decision is reached to assign programmatic responsibility to another Hanford Site program, the TWRS program can be readily modified to remove scope and cost associated with these activities.</p> <p>Regardless of the organization assigned programmatic responsibility for treatment and disposition of these wastes, interface acceptance requirements need to be established to determine the extent of treatment required prior to transfer of these wastes to these other Hanford Site functions. If interface acceptance requirements are established prior to completing conceptual design efforts for treatment and disposal facilities (fiscal year 1997), then the schedule and financial risks can be minimized.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.3.b DETERMINE WHETHER IMMOBILIZED LLW CAN BE DISPOSED IN 200 AREAS</p> <p>LLW generated during remediation of Hanford Site tank waste must be disposed of either onsite or offsite. If onsite disposal is acceptable, then the specific site location must be decided.</p>	<p>a. Disposal of all LLW offsite.</p> <p>b. Disposal of all LLW within the 200 Area plateau.</p>	<p>A Record of Decision has not been formalized. It has been assumed that LLW disposal will be allowed within the 200 Area plateau. Stakeholders group have expressed disposal of safe LLW in the 200 Area is acceptable (DOE 1992a and DOE 1993).</p>	<p>This decision could have a significant impact on the TWRS program. Current plans do not include offsite disposal of LLW. If the decision is made to dispose LLW offsite, then the scope of the TWRS program will have to be expanded to include such actions. This will significantly increase costs and extend the Hanford site cleanup schedule. Additionally, public acceptance may not be forthcoming for the disposal of Hanford Site low-level waste at a location other than Hanford. Transportation and radiological hazards may exist with shipment of LLW from the Hanford Site to another location for disposal.</p>
<p>4.2.3.c NRC DETERMINES CLASSIFICATION OF SST WASTE</p> <p>The NRC determines the classification of pretreated SST waste fraction intended for immobilization and onsite disposal.</p>	<p>a. SST LLW fraction incidental.</p> <p>b. All SST waste is HLW.</p>	<p>The TWRS program assumes the selected pretreatment processes will adequately treat the SST waste such that after vitrification, the waste will meet the NRC's criteria for incidental waste.</p>	<p>If the NRC decides that all of the SST waste must be treated as HLW, either additional and/or alternate pretreatment separation technologies will have to be utilized, or the pretreatment and LLW vitrification facilities must be eliminated in favor of a much larger HLW vitrification facility. In either case, this may significantly increase the volume of HLW, the TWRS program cost and schedule duration.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.3.1.a DETERMINE LLW FORM</p> <p>A material form is selected for immobilization and disposal of the low-level waste fraction derived from pretreatment of Hanford Site tank wastes.</p>	<p>a. Grout (ie. mineral, ceramic, salt).</p> <p>b. Glass.</p> <p>c. Polyethylene.</p>	<p>The vitrification of LLW to produce a glass waste form has been selected as the planning basis for the TWRS. The fourth amendment of the Hanford Federal Facility Agreement and Consent Order incorporates this approach. Performance assessment studies will be completed to evaluate the performance of glass and the disposal system to meet environmental standards.</p>	<p>DOE Order 5820.2A, Chapter III, policy states that DOE LLW shall be managed on a systematic basis.</p> <p>The results of the performance assessment may impact the selection of a LLW form. If these PA results are unfavorable, then: (1) the LLW formula may need to be modified, (2) the use of a matrix material may need to be incorporated in the disposal configuration, (3) an alternate disposal form may need to be evaluated and selected, or (4) pretreatment to remove additional radionuclides and/or hazardous materials may need to be conducted.</p> <p>Development of an acceptable LLW formula and the evaluation of matrix materials are currently being conducted as part of the LLW Program. Similarly, the development of pretreatment technologies for the removal of radionuclides which could effect the environmental performance of the LLW form (i.e. technetium and transuranic elements) is being conducted as part of the Pretreatment Program.</p> <p>A preliminary assessment of a low-level glass waste form in the disposal system will be completed by September 1994. This assessment will identify the relative performance of the vitrified waste form, waste inventory, barriers, matrix materials and disposal site for meeting environmental standards. Cost and schedule impacts may occur depending on the outcome of this preliminary assessment of low-level glass waste.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.3.1.b DETERMINE IMMOBILIZED LLW DISPOSAL CONFIGURATION</p> <p>It has been suggested by stakeholder groups the immobilized LLW generated from treatment and disposal of Hanford Site tank waste be configured to allow near term retrieval in the event future requirement or conditions dictate this action. The retrieval period for repackaging of the immobilized LLW has been assumed to be 50 years after start of disposal actions. A decision regarding LLW retrievability is needed to establish the LLW disposal configuration.</p>	<p>a. Onsite permanent disposal.</p> <p>b. Retrievable for repackaging and onsite disposal.</p>	<p>The TWRS program has decided for planning purposes that the vitrified LLW will be placed in an onsite near-surface disposal system in a manner that will allow retrieval for repackaging (for up to 50 years from the time of emplacement), should that become necessary.</p>	<p>The TWRS program has assumed as a planning basis disposal of LLW in the 200 Area is acceptable and the LLW form will be retrievable for future repackaging if necessary. Stakeholder groups expressed a desire to have the LLW form retrievable when potential hazards from the waste may require future retrieval and when retrievability does not cause inordinate delays in getting on with cleanup.</p> <p>Since the TWRS Program has assumed that a retrievable LLW form will be necessary, the impact from determining a retrievable LLW form is not necessary would probably be a reduction in the estimated cost of disposing LLW at Hanford. No schedule impact is anticipated. An engineering evaluation of the LLW disposal facility configurations will be completed prior to initiating definitive design of the LLW immobilization (December 1996) so that resources are properly directed toward the outcome of this evaluation.</p>
<p>4.2.3.2 DETERMINE GASEOUS EFFLUENT TREATMENT CONCEPT</p> <p>A strategy for gaseous effluent treatment needs to be selected to establish functions and interface requirements.</p>	<p>a. Local treatment by generator.</p> <p>b. Centralized treatment.</p> <p>c. Combination of local and centralized treatment.</p>	<p>A combination of both local and centralized treatment has been adopted for planning. Functions which are dispersed (e.g., 242-A waste evaporator) have local treatment systems for gaseous effluents. Functions which are (or proposed to be) located centrally (e.g., Aging Waste tanks, supernate pretreatment and LLW vitrification) have centralized treatment systems for gaseous effluents. In general, local treatment by generators reduces safety/environmental concerns. Some economic benefits may result from collection of those wastes in close proximity with treatment at a central facility.</p>	<p>All gaseous effluents presently generated from TWRS activities are treated and discharged to the atmosphere in accordance with applicable federal, state and local regulations. This decision will effect the designs of future facilities for remediation of tank waste. If this decision is made prior to finalizing facility designs, no programmatic impacts are anticipated.</p>

Table 2-1. Tank Waste Remediation System Program Decisions.

Decision	Alternatives	Planning Basis	Uncertainties & Consequences
<p>4.2.3.3 DETERMINE LIQUID EFFLUENT TREATMENT CONCEPT</p> <p>A strategy for liquid effluent treatment needs to be selected to establish necessary functions and interface requirements.</p>	<p>a. Local treatment by generator.</p> <p>b. Centralized treatment.</p> <p>c. Combination of local and centralized treatment.</p>	<p>A combination of both local and centralized treatment has been adopted for planning. In general, local treatment by generators reduces safety/environmental concerns. Some economic benefits may result from collection of those wastes in close proximity with treatment at a central facility.</p>	<p>All liquid effluents presently generated from TWRS activities are treated and discharged to the environment in accordance with federal, state and local permits. This decision will effect the designs of future facilities for remediation of tank waste. If this decision is made prior to finalizing facility designs, no programmatic impacts are anticipated.</p>
<p>4.2.3.4 DETERMINE SOLID WASTE TREATMENT CONCEPT</p> <p>A strategy for solid waste treatment needs to be selected to establish functions and interface requirements.</p>	<p>a. Local treatment by generator.</p> <p>b. Centralized treatment.</p> <p>c. Combination of local and centralized treatment.</p>	<p>A combination of both local and centralized treatment has been adopted for planning. In general, local treatment by generators reduces safety/environmental concerns. Some economic benefits may result from collection of those wastes in close proximity with treatment at a central facility.</p>	<p>All solid waste presently generated from TWRS activities is locally collected, sorted, characterized, and packaged for acceptance by the Hanford Site Remedy Solid Waste function for disposition. This decision would effect future generation of solid waste from facilities designed for remediating tank waste. If this decision is made prior to finalizing facility design, no programmatic impacts are anticipated.</p>
<p>4.2.3.5 DETERMINE EXCESS FACILITIES INTERFACE REQUIREMENT</p> <p>Acceptance criteria for transfer of excess facilities to the Hanford site-level Deactivate Facilities function (4.1) Environmental Restoration contractor for decommissioning need to be established. The interface requirements will determine scope for each program.</p>	<p>a. Deactivate, then transfer excess facility to Environmental Restoration contractors for decommissioning.</p> <p>b. Following cessation of operations, transfer excess facilities to the Environmental Restoration contractor for deactivation and decommissioning.</p>	<p>The TWRS program has adopted a strategy of deactivating the facilities before transfer.</p>	<p>The establishment of requirements for transfer of excess facilities from the TWRS to the Environmental Restoration contractor will effect the scope of each program and the design of facilities for remediation of tank wastes. Since interface requirements will be established in August 1995 prior to finalizing facility designs, no programmatic impacts are anticipated.</p>
<p>4.2.3.6 DETERMINE RECYCLE/REUSE CONCEPT</p> <p>A strategy needs to be selected for effectively recycling reusable materials to minimize cost and waste generation.</p>	<p>a. Local recycle and reuse.</p> <p>b. Centralizing recycling.</p> <p>c. Combination of centralized and local recycling.</p>	<p>The TWRS program has adopted the concept of a combination of centralized recycling and local recycling of reusable materials.</p>	<p>Utilization of centralized reusable material collection and treatment facility may not be practical if facilities are not located within a reasonable distance from one another. Whatever the final decision, the strategy chosen will need to reflect stakeholder values and be cost effective.</p>

TANK WASTE REMEDIATION SYSTEM TECHNICAL SCOPE DECISION LOGIC

Figure 2-1. TWRS Technical Scope Decision Logic.

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Figure 2-2. Integration of TWRS Decisions and Program Schedules.

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Activity ID	Description	Early Start	Early Finish	E	FY94	FY95	FY96	FY97	FY98
SDW4025	RW DISPOSAL ACCEPTABILITY DECISIONS: Cs/Sr	03OCT94	12APR95	H					
SDW4035	RW DISPOSAL DECISION Cs & Sr WASTE FORMS	18AUG95	17AUG95	H					
SDW4050	DESIGN STRATEGY OPTIONS & CONCEPTS FOR OVERPACK	03OCT94	17AUG95	H					
SDW4100	KEY DECISION ON NEED/REF FOR OVERPACKING Cs/Sr	18AUG95	17AUG95	H					
SDW4150	RW REPOSITORY DISPOSAL COST ESTIMATES FOR Cs/Sr	18AUG95	22DEC95	H					
SDW4156	TWRS/DOE-EM DEC ANALYSIS/REF DISP OPTION SELECT	27DEC95	18JUL96	H					
SDW4200	IDENTIFY WHC PROCESSING NEED FOR EACH DISP OPT	03OCT94	10APR95	H					
SDW4250	Cs/Sr CALPSULE DISPOSITION TASK SUPPORT	03OCT94	18JUL95	H					
SDW4300	STRATEGY AND PLAN FOR RESOLVING REF Cs/Sr CAPS	15FEB95*	18APR95	H					
SDW4350	TECH EVAL & COST EST FOR PROCESS WORK FOR Cs/Sr	19APR95	28NOV95	H					
SDW4400	REV BASELINE PER Cs/Sr CAPS TSK RESULTS	19JUL96	11DEC96	H					
4.2.2.1 Determine Waste Separations Process (Use Planning Calendar for Activity Dates)									
PSW04410	Develop Decision Analysis 1995 Report M-50-03	03OCT94	31MAR95	P					
PSW04411	Prepare Decision Analysis 1995 Report M-50-03	03APR95	29SEP95	P					
PSW04412	Stakeholders Input to Decision Basis 1995 Report	30DEC94	17AUG95	P					
PSW04413	RL and Stakeholders Review 1995 Report	18AUG95	15SEP95	P					
PSW04413A	RL Transmits 1995 Report to WDOE		29SEP95	P					
PSW04415	Develop Decision Analysis 1996 Report M-50-03	02OCT95	29MAR96	P					
PSW04416	Prepare Decision Analysis 1996 Report M-50-03	01APR96	30SEP96	P					
PSW04417	Stakeholders Input to Decision Basis 1996 Report	29DEC95	15AUG96	P					
PSW04418	RL and Stakeholders Review 1996 Report	16AUG96	16SEP96	P					
PSW04418A	Iss Prelim Rec on Reqmt for Adv Sldg Sep Process		30SEP96	P					
PSW04420	Develop Draft 1997 Recommendations	01OCT96	31MAR97	P					
PSW04421	Prepare Draft 1997 Recommendations	01APR97	29SEP97	P					
PSW04422	Stakeholders Input to Decision Basis 1997 Report	30DEC96	15AUG97	P					
PSW04423	RL and Stakeholders Review 1997 Report	18AUG97	30SEP97	P					
PSW04423A	Iss Draft Rec on Reqmts for Adv Sldg Sep Process		30SEP97	P					
PSW04425	Prepare Final TPA M-50-03 Report	01OCT97	11NOV97	P					

Activity ID	Activity Description	Early Start	Early Finish	E	FY94	FY95	FY96	FY97	FY98
PSW04427	RL and Stakeholders Review Final Report	29OCT97	25NOV97	P					
PSW04428	Incorporate Changes from DOE and Stakeholders	26NOV97	11DEC97	P					
PSW04429	RL Transmits Final Report to WDOE	12DEC97	31DEC97	P					
4.2.2.1.1: Select Supernate Pretreat Fac Concept									
PSW00120	Info Gathering - Sel Supernate Pretreat Fac	03OCT94	01NOV94	P					
PSW00130	Prep Draft Document - Sel Supernate Pretreat Fac	02NOV94	15DEC94	P					
PSW00140	Review Coordination - Sel Supernate Pretreat Fac	16DEC94	16JAN95	P					
PSW00150	Comment Resolution - Sel Supernate Pretreat Fac	17JAN95	01FEB95	P					
PSW00160	Final Document Prep - Sel Supernate Pretreat Fac	02FEB95	15FEB95	P					
PSW00170	Approve Document - Sel Supernate Pretreat Fac	16FEB95	01MAR95	P					
PSW00170A	Iss Sel Supernate Pretreat Fac Rpt (4 2 2 1 1)		01MAR95	P					
4.2.2.2.a: Determine HLW/TRU Immobilization Process									
SDW3070	ALTERNATIVE GLASS TYPES	06JUL95	05JAN96	H					
4.2.2.2.b: Determine Whether TRU & HLW In Same Fac									
SDW7473	AE TRADE STUDY CLOSE OUT	08OCT94	12JAN95	H					
4.2.2.2.c: Determine HLW Vitrification Facility Concept									
SDW7550	IDENTIFY TECH DEV TO RESOLVE EQ DES UNCERTAINTY	20SEP95	18NOV95	H					
SDW7750	UPDATE FACILITY CONCEPTS	01MAY96	14OCT96	H					
4.2.2.4 & 4.2.2.6 (Combined in 1 Activity)									
SDW7460	DET. HLW/TRU CONTAINER STRG FACI CONCEPT DP4224	07NOV96	18MAR97	H					
4.2.3: Develop System Generated Waste Disposal Concept									
PSW04850	Prepare White Paper Doc Trade Study Dec 4 2 3	03OCT94	03MAR95	P					
PSW04850A	Issue White Paper Doc Trade Study Dec 4 2 3		03MAR95	P					
4.2.3.c: NRC Determine Class of SST LLW Waste									
L4010501	DETERMINE NRC CLASSIFICATION OF SST LLW FRACTION	03APR95	22JUL95	L					
4.2.3.1.1: Determine LLW Form									
L4010301	4231A - PRODUCT CONFIGURATION TRADE STUDY	03OCT94	03JAN95	L					
4.2.3.1.b: Determine LLW Disposal Configuration									
L4010302	4231B - DETERMINE LLW DISPOSAL RETRIEVABILITY	04JAN95	05SEP95	L					
L4010404	4231B - LLW DISPOSAL OPTIONS CONFIGURATION STUDY	03OCT94	02MAR95	L

3.0 DECISION PROCESS

The roles of stakeholder groups and the general public in the TWRS decision process is described. The methodology for evaluation decisions and recommending a consensus alternative is presented.

3.1 PUBLIC INVOLVEMENT

Stakeholder groups and the general public are invited to participate in the decision process from the formulation of decisions, identification of alternatives, evaluation of alternatives, through the development of a consensus recommendation for each decision. Involvement of stakeholder groups and the general public in the decision process is intended to aid in the success of completing the TWRS mission: to store, treat, and immobilize highly radioactive Hanford waste (tank waste and cesium and strontium capsules) in an environmentally sound, safe, and cost effective manner (WHC 1993a). Involvement of stakeholder groups and the public in the decision process is intended to be complimentary to the oversight role of these organizations. In order to not overwhelm stakeholder groups and the general public, the participation of all groups in every decision will not be necessary. Instead, stakeholder groups and the general public will be invited to participate in decisions that set the requirements for the TWRS, or effect the environment, public or workers.

The participation of stakeholder groups and the general public was formally initiated in 1988 with the preparation of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1988). Involvement of stakeholder groups and the general public has been continued through quarterly reviews of this agreement and other forums such as the Hanford Site Tank Waste Task Force. When revisions to the Tri-Party Agreement have been proposed, regional public meetings have been held to solicit opinions from stakeholder groups and the general public. The results of the latest stakeholder groups and public participation in the decision process is presented in the fourth amendment to the Tri-Party Agreement (Ecology 1994).

The continued involvement of stakeholder groups and the general public will be actively sought in the TWRS decision process. A formal public involvement plan has been prepared to achieve this goal (need reference).

3.2 DECISION METHODOLOGY

The principles applied to all TWRS decisions are described in the following sections. The participants in the process are intended to be the people who have the responsibility for making and defending the result. This requires their active participation in the identification and statement of the decision scope, the assumptions needed to accept the scope, and the information needed to make a selection. In addition, the process is often iterative and involves frequent communication with the stakeholders.

Define Frame of Decision: The specific decision to be analyzed is identified and a clear statement of the decision formulated. The decision statement is typically stated as a question that requires resolution. The boundaries (regulatory requirements, desires of the stakeholder groups and public, what is and is not part of the decision scope, etc.) of this decision are defined. Higher order decisions that have been made are reviewed to ensure the decision at hand has been defined consistent with these past decisions.

State Issues: Uncertain boundary limits, open issues, and higher order decisions than the decision being addressed are identified. When necessary, assumptions are listed to clarify the decision statement or to set boundary limits. Assumptions must be verified in subsequent steps of the program development.

Develop a Set of Alternatives: Possible solutions to the decision are identified and described. The possible solutions (i.e., alternatives) selected must satisfy the boundaries of the specific decision; alternatives must satisfy all requirements. The set of alternatives does not have to be an exhaustive list, but must represent interests of stakeholder groups and the public.

Analyze Alternatives: Analyze set of alternatives to ensure conformance with all known requirements and boundaries of decision. Determine potential performance measure applicable for evaluation of each alternative.

Formulate Decision Criteria/Values: The desires and expressed final conditions for remediation of the Hanford Site are solicited from stakeholder groups, and the public, as well as the decision makers. It should be noted that while a set of values may be identified for the program, not all values will have a discriminating effect on all decisions.

Translate Decision Values into a set of Measures: The decision values of the stakeholder groups and the public need to be translated into quantifiable measures. The stakeholder group or other interested party that originally expressed the decision value should be involved or at least aware of the translation of the decision value into a quantifiable measure. Information will be generated for each alternative in terms of these quantifiable measures. Once again, the measures developed for a given decision may vary depending on the issues being addressed.

Evaluate Alternatives: Information is generated for each alternative in terms of the quantifiable measures for the decision criteria.

Present Results to Decision Body: The information generated is presented to the decision makers. The decision makers may request additional information to provide insight into the information presented. This may be the result of either their own desires or the result of consultation with the stakeholders.

3.3 DECISION CRITERIA AND PERFORMANCE MEASURES

Stakeholder groups; The Future for Hanford: Uses and Cleanup (1992) and Hanford Tank Waste Task Force (1993), were convened in 1992 and 1993 to elicit a list of values to be applied when evaluating alternative solutions for decisions (DOE 1992 and DOE 1993a). The decision criteria elicited from these stakeholder groups is provided in Table 3-1. These criteria are at a very high level. Translation of these decision criteria into performance measures needs to be conducted to provide simple natural measures or constructed measures for use by decision makers.

Table 3-1. Stakeholder Groups Values.

VALUE
Protect public / worker health and safety
Transport waste safely and be prepared
Protect the environmental
Protect the Columbia River
Deal realistically and forcefully with groundwater contamination
Do no harm during cleanup or with new development
Use the central plateau wisely for waste management
Cleanup areas of high future use value
Cleanup to the level necessary to enable the future use option to occur
Capture Economic Development Opportunities Locally
Involve the public in future decisions about Hanford
Establish management practices that ensure accountability, efficiency, and allocation of funds to high priority items
Get on with the cleanup to achieve substantive progress in a timely manner
Use a systems design approach that keeps end points in mind as intermediate decisions are made
Protect Rights of Native American Indians
Ensure Compliance
Enhance Technology Development
Reduce Cost
Improve Waste Management
Use Mature Technologies
Enhance Public Acceptance
Use Open and Fair Processes
Increase Efficiency

4.0 EVALUATION OF DECISIONS

A preliminary list of decisions effecting the technical requirements, and/or scope of the TWRS has been prepared from information (i.e., list of issues and required analyses) contained in the *Tank Waste Remediation System Functions and Requirements* (DOE 1994a draft). This preliminary list of decisions is intended for use when initiating dialogue among stakeholder groups, the public, and the DOE. As discussions proceed among these groups and as technical issues are identified, additional decisions will be added to those identified in this section.

The information presented in this section is only the information available at the time this document was prepared. Additional information needed to support selection of an alternative solution has been identified for each decision and activities to acquire the necessary information are identified in the Tank Waste Remediation System Program Multi-Year Work Plan (WHC 1994a). Evaluation of each decision using the methodology detailed in section 3.0 will be conducted following development of necessary information.

4.1 STRUCTURE OF DECISION TABLES

The decisions identified in this section are listed in a hierarchical order, which is consistent with the hierarchical order of the associated functions described in the *Tank Waste Remediation System Functions and Requirements* (DOE 1994a draft). The hierarchical order of TWRS functions and a brief description of each function is provided in Figure 4-1 and Table 4-1. Each decision is numbered to correspond to the associated function; that is decision 4.2 corresponds to function 4.2 Remediate tank Waste and decisions 4.2.1.1.a, 4.2.1.1.b, 4.2.1.1.c, and 4.2.1.1.d all correspond to function 4.2.1.1 Store Waste.

In the following function tables, each decision is briefly described. The related work breakdown structure (WBS) element and function are identified. A date for accomplishing each decision is proposed. A rationale for conducting or excluding public participation (i.e. Public Involvement Plan) in each decision is provided. A preliminary listing and description of alternative solutions and available information for the specific decision are provided. Activities are identified to develop information necessary for conducting each decision (i.e. Program Element Schedule Integration). Finally, the planning basis adopted by the DOE and a qualitative discussion of program uncertainties, risk, and risk mitigation actions associated with the planning basis is provided.

In lieu of having selected a preferred alternative solution for each decision, the DOE has adopted a planning basis to identify and develop necessary technologies, engineering plans, program schedules, and program cost estimates. The selection of a preferred alternative solution for each decision will be developed through participation of stakeholder groups and the public, as discussed in Section 3.0, Decision Process. TWRS program plans will be revised to reflect the selected alternative solution upon completion of each decision.

Figure 4-1. Tank Waste Remediation System Function Hierarchy

Rev. Date 8/9/94 79304041.100a

Table 4-2. Definition of Tank Waste Remediation System Functions.

Function	Definition
4.2	<p>Remediate Tank Waste Store, treat, and immobilize highly radioactive Hanford waste (existing and future tank waste and the strontium and cesium capsules) in an environmentally sound, safe, and cost effective manner.</p>
4.2.1	<p>Manage Tank Waste (MTW) Manage existing tank waste (e.g., waste contained in DSTs, SSTs, 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. Manage tank waste includes safe compliant storage, waste characterization, waste retrieval, waste concentration, and waste transfer to other facilities or processes.</p> <p>The waste will continue to be managed until all of the waste is removed from all of the tanks.</p>
4.2.1.1	<p>Store Waste Contain and monitor SST waste, waste in miscellaneous tanks, and cesium and strontium capsules. Receive, contain and monitor DST waste and in-process waste. Define and initiate actions for mitigation/resolution of safety issues.</p> <p>Waste is currently being received, contained and monitored. This will continue until all waste is removed for final processing.</p>
4.2.1.2	<p>Characterize Waste Provide physical, chemical, and radiological characterization information in support of process control, safety issue resolution, TSD decisions, or other TWRS needs.</p> <p>Waste characterization is currently being performed and will continue until the waste is retrieved and the waste tanks meet the MSGW & EF acceptance criteria.</p>
4.2.1.3	<p>Retrieve Waste (RW) Remove tank waste from SSTs, 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 liquids, saltcake, 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 other wastes or as required to allow completion of closure activities.</p> <p>Waste retrieval has been initiated. Sufficient tank waste will be removed to allow closure without further removal of material.</p>
4.2.1.4	<p>Transfer Waste Move retrieved liquid, slurry, and solid tank waste from SSTs, DSTs, miscellaneous tanks, and the cesium and strontium capsules from WESF to treatment facilities or other storage locations. Move new tank waste from facilities outside of TWRS to treatment facilities or to storage. This function does not encompass waste sample transfers, transfers within treatment facilities, or transfers to and from the evaporator, but does include the transfers of in-process waste and transfers of secondary waste.</p> <p>This will continue until all waste is transferred from the tanks.</p>

Table 4-2. Definition of Tank Waste Remediation System Functions.

4.2.1.5	<p>Concentrate Waste Remove excess water from liquid DST waste to reduce volume of waste feed for treatment and to free up storage capacity in existing tanks.</p>
4.2.2	<p>Process Waste Process tank waste (including DST waste, SST waste, miscellaneous underground storage tanks which contain high-level waste, and cesium/strontium capsules, if required) for disposal. This includes any pretreatment (if required) immobilization and certification of the immobilized waste for disposal. Waste excluded from processing by this function is the underground storage tanks and support structures, production reactor fuels, radioactive materials at reactors, disposal facilities, transfer lines, cribs, ponds, ditches, and low level waste.</p> <p>The Process Waste function is initiated upon waste retrieval for treatment and will continue until the last IHLW/ITRU package is shipped to a geologic repository.</p>
4.2.2.1	<p>Pretreat Waste Separate tank waste into a HLW/TRU fraction and LLW fractions suitable for immobilization and into a fraction suitable for reuse. Pretreatment includes: preparing all retrieved tank waste for separations processes, separating the waste constituents suitable for immobilization as LLW and for reuse, and converting the remaining waste into feeds to the HLW and TRU waste immobilization system. Tank waste will be pretreated when needed to: provide feed for LLW immobilization and/or provide feed for HLW and TRU immobilization.</p> <p>Pretreatment will continue until all tank waste has been converted to feed for immobilization processes. Note: This function included blending of pretreated waste streams, as necessary, to meet feed specifications for the HLW/TRU immobilization and the LLW immobilization systems.</p>
4.2.2.2	<p>Immobilize HLW/TRU Waste Immobilize pretreated HLW and TRU waste, seal the immobilized waste into primary containers, decontaminate the container outer surfaces, and test the integrity of the sealed containers.</p> <p>Tank waste immobilization will begin when the immobilization facility is authorized to begin hot operations and will continue until all of the HLW/TRU is immobilized.</p> <p>Note: DOE/WIPP requirements apply only if a decision is made to dispose of ITRU at WIPP.</p>
4.2.2.3	<p>Prepare Cs/Sr Capsules for Disposal Receive Cs/Sr Capsules from storage, prepare capsules for interim storage at Hanford and disposal offsite at HLW geologic repository.</p>

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Table 4-2. Definition of Tank Waste Remediation System Functions.

4.2.2.4	<p>Interim Store IHLW Transport sealed canisters of IHLW from the HLW/TRU Immobilization facility location, emplace IHLW canisters in their designated storage locations, monitor canisters for storage containment integrity, and eventually retrieve from storage, prepare, and load IHLW canisters on other transport conveyances for offsite shipment.</p> <p>The IHLW canisters will be received from the HLW/TRU Immobilization facility on a regular basis, daily or every so many days depending on canister size, glass production rate, and scheduled production run and will continue until all HLW has been immobilized. Accumulation of IHLW canisters in interim onsite storage will continue until a geologic repository is readied and authorizes shipment of IHLW canisters to it at which time dispatch of IHLW canisters will commence and continue on a regular basis until the IHLW facility is emptied of IHLW canisters.</p> <p>Transport overpacked containers of Cs/Sr from overpacking facility, emplace containers in their designated storage locations, monitor containers for storage containment integrity, and eventually retrieve from storage, prepare, and load containers on other transport conveyances for offsite shipment.</p>
4.2.2.5	<p>Interim Store and Transport ITRU Waste Transport sealed canisters of ITRU from the HLW/TRU Immobilization facility location, emplace ITRU canisters in their designated storage locations, monitor canisters for storage containment integrity, and eventually retrieve from storage, prepare, load IHLW canisters on transport conveyances, and transport to an offsite repository.</p> <p>The ITRU canisters will be received from the HLW/TRU Immobilization facility on a regular basis, daily or every so many days depending on canister size, glass production rate, and scheduled production run and will continue until all TRU has been immobilized. Accumulation of ITRU canisters in interim onsite storage will continue until a geologic repository is readied and authorizes shipment of ITRU canisters to it at which time dispatch and transport of ITRU canisters will commence and continue on a regular basis until the ITRU facility is emptied of ITRU canisters.</p> <p>Note: This function and its allocated requirements are valid only if a decision is made to dispose of ITRU at WIPP.</p>
4.2.2.6	<p>Interim Store Overpacked Cs/Sr Capsules Transport overpacked containers of Cs/Sr from overpacking facility, emplace containers in their designated storage locations, monitor containers for storage containment integrity, and eventually retrieve from storage, prepare, and load containers on their transport conveyances for offsite shipment</p>

Table 4-2. Definition of Tank Waste Remediation System Functions.

4.2.3	<p>Manage System Generated Waste & Excess Facilities Manage waste and excess facilities generated during the process of remediating tank waste. Activities to be managed include immobilization of the LLW (if generated) components, disposition of liquid and gaseous effluent, as well as solid waste, excess facilities, and the disposition of reusable materials.</p> <p>This effort includes management of miscellaneous wastes and processing to transfer failed equipment like pumps and melters to the organization responsible for ultimate disposal. This activity will terminate when all tank waste is remediated and all excess facilities have been turned over to the site-level Deactivate Facilities function (4.1) for final clean-up and closure.</p>
4.2.3.1	<p>Immobilize & Dispose LLW Receive pretreated LLW from the process waste (PW) function, treat LLW, and dispose LLW onsite. This function includes; receipt of the Low-level waste, treatment of the waste by an immobilization process, disposal of the immobilized waste, and closure of the disposal site.</p> <p>This function begins when the LLW is received from PW. Treatment will continue until all waste shipped from PW is treated and the disposal site is closed.</p>
4.2.3.2	<p>Disposition Gaseous Effluent (DGE) Filter, scrub, and exhaust treated gaseous effluent generated from facilities, tanks and processes. Exhaust effluent stream(s) to an external system.</p> <p>This effort is ongoing and will terminate with the last process activity.</p>
4.2.3.3	<p>Disposition Liquid Effluent (DLE) Prepare for disposition the liquid effluent generated as a result of remediating tank waste. Includes collecting, storing, and treating liquid effluents before transfer to the Hanford Site level Manage Aqueous Waste (4.5) function.</p> <p>This effort is ongoing and will terminate with the last liquid effluent treatment activity.</p>
4.2.3.4	<p>Disposition Solid Waste (DSW) Prepare solid waste generated as a result of remediating tank waste for disposition. This includes segregating, characterizing, treating, packaging, and transferring system generated solid waste. Solid waste includes: High-level and low-level radioactive waste, mixed low-level and dangerous waste, transuranic waste, mixed transuranic and dangerous waste, dangerous waste, and nonradioactive non-dangerous solid waste.</p> <p>Disposition solid waste is ongoing and will continue as long as solid waste is generated by TWRS.</p>

Table 4-2. Definition of Tank Waste Remediation System Functions.

4.2.3.5	<p>Disposition Excess Facilities (DEF) Empty, decontaminate, deactivate, and dispose of excess facilities accordingly. Reuse will be determined at the Site level and be acted on by DEF. If reuse within the Remediate Tank Waste function is not an option, then the excess facility will be prepared for transfer to Hanford site-level Deactivate Facilities function (4.1) (D&D) for closure, after the following activities: Identification and/or removal of chemical inventories, decontamination or stabilization of work areas, shut down non-essential support systems, disconnection of utilities, and isolation of tanks (where applicable). Excess facilities are those structures used in the storage, treatment, or processing of tank waste which have no currently identifiable programmatic uses. Excess facilities include: DSTs, SSTs, miscellaneous tanks, transfer liens, pretreatment structures, LLW/HLW facilities and any other facilities that are of the remediation of tank waste function.</p> <p>Processing through DEF is ongoing, specifically clean-up activities on existing, inactive excess facilities (e.g., 244AR Vault, 244CR Vault, 242S Evaporator) awaiting transfer to the Hanford site level Deactivate Facilities (4.1) function. This process ends when the facility meets the acceptance criteria for site-level reuse or transfer for closure.</p>
4.2.3.6	<p>Disposition Reusable Materials (DRM) Evaluate for reuse (before acceptance), collect, store, treat (e.g., recycled water with corrosion inhibitors), package, and transfer materials for Remediate Tank Waste and Hanford site-level reuse. Major types of reusable materials include water, nitrous oxide, concrete (for road aggregate), and scrap metal (e.g., iron, steel, railroad rails, salvage drums/gas cylinders, aluminum, and copper from electrical wiring).</p> <p>This process is ongoing and will terminate with the last process activity.</p>

4.2 DECISION: DETERMINE DISPOSITION OF HANFORD TANK WASTE

DESCRIPTION:

A strategic alternative for treatment and disposal of Hanford tank waste is selected.

RELATED WBS ELEMENT: 1.1.1.1.01.02.04
RELATED FUNCTION: 4.2 REMEDIATE TANK WASTE

DECISION DATE: October 1996

Formal evaluation of this decision will be conducted through the National Environmental Policy Act. A record of decision will be issued to document this decision. An environmental impact statement, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (DOE 1988), and accompanying record of decision was prepared for disposition of the Hanford double-shell tank waste and encapsulate cesium and strontium salts in 1988.

PUBLIC INVOLVEMENT PLAN:

The National Environmental Policy Act requires the solicitation of public comments throughout the preparation for this decision. Public and stakeholder groups participation in the selection and evaluation of alternatives will be obtained while preparing this environmental impact statement.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternative strategies for disposition of the Hanford tank waste will be formulated through involvement of the public. A notice of intent to prepare an environmental impact statement for proposed actions relating to the disposition of Hanford tank waste has been prepared. Public comment on the proposed alternatives has been received and the final list of alternatives for consideration in this environmental impact statement is being prepared.

It is anticipated the list of alternatives will be similar to those previously considered in the *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington*.

a. Continue Storage (i.e. Do Nothing). This alternative encompasses actions to safely store Hanford tank wastes for the indefinite future at the Hanford Site. Safety issues with storage of tank wastes would be resolved. Possible actions would involve stabilization. No treatment or disposal actions would be undertaken.

b. Retrieve "all waste" from all Hanford radioactive tanks. This alternative encompasses actions to safely store Hanford tank wastes until retrieval actions can be initiated. Consistent with appropriate regulations and to the extent technically and economically feasible,

waste would be removed from the Hanford radioactive waste storage tanks for treatment and disposal. It is anticipated that a minimum of 99 volume percent of the waste would be retrieved for treatment and disposal.

c. Retrieve some waste and dispose the remainder in situ. This alternative encompasses actions to safely store Hanford tank wastes until retrieval and in situ disposal actions can be initiated. Consistent with appropriate regulations and to the extent technically and economically feasible, some waste would be removed from a portion of the Hanford radioactive waste storage tanks for treatment and disposal. The remaining waste and tank system would be disposed in situ. A risk based approach would be used for selection of tanks and waste for retrieval and in situ disposal.

d. In situ dispose of all tank waste. This alternative encompasses actions to safely store Hanford tank wastes until in situ disposal actions can be initiated. After which period, all tank waste would be disposed in situ, i.e., without removal from the tank system.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An environmental impact statement, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (DOE/EIS-0113), and accompanying record of decision was prepared for disposition of the Hanford double-shell tank waste and encapsulated cesium and strontium salts in 1988. A new environmental impact statement will be prepared by October 1996, addressing proposed actions for the single-shell tank waste and revised actions proposed for the double-shell tank waste and encapsulated cesium and strontium (i.e. TWRS environmental impact statement). The TWRS EIS will address disposition of the residual waste and the tank system itself.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The program management program element schedule contained in the TWRS Multi-Year Work Plan presently identifies the preparation of the TWRS EIS as activity numbers ES950402; Provide Final Draft SAR, ES9504021; Complete Final Draft SAR, ES950405; Prepare Emission / Non-Emission Data, ES960401; Review / Resolve Issues for TWRS EIS (WHC 1994a). Issuance of the associate record of decision is identified as activity number ES96M01.

DECISION

a. PLANNING BASIS

Retrieval of all tank waste was adopted in December 1991 by U.S. DOE as the planning basis for the TWRS (*Secretary Decision Concerning the Tank Waste Remediation System, Hanford Site*, U.S. DOE Assistant Secretary for the Environmental Restoration and Waste Management memorandum to Manager, DOE Field Office, Richland Washington). All TWRS program activities are directed toward achieving this goal. After completing the NEPA process,

revisions to the TWRS program will be made as necessary to achieve the goals defined through the record of decision.

b. FORMAL DECISION

To be documented in the record of decision for the TWRS environmental impact statement.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The actions addressed and selection of an alternative in the environmental impact statement (EIS) are influenced by societal as well as technical factors. Actions proposed or underway at other DOE sites as well as the Hanford Site may influence the selection of a strategy for dispositioning Hanford tank waste.

b. Impacts and Mitigation

Since the U.S. DOE adopted retrieval of all tank waste as the planning basis, the TWRS has been developing plans and technologies to implement this strategy. This strategy is reflected in the Hanford Federal Facility Agreement and Consent Order.

Currently, the TWRS program is developing and evaluating alternative technologies and facility concepts for treating tank waste for disposal. The TWRS program is not scheduled to engage in the detailed design of any major facility needed for treatment and disposal of Hanford tank wastes until after the completion of the environmental impact statement. Therefore, the financial exposure is low. Schedule risks arise if the TWRS EIS record of decision is delayed past September 1996 or it is significantly different than the planning basis adopted by the U.S. DOE.

These risks can be mitigated by continued involvement of the public and stakeholder groups throughout the preparation of the TWRS environmental impact statement. Based upon public comments received during the fourth amendment revision of the Hanford Federal Facility Agreement and Consent Order and review of the EIS notice of intent, the overwhelming regional societal view is to retrieve all waste from the Hanford radioactive waste storage tanks. It seems unlikely a different alternative would be selected in the record of decision for the TWRS environmental impact statement.

4.2.1 DECISION: DETERMINE TANK WASTE MANAGEMENT STRATEGY

DESCRIPTION:

A strategy is needed for managing Hanford Site tank wastes until these wastes are removed from the tank system, treated, disposed, and the tank system is closed.

RELATED WBS ELEMENT: 1.1.1.2.01.03
RELATED FUNCTION: 4.2.1 MANAGE TANK WASTE

DECISION DATE: Decision was previously conducted and results included in the fourth amendment to the Hanford Federal Facility Agreement and Consent Order (January 1994).

PUBLIC INVOLVEMENT PLAN:

This decision defines strategic plans for management of waste contained in the Hanford Site tanks. The strategy for management of tank wastes has significant influence on resources expended to store, treat and/or dispose of these radioactive solutions. Therefore, public participation in determining the strategy for management of tank waste was deemed necessary and conducted through Hanford Federal Facility Agreement and Consent Order meeting.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

A single alternative was developed for management of Hanford Site tank wastes. This alternative is the only strategy conceived which satisfies all functional requirements.

- a. Compliant and safe operating system. Existing elements of the tank system would be reviewed for compliance with regulations to determine deficiencies. Deficient components which must remain operational for an extended period of time and are necessary to support tank waste remediation actions would be replaced or upgraded to a condition that complies with current codes and regulations.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An evaluation of upgrades required to achieve safe management of the tank system has been previously conducted to prioritize upgrades based upon risks created by existing tank system conditions. The U.S. DOE and Washington State Department of Ecology reviewed the proposed upgrades to the tank system and selected those upgrades necessary to continue safe management of the tank system, while striving toward remediation of the tank waste as the final goal. The Hanford Federal Facility Agreement and Consent Order reflects the agreed upon upgrades by establishing a schedule (milestones) for completing upgrades to the tank system ventilation, instrumentation, electrical and transfer system components.

Safety documentation for the existing tank system identifies the physical attributes of each component to insure the safety of the public, environment, and workers. Interim safety basis documentation identifies specific upgrades to the tank system to ensure the safety of the public, environment and workers, where formal safety analysis reports have not been prepared to current standards.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The Tank Farms operations schedule does not presently identify specific elements for conducting the necessary studies to support this decision. Upgrades to the tank system are identified under WBS element 1.1.1.2.03.07 and within the tank farm upgrades program element schedule.

DECISION

a. PLANNING BASIS
See formal decision.

b. FORMAL DECISION
The strategy for management of Hanford Site tank wastes is included as part of the actions detailed in the Hanford Federal Facility Agreement and Consent Order, the Resource Conservation and Recovery Act permit for the tank system, interim safety basis documents, and safety analysis reports for tank system facilities. The DOE will continue compliant and safe operation of the tank system. Components which must remain operational for an extended period of time and are necessary to support tank waste remediation actions will be replaced or upgraded to a condition that complies with current codes and regulations.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions
The tank waste management strategy adopted by the DOE influences total resource needs as well as resource profile. The restoration of the tank system to compliant operating conditions may require excessive resources and delay actions for remediation of the tank waste or the Hanford Site as a whole.

b. Impacts and Mitigation
Efficient use of the public's resources and demonstration of accomplishments is necessary to sustain public trust in the DOE's remediation of the Hanford Site. Without public confidence, funding for remediation of the Hanford Site is in doubt.

The DOE is pursuing a graded approach for restoration of the tank system to compliant conditions. Components which have significant impact to public / worker safety or the environment will be evaluated for regulatory compliance. Identified deficiencies will be corrected expeditiously and cost effectively. Tank waste remediation activities will be conducted as the next priority, with emphasis on demonstration of progress toward clean up.

This approach will ensure that the risk to the public, workers and environment remains low through continued maintenance of the tank farm system. The graded approach for restoration of the tank system and the interactions with the tank waste remediation activities have been integrated in the TWRS Program baseline schedule and cost estimates. Since the graded approach to restoration of the tank system is integrated with tank waste remediation actions, the schedule and cost impacts to the TWRS Program are being managed and remain low. Impacts to the baseline program would only occur if additional tank system deficiencies are discovered, the scope of currently identified upgrades changes, or there are major changes to external programs which generate significant amounts of waste.

4.2.1.1.a DECISION: DETERMINE DOUBLE-SHELL STORAGE SPACE REQUIRED TO SUPPORT TANK WASTE REMEDIATION SYSTEM ACTIVITIES

DESCRIPTION:

The strategy for acceptance of new waste and management of existing waste in the Hanford Site double-shell tanks is established.

RELATED WBS ELEMENT: 1.1.1.2.01.03.06
RELATED FUNCTION: 4.2.1.1 STORE WASTE

DECISION DATE: September 1995 - DST storage space required to support continued safe storage of tank wastes.

September 1997 - DST storage space required to support treatment and disposal of tank wastes.

PUBLIC INVOLVEMENT PLAN:

This decision defines strategic plans for management of existing and acceptance of new waste into the double-shell tank system. The strategy for management of double-shell tank space has significant influence on the need for additional double-shell tanks as well as Hanford Site remediation activities. The public has previously expressed interest in the construction of additional double-shell tanks. Therefore, public participation in determining the strategy for management of double-shell tank space is deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Currently, radioactive liquid wastes are generated at facilities previously used for waste management and defense production (e.g., B Plant, PUREX, Z Plant), analytical laboratories (e.g., 222-S building, waste sampling and characterization facility), stabilization of single-shell tanks and miscellaneous sources. Facilities which were previously used for waste management and defense production contain radioactive materials which need to be removed (i.e. decontamination) to reduce worker radiological exposure and prepare these facilities for decommissioning. Decontamination of these facilities will result in the generation of radioactive liquid wastes. Stabilization of single-shell tanks is being conducted to remove pumpable liquids from these older underground storage tanks. Several of these single-shell tanks have leaked or are suspected of having leaked drainable radioactive liquids into the soil column. Other potential actions which require the use of double-shell storage tanks are the mitigation of tank waste safety issues (e.g., high heat waste in tank 241-C-106).

Four alternatives have been proposed for management of existing waste and acceptance of new wastes within the double-shell tanks at the Hanford Site. Although these alternative concepts are described singularly, they may be combined.

a. Accept no new waste into the double-shell tank system. This alternative would require the facilities which generate radioactive liquid wastes to provide appropriate treatment, storage and disposal (TSD). Each TSD facility would need to obtain appropriate permits and acquire necessary equipment.

b. Develop alternative storage methods. Some facilities generate liquid wastes containing low-levels of radioactive elements. Stakeholder groups (i.e. Washington Department of Ecology, Yakama Indian Nation) have suggested storing these low-activity waste solutions in rail cars. Secondary containment and spill prevention / collection components would need to be included with these rail cars.

Calcinization of existing and planned sources of tank wastes has also been suggested as an alternative storage method. A calcinization facility would need to be constructed. Tank wastes would be calcined and placed into storage bins.

c. Consolidate wastes. Waste consolidation methods are currently being used for managing double-shell tank space at the Hanford Site. Waste consolidation methods presently used include minimization of liquid waste generation, evaporation of dilute radioactive tank wastes to reduce storage volume, and combining compatible wastes. Additional actions which could be conducted to further consolidate tank wastes include installation of retrieval systems to consolidate compatible tank waste sludges. However, there is a long lead time (3 to 5 years) for design and construction of waste retrieval systems.

d. Build new double-shell tanks. New double-shell tanks would be constructed as necessary to store the projected volume of new tank waste from operation of analytical laboratories (e.g. 222-S building, waste sampling and characterization facility), stabilization of single-shell tanks, decontamination of previously used waste management facilities, etc.

INFORMATION AVAILABLE TO SUPPORT DECISION:

A technically defensible projection of the volume of new tank waste from operation of analytical laboratories (e.g. 222-S building, waste sampling and characterization facility), stabilization of single-shell tanks, mitigation of safety issues decontamination of previously used waste management facilities, and other activities which will generate radioactive liquid wastes needs to be prepared. The technical basis should be developed for all actions which generate tank wastes. Assumptions used in this waste volume projection need to be agreed to by interested parties. Feasible actions which do not increase risks such as minimizing waste generation, delaying activities, or consolidating tank waste should be explored. Then, a best approach for managing double-shell tank space can be agreed to by interested parties.

An Interim Safety Basis for storage of wastes in this tank system has been prepared by Westinghouse Hanford Company. However all safety issues have not been fully addressed. Specifically relating to waste storage capacity requirements, a safety assessment of the active mitigation systems (i.e. mixer pumps) presently or planned to be deployed for mitigation of the flammable gas

watchlist tanks (e.g, tanks 241-SY-101 and 241-SY-103) should be conducted to determine the adequacy of active mitigation. A evaluation of whether to continue active mitigation or proceed with passive mitigation (e.g., dilution of wastes) is needed. The requirements for a passive mitigation system for the flammable watchlist tanks needs to be established. These engineering analysis will establish whether or not additional waste storage capacity is needed for mitigation of the flammable gas watchlist tanks.

An environmental impact statement for the Safe Interim Storage of Hanford Tank Wastes is being prepared to resolve near-term tank safety issues associated with wastes in tanks 241-SY-101 and 241-SY-103 (DOE 1994c draft).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The Tank Farms operations schedule identifies preparation of waste volume projections to support this decision as activity numbers N1F660H02, N1F660H04, N1F660H06, N1F660H08, N1F660H10, N1F660H12, N1F660H14, N1F660H16, N1F660H18, N1F660H20, N1F660H22, N1F660H24. These tasks are being conducted in support of the Hanford Federal Facility Agreement and Consent Order, milestone M-46-00.

DECISION

a. PLANNING BASIS

As a planning basis, waste consolidation and construction of 2 new double-shell tanks has been adopted, based upon projections of tank space utilization and quantity of new tank waste generated from decontamination of previously used waste management facilities (WHC 1994b). An option to build additional tanks for safe waste storage will be reviewed in September 1995, based upon available waste volume projections and validation of assumptions. The planning basis includes construction of two new double-shell tanks in the 200 West Area and possibly other new double-shell tanks in the 200 East Area of the Hanford Site. The new tanks in the 200 West Area would be operational in calendar year 1999.

Waste treatment and disposal processes and facility concepts have not been selected. Demonstration of waste retrieval systems and waste pretreatment processes (sludge washing) will be conducted in calendar year 1997. An evaluation of double-shell storage capacity needs to support waste treatment and disposal operations (scheduled to commence in 2004) will be conducted by September 1997, following identification of waste treatment storage requirements.

b. FORMAL DECISION

A formal decision for additional waste storage capacity needs will be conducted in September 1995 following completion of the above analyses.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The availability of double-shell tank space effects the timing and ability to accomplish the TWRS mission. Retrieval of single-shell tank waste for treatment and disposal, pretreatment of double-shell and single-shell tank waste, and immobilization of these tanks wastes can not be initiated nor efficiently conducted unless adequate double-shell tank space is available to support these activities.

b. Impacts and Mitigation

The major uncertainty with pursuing the planning basis; waste consolidation and construction of new double-shell tanks, is the new tanks will not be required or not required in the time frame which the tanks are operational. Resources will have been expended which could have been directed toward other Hanford Site remediation activities. The source of this uncertainty is the assumptions used to project sources of radioactive liquid wastes requiring storage in the double-shell tank system.

Compounding the uncertainty with the need for new double-shell tanks is risks associated with not providing sufficient double-shell tank storage space to allow timely stabilization of single-shell tanks or mitigation of tank safety issues. Delays to conducting stabilization of single-shell tanks could result in additional inadvertent leakage of radioactive liquids into the soil column. Delays to the mitigation of safety issues associated with wastes in tanks 241-SY-101 and 241-SY-103 would require continuation of active mitigation practices as opposed to passive mitigation through dilution of these wastes.

The assumptions used to project sources of radioactive liquid wastes requiring storage in the double-shell tank system are being reviewed by stakeholder groups (e.g., DNFSB, Washington Department of Ecology) to reach consensus. The planning basis adopted by the U.S. DOE allows for the earliest possible stabilization of single-shell tanks, decontamination of older facilities and passive mitigation of tank waste safety issues. This approach represents the lowest environmental and safety risks, and does not commit funds for construction of new double-shell tanks until requirements for these tanks have been established. Active safety issue mitigation of the wastes in tanks 241-SY-101 and 241-SY-103 (flammable gas generation) would need to be continued until sufficient double-shell tank storage space where available to allow passive safety issue mitigation through retrieval and dilution of these wastes.

4.2.1.1.b DECISION: DETERMINE SINGLE-SHELL TANK STORAGE CONCEPT

DESCRIPTION:

The strategy for management of waste contained within single-shell tanks must be determined to establish TWRS requirements and determine programmatic scope, cost and schedule needs.

RELATED WBS ELEMENT: 1.1.1.2.01
RELATED FUNCTION: 4.2.1.1 STORE WASTE

DECISION DATE: To be determined.

PUBLIC INVOLVEMENT PLAN:

This decision defines strategic plans for management of waste contained in the single-shell tanks. The strategy for management of waste contained in the single-shell tanks has significant influence on resources expended to store, treat and/or dispose of these radioactive materials. Therefore, public participation in determining the strategy for management of waste contained in the single-shell tanks is deemed necessary.

ALTERNATIVES EVALUATED:

Three alternatives have been proposed for management of waste contained in single-shell tanks (SSTs). All three alternatives are consistent with applicable regulatory requirements.

a. Seal SSTs until retrieval of waste. The interstitial liquid still remaining in some single-shell tanks would be removed to reduce the impacts if a leakage of solution occurred. All ancillary interfaces with the single-shell tanks would be isolated, leaving only interfaces necessary for safely monitoring and controlling the conditions of the waste within these tanks. The SSTs would be isolated until waste needed to be removed to resolve a tank safety issue or to retrieve for processing.

b. Continue current SSTs operating and storage plans. The interstitial liquid still remaining in some single-shell tanks would be removed to reduce the impacts if a leakage of solution occurred. The sludges and saltcakes would continue to be stored in the single-shell tanks until needed for processing or resolution of safety issues. The single-shell tanks would be monitored and controlled to ensure safety conditions are maintained. Any practical upgrades would be conducted to maintenance and monitoring equipment to ensure safe storage.

c. Perform major upgrades to SSTs. The interstitial liquid still remaining in some single-shell tanks would be removed to reduce the impacts if a leakage of solution occurred. Major upgrades to the SSTs maintenance and monitoring equipment would be conducted to provide for long-term safe storage of waste.

INFORMATION AVAILABLE TO SUPPORT DECISION:

A safety based engineering evaluation needs to be performed to determine the best plan for management of wastes within single-shell tanks. A safety evaluation of interim stabilization of single-shell tanks was conducted in October 1992 and concluded that stabilization of non-watchlist single-shell tanks was acceptable (WHC 1992).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

Not identified on program element schedules.

DECISION

a. PLANNING BASIS

Continuation of current operating and storage plans for the single-shell tanks has been incorporated in the program. This is in accordance with DOE Order 5820.2A, *Radioactive Waste Management, High-Level Waste* and Washington state administrative codes.

b. FORMAL DECISION

No formal decision has been developed.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Single-shell tank waste storage concepts which effect the characteristics (physical and chemical) of the tank system or tank waste will influence waste mobilization concepts (decisions 4.2.1.3). Single-shell tank waste storage concepts which effect the volume of stored waste or require retrieval of tank waste prior to having pretreatment and immobilization systems available will influence double-shell tank space management decisions (decision 4.2.1.1.a).

The planning basis adopted by the DOE minimizes the influence on double-shell tank storage space. Removal of liquids from the single-shell tanks may influence waste mobilization concept selection, but the reduction in environmental risks from preventing radioactive solution leak is far more beneficial.

b. Impacts and Mitigation

Sixty-seven of the 149 single-shell tanks are suspected or have leaked radioactive solutions into the environment. Continued storage of waste within these tanks increases the likelihood that future leakage of radioactive solutions into the environment will occur. Stakeholder groups may not support continued storage of wastes within the single-shell tanks.

Stabilization of single-shell tanks is being conducted to remove liquids from these older underground storage tanks (WBS element 1.1.1.2.01.05). Stabilization of single-shell tanks is scheduled to be completed by September 2000.

Stakeholder groups participated in the evaluation of alternatives for managing single-shell tank waste. Stakeholder groups initially requested inclusion of an alternative for retrieval of all single-shell tank waste into double-shell tanks at the earliest possible date. An initial evaluation of this stakeholder proposed alternative indicated a minimum of 70 new double-shell tanks (~3.8 million liters capacity each) would need to be constructed to store the single-shell tank waste. All single-shell tank waste was estimated to be transferred into double-shell tanks by 2016 (WHC 1993e). Stakeholder groups did not find this alternative favorable. Instead, the consensus alternative for managing single-shell tank wastes is the DOE planning basis, which is embodied in the Hanford Federal Facility Agreement and Consent Order (Ecology 1994). The likelihood of a change in this management approach is low, since this consensus was reached among stakeholder groups.

The other two alternatives for managing the SST wastes, seal the SST until retrieval and upgrade the SST system, would be time consuming to implement. The cost effectiveness of perceived reductions in environmental and safety risks from implementing either of these options is doubtful, since the retrieval of waste from SST is scheduled to commence in December 2003.

4.2.1.1.c DECISION: DETERMINE CAPSULE INTERIM STORAGE CONFIGURATION

DESCRIPTION:

Select a configuration for interim storage of cesium and strontium capsules which supports interim storage of the existing capsules until completion of capsule disposition.

RELATED WBS ELEMENT: This activity is an element of the Transition Projects program.

RELATED FUNCTION: 4.2.1.1 STORE WASTE

DECISION DATE: July 1995

PUBLIC INVOLVEMENT PLAN:

This decision defines strategic plans for management of the cesium and strontium capsules. The strategy for the cesium and strontium capsules has significant influence on resources expended to store, treat and/or dispose of these radioactive materials. Therefore, public participation in determining the strategy for management of the cesium and strontium capsules is deemed necessary.

ALTERNATIVES EVALUATED:

The Waste Encapsulation and Storage Facility (WESF) provides pool cells (water filled basins) as the current interim storage system for capsules. The WESF was constructed as an annex to the B Plant and relies upon B Plant for disposal of liquid effluents. Construction of the WESF was completed in 1972. This system is considered a relatively old and high cost method of providing interim capsule storage. Therefore, the following alternatives for providing the capsule interim storage capability were defined.

- a. Continue Interim Storage in WESF. Continue capsule interim storage in WESF until the capsules are removed for disposition processing. This alternative may be combined with activities to decouple WESF from the B Plant supporting systems in order to reduce interim storage costs.
- b. New "Wet" Storage Facility. Construct a new facility which provides pool cells similar to the current WESF configuration. Upon completion of the new facility, capsules are removed from WESF allowing the older facility to be shut down. The new facility is used for interim capsule storage until disposition processing is complete.
- c. New "Dry" Storage Facility. Construct a new facility based on dry storage concepts. Upon completion of the new facility, capsules are removed from WESF allowing the older facility to be shut down. The new facility is used for interim capsules storage until disposition processing is complete.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An assessment of the economic, environmental, and safety factors for each interim storage alternative needs to be conducted to verify continued storage of capsules in WESF is preferential to other alternatives. The Hanford Site Level System Engineering organization is conducting an analysis of capsule interim storage options as part of Hanford Federal Facility Agreement and Consent Order milestone M-33-00-T04.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

Not identified on program element schedules.

DECISION

a. PLANNING BASIS

Current planning assumes that WESF storage of capsules is acceptable. However, the potential that more cost effective interim storage alternatives exist is recognized.

b. FORMAL DECISION

No formal decision has been developed.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The interim storage configuration decision may be influenced by the capsule disposition decision (decision 4.2.2.c). This influence may result from the degree that reliance is placed upon the current capsule primary container for long term integrity as part of the selected disposition method. If long term primary container integrity is required for the disposition, then time, chemical environment and temperature limits for the container walls may be imposed on the interim storage configuration.

If the disposition of the capsules is to send them to the HLW repository, the interim storage configuration decision may also influence decisions on facility concepts for the capsule overpack facility (decision 4.2.2.3) and/or HLW vitrification facility (decision 4.2.2.2.c). This influence is at a relatively low level of design configuration, impacting the design of capsule receiving and handling systems.

b. Impacts and Mitigation

The impacts from the uncertainty in the interim storage configuration of the capsules are considered relatively low at this time. Sufficient time exists to determine the interim storage configuration and incorporate design features in either the capsule overpack or HLW/TRU immobilization facilities, if necessary.

Constructing a new dry or wet storage facility may allow the shutdown of the WESF. However, storage of capsules in WESF is fully compliant with existing regulations. There may be increased risk to workers and the

environmental by moving the capsules to a new facility, since handling of the capsules is involved. A cost reduction may occur if the life cycle cost of a new facility were less than the operating costs for WESF. An analysis of alternative storage methods is being conducted to evaluate alternatives (milestone M-33-00). In all cases, interim storage configuration criteria should be developed to maintain the capsule primary container integrity throughout the interim storage time frame. If reprocessing disposition is selected, the long term performance of the existing capsule containers is not an issue because the capsules would be cut open to blend the material with tank waste as part of the disposition process.

Uncertainties with the long term performance of the primary capsule can be mitigated by providing at least one overpack barrier. This overpack barrier should be independent of the primary container condition, eliminating any reliance on the long term integrity of the existing capsule for all disposition alternatives.

The uncertainty in the interim storage configuration imposes some design uncertainties in the receiving systems of any capsule disposition processing facility. This uncertainty can be mitigated by specifying a reference transport package for capsules (decision 4.2.1.4) which must be accommodated by the interim storage system, independent of the selected storage configuration.

4.2.1.1.d DECISION: DETERMINE FUNCTIONAL RESPONSIBILITY FOR MISCELLANEOUS UNDERGROUND STORAGE TANKS

DESCRIPTION:

There are approximately 50 miscellaneous underground storage tanks located in the 200 Area of the Hanford Site which potentially contain waste similar to other TWRS tank waste. These miscellaneous underground storage tanks were previously used in association with processing of defense wastes. A decision is needed whether the remediation of the waste within these tanks is or not within the TWRS scope. If remediation of the waste within these tanks is not part of the TWRS scope, then this scope needs to be assigned to another Hanford Site program.

RELATED WBS ELEMENT: 1.1.1.2.02.07
RELATED FUNCTION: 4.2 REMEDIATE TANK WASTE

DECISION DATE: September 1994

PUBLIC INVOLVEMENT PLAN:

This decision defines work scope for Hanford Site programs. The specific alternatives for remediation of the miscellaneous underground storage tanks are not being evaluated. Therefore, public participation in determining programmatic scope is not deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

The remediation of the miscellaneous underground storage tanks waste can either be conducted as part of the TWRS or assigned to another Hanford Site program.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Information (e.g. estimated waste composition, tank locations, dimensions) on the miscellaneous underground storage tanks is contained in *Engineering Study of 50 Miscellaneous Inactive Underground Radioactive Waste Tanks Located at the Hanford Site, Washington*, WHC-SD-EN-ES-040. This information may be useful in determining programmatic responsibility for remediating the waste contained in the miscellaneous underground storage tanks.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

This activity will be completed during fiscal year 1994, which precedes issuance of the TWRS Program Multi-Year Work Plan. Therefore, no schedule element is identified in the TWRS Program Multi-Year Work Plan for determining functional responsibility of the MUSTs.

The tank waste safety identifies activities for assessing the MUSTs as activity numbers N2G710A010 through N2G710G6.

DECISION

a. PLANNING BASIS

As a planning basis, programmatic responsibility for remediating the waste contained in the miscellaneous underground storage tanks has been assumed to be assigned to TWRS. Additionally, TWRS has assumed as a planning basis that retrieval of waste from the miscellaneous underground storage tanks will be the preferred alternative identified in the closure plan.

b. FORMAL DECISION

A formal decision has not been developed.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

A closure plan needs to be prepared addressing the proposed disposition of the miscellaneous underground storage tanks and wastes contained therein. The closure plan will not effect programmatic responsibility for dispositioning the miscellaneous underground storage tanks and associated wastes. However, activities required for dispositioning these wastes will be defined in this closure plan.

b. Impacts and Mitigation

Present MUSTs activities being conducted by TWRS involve monitoring and safe storage and evaluation of potential safety issues. These activities need to be conducted regardless of the programmatic responsibility for these tanks. Therefore, TWRS is proactively reducing the risk to completion of the Hanford Site mission by conducting these activities. Since disposition of these tanks will not be conducted for a number of years, assessment of the safety and environmental conditions of these tanks is also being conducted to assess these risks, which are presently considered low.

4.2.1.2 DECISION: DETERMINE PROCESS FOR OBTAINING TANK WASTE
CHARACTERIZATION INFORMATION

DESCRIPTION:

A methodology is selected for obtaining and analyzing the physical and chemical properties (i.e. characterization information) of the Hanford Site tank waste.

RELATED WBS ELEMENT: 1.1.1.2.04.05
RELATED FUNCTION: 4.2.1.2 CHARACTERIZE WASTE

DECISION DATE: January 1994

PUBLIC INVOLVEMENT PLAN:

This decision was evaluated as part of the fourth amendment to the Hanford Federal Facility Agreement and Consent Order (Ecology 1994). The process for amending the Hanford Federal Facility Agreement and Consent Order solicited input and comments from stakeholder groups, the general public, the Washington Department of Ecology, the Yakama Indian Nation, and the DOE.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Four alternatives for obtaining tank waste characterization information have been proposed. These alternatives are discussed below.

a. Use existing tank waste characterization information. Historical records are available describing processes used to generate various tank wastes, chemicals added to the tank system, and movement of tank waste within the tank system. Samples of tank waste were obtained at the time of generation and analyzed for specific components. The results of these analytical analyses are also available. However, the accuracy of these historical analytical analyses may not meet present standards. All tank waste chemical components and physical properties of present interest were not analyzed in these historical samples. Additionally, physical properties of the tank waste has changed since placement in the tank system.

b. Obtain and analyze tank waste samples. Functional requirements for obtaining tank waste characterization information would be identified. Accuracy of information and analyses needed would be assessed. Samples of tank waste would be obtained and analyzed to determine physical and chemical properties.

c. Analyze tank waste in situ. Functional requirements for obtaining tank waste characterization information would be identified. Accuracy of information and analyses needed would be assessed. Tank waste physical and chemical properties information would be obtained by assessing the waste without removal from the tank system.

d. Use existing tank waste characterization, obtain and analyze tank waste samples, and analyze tank waste samples in situ. A review of user needs would be conducted to determine which method or combination of methods is appropriate for obtaining tank waste characterization information.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The Defense Nuclear Facility Safety Board (DNFSB) recognized the importance of obtaining accurate tank waste physical and chemical properties information in order to resolve safety issues with tank waste storage. The DNFSB expressed concerns that the tank waste characterization methodology would be satisfactory. In response to the DNFSB's concerns, The DOE, Richland Field Office, developed a plan for obtaining the necessary tank waste physical and chemical properties information (DOE 1994a).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The tank waste characterization program element schedule reflects a series of activities for obtaining the needed physical and chemical properties of tank waste. The principle activity for determining tank waste characterization needs is the data quality objective process. Additionally, an assessment of historical tank waste characterization data is being conducted. An evaluation of the processes for obtaining tank waste characterization information (i.e. alternatives identified above) is scheduled (activities N4E52A01 and N4E52A01A) to be completed by February 1995 (WHC 1994a). Revision to the strategy for characterizing tank wastes will be conducted based upon this evaluation.

DECISION

a. PLANNING BASIS

See formal decision section.

b. FORMAL DECISION

A methodology for obtaining tank waste characterization information was evaluated during the fourth amendment to the Hanford Federal Facility Agreement and Consent Order (Ecology 1994). Stakeholder groups, the Washington Department of Ecology, the Yakama Indian Nation, and the U.S. Department of Ecology all participated in the formulation and review of proposed revisions to the Hanford Federal Facility Agreement and Consent Order. The alternative selected in the Hanford Federal Facility Agreement and Consent Order for obtaining tank waste characterization information is where appropriate to utilize historical information, obtain and analyze samples of tank waste, and analyze tank waste in situ to obtain necessary information.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of a methodology for obtaining tank waste characterization information influences the availability of this information. Timely availability of tank waste characterization information is necessary to determine the disposition of tank waste (decision 4.2), resolve safety issues with storage of tank waste, obtain NRC concurrence on the disposition of single-shell tank waste (decision 4.2.3.c), and select processes / strategies for waste mobilization (decision 4.2.1.3) and waste processing (decisions 4.2.2, 4.2.2.a, and 4.2.2.2.a).

b. Impacts and Mitigation

Due to limited access and the non-homogeneous nature of wastes in the tanks, analyses of physical tank waste samples will not provide precise knowledge of tank waste characteristics. Instead, analyses of tank waste samples will provide confirmatory information regarding historical records and may indicate tanks which have unusually high concentrations of waste components of concern to safe storage or treatment.

The selected methodology for obtaining tank waste characterization information is a robust strategy which tailors information availability to users needs. When appropriate, historical tank waste information is available to make decisions. If additional information is required, in situ analyses of tank waste or analyses of waste samples can be conducted.

The key to supplying tank waste characterization information in a timely manner to support the decision process is availability of historical information, in situ analyses techniques or laboratories to analyze waste samples, when needed. The DOE, Richland Field Office, has developed a plan for obtaining the necessary tank waste physical and chemical properties information in a timely manner (DOE 1994a). The availability of tank waste characterization information is highly important to conducting interfacing decision. Through successful execution of the tank waste characterization plan, the availability of tank waste characterization information to support decision can be managed at a low level of risk.

4.2.1.3 DECISION: DETERMINE WASTE RETRIEVAL STRATEGY

DESCRIPTION:

A strategy is selected for developing, testing and deploying waste mobilizing systems for waste contained in single-shell, double-shell and miscellaneous underground waste tanks. A methods is selected for retrieval of cesium and strontium capsules from the interim storage facility.

RELATED WBS ELEMENT: 1.1.1.2.05.01.01
RELATED FUNCTION: 4.2.1.3 RETRIEVE WASTE

DECISION DATE: January 1995

PUBLIC INVOLVEMENT PLAN:

This decision selects a strategy for development, testing and deployment of systems for retrieval of waste contained in single-shell, double-shell and miscellaneous underground storage tanks. Additionally, a method for retrieval of capsules from the interim storage facility is selected. The waste retrieval strategy (coupled with the use or non-use of barriers) may potentially cause an inadvertent leakage of radioactive liquid solutions during waste retrieval. Cesium and strontium capsules contain a large quantity of radioactive materials. Movement of cesium and strontium may potential expose workers or the environment to large dose of radioactive materials, if handled improperly. Therefore, public participation in determining these strategies is deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

A preliminary list of alternative concepts for mobilizing tank waste have been developed based upon previous evaluations of technologies. These alternative concepts are grouped into concepts which have been previously deployed on a large scale for waste mobilization process, enhancements to these previously demonstrated technologies, and alternatives technologies.

a. Use Existing Waste Retrieval Technologies. High velocity jets or streams of fluid have been used to hydraulically mobilize waste within Hanford Site single-shell tanks (RHO 1980), Hanford Site double-shell tanks (e.g., tank 241-SY-101) and Savannah River Site tanks. Previously deployed hydraulic retrieval systems include sluicers and mixer pumps. These technologies would be adapted and demonstrated for retrieval of wastes contained in single-shell, double-shell, and miscellaneous underground storage tanks. Subsurface barriers would be evaluated to determine effectiveness and could be deployed in combination with retrieval of wastes from tanks of questionable structural integrity.

The previously demonstrated method for retrieval of capsules from the Waste Encapsulation and Storage Facility (WESF) is to use a manual manipulator to grasp the capsules and remove them from the storage rack. The capsules are maintained under water, which provides radiation

shielding for the operator, while this operation is conducted. The retrieved capsules are manually transported to a shielded cell, where they can safely be handled. Assuming the capsule interim storage facility was either WESF or a similar facility using wet storage concepts, this method of retrieval could be used.

b. Use Existing Waste Retrieval Technologies, Transition to Enhanced Technologies or Alternatives. Subsurface barriers would be evaluated to determine effectiveness and could be deployed in combination with retrieval of wastes from tanks of questionable structural integrity. Initially, existing waste retrieval technologies (e.g., sluicers and mixer pumps) would be developed and demonstrated for retrieval of tank wastes. Enhancements and alternative technologies to these previously demonstrated retrieval technologies would be developed and tested as back up systems and would be deployed if economically, environmentally, or otherwise superior.

Enhanced retrieval systems could be mechanical modifications to provide directional control of sluicers, reduction in hydraulic fluid usage, or limited dispersion of the hydraulic fluid.

Alternative concepts for waste mobilization could include mechanical processes (mechanical forces are used to dislodge waste so they can be removed from tanks), pneumatic processes (a high velocity pneumatic jet is used to mobilize waste), dissolution processes (water or other chemicals are used to dissolve waste, which is then removed from the tank), thermal processes (temperature increase or changes are used to change the physical phase of the waste), focused ultrasonic processes (ultrasonic waves are used to dislodge waste for removal from the tank), shaped charges (a small explosive device is used to dislodge waste for removal from the tank).

Alternatives for capsule retrieval methods are potentially automated manipulators or robots for removal of capsules from storage locations and transportation to the shielded handling cell.

c. Use Alternative Technologies Only. Alternative technologies would be evaluated, tested, and demonstrated prior to selecting a technology for deployment.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Attributes of the tank waste retrieval concepts are identified in section 6.0 and appendix F of the *Tank Waste Technical Options Report* (WHC 1993d), *Review of Prior Single-Shell Tank Waste Retrieval Process Studies*, (WHC 1993f), *Single-Shell Tank Waste Retrieval Concept Review*, (WHC 1991a), *Retrieval Concepts Selection Decision Analysis*, (WHC 1991b), and *Single-Shell Tank Waste Retrieval Study*, (WHC 1990a).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The tank waste retrieval program element schedule presently identifies the evaluation and development of a waste retrieval strategy as activity number ROA100-5A; Issue Determination of Tank Waste Retrieval Strategy (WHC 1994a).

DECISION

a. PLANNING BASIS

A combination of mechanical (i.e. long reach arm) and hydraulic (i.e. sluicing) waste retrieval processes has been adopted for retrieval of high heat waste from tank 241-C-106. These processes will be demonstrated in 1997 and 2003, respectively. A hydraulic process (i.e. mixer pumps) has been adopted for retrieval of waste in tanks 241-AZ-101, 241-SY-101, and 241-SY-103. This process will be demonstrated in 1997 for tank 241-AZ-101 and in 1998 for tanks 241-SY-101 and 241-SY-103. It is assumed mechanical and hydraulic processes, transitioning to enhancements to these technologies, will be used for retrieval of waste from other single-shell tanks, double-shell tanks, and miscellaneous underground storage tanks.

Subsurface barriers will be evaluated for effectiveness, but it is assumed that these will not be deployed.

Retrieval of capsules from the interim storage facility is assumed to be conducted using the manual manipulator technique.

b. FORMAL DECISION

Selection of waste retrieval processes will most likely be made on a tank by tank basis, dependent upon closure requirements, the physical and chemical properties of the waste, the structural condition of the tank, and the feasibility of using subsurface barriers to inhibit / prevent migration of radionuclides into the environment.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Selection of a tank waste retrieval strategy is influenced by the operable units closure requirements, conditions of retrieved waste for acceptance by interfacing functions (e.g., storage and pretreatment), the chemical and physical properties of the waste, and prevention of radioactive material dispersion during waste mobilization.

The closure requirements will be derived from regulatory mandated tank closure plans. Closure requirements determinations regarding landfill versus clean closure and acceptable residue in tanks are required to be made before closing these tanks and the tank farm operable unit (see decision 4.2.3.5). Determination of these closure requirements will provide the criteria for waste retrieval, thus influencing the waste retrieval strategy decision.

The selection of a method for retrieval of cesium and strontium capsules is influenced by the selection of the interim storage facility (decision

4.2.1.1.c) and assessment of radiological exposure reduction versus continuation of manual capsule handling methods.

b. Impacts and Mitigation

The availability of tank waste characterization information will impact the selection of tank waste retrieval systems. Required tank waste characterization information to support selection of waste retrieval systems will be determined using the data quality objectives (DQO) process. After identification of tank waste characterization requirements for the entire TWRS program, prioritization of requirements will be conducted and tank waste information obtained for each program element. Complete characterization of tank wastes is scheduled to be completed by 1999. However, the U.S. Department of Energy is striving to complete tank waste characterization earlier; sample all requested tanks by February 1997. Given this, tank waste characterization information should be available in a timely manner to support the selection of a waste retrieval strategy and this risk is considered low.

The major program impacts from proceeding with the use of mechanical and hydraulic waste retrieval concepts is derived from the uncertainty whether these concepts will achieve the closure requirements and achieve the schedule goals negotiated in the Hanford Federal Facility Agreement and Consent Order (Ecology 1994). The Hanford Facility Federal Agreement and Consent Order specifies that a maximum of 360 cubic feet of waste shall remain in each of the 100 series and a maximum of 30 cubic feet shall remain in each of the 200 series single-shell tanks at completion of waste retrieval milestone M-45-00). However, this document also requires preparation and approval of a closure plan by 2006 (milestone M-45-06-T02).

Full scale demonstration of proposed sluicing waste retrieval processes is planned approximately six years prior to initiating the large scale retrieval of single-shell tank wastes in 2003. Through early demonstration of sluicing, the viability of this technology can be assessed and corrections to the retrieval strategy made if necessary. However, demonstration of the arm based waste retrieval system is not planned until 2003. Therefore, initial follow-on single-shell tank waste retrieval systems will need to be based upon sluicing or enhancements developed prior to 2003.

Development and approval of a closure plan for regulatory approval is not planned until 2006. Approval of a closure plan in 2006 does not allow for revision of the retrieval strategy without adversely impacting program cost and schedule. If the closure plan stipulates removal of tank waste in excess of the criteria specified in Tri-Party Agreement milestone M-45-00, the risk to the program schedule and cost baseline is high.

This risk is being managed through development of a SST closure work plan, describing the work integration process for closure and status of work. This work plan serves as road map for the regulatory process.

4.2.1.4 DECISION: DETERMINE WASTE TRANSFER MECHANISM

DESCRIPTION:

Mechanisms for transfer of tank wastes and encapsulated cesium and strontium for storage, treatment and disposal need to be selected to establish system requirements.

RELATED WBS ELEMENT: 1.1.1.2.05.01.01

RELATED FUNCTION: 4.2.1.4 TRANSFER WASTE

DECISION DATE: January 1996

PUBLIC INVOLVEMENT PLAN:

This decision defines concepts for movement (i.e. transfer) of waste contained in single-shell tanks, double-shell tanks, miscellaneous underground storage tanks, and encapsulated cesium and strontium. The waste transfer concepts have influence on resource needs and the potential for exposure of the public, workers and the environment to hazardous materials. Therefore, public participation in determining the concepts for waste transfer is deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternatives considered for conducting waste transfer are described below.

a. Transfer lines. Underground pipelines are currently used to transfer waste within the Hanford Site tank system. Underground or above ground pipelines could be used to transfer tank waste within the tank system or to process facilities. Tank waste would be transported as a liquid or slurry to the process facilities. Cesium and strontium capsules or other unique sources (e.g., cobalt slugs, fuel pins) could be transferred by this method.

b. Tanker vehicle. A rail car and receiving facility (building 204-AR) is currently used to receive shipments of radioactive liquids generated from activities at the 100-N reactor and the Fast Flux Test facility. This concept could be applied for movement of tank waste within the tank system or to process facilities. Tank waste would be retrieved from the tank system and placed in shielded tankers for transportation. The tankers would be transported to the process facilities using truck or rail systems. Cesium and strontium capsules or other unique sources (e.g., cobalt slugs, fuel pins) could be transferred by this method.

c. Shielded cask. Cesium and strontium capsules are transported using a shielded cask due to the high radiation dose from these materials. This concept could be applied for movement of tank waste within the tank system or to process facilities. Tank waste, capsules or other unique sources (e.g., cobalt slugs, fuel pins) would be retrieved from the tank system and placed in shielded casks for transportation. The casks would be transported to the process facilities using truck or rail systems.

d. Solid waste container. Liquids presently contained in the tank system would be removed and transferred by one of the previously discussed alternatives. Sludges and solids would be retrieved from tanks and placed into shielded containers and transferred as solids to processing facilities. The process facility would convert the sludges and solids to a form suitable for processing.

e. Pneumatic transfer. This alternative could be applied to transfer of cesium and strontium capsules from the Waste Encapsulation Facility to another facility for dispositioning. Capsules would be removed from pool cell storage and conveyed to another facility for dispositioning using pneumatic mechanisms. These principles could also be applied for transfer of tank waste.

f. Multiple modes of transfer. As noted above, transfer lines, tanker vehicles, and shielded casks are presently used to transfer tank waste and capsules to various locations. Deployment of any one or combination of transfer methods can be achieved depending on the physical and chemical properties of the tank waste or capsule and the desired condition of these materials upon receipt at a processing facility.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Several engineering studies need to be conducted to evaluate each of these alternatives. An analysis of alternative transport mechanisms for capsules, MUST waste, and miscellaneous materials is needed. Miscellaneous materials (e.g., cobalt slugs, fuel pins) are present in a few of the single-shell tanks. These materials may not be retrieved using the same methods as the tank waste and may even interfere with such efforts. These miscellaneous materials are solid objects and are more amenable to transfer using mechanisms similar to capsule transfer. The miscellaneous underground storage tanks contain primarily solids, are isolated and dispersed throughout the 200 Areas. No transfer mechanism (e.g., underground transfer lines) presently serve these tanks. The waste contained within these tanks may be more readily transported using mechanisms similar to capsules or miscellaneous tank materials.

An analysis of alternative transport mechanism is needed to select methods for transport of existing single-shell and double-shell tank wastes. Dry versus slurry transport methods should be evaluated.

An analysis of alternative transport mechanism is needed to select methods for transport of new waste requiring storage within the tank system.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The tank waste retrieval program element schedule presently identifies the evaluation of waste transfer mechanisms as activity number ROA100-5B; Issue Determination of Tank Waste Transfer Mechanism Trade Study (WHC 1994a).

DECISION

a. PLANNING BASIS

Consistent with the planning assumption to use hydraulic methods for retrieval of tank wastes, pipelines are planned to be used for the transfer of retrieved single-shell and double-shell tank wastes to processing facilities. A method for transfer of wastes retrieved from MUSTs has not been established. Receipt of new waste into the tank system is planned to continue using current methods; pipelines and tanker vehicle. Waste transfer facilities will be needed to support transportation of wastes. Capsules are planned to be transported using a shielded cask.

b. FORMAL DECISION

No formal decision has been developed.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The transfer waste and retrieve waste functions are closely interrelated. The retrieve waste function must transform waste (tank waste, capsules, or miscellaneous materials in SSTs) to conditions suitable for transportation. The transfer waste function must deliver waste to the process facilities in a condition suitable for treatment. If the transfer waste function does not transform retrieved waste, then the retrieve waste function must condition wastes such that wastes can be received at the process facilities. Interim storage of wastes awaiting processing may be necessary, thus establishing an additional interface between transfer waste and store waste functions. These interfaces between the store waste, transfer waste, retrieve waste and process waste functions influence selection of waste storage concepts, waste transfer mechanism(s), waste retrieval process(es), and design features of the waste process facilities.

b. Impacts and Mitigation

Failure to integrate the design of the waste retrieval, transfer, storage, and processing systems could lead to a high risk to successful completion of the tank waste remediation mission.

The existing tank waste storage system is designed to receive and store liquid slurries of wastes. Given that the tank waste storage system will continue to be used, the waste transfer and retrieve mechanisms will need to condition wastes for storage in the existing tanks. Integration between the waste retrieval and transfer functions is necessary to establish interface conditions and ensure waste is properly conditioned for receipt into the storage and process facilities.

Design of capsules and miscellaneous tank materials transportation systems will need to be coordinated with the design of the process facilities, which will disposition these materials.

Through using systems engineering principles, integration of these functions can be successfully achieved. The risk to achieving the program goals is considered low.

4.2.1.5 DECISION: DETERMINE WASTE CONCENTRATION MECHANISM

DESCRIPTION:

A process needs to be selected for reducing the volume of radioactive liquid wastes requiring storage in the Hanford Site underground radioactive liquid waste tank system.

RELATED WBS ELEMENT: 1.1.1.2.01.06 (TF Evaporator/AP& AW Farm Operations)
1.1.1.3.01.04.02 (Tank Waste Pretreatment)

RELATED FUNCTION: 4.2.1.5 CONCENTRATE WASTE

DECISION DATE: June 1995

PUBLIC INVOLVEMENT PLAN:

This decision selects a process equipment concept for concentration of tank wastes. Public involvement in determining appropriate equipment concepts for concentration of tank waste is not deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

The preliminary list of processes considered for reducing the volume of radioactive liquid wastes requiring storage are as follows:

- a. Manage tank system without concentration of tank waste. The radioactive liquid wastes presently within the tank system and any new radioactive liquid wastes generated from Hanford Site remediation actions would be stored without reduction of volume. Generators of new radioactive liquid waste would be required to either cease generation of waste or conduct waste volume reduction locally. New double-shell storage tanks may need to be constructed to store wastes and support treatment and disposal actions. See decision 4.2.1.1.a for further discussion of double-shell tank space management.
- b. Evaporation. Heat would be applied to tank waste to separate a liquid fraction for treatment and disposal. The 242-A thermosiphon evaporator is an example of a process which evaporates tank waste.
- c. Selective precipitation. Selective precipitation of hazardous components and / or radionuclides could be accomplished to allow separation of a liquid fraction. The separated liquid fraction would be treated and disposed.
- d. Reverse osmosis. Dissolved ions and particulates could be separated from the bulk liquid using filtration and reverse osmosis. Tank waste would be forced through multiple stages of filter and osmosis (membranes) units to generate a liquid phase depleted in radionuclides and hazardous components. This liquid stream would be treated and disposed.

e. Ion exchange. Radionuclides and / or hazardous components could be separated from the liquid phase of tank waste using ion exchange techniques. The resultant solution would be treated and disposed.

f. Crystallization. Radionuclides and / or hazardous components could be separated from the liquid phase of tank waste by crystallization. The resultant solution would be treated and disposed.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Several engineering studies need to be conducted to evaluate each of these alternatives. An analysis of each alternative method for waste concentration needs to be completed to determine which alternative best satisfies stakeholder groups values. The capacity and useful operating life of the 242-A thermosiphon evaporator needs to be compared against performance requirements for the concentrate waste function to determine whether or not this unit can satisfy system requirements.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The pretreatment program element schedule identifies conducting an evaluation of waste concentration mechanisms as schedule activity numbers PSW00000 through PSW00050A (WHC 1994a).

DECISION

a. PLANNING BASIS

Evaporation of tank waste using the existing 242-A evaporator was selected as the method for concentration of tank wastes. The 242-A evaporator meets regulatory requirements and was recently upgraded (project B-534) resulting a planned life extension of ~10 years.

b. FORMAL DECISION

No formal decision has been developed.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The concentrate waste and store waste functions are closely interrelated (see decision 4.2.1.1.a). The concentrate waste function reduces the volume of waste requiring storage, but may also change the physical and chemical properties of wastes. Processes which modify waste properties also effect the process waste function. These interfaces between the store waste, concentrate waste and process waste functions influence selection of waste storage concepts, waste concentration process(es), and waste treatment processes.

b. Impacts and Mitigation

Failure to integrate the design of the waste concentration, storage, and processing systems could lead to a high risk to successful completion of the tank waste remediation mission. Concentration of tank wastes is

necessary to manage the available waste storage capacity to achieve mitigation of tank safety issues (e.g., dilution of tank 241-SY-101 waste), terminal clean out of excess facilities, and stabilization of single-shell tanks. These tasks result in the reduction of environmental and safety risks. Failure to successfully manage the inventory of tanks wastes will result in the increase of environmental and safety risks. The existing tank waste storage system is designed to receive and store liquid slurries of wastes. Given that the tank waste storage system will continue to be used, the waste concentration processes can not alter wastes such that it can not be stored in the existing tanks. Additionally, the concentration of tank wastes can not result in safety issues with storage of wastes.

The existing 242-A evaporator has been designed to operate in conjunction with the existing double-shell tanks for management of the waste storage system. This evaporator can be operated to reduce the volume of wastes requiring storage, while maintaining the conditions for safe storage of tank wastes. Continued use of this evaporator is critical to provide the waste storage space necessary for mitigation of tank safety issues, terminal clean out of excess facilities, and stabilization of single-shell tanks. The evaporator represents a means to reduce to the environmental and safety risks associated with these items.

Systems engineering principles will be applied to evaluation of replacement waste concentration processes to ensure integration with interfacing functions. The risk to achieving the program goals is considered low.

4.2.2 DECISION: DETERMINE WASTE PROCESSING STRATEGY

DESCRIPTION:

A strategy must be selected for processing the Hanford tank waste for disposal. The decision to select a waste processing strategy is predicated upon selecting retrieval of "all waste" from all Hanford radioactive tanks (or the majority of waste) as the preferred alternative for the decision *Determine Disposition of Hanford Tank Waste*.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
RELATED FUNCTION: 4.2.2 PROCESS WASTE

DECISION DATE: October 1996 - EIS
June 1995 - Validation of Planning Basis

Formal evaluation of this decision will be conducted through the National Environmental Policy Act. A record of decision will be issued to document this decision in October 1996. To validate the planning basis, an evaluation of waste processing approaches will be conducted by June 1995.

PUBLIC INVOLVEMENT PLAN:

The National Environmental Policy Act requires the solicitation of public comments throughout the preparation for this decision. Public and stakeholder groups participation in the selection and evaluation of alternatives will be obtained while preparing this environmental impact statement.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternative strategies for processing the Hanford tank waste will be formulated through involvement of the public. A notice of intent to prepare an environmental impact statement (EIS) for proposed actions relating to the disposition and processing of Hanford tank waste is being prepared. Alternatives for dispositioning and processing Hanford tank waste will be developed through solicitation of public comment and technical considerations.

Three preliminary alternatives have been proposed by various stakeholder groups and technical experts for the processing of Hanford tank wastes. These alternatives may be modified once the public has commented on the TWRS EIS. These preliminary alternatives are discussed below.

- a. Immobilize all of the tank waste for offsite disposal. All tank waste would be retrieved to the extent economically and technically practical. The retrieved tank waste would be converted into a waste form suitable for disposal in a mined geological disposal system (i.e. geological repository). Since the total solids mass of the existing tank waste is relatively large, about 2 E+05 metric tons (excluding water), the volume of immobilized tank waste would also be quite large.

b. Separate tank waste into fractions for onsite and offsite disposal. In order to reduce the volume of immobilized tank waste sent to the geological repository, the waste would be separated into a low-activity and a high-activity fraction. All tank waste would be retrieved to the extent economically and technically practical. The retrieved tank waste would be separated into fractions. The low-activity fraction would be immobilized and disposed at the Hanford site as low-level waste. The high-activity fraction would be immobilized and disposed at a geological repository.

c. Treat tank waste to an intermediate waste form. This alternative would retrieve all tank waste to the extent economically and technically practical. The retrieved tank waste would be converted to an intermediate waste form, without making a low-activity fraction for disposal at the Hanford site. The intermediate waste form would be stored at the Hanford site until the specifications for the geological repository have been finalized. At which time, the intermediate waste form would be prepared for disposal in the geological repository.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An environmental impact statement, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington* (DOE/EIS-0113), and accompanying record of decision was prepared for disposition of the Hanford double-shell tank waste in 1988. A new environmental impact statement will be prepared by October 1996, addressing proposed actions for the single-shell tank waste and revised actions proposed for the double-shell tank waste (i.e. TWRS environmental impact statement).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The program management program element schedule presently identifies the preparation of the TWRS EIS and issuance of the associate record of decision (see decision 4.2).

The pretreatment program element schedule identifies conducting an evaluation of waste processing strategies as schedule activity numbers PSW00060 through PSW00110 (WHC 1994a).

DECISION

a. PLANNING BASIS

Separation of Hanford tank waste into a low-activity and a high-activity fractions has been adopted as the planning basis for the TWRS based upon concurrence of stakeholder groups as reflected in the fourth amendment of the Hanford Federal Facility Agreement and Consent Order. TWRS program activities are directed toward achieving this goal.

b. FORMAL DECISION

To be documented in the record of decision for the TWRS environmental impact statement.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selected strategy for dispositioning Hanford tank waste (decision 4.2) directly effects the selection of an alternative for processing tank waste. Two of the alternative strategies for dispositioning Hanford tank waste; do nothing and insitu dispose of all tank waste, preclude selection of alternatives for processing tank waste. Therefore, it is appropriate for these two decisions to be made using the same NEPA process.

b. Impacts and Mitigation

The Hanford Federal Facility Agreement and Consent Order and the TWRS program reflect separation of tank waste into fractions for disposal as the basis for program plans. Currently, the TWRS program is developing and evaluating alternative technologies for separating tank waste into fractions for immobilization and disposal. The TWRS program is not scheduled to engaged in the detailed design of any major facility needed for tank waste separations until after the completion of the TWRS environmental impact statement. Therefore, the financial exposure is low. Schedule risks arise if the environmental impact statement record of decision is delayed past September 1996 or it is significantly different than the planning basis.

These risks can be mitigated by continued involvement of the public and stakeholder groups throughout the preparation of the TWRS environmental impact statement. Based upon public comments received during the fourth amendment revision of the Hanford Federal Facility Agreement and Consent Order, there is disagreement among stakeholder groups regarding the preferred alternative for processing the Hanford tank waste. However, the general consensus was to separate tank waste into fractions as the preferred alternative.

4.2.2.a DECISION: DETERMINE DISPOSITION OF TRANSURANIC TANK WASTE

DESCRIPTION:

A reference approach for disposition of Hanford tank waste which may be designated as transuranic waste (instead of high-level waste) is selected, defining the waste form criteria which will be imposed.

RELATED WBS ELEMENT: 1.1.1.3.03.04.02
RELATED FUNCTION: 4.2.2 PROCESS WASTE

DECISION DATE: October 1996

PUBLIC INVOLVEMENT PLAN:

Public involvement is included in evaluating actions for disposal system design and operation of the immobilized high-level waste and transuranic waste repositories. As such, public involvement should be continued in determining the disposition of Hanford Site transuranic tank wastes which could potentially be disposed in either repository.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternatives for disposition of transuranic (TRU) tank waste are predicated on the assumption selected tank waste types can be designated as TRU waste instead of HLW. Tank waste types currently designated as TRU tank waste are plutonium finishing plant (PFP) waste derived from the second cycle purification of plutonium solutions and neutralized cladding removal waste (NCRW) derived from dissolution of cladding on spent nuclear fuels. This assumption needs to be evaluated due to the potential for mixing of waste which would be identified as TRU based on process source knowledge with tank waste heels that may be designated as HLW. Assuming that TRU tank waste is determined to exist, three options have been identified as alternatives for the disposition of TRU tank waste.

- a. Dispose in HLW Repository. Dispose of the TRU tank waste in the HLW repository along with HLW tank waste. This disposition could result in blending schemes such that the TRU tank waste would not be an identifiable, segregated waste type, separate from other tank waste. These waste would be immobilized and sent to the spent nuclear fuel / HLW geological repository for disposal.
- b. Dispose in the Waste Isolation Pilot Plant (WIPP). The TRU tank waste is processed in a manner to produce an immobilized waste form which is in discrete containers that are separate from the remainder of tank waste. This segregated, immobilized waste is then disposed of in the WIPP TRU repository, while the remainder of immobilized HLW is disposed of in the spent nuclear fuel / HLW repository.
- c. Disposition Unacceptable in either the WIPP or HLW Repositories. The TRU tank waste disposition, based on current repository scopes, is found to be unacceptable for receipt in either the WIPP or HLW repositories.

This situation could occur under a number of scenarios, such as, the TRU tank waste is found to be unacceptable for disposition in the HLW repository due to legal definition constraints and unacceptable for disposition in the WIPP due to lack of space and priority based on the current repository scope.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Presently known characteristics of NCRW, PFP waste and other tank wastes are documented in *Radionuclide and Chemical Inventories for Double-Shell Tanks* (WHC 1993b), and *Radionuclide and Chemical Inventories for Single-Shell Tanks* (WHC 1993c). Historical tank utilization and transfers of waste types are documented in *A History of the 200 Area Tank Farms*, (WHC 1990b). This information may be useful in establishing whether or not certain types of tank waste are classified as transuranic tank waste.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste (HLW) program element schedule identifies the following tasks for resolution of this decision as activity numbers

SDW5000	Identify TRU waste tanks,
SDW5100	Evaluate WIPP as alternative to HLW repository,
SDW5150	Obtain DOE review and concurrence on WHC recommended disposition of TRU tank wastes

A follow on activity for development of a strategy for segregation of TRU tank waste is also identified (activity number SDW5300) and would be implemented if a decision is reached to send the TRU tank wastes to WIPP (WHC 1994a).

DECISION

a. PLANNING BASIS

Planning decision disconnects exist at this time. For planning purposes, HLW Program plans are based on the concept that any TRU tank waste which may exist at Hanford is assumed to be disposed in the HLW repository. This assumption reflects an interpretation of the decisions for geologic disposal of DST waste documented in the HDW-EIS (DOE 1988). However, other planning documents for the DOE complex indicate that glass volumes from potential TRU tank waste are not currently included in estimates of defense materials expected to be disposed of in the HLW repository (DOE 1992b).

b. FORMAL DECISION

A formal decision will be made after consultation with personnel at the WIPP repository and the HLW repository.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of a specific disposition for TRU tank waste will potentially influence the decision selecting a process for immobilization of TRU tank waste. This influence is derived from the disposal criteria imposed on waste form acceptance at the WIPP and HLW repositories, which may vary with the disposition site selected.

b. Impacts and Mitigation

The primary impact of alternatives for this decision is the potential for variation of the waste form, depending on the disposition selection. The impact on process selection can vary as follows:

1. No impact. Waste acceptance criteria variations at WIPP and HLW repositories have minimal impact on the waste form and immobilization process selection such that vitrification is deemed suitable for all TRU tank waste disposition alternatives.
2. Two immobilized tank waste forms must be developed and manufactured. Waste acceptance criteria variations are sufficiently different such that a separate waste form and process is either required for the TRU tank waste in order for acceptance in the selected repository or desirable for the Hanford site in order to minimize manufacturing costs.

In addition to potentially impacting the waste form selection, the alternatives selection will impact staging of the waste form manufacturing. If the TRU tank waste disposition is different than that for the HLW, the immobilized TRU tank waste must be manufactured in a campaign or process system which is separate from the HLW tank waste. This staging is independent of the waste form selection and will restrict the sequencing of DST retrieval activities such that the TRU tank waste is maintained as a separate block of waste through pretreatment and immobilization processes. The segregation of TRU tank waste could potentially lengthen tank waste processing duration and increase total program costs.

Fortunately, the conceptual design of the tank waste immobilization facility is not scheduled to be completed until March 1998. This decision can be resolved in the intervening three years to reduce the program risk to an acceptably low level. Discussion with personnel at the HLW and WIPP repositories will be conducted during FY 1995 to resolve this issue. If resolution can not be achieved before commencing definitive design of the HLW immobilization process, segregation of potentially TRU tank wastes will be maintained throughout retrieval, pretreatment, and immobilization to distinguish these waste from the remainder of tank waste until the decision is verified.

4.2.2.b DECISION: DETERMINE ACCEPTABILITY OF ALTERNATIVE CONTAINERS FOR HLW REPOSITORY

DESCRIPTION:

A reference waste package container must be selected for disposal of Hanford waste in the HLW repository.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03
RELATED FUNCTION: 4.2.2 PROCESS WASTE

DECISION DATE: March 1995

PUBLIC INVOLVEMENT PLAN:

Public involvement has been conducted by the DOE-RW in evaluating waste storage packages for disposal at the immobilized high-level waste repository. As such, public involvement should be continued in determining the acceptability of proposed Hanford Site high-level waste container concepts.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Container alternatives for the HLW repository are derived from current acceptance criteria for the repository and interpretation of the recent evolutions in the HLW repository reference design. The alternatives for container sizing are:

- a. DWPF Standard Canister. This is the current standard canister for HLW specified in repository waste acceptance criteria. The container volume is $\sim 0.62 \text{ m}^3$.
- b. Spent Nuclear Fuel Canister. This canister is being considered for containing commercial spent nuclear fuel elements. The container volume is $\sim 1.25 \text{ m}^3$.
- b. Large Canister/Cask. The repository design appears to be evolving toward use of a larger Multi-Purpose Canister (MPC) as the standard unit for emplacement of commercial spent nuclear fuel and immobilized high-level defense waste (DOE-OCRWM 1994a). The defense waste style MPC volume is $\sim 10 \text{ m}^3$, with the commercial spent nuclear fuel MPC slightly larger with volume of $\sim 19 \text{ m}^3$. A large cask would be filled with immobilized HLW and placed in the MPC for disposal at the repository.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Discussion with DOE-RW will need to be conducted to determine the technical feasibility of large containers placed with MPCs for transfer and disposal at the geological repository. Discussions with DOE-RW Program Control and Administration division have indicated an economic incentive to package immobilized HLW in containers larger than the standard DWPF canister. The use of containers such as the spent nuclear fuel canister and the proposed 10 m^3

container could result in program savings in excess of \$2 billion (DOE-OCRWM 1993).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste (HLW) program element schedule specifies activity number SDW7450, Determine Acceptability of Alternative Containers for HLW Repository, for resolution of this decision.

DECISION

a. PLANNING BASIS

Current program planning cost estimates are based on using the spent nuclear fuel canister for containing the immobilized HLW.

b. FORMAL DECISION

A formal decision will be conducted after DOE-RW completes analysis of economic, environmental, safety, and technical factors for use of the Multi-Purpose Canister for storage, transportation and disposal of spent nuclear fuel and defense waste.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of the immobilized HLW container will influence lower level decisions for the establishment of the HLW/TRU immobilization facility design criteria and selection of the immobilized HLW/TRU container interim storage facility.

b. Impacts and Mitigation

The HLW container selection is to establish the package size envelope used for the waste form disposed in the HLW repository. This container size selection impacts: the number of packages which must be generated by the immobilization facility, which determines the capacity of product canister handling systems, the space within the HLW facility required for equipment, the estimated repository disposal fee, the dimension and weight of packages which must be positioned and moved inside the facility process cell, which determines the space with the facility for equipment and the crane lift capacities, and the interim storage facility concept. While the impacted decisions are relatively low level decisions, the time required to establish an alternative to the standard HLW package may result in this decision being on the critical path for initiating conceptual design.

The U.S. Department of Energy, Office of Civilian Radioactive Waste Management has initiated a request for proposals to procure MPCs (DOE-OCRWM 1994c). The procurement will occur in three steps; assessing the system effects, environmental impacts and regulatory issues during this process. The decision to proceed with the procurement of MPCs is scheduled to be made in mid-1997. This is one year prior to completing

the conceptual design for the HLW/TRU immobilization facility, thereby providing sufficient time to resolve this issue. Timely resolution of this issue will reduce the program risk to an acceptably low level.

If timely resolution of this issue is not achieved the following mitigation approach could be pursued. This approach would increase design or facility construction costs. The primary method of mitigating this uncertainty within the HLW immobilization facility prior to a final decision would be to produce two equipment designs during the conceptual design and provide a facility structure sized to accommodate either equipment system. This larger envelope for canister handling systems could be carried through detailed design and facility construction if the decision continues to be deferred and the increased costs can be accepted in the detailed design and construction phases of the immobilization facility.

The multiple design approach for the interim storage facility becomes more difficult if optimization studies indicate a significant cost incentive for alternative storage concepts would be proposed as a result of selecting one package size over the other. Mitigation of container size selection uncertainty could be achieved by using the larger container size envelop as the basic unit for storage, with the array of smaller containers placed inside the larger container for design purposes. However, this would impose a risk that reduced cost storage systems, which may be available if only the standard canister is used as a basis, would not be identified.

4.2.2.c DECISION: DETERMINE DISPOSITION OF Cs/Sr CAPSULES

DESCRIPTION:

The disposition of the encapsulated cesium chloride and strontium fluoride salts needs to be established. This evaluation should determine whether the HLW geological repository will accept overpacked capsules and if not, is processing of the cesium chloride and strontium fluoride salts necessary to allow disposal in the geological repository.

RELATED WBS ELEMENT: 1.1.1.3.03.04.02
RELATED FUNCTION: 4.2.2 PROCESS WASTE
4.2.2.3 Prepare Cs/Sr Capsules for Disposal

DECISION DATE: August 1995

PUBLIC INVOLVEMENT PLAN:

Public involvement has been conducted by the DOE-RW for issues relating to the immobilized high-level waste repository. As such, public involvement should be continued in determining the acceptability of disposing of Hanford Site cesium and strontium capsules in the HLW repository.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Based on the HDW-EIS record of decision, cesium and strontium capsules will be disposed of in the HLW repository. While the Hanford Site impacts in the HDW-EIS were evaluated based on overpacking the capsules for repository disposal, the EIS assumed that the overpacking could be accomplished such that the existing material chemical form would not be an issue in the acceptance of the waste. Discussion with personnel at the HLW repository indicate that uncertainties may exist in the acceptance of the existing material. The primary uncertainty is related to the halides (chlorides and fluorides) and the potential these materials may impose on accelerating corrosion of nearby waste packages rather than the radionuclide content of the overpacked capsules. Therefore, the following process alternatives have been identified for supporting disposition of the capsules in the HLW repository.

- a. Overpack/ship capsules to HLW repository. The existing, unopened capsules are placed in an overpack canister for disposal in the HLW repository.
- b. Reprocess capsules. The capsules are cut open, contents removed, and the material selectively blended with other retrieved tank waste for vitrification and disposal in the HLW repository.
- c. Embed Capsules in Glass. The existing, unopened capsules are placed in an overpack canister and then surrounded by glass such that the capsule is embedded in the glass. (Possible capsule failure could result from exposing the capsules to the temperature of molten glass.)

INFORMATION AVAILABLE TO SUPPORT DECISION:

An evaluation of the capsule disposition was previously conducted in *Feasibility Study for the Processing of Hanford Site Cesium and Strontium Isotopic Sources in the Hanford Waste Vitrification Plant*, WHC-EP-0460. A reevaluation is planned to be completed by the TWRS high level waste program.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste (HLW) program element schedule specifies the following activities for resolution of this decision:

SDW4025	DOE-RW determines whether or not capsules are acceptable,
SDW4035	DOE-RW determines acceptable waste form for encapsulate Cs/Sr
SDW4100	Key Decision on Need for Overpacking Cs / Sr Capsules
SDW4150	RW Repository Disposal Cost Estimates for Cs / Sr Capsules
SDW4156	TWRS / DOE-EM Decision Analysis / Reference Disposal Option Selection
SDW4300	Strategy and Plan for Resolving Reference Disposal Option for Cs / Sr Capsules
SDW4400	Revise Baseline per Cs / Sr Capsules Task Results

DECISION

a. PLANNING BASIS

Current program planning is based on assuming capsules will be overpacked for HLW repository disposal.

b. FORMAL DECISION

The record of decision for the HDW-EIS directs that cesium and strontium capsules be disposed of in a geologic repository. For the purposes of impact evaluation at the Hanford Site in the HDW-EIS, it was assumed that capsules could be overpacked in canisters such that repository waste acceptance criteria could be met. However, uncertainty exists as to whether the current cesium and strontium chemical form can comply with repository criteria when overpacked. Independent of the waste form acceptance, the potential exists for alternatives to the overpacking alternative to be more economically attractive.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of the capsule overpack disposition process may influence the selection of processes and design of facilities for: pretreatment of Hanford tank wastes, HLW vitrification, or capsule overpack facility. This influence is primarily derived from determining which facility will contain the capsule disposition processing systems.

b. Impacts and Mitigation

Uncertainty exists as to whether the current cesium and strontium chemical form can comply with repository criteria when overpacked. In addition to the uncertainty associated with existing capsule material acceptance as a waste form, economic incentives may exist which favor

incorporation of the capsule material into the vitrified tank waste. This would be achieved if blending the capsule material with tank waste can be accomplished such that the total number of HLW canisters is reduced over that which would be generated by the overpack scenario.

This decision impacts the scope selected to be included in facilities. The disposition selection will likely influence which facility in the TWRS is compatible with the capsule disposition system. For example, direct overpacking of capsules is more likely to be included in the vitrification or canister storage systems scope since overpacking primarily requires package handling steps. While capsule reprocessing might be better suited to be combined with pretreatment activities, where solution handling capabilities are required. This impact can be mitigated by (1) completing the disposition decision prior to defining all facility scopes, or (2) plan on capsule processing in a stand alone facility, add on facility, or by equipment replacement such that the disposition decision does not delay other tank waste facility definition.

This decision may impact tank processing schedules if a disposition decision is deferred for many years. Schedule impacts may result if the reprocessing disposition is selected, as the blending requires that pretreated tank waste sludges/solids be available to blend with the capsule material. This impact becomes a consideration only if the capsule disposition decision is delayed for a very long time.

The decision may also impact the capsule interim storage concept selected. The potential exists that the conditions suitable for interim storage may be different if, in one case, at the conclusion of storage the capsule is to be overpacked for geologic disposal, while in another case, the capsule is cut open and the material removed.

The pretreatment of sludges/solids is not scheduled to be initiated until November 1998, with full scale processing anticipated to start by November 2004. The conceptual design of the HLW (sludges/solids) pretreatment facility is not scheduled to be completed until March 1998. The conceptual design of the HLW vitrification and canister interim storage facilities is not scheduled to be completed until September 1998 (milestone M-51-03-T01). Therefore, a decision on the disposition of the capsules needs to be made before March 1998, to avoid impacting the schedule for pretreatment and vitrification of HLW.

Re-evaluation of capsule disposition alternatives is planned to be conducted by the TWRS HLW program. This study will be completed by August 1995 and will determine whether or not the HLW repository can accept the capsules. The schedule risks are considered low, since re-evaluation of the capsule disposition alternatives will be completed one year prior to completion of conceptual design for the HLW pretreatment and vitrification facilities.

4.2.2.1 DECISION: DETERMINE WASTE SEPARATIONS PROCESS

DESCRIPTION:

A reference processing approach is selected for separating Hanford tank waste into a low-activity and high-activity fractions for disposal.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
RELATED FUNCTION: 4.2.2.1 PRETREAT WASTE

DECISION DATE: October 1996 - EIS
December 1997- Complete Evaluation of Minimum Separations and Determine Need for Advanced Separations Processes

PUBLIC INVOLVEMENT PLAN:

The National Environmental Policy Act requires the solicitation of public comments throughout the preparation for this decision. Public and stakeholder groups participation in the selection and evaluation of alternatives will be obtained while preparing this environmental impact statement. Additionally, the decision analysis plan for evaluating the minimum separations process includes involvement of the public (WHC 1994c).

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Two approaches bound the possible methods for separation of Hanford tank waste into a low-activity and high-activity fractions for disposal. A continuum exists between these two bounding methods for separation of Hanford tank waste into a low-activity and high-activity fractions.

a. Minimum separations. Existing technologies will be adopted for separation of tank waste into a low-activity and high-activity fractions. Radionuclides will be removed from the liquid fraction of tank waste to the extent required for immobilization and disposal of the liquid fraction at the Hanford Site. This low-activity fraction would meet requirements established by the U.S. Nuclear Regulatory Commission to determine it is not high-level waste. Principle methods proposed for separation of radionuclides from the liquid tank waste fraction are ion exchange, precipitation, crystallization or other similar methods.

The sludge / solid fraction of tank waste would be treated to separate components (e.g. aluminum, phosphate, chromium, sodium) which would contribute to the volume of immobilized high-level waste. The envisioned methods for separating components from tank waste sludges / solids is water washing, caustic leaching or other similar methods which do not require bulk dissolution of the sludges / solids. After treatment, the sludges / solids would be immobilized and disposed in a deep geological repository.

b. Minimize immobilized high-level / transuranic (HLW/ TRU) waste volume. This alternative utilizes the same methods described above for the minimum separations alternative. Additional processes proposed to minimize immobilized HLW / TRU waste volume include bulk dissolution of tank waste sludges / solids using acids solvents resulting in a acidic solution. The acidic solution would be treated to separate radionuclides from other waste constituents which would contribute to the volume of immobilized high-level / transuranic waste. Collectively, these processes are referred to as advanced separations processing. The separated radionuclides would be immobilized for geological disposal. The separated waste constituents would be immobilized for disposal at the Hanford Site as low-level waste.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Although the TWRS EIS may select a reference process for separation of tank wastes into a low-activity and high-activity fraction, confirmation that the selected process will satisfy the public and stakeholder groups values needs to be conducted. Development and evaluation of enhanced sludge washing (i.e. minimum separations alternative) and advanced sludge separation processes (i.e. minimize immobilized HLW / TRU waste alternative) will continue after completion of the TWRS EIS to provide this confirmation.

The fourth amendment to the Hanford Federal Facility Agreement and Consent Order (Ecology 1994) specifies completion of the evaluation of enhanced sludge washing to determine whether advanced sludge separation processes are required (milestone M-50-03). This evaluation is scheduled for completion by March 1998. A schedule for development of criteria and a decision methodology, which reflect public and stakeholder values, will be developed by September 1994 to aid in the evaluation of these two alternatives (milestone M-50-03A).

A parametric evaluation needs to be developed for comparison of the low-level waste disposal system environmental performance versus pretreatment system performance (i.e. quantity and type of radionuclides separated from low-activity solutions). This parametric evaluation is scheduled to be completed by September 1994 and will provide insight as to desired performance of pretreatment, characteristics of the low-level waste form, and characteristics of the low-level waste disposal system.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The pretreatment program element schedule presently identifies the preparation of a decision analysis process to support the evaluation of these alternatives as activity numbers PSW04410 through PSW-4429 (WHC 1994a).

DECISION

a. PLANNING BASIS

Separation of Hanford tank waste into a low-activity and a high-activity fractions using the minimum separations approach has been adopted as the planning basis for the TWRS. The proposed tank waste separation processes are cesium removal from supernatants and chemical leaching of

HLW sludges/solids to remove constituents near the limiting concentration for an acceptable HLW formulation. Supernatants which contain TRU or Sr in excess of the LLW immobilization process specification will be treated using a heat digestion process to precipitate TRU and Sr (WHC 1994d).

The fourth amendment of the Hanford Federal Facility Agreement and Consent Order (Ecology 1994) incorporates this approach and directs confirmation of the minimum separation process alternative (milestone M-50-03).

b. FORMAL DECISION

A formal decision will be documented in the record of decision for the TWRS environmental impact statement. Confirming the acceptability of the selected waste separation process will be documented by December 1997.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of a waste separation process is influenced by decisions which establishes requirements for deep geological disposal of high-level waste and disposal of low-level waste. The establishment of acceptable volume limits for disposal of immobilized high-level waste in a deep geological repository may necessitate incorporation of additional processes for separation of tank waste. Geological repository volume limitations have not been established, thus uncertainty exists as to the acceptability of either alternative process for separation of tank waste.

Similarly, limits for acceptable radionuclides concentrations and volume of immobilized low-level waste have not been established. Therefore, uncertainty exists as to the acceptability of either alternative process for separation of tank waste.

b. Impacts and Mitigation

The limits for acceptable radionuclides in the low-activity solution can be understood by conducting the parametric evaluation previously discussed. Once the inter-relationship between the pretreatment process and the low-level waste disposal system environmental performance is understood, management of this uncertainty can be achieved.

The minimum separations alternative is estimated to result in the production of ~8,200 to ~14,800 m³ of borosilicate high-level waste glass, which when packaged in 10 m³ disposal casks (80 percent fill) would result in ~1025 to 1850 containers. The DOE-OCRWM has proposed a multipurpose canister (internal volume of ~10m³ for defense waste) for interim storage, transportation and disposal of spent nuclear fuels and immobilized defense waste canisters (DOE-OCRWM 1994a). The DOE-OCRWM is conducting an advanced conceptual design of the repository. The ACD will lead to improved definition of the technical impacts and repository disposal fee associated with these alternative waste separation processes. Additionally, the multipurpose canister could be utilized for disposal Hanford Site tank waste, with significant cost reductions, thus lessening the cost impacts of proceeding with the minimum separation process (DOE 1994b).

4.2.2.1.1 DECISION: DETERMINE HLW AND LLW SEPARATIONS FACILITIES CONCEPTS

DESCRIPTION:

- a. The facility concept for pretreatment of Hanford tank waste supernatants (i.e. LLW Pretreatment) is selected.
- b. The facility concept for pretreatment of Hanford tank waste sludges/solids (i.e. HLW Pretreatment) is selected.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
 RELATED FUNCTION: 4.2.2.1.2 PRETREAT SUPERNATES

DECISION DATE: March 1995 LLW Pretreatment Facility Concept
 October 1996 HLW Pretreatment Facility Concept

PUBLIC INVOLVEMENT PLAN:

The Federal Facility Agreement and Consent Order (Ecology 1994) specifies a target milestone (M-60-03-T01) for completing an engineering study evaluating alternative Tank Waste Remediation facility concepts. This engineering study has been completed and will form the basis for selecting a supernate pretreatment facility concept for further evaluation.

The public and stakeholder groups participated during preparation of this study. The public was informed of this study's basis, provided suggestions and input through review of information as it was prepared and received the results of this study. A recommended supernate pretreatment facility alternative will be based upon all received comments, technical considerations and stakeholder groups' values. These public involvement actions are consistent with the decision analysis process identified in section 3.0.

The evaluation of facility concepts for pretreatment of sludges/solids will involve the public in formulation of alternatives through selection of a facility concept as the design basis.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

- a. LLW Pretreatment - The supernate pretreatment facility concept can either be a stand alone facility or a supernate pretreatment capability combined with the other waste treatment functions. A description of each alternative follows:

- i. The stand alone supernate pretreatment facility concept can consist of either dispersed modules, a centralized pretreatment facility, or modules in a centralized configuration. Each of these stand alone supernate pretreatment facility concepts would contain all the capabilities to process tank wastes.

ii. The supernate pretreatment function can be combined with low-level waste vitrification (function 4.2.3.1). By combining these two functions, common components (e.g. process building structure, ventilation, etc.) would be shared. The combined supernate pretreatment and low-level waste vitrification functions could be deployed as a series of dispersed modules, a centralized facility, or modules in a centralized configuration.

iii. The supernate pretreatment function can also be combined with high-level waste vitrification (function 4.2.2.2). By combining these two functions, common components (e.g. process building structure, ventilation, etc.) would be shared. The combined supernate pretreatment and high-level waste vitrification functions could be deployed as a series of dispersed modules, a centralized facility, or modules in a centralized configuration.

iv. Finally, the pretreatment function can also be combined with both vitrification functions. By combining these functions, common components (e.g. process building structure, ventilation, etc.) would be shared. The combined supernate pretreatment, low-level waste vitrification and high-level waste vitrification functions could be deployed as a series of dispersed modules, a centralized facility, or modules in a centralized configuration.

b. HLW Pretreatment - The HLW pretreatment facility concept can either utilize the existing (or those planned to be constructed) double-shell tanks or a new facility to accomplish pretreatment of tank waste sludges/solids. A description of each alternative follows:

i. The existing (or those planned to be constructed) double-shell tanks can be used to accomplish pretreatment of tank waste sludges/solids. The pretreatment processes deployed would be limited to those processes which are chemically compatible with these carbon steel tanks. Simple processes such as washing sludges with water, selective leaching of waste components, solids separation from supernatants, or low temperature thermal decomposition of organic compounds may be feasible in these tanks. These processes represent the minimum separations approach for pretreatment of Hanford tank waste (see decision 4.2.2.1).

ii. A new waste separations facility may be necessary to accomplish pretreatment of tank waste sludges/solids. The need for a new waste separations facility may arise if the selected waste separations process is the minimize immobilized high-level / transuranic waste volume alternative (see decision 4.2.2.1). This waste separations alternative involves bulk dissolution of tank waste sludges/solids using acids to chemically separate high-level / transuranic waste components. Acid dissolution of sludges/solids can not be conducted in the existing double-shell tanks (DSTs). Similarly, if there were not sufficient existing DSTs available or tests indicated these tanks were not suitable for conducting the minimum separations process approach, a new waste separations facility would be needed. The new waste separations facility can either be a stand alone facility or constructed in conjunction with other planned waste treatment facilities.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The *TWRS Treatment Facility Configuration Study* was completed in June 1994 (WHC 1994e). This study provides information regarding the performance of the alternative facility concepts for supernate pretreatment, low-level waste vitrification and high-level waste vitrification. However, this study does not address pretreatment of tank waste sludges/solids. A separate evaluation of the facility concepts for pretreatment of tank waste sludges/solids is needed.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The DOE-RL is reviewing the *TWRS Treatment Facility Configuration Study* and is anticipated to provide comments to WHC by October 1994. The pretreatment program element schedule presently identifies the revision of the facility configuration study in response to DOE-RL comments as activity numbers PSW00120 through PSW00170A.

DECISION

a. PLANNING BASIS

A stand alone supernate pretreatment facility concept with centralized pretreatment components has been reflected in the TWRS planning basis. The TWRS planning basis has reflected the use of the existing DSTs for washing and selective leaching of tank waste sludges/solids. Development of sludges/solids pretreatment processes is continuing and the results will be factored into selecting an appropriate facility concept.

b. FORMAL DECISION

Westinghouse Hanford Company (WHC) made a formal recommendation of a reference pretreatment facility concept to the DOE/RL on July 18, 1994. The WHC recommendation is to design and construction a common, centralized facility for supernate pretreatment and low-level waste vitrification. The HLW vitrification function will be located near the other functions and will be serviced by the same support utilities.

The supernate pretreatment portion of the combined facility will provide a minimum cesium decontamination factor (DF) of 100. Design features will be incorporated to reserve the capability to add additional cesium and/or strontium removal processes for operational reasons, or technetium removal to meet the low-level waste form performance requirements. The low-level waste vitrification portion of the facility will be designed for the minimum cesium DF by including the necessary shielding and remote features suitable for the expected source term. Design concepts which integrate the HLW and LLW vitrification functions in a common facility will be investigated (WHC 1994f).

The DOE/RL is reviewing the technical basis for this recommendation. DOE/RL is anticipates to complete this review by October 1994 and determine whether or not to proceed with this recommendation.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The TWRS program scope has been defined based upon system requirements and decisions implemented at higher levels of the program. The selection of facility concepts for pretreatment of supernatants and sludges/solids is to be conducted within the framework defined by these higher level decisions. The assumed results of these higher level decisions are:

a) Decision 4.2 Determine disposition of Tank Waste - As a planning basis, all tank waste will be retrieved from tanks and treated for disposal.

b) Decision 4.2.2. Determine Waste Processing Strategy- As a planning basis, tank wastes will be separated into a low-activity and a high-activity / transuranic waste fractions for immobilization and disposal.

c) Decision 4.2.2.1 Determine Waste Separations Process - As a planning basis, tank wastes will be separated into a low-activity and a high-activity / transuranic waste fractions using the minimum separations approach. Minimum separations involves the removal of select radionuclides from the liquid fraction of tank wastes and the removal of select non-radioactive components from the solid fraction of tank wastes to produce a reasonable quantity of high-level waste for disposal in the geological repository.

The selection of pretreatment facility concepts is inter-dependent upon the selection of facility concepts for vitrification of both high-level and low-level wastes (functions 4.2.2.2 and 4.2.3.1). As such, selection of facility concepts for all three functions must be made simultaneously, so ensure interactions (or lack thereof if separate facilities) are considered.

b. Impacts and Mitigation

Cost Profile - This configuration decision has the potential to impact the number of discrete major construction projects proposed for support of the TWRS disposal systems. Alternatives which combine disposal functions will reduce the number of projects. It is anticipated that an overall economic incentive, along with other stakeholder groups values, would be a part of any alternative which is selected.

Each alternative facility concept was evaluated and determined to uphold stakeholder groups' values. Reduced construction and operating costs which may be achieved by combination of the supernatant pretreatment function with other functions were evaluated to verify that the resultant construction cost profile does not exceed projected available funding during the construction period as the project scope is increased. The cost profiles for all combinations of pretreatment, LLW and HLW vitrification functions were determined. The funding profile for combined pretreatment and LLW vitrification facility with a separate HLW facility was found to be the most favorable and does not exceed the projected available funding.

Radionuclide Separation Requirements - The selected supernate pretreatment facility concept may not support deployment of all required candidate (minimum separations) radionuclide separations technologies. Cesium has been identified as the primary radionuclide requiring separations from the Hanford tank wastes. Candidate cesium removal processes are solvent extraction, precipitation, reverse osmosis, crystallization, and ion exchange. These chemical processes are the general industry processes applied for separations of liquid-liquid mixtures or liquids with dissolved solids (*Handbook of Separation Techniques for Chemical Engineers*, McGraw-Hill book company, P. A. Schweitzer, 1979). Based upon previous works, it has been assumed that ion exchange will be used to separate cesium from Hanford tank wastes. However, a thorough evaluation of all separation processes has not been conducted. Production scale deployment of all candidate cesium separation processes may not be achievable in all candidate facility concepts (e.g. dispersed supernate pretreatment modules).

Additional radionuclides (e.g. technetium or strontium) may need to be separated from the Hanford tank wastes to achieve a lightly shielded low-level waste vitrification facility or achieve the desired environmental performance of the low-level waste disposal system. Production scale deployment of technetium and strontium separation processes may not be achievable in all candidate facility concepts (e.g. dispersed supernate pretreatment modules).

The WHC recommended facility concept mitigates these concerns by incorporating design features to reserve the capability to add additional cesium and/or strontium removal processes for operational reasons, or technetium removal to meet the low-level waste form performance requirements. Re-evaluation of the selected supernate pretreatment facility concept should be made after selection of the cesium separation process to confirm the technical approach. A similar re-evaluation is necessary after the environmental performance of the low-level waste disposal system is understood. A preliminary assessment of the low-level waste form performance will be available by September 1994. The finalized environmental performance of the low-level waste disposal system may not be defined for some time. The selected supernate pretreatment facility concept must be a robust concept which allows for future addition of technetium (or other radionuclides) separation if deemed necessary. The WHC recommended concept includes these features, thus providing flexibility to respond to uncertainties.

A similar situation arises with the selection of the sludges/solids pretreatment facility concept. The use of existing double-shell tanks may not support deployment of required candidate (minimum separations - enhanced sludge wash) waste component separations technologies. Presently, chromium, phosphate aluminum, sodium and bismuth have been identified as the primary waste components requiring dissolution from tank waste sludges/solids. The degree to which these waste components are separated from the sludges/solids will influence the volume of immobilized high-level waste disposed in the geological repository. If the enhanced sludge wash process approach does not result in an acceptable volume of immobilized high-level waste, then alternative waste processing approaches will need to be pursued. Deployment of alternative

waste processing approaches in existing double-shell tanks may not be feasible.

British Nuclear Fuels Limited (BNFL) is conducting a review of in-tank sludge washing conducted at the West Valley Demonstration Process, Savannah River Site, and at BNFL facilities in the United Kingdom. This technical review will be completed by March 1995 and a report issued. BNFL and WHC will review this report and recommended to the DOE/RL whether or not sludge washing should be conducted in existing double-shell tanks or specially designed facilities.

This technical evaluation of in-tank sludge washing will be completed in a timely manner, thus allowing sufficient time to incorporate recommendations into the program baseline, without significant schedule impacts. If the use of existing double-shell tanks is recommended, confirmation of the acceptability will be through a full scale process demonstration of sludge washing in tank 241-AZ-101. This process test will provide information on the ability to wash sludges in existing double-shell tanks. The evaluation of the enhanced sludge wash process to determine whether advanced sludge separations processes are required is scheduled to be completed by December 1997.

4.2.2.2.a DECISION: DETERMINE HLW/TRU WASTE IMMOBILIZATION PROCESS

DESCRIPTION:

A reference waste form and immobilization process for producing the waste form proposed for offsite disposal in a geologic repository is selected.

RELATED WBS ELEMENT: 1.1.1.3.03.04.02
RELATED FUNCTION: 4.2.2.2 IMMOBILIZE HLW/TRU WASTE

DECISION DATE: DOE published a decision in 1990, selecting vitrification of high-level wastes.

Alternative glass types will be evaluated and a selection made in January 1996.

PUBLIC INVOLVEMENT PLAN:

Public involvement in selection of the glass types is not deemed to be required.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternative immobilization processes have been considered to produce the following waste forms.

- a. Ceramic Manufacture. Immobilization by heating waste to remove water, oxidize remaining elements, and then incorporate the waste oxide components into a crystalline structure, usually tailored to form compounds similar in composition to natural minerals. The ceramic material is packaged in a cask/canister for storage.
- b. Waste Calcination. Immobilization by heating waste to remove water, and oxidize the remaining elements. The waste oxides are packaged in a cask/canister for storage.
- c. Vitrification. Immobilization by heating waste to remove water, oxidize remaining elements, and then incorporate the waste oxide components into a continuous phase glass structure. The glass material is packaged in a cask/canister for storage.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The rationale for selecting vitrification to produce borosilicate glass as the reference process / waste form is provided in DOE/RL-90-27, revision 1, *Evaluation and Selection of Borosilicate Glass as the Waste Form for the Hanford High-Level Radioactive Waste* (DOE 1990).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program will evaluate glass formulations suitable for immobilization of high-level waste. The program element schedule identifies this evaluation as activity number SDW3070; Alternative Glass Types Evaluation (WHC 1994a).

DECISION

a. PLANNING BASIS

See formal decision for selection of waste form. As a planning basis, the DOE-RL is pursuing the production of a borosilicate glass as the high-level / transuranic waste form. However to minimize the volume of vitrified high-level / transuranic waste, alternative glass formulations such as alumino-silicate glasses will be evaluated. The DOE-RW must determine the acceptability of alternative glass formulations for disposal in the high-level waste repository.

b. FORMAL DECISION

Vitrification of HLW/TRU tank waste to produce a glass product has been selected for program development (DOE 1990).

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The selection of a specific alternative will be influenced by interactions with the geologic repository criteria imposed on the HLW/TRU product form. Therefore, the selected disposition of high-level and TRU tank wastes (decision 4.2.2.a) will influence this decision due to the potential for repository criteria to depend on the type of geologic formation used for disposed waste emplacement. The process selected will also influence determination of whether TRU and HLW can be processed in the same plant (decision 4.2.2.2.b), and the HLW facility concept (decision 4.2.2.2.c).

b. Impacts and Mitigation

Current planning assumptions are based on generating vitrified tank waste to a single set of disposal criteria based on disposal in the HLW repository. Modifications to the facility configuration will result if an alternate other than vitrification is selected for either the HLW or TRU process.

If an alternate to vitrification for both the HLW and TRU waste is selected, activities for selection of vitrification technologies applicable to tank waste will no longer be useful and development activities must be redirected to support the selected process. If an alternate to vitrification is selected for either the HLW or TRU waste, while retaining vitrification for the other waste type, then vitrification development activities will continue to be useful, but a second technology development effort must be initiated in parallel to the vitrification activity. Parallel technology development efforts would divert resources and jeopardize the program baseline schedule.

Program activities are based on the process selection issue for HLW being closed, with a vitrification process representing the selected alternative. Therefore, the primary uncertainty remains within the disposition selected for TRU tank waste. The alternatives for dispositioning of immobilized TRU tank wastes are disposal in the: (i) WIPP repository, (ii) spent nuclear fuel / HLW repository, or (iii) an alternative geological repository. The criteria for geological disposal of radioactive and hazardous wastes are established to protect the public, workers, future generations, and the environment. The waste acceptance criteria for the WIPP repository and the HLW repository (or any other proposed repository) are based upon fundamentally similar federal regulations (e.g., RCRA, 40 CFR Part 191, 10 CFR Part 961, 10 CFR Part 60). A cursory review of the waste acceptance criteria for both repositories indicates a TRU tank waste glass formulation could be demonstrated to meet either criteria. Dialogue with the DOE-AL and DOE-OCRWM needs to be established to determine if the a vitrified waste form is acceptable for TRU tank waste.

Uncertainty mitigation methods available are limited for the case where a process other than vitrification is selected for any TRU tank waste. Alternatives appear to be limited to:

1. Continuing with the assumption that vitrification will be appropriate for TRU tank waste until the TRU tank waste disposition decision is made. At that time, TRU waste criteria defined by the disposition decision can be used as a basis for comparing the vitrified waste form with alternative waste forms. If an alternate to vitrification contains strong drivers for selection, the alternate technology development would be initiated, process defined, and implemented in the facility as an add-on structure to the HLW facility, or a separate new facility.
2. Same as 1, except the process defined for TRU waste is implemented in the facility by replacing equipment at the conclusion of HLW processing. The entire facility would require waste clean out activities to the extent that it could be demonstrated that HLW is not commingled with the TRU waste. The approach also may not support completing tank waste processing in accordance with the TPA schedule.
3. Same as 1, except the process defined for TRU waste is implemented in the initial facility construction and equipment replacement is used to install the HLW vitrification process. This mitigation method avoids waste clean out activities, but continues to add risk to the programs ability of completing tank waste processing in accordance with the TPA schedule.

4.2.2.2.b DECISION: DETERMINE WHETHER TRU & HLW CAN BE PROCESSED IN THE SAME PLANT

DESCRIPTION:

An implementation strategy is selected for the HLW and TRU tank waste which determines whether a single plant will be developed to immobilize both waste types.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03
RELATED FUNCTION: 4.2.2.2 IMMOBILIZE HLW/TRU WASTE

DECISION DATE: January 1995

PUBLIC INVOLVEMENT PLAN:

This decision has the potential to result in the construction and operation of separate facilities for immobilization of HLW and TRU tank wastes. The resource expenditures and environmental impacts could be significant if separate facilities are needed for immobilization of HLW and TRU tank wastes. If separate facilities are determined to be necessary, the public should be consulted prior to implementing this decision. A revision to the TWRS EIS and public review and comment would be necessary if separate facilities were determined to be needed for immobilization of HLW and TRU tank wastes.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Two alternatives exist for providing the capability to immobilize HLW and TRU tank waste.

a. Separate Facilities. Separate facilities are constructed for processing the HLW and TRU tank waste. This implementation strategy is potentially attractive if:

1. The TRU tank waste disposition is different from the HLW (different production criteria to be satisfied),
2. The TRU tank waste immobilization form is different from HLW (different process to be installed), or
3. Process vessel geometries required to handle TRU tank waste immobilization are different from HLW (e.g., segregated processing increases criticality concerns).

b. Combined TRU/HLW Facility. A single facility is constructed for immobilizing the HLW and TRU tank waste. This implementation strategy is attractive if:

1. The TRU tank waste disposition is the same as for HLW such that segregated processing is not required, or
2. The TRU tank waste immobilization form is the same as for HLW and segregated processing can be scheduled before HLW processing is

initiated or after HLW processing is complete. This implementation strategy would also accommodate equipment change outs in order to modify equipment geometries should that be required to support segregated TRU tank waste immobilization.

INFORMATION AVAILABLE TO SUPPORT DECISION:

No information is presently prepared on this decision.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program element schedule includes activity SDW7473; A/E Trade Study Close Out, which will provide information for resolution of this decision.

DECISION

a. PLANNING BASIS

For planning purposes, the HLW Program has assumed that both HLW and TRU tank waste can be processed in the same facility without segregating the TRU tank waste from HLW.

b. FORMAL DECISION

A formal decision has not been conducted.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

As indicated in the alternatives description, this decision is influenced by the disposition decision for TRU tank waste (decision 4.2.2.a) and the TRU tank waste immobilization process selection (decision 4.2.2.2.a). The planning assumption of processing both the HLW and TRU tank wastes in the same facility is consistent with the planning assumptions to produce a vitrified waste form for both types of waste and to dispose of the vitrified wastes in the HLW geological repository.

b. Impacts and Mitigation

A review of processing history, waste storage practices, and chemical composition of suspected tank wastes needs to be conducted to establish whether or not these wastes are TRU. Resolution of this issue would reduce the uncertainty associated with this decision and decisions 4.2.2.a, 4.2.2.2.a.

This decision can have significant impacts on the projected cost and schedule of tank waste immobilization. Selecting individual facilities for immobilization of HLW and TRU tank waste represents the upper bound of facility construction and operating costs for the alternatives identified, while processing the two waste types in a single facility without segregation represents the lower bound of costs. Current program planning cost estimates are based on an implementation strategy which produces the lower bound costs. Therefore, there is some risk the costs

could be under estimated if an alternative to the planning assumption is selected. The risk of significant program cost increases would be expected to be mitigated to a large extent if any segregated processing requirements for TRU tank waste were addressed by an equipment change out implementation strategy rather than using separate facilities.

If segregated TRU tank waste processing is required and the single facility concept using equipment change out is selected as an implementation strategy, then some increase in schedule risk should be anticipated. The increased schedule risk would result from incorporating downtime in the overall facility program schedule to allow for equipment change out activities. This risk can be mitigated if the need for segregated TRU tank waste is identified at an early stage of facility design such that the design capacity can be increased. Otherwise, the schedule risk could be potentially mitigated by relying on technology advances or design conservatism to provide the increased plant capacity such that the overall program schedule is not perturbed.

4.2.2.2.c DECISION: DETERMINE HLW VITRIFICATION FACILITY CONCEPT

DESCRIPTION:

Alternatives exist for developing the TWRS disposal system as individual facilities supporting pretreatment, LLW immobilization, and HLW vitrification, or combining these systems in groups. A concept for the HLW facility grouping is selected by this decision.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03
RELATED FUNCTION: 4.2.2.2 IMMOBILIZE HLW/TRU WASTE

DECISION DATE: October 1996

PUBLIC INVOLVEMENT PLAN:

The Federal Facility Agreement and Consent Order (Ecology 1994) specifies a target milestone (M-60-03-T01) for completing an engineering study evaluating alternative Tank Waste Remediation facility concepts. This engineering study has been completed and will form the basis for selecting a HLW vitrification facility concept for further evaluation. The public and stakeholder groups participated during preparation of this study. The public was informed of this study's basis, provided suggestions and input through review of information as it was prepared and received the results of this study.

Further refinement of the HLW vitrification facility concept will be conducted during fiscal years 1995 and 1996. The participation of the public and stakeholder groups to help guide the development of the HLW vitrification facility concept will continue to be elicited. A recommended HLW vitrification facility concept will be based upon all received comments, technical considerations and stakeholder groups' values. These public involvement actions are consistent with the decision analysis process identified in section 3.0.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Facility concept alternatives for integrating the HLW vitrification facility with other TWRS disposal system facilities have been proposed as a means of reducing the overall costs for remediation of Hanford tank waste. The proposed alternatives include the following combinations.

- a. Stand Alone HLW Vitrification Facility. A separate facility is constructed to support the immobilization functions required to process HLW and TRU tank waste.
- b. HLW Vitrification Combined with Pretreatment. The immobilization functions required to process HLW and TRU tank waste are combined with functions supporting tank waste pretreatment in a single facility.
- c. HLW Vitrification Combined with LLW Immobilization. The immobilization functions required to process HLW and TRU tank waste are

combined with functions supporting LLW immobilization in a single facility.

d. HLW Vitrifaction Combined with pretreatment and LLW immobilization. The immobilization function required to process HLW and TRU tank waste are combined with function supporting both pretreatment and LLW immobilization in a single facility.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The TWRS Facility Configuration Study was completed in June 1994 (WHC 1994e). This study provides information regarding the performance of the alternative facility concepts for supernate pretreatment, low-level waste vitrification and high-level waste vitrification.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program will conduct follow on refinement of the facility concept as schedule activities number SDW7550; Identify Technology Development to Resolve EQ Decision Uncertainty, and SDW7750; Update Facility Concepts (WHC 1994a).

DECISION

a. PLANNING BASIS

The HLW Program is based on a stand alone HLW Vitrifaction facility.

b. FORMAL DECISION

Westinghouse Hanford Company (WHC) made a formal recommendation of a reference HLW vitrification facility concept to the DOE/RL on July 18, 1994. The WHC recommendation is to design and construction a common, centralized facility for supernate pretreatment and low-level waste vitrification. The HLW vitrification function will be located near the other functions and will be serviced by the same support utilities. Design concepts which integrate the LLW and HLW vitrification functions in a common facility are recommended to be investigated, with a decision by November 1998 (start of definitive design for the LLW vitrification facility). HLW vitrification facility concepts recommended for further evaluation are a detached facility, combined LLW and HLW vitrification facility, or conversion near the end of LLW processing one of the LLW lines to serve as the HLW vitrification process (WHC 1994f).

The DOE/RL is reviewing the technical basis for this recommendation. DOE/RL is anticipates to complete this review by September 1994 and determine whether or not to proceed with this recommendation.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Interfacing decisions may influence the attractiveness of specific alternatives for the HLW vitrification. The selected LLW form (decision 4.2.3.1.a) may influence the consideration of combining HLW and LLW immobilization, or all three systems, in the same facility. The selected waste separation process (decision 4.2.2.1) may influence the consideration of combining pretreatment and HLW immobilization, or all three systems, in the same facility.

b. Impacts and Mitigation

This configuration decision has the potential to impact the number of discrete major construction projects proposed for support of the TWRS disposal systems. Alternatives which combine disposal functions will reduce the number of projects. It is anticipated that an overall economic incentive, along with other stakeholder groups values, would be a part of any alternative which is selected. These influences and the aforementioned interfacing decisions were considered during development of the TWRS Facility Configuration Evaluation and the accompanying WHC recommended facility concepts.

Each alternative facility concept was evaluated and determined to uphold stakeholder groups' values. Reduced construction and operating costs which may be achieved by combination of the HLW vitrification with other functions were evaluated to verify that the resultant construction cost profile does not exceed projected available funding during the construction period. The cost profiles for all combinations of pretreatment, LLW and HLW vitrification functions were determined. The funding profile for combined pretreatment and LLW vitrification facility with a separate HLW facility was found to be the most favorable and does not exceed the projected available funding. Additional cost reductions may be achievable after further evaluation of concepts for combining LLW and HLW vitrification facility, or conversion near the end of LLW processing one of the LLW lines to serve as the HLW vitrification process.

4.2.2.3 DECISION: DETERMINE CAPSULE OVERPACK FACILITY CONCEPT

DESCRIPTION:

A reference facility concept for implementing the capsule overpack capabilities needs to be selected. This decision is predicated upon determining the capsules are a suitable waste form for disposal in the HLW repository per decision 4.2.2.c.

RELATED WBS ELEMENT: 1.1.1.3.03.04.02
RELATED FUNCTION: 4.2.2.3 DISPOSITION CS/SR CAPSULES

DECISION DATE: December 1996

PUBLIC INVOLVEMENT PLAN:

Involvement of the public and stakeholder groups in selecting a capsule overpack facility concept should be conducted. The selection of a capsule overpack facility concept has the potential to result in the construction of new facilities. A supplement to the TWRS EIS may be necessary if a separate capsule overpack facility is determined to be needed.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Due to high radiation field, capsules are usually handled in a hot cell type of facility or other similarly remote type facility. Concepts for overpack systems are presumed to be performed in a hot cell type of structure. Therefore, potential cost savings may be realized if the capsule overpack system is incorporated in a facility which has similar characteristics and performs other functions. This cost savings would be expected to be derived from using common ventilation and other support systems or reusing process space after equipment replacement. The alternatives proposed for the overpack facility configurations are as follows.

- a. Combine with HLW Vitrification. Combines the capsule overpack systems with the scope defined for the HLW vitrification facility. Provides opportunity to use common support, ventilation capabilities, and canister mechanical handling (e.g., canister welding, inspection, decontamination, and load out) systems.
- b. Combine with Pretreatment Facility. Combines the capsule overpack systems with the scope defined for the pretreatment facility. Provides opportunity to use common support and ventilation capabilities.
- c. Separate Capsule Facility. Provides a new facility specifically design to support the capsule overpack systems.
- d. Combine with IHLW/ITRU Interim Storage Facility. Combines the capsule overpack systems with the scope defined for the interim canister storage system for immobilized HLW and TRU tank waste.

INFORMATION AVAILABLE TO SUPPORT DECISION:

A concept for a separate capsule overpack facility has been prepared. Features of this separate capsule overpack facility are presented in section 9 of the *Tank Waste Technical Options Report* (WHC 1993d). An evaluation of alternative facility concepts in terms of the stakeholder groups' values and interfacing decisions is necessary to aid in the selection of a reference facility concept.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

Actions proposed by the high-level waste program element schedule for resolution of this decision are identified as activity numbers:

SDW4050	Design Strategy Options and Concepts for Overpack,
SDW4100	Key Decision on Need / Ref for Overpacking Cs/Sr,
SDW4150	DOE-RW Repository Disposal Cost Estimate for Cs/Sr
SDW4156	TWRS / DOE-EM Decision Analysis / Ref Disposal Option Selection
SDW4300	Strategy and Plan for Resolving Ref Cs/Sr Capsules
SDW4400	Revise Baseline per Cs/Sr Capsules Task Results

DECISION

a. PLANNING BASIS

Current planning assumptions are based on combining the cesium and strontium overpack systems into the HLW Vitrification facility.

b. FORMAL DECISION

A formal decision will be made following completion of the identified analyses.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The TWRS program scope has been defined based upon system requirements and decisions implemented at higher levels of the program. The selection of a capsule overpack facility concepts is to be conducted within the framework defined by these higher level decisions. The assumed results of these higher level decisions are:

a) Decision 4.2 Determine Disposition of Tank Waste - As a planning basis, all tank waste will be retrieved from tanks and treated for disposal.

b) Decision 4.2.1.1.c Determine capsule interim storage configuration - As a planning basis, interim storage of capsules at WESF will be continued.

c) Decision 4.2.2.c Determine Disposition of Cs/Sr Capsules - As a planning basis, Cs and Sr capsules will be overpacked in canisters such that the repository waste acceptance criteria could be met.

The selection of the capsule overpack facility concept will be influenced by the determination of whether or not the capsules are a waste form acceptable for disposal in the geological repository (decision 4.2.2.c). If the capsules are not suitable for disposal in the HLW repository, then this decision is not necessary. The overpack facility concept selection has the potential to influence either the waste pretreatment facility concept (decision 4.2.2.1), HLW vitrification facility concept (decision 4.2.2.2.c), or the immobilized HLW/TRU waste container facility concept selection (decision 4.2.2.4).

b. Impacts and Mitigation

The immobilized HLW/TRU waste container facility concept selection potentially impacts consideration of the capsule overpack facility alternative which combines overpack systems with the interim storage facility. A reasonable opportunity for considering this combination option will exist if the enclosed facility option is selected for HLW/TRU container storage. However, if the open facility concept (casks on pads) is selected for container storage, there would be essentially no facility capabilities which would be attractive for combining with the capsule overpack systems. Separate facilities would be necessary.

The impact of the overpack facility concept selection on the pretreatment and HLW Vitrification facility concepts is to add systems to the facility scope which must be incorporated into the facility at some time during the design, construction, or operating life. This could be accomplished by an early decision as to the capsule overpack facility concept such that additional systems could be included in the facility design as an integral portion of the facility. Alternatively, the capsule facility could be added on to either facility at a later date, much as the Waste Encapsulation and Storage Facility was added to the B Plant. The program baseline schedule and cost estimates are based upon the inclusion of the capsule overpack facility into the HLW vitrification facility. Therefore, there are no impacts from this alternative. Combining the capsule overpack function with other functions could result in program

cost reductions. The benefits of each alternative facility concept will be evaluated by December 1996, before design is initiated on the pretreatment, HLW, or immobilized HLW/TRU waste interim storage facilities. Therefore, an opportunity exists to optimize the program costs.

If a separate capsule overpack facility concept were selected, the program baseline cost would increase. However, the program schedule may not be impacted, since design, construction and operation of an overpacking facility can be conducted independent of tank waste pretreatment and vitrification activities. Phasing of the construction schedule would be necessary to avoid impacts on annual funding profiles.

4.2.2.4 DECISION: DETERMINE IHLW/ITRU CONTAINER FACILITY CONCEPT

DESCRIPTION:

A reference facility concept for temporary onsite storage of immobilized HLW and TRU waste in containers is selected.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03
RELATED FUNCTION: 4.2.2.4 INTERIM STORE IHLW/ITRU

DECISION DATE: March 1997

PUBLIC INVOLVEMENT PLAN:

Onsite interim storage of immobilized HLW/TRU tank wastes is necessary until the HLW repository is available to receive these wastes. Shipment of immobilized defense HLW to the HLW repository is planned to commence in 2015 and be completed by 2032. Immobilization of the HLW at the Hanford Site is scheduled to commence by December 2009. Therefore, onsite interim storage of immobilized HLW/TRU tank wastes may be required for several decades. The participation of the public and stakeholder groups in defining and evaluating suitable alternatives for interim storage of immobilized HLW/TRU tank wastes is important in gaining acceptance of the real and perceived safety, environmental, and land use implications.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Immobilized HLW and TRU waste in containers will be stored for an interim time period at the Hanford site prior to shipment to an offsite repository. A storage system must be selected to accomplish this function. Alternative facility concepts to be evaluated for the storage system are as follows.

- a. Enclosed Facility. The enclosed facility concept utilizes a facility structure to provide containment and shielding for the immobilized HLW containers.
- b. Open Facility (Casks on Pad). The open facility concept utilizes casks (possibly as large as 10 m³) to provide shielding, containment, and protection of the waste containers from the elements. The casks contain individual waste containers, or groups of containers, which are placed on a concrete storage pad.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Concepts for a interim storage of shelf shielded casks and canisters requiring shielded storage are presented in section 9 and detailed in Appendix I of the *Tank Waste Technical Options Report* (WHC 1993d). An update of disposal container configurations and interim storage concepts is being conducted by Fluor-Daniels Engineering. Evaluation of alternative HLW disposal containers and interim storage facility concepts for each type of container is scheduled to be completed in May 1995.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program element schedule identifies conducting an engineering evaluation for resolution of this decision as schedule activity SDW7460; Determine IHLW/ITRU Container Storage Facility Concept (WHC 1994a).

DECISION

a. PLANNING BASIS

For planning purposes, the use of the spent nuclear fuel canister for containment of immobilized HLW has been assumed (refer to decision 4.2.2.b). The program planning assumptions is for placement of these canisters in a enclosed interim storage facility. Additionally, if overpacking of cesium and strontium capsules is selected (refer to decision 4.2.2.c), then interim storage of the overpacked capsules will be incorporated into the IHLW/ITRU canister storage facility concept.

b. FORMAL DECISION

A formal decision will be made following completion of the identified analyses.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The immobilized HLW / TRU waste container facility configuration selection may be influenced by the selected container size and configuration (decision 4.2.2.b). For planning purposes, the use of the spent nuclear fuel canister for containment of immobilized HLW has been assumed (refer to decision 4.2.2.b). The program planning assumptions is for placement of these canisters in a enclosed interim storage facility. However, the use of the spent nuclear fuel canister does not preclude overpacking into a large cask, such as the multipurpose canister, and placement into a concrete cask.

b. Impacts and Mitigation

The selected immobilized HLW / TRU waste container size may impact the viability of enclosed facility concepts for waste container storage. The standard DWPF canister size (61 cm diameter by 3 meters length) provides a container amenable to individual placement in a storage position for most proposed enclosed facility storage concepts. The individual standard canister size is similar in geometry to commercial spent nuclear fuel assemblies such that storage configurations developed for the commercial reactor industry could be adapted for canister storage.

The 10 m³ canister dimensions are significantly larger than the standard canister, and commercial reactor fuel, such that it is likely that the open facility concept will be the primary storage configuration which will be attractive from an economic point of view. The large cask could be placed within a multipurpose canister, which in turn could be placed into a concrete cask for shielding during interim storage.

Both enclosed and open facility configurations have been proposed for commercial fuel storage, while the enclosed facility configuration is

utilized at the DWPF for immobilized HLW. Commercial fuel storage by Duke Power uses a large shelf shielded cask stored in an open facility. Therefore, designs should be achievable for successful implementation of either concept.

One method of mitigating the uncertainty in the container storage configuration is to base planning on the open facility configuration, assuming the canister produced from HLW immobilization can be overpacked within the multipurpose canister envelope. This approach would reduce the impact of canister size on storage facility concept selection. However, the overall program costs for storage could be increased if the multipurpose canister was not ultimately selected for use.

4.2.2.6 DECISION: DETERMINE OVERPACKED Cs/Sr CAPSULE INTERIM STORAGE FACILITY CONCEPT

DESCRIPTION:

A reference facility concept for temporary onsite storage of overpacked cesium and strontium capsules is selected. This decision is predicated upon the determination that capsules will be overpacked and sent to the HLW repository for disposal (decision 4.2.2.c).

RELATED WBS ELEMENT: 1.1.1.3.03.04.03

RELATED FUNCTION: 4.2.2.6 INTERIM STORE OVERPACKED Cs/Sr CAPSULES

DECISION DATE: March 1997

PUBLIC INVOLVEMENT PLAN:

Onsite interim storage of overpacked cesium and strontium capsules is necessary until the HLW repository is available to receive these wastes. Shipment of defense HLW to the HLW repository is planned to commence in 2015 and be completed by 2032. Therefore, onsite interim storage of overpacked capsules may be required for several decades. The participation of the public and stakeholder groups in defining and evaluating suitable alternatives for interim storage of overpacked capsules is important in gaining acceptance of the real and perceived safety, environmental, and land use implications.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Overpacked capsules will be stored for an interim time period at the Hanford site prior to shipment to an offsite repository. A storage system must be selected to accomplish this function. Alternative facility concepts to be evaluated for the storage system are as follows.

- a. Combine with Capsule Interim Storage Facility. Combines the interim storage of overpacked capsules with the capsule interim storage facility. Provides opportunity to use common support and ventilation capabilities systems.
- b. Combine with Capsule Overpack Facility. Combines the interim storage of overpacked capsules with the capsule overpack facility. Provides opportunity to use common support, ventilation capabilities, and canister mechanical handling (e.g., inspection, decontamination, and load out) systems.
- c. Combine with IHLW/ITRU Interim Storage Facility. Combines the overpacked capsules interim storage systems with the scope defined for the interim canister storage system for immobilized HLW and TRU tank waste.
- d. Separate Overpacked Capsule Interim Storage Facility. Provides a new facility specifically design to support the interim storage of overpacked capsule overpack systems.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An engineering evaluation of alternative facility concepts is planned to be conducted by March 1997 to determine a suitable alternative.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program element schedule identifies conducting an engineering evaluation for resolution of this decision as schedule activity SDW7460; Determine IHLW/ITRU Container Storage Facility Concept (WHC 1994a). This study included evaluation of options for interim storage of overpacked Cs/Sr capsules.

DECISION

a. PLANNING BASIS

The program baseline schedule and cost estimates are based upon the inclusion of the interim storage facility into the IHLW/ITRU waste interim storage facility.

b. FORMAL DECISION

A formal decision concerning a facility concept for interim storage of overpacked capsules will be conducted after evaluating alternative facility concepts and interfacing decisions.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

As implied by the alternatives, the selection of the overpacked capsule interim storage facility concept may influence selection of the interim storage facilities for the capsules (decision 4.2.1.1.c) and immobilized HLW/TRU tank wastes (decision 4.2.2.4), as well as the selection of a capsule overpack facility concept (decision 4.2.2.3). The selection of the overpacked capsule interim storage facility concept is in turn influenced by the determination of the disposition of the capsules (decision 4.2.2.c).

b. Impacts and Mitigation

Since the disposition of capsules has not been established, there is uncertainty for the need of a interim storage facility for the overpacked capsules. The acceptability of overpacked capsules for disposal in the geological repository should be established first. If overpacked capsules are an acceptable waste form for disposal in the HLW repository, then the evaluation of an overpack facility and an interim storage facility should be conducted.

The impact of the interim storage facility concept selection on the capsule interim storage, capsule overpack, or IHLW/ITRU waste interim storage facility concepts is to add systems to the scope of one of these facilities. This scope must be incorporated into the selected facility at some time during the design, construction, or operating life. This could be accomplished by an early decision as to the interim storage

facility concept such that additional systems could be included in the selected facility design as an integral portion of the facility. Alternatively, the interim storage facility could be added at a later date, much as the Waste Encapsulation and Storage Facility was added to the B Plant. The program baseline schedule and cost estimates are based upon the inclusion of the interim storage facility into the IHLW/ITRU waste interim storage facility. The capsule overpack function is assumed to be combined with the HLW vitrification facility. Therefore, there are no impacts from this alternative. Combining the overpacked capsules interim storage function with other functions could result in program cost reductions. The benefits of each alternative facility concept will be evaluated by March 1997, before design is initiated on these facilities. Therefore, an opportunity exists to optimize the program costs.

If a separate interim storage facility concept were selected, the program baseline cost would increase. However, the program schedule may not be impacted, since design, construction and operation of an interim storage facility can be conducted independent of tank waste pretreatment and vitrification activities. Phasing of the construction schedule would be necessary to avoid impacts on annual funding profiles.

4.2.3 DECISION: DETERMINE SYSTEM GENERATED WASTE DISPOSAL STRATEGY

DESCRIPTION:

A decision is needed whether the treatment and disposition of system generated waste (e.g. low-activity fraction of tank waste, gaseous effluents, liquid effluents and solid waste) & excess facilities is part of the TWRS scope. If treatment and disposition of system generated waste & excess facilities is not part of the TWRS scope, then this scope needs to be assigned to other Hanford Site program.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
RELATED FUNCTION: 4.2.3 MANAGE SYSTEM GENERATED WASTE & EXCESS FACILITIES

DECISION DATE: March 1995

PUBLIC INVOLVEMENT PLAN:

This decision defines work scope for Hanford Site programs. The specific alternatives for treatment and disposition of system generated waste & excess facilities are not being evaluated. Therefore, public participation in determining assignment of scope to programs is not deemed necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

The treatment and disposition of system generated waste & excess facilities can either be conducted as part of the TWRS or assigned to another Hanford Site program.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The *Tank Waste Remediation System Mission Analysis*, WHC-EP-0627, assigned programmatic responsibility for treatment of system generated waste and excess facilities derived from remediation of tank wastes to the TWRS program. This programmatic allocation of scope was in accordance with direction received from the U.S. Department of Energy (DOE), Richland Field Office and draft DOE Order 58XX.XX, *Transition of Excess Facilities to Environmental Restoration*.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

Acceptance criteria for transfer of "empty" miscellaneous underground storage tanks (MUSTs), single-shell (SST) and double-shell tanks (DST) (i.e. containing an acceptable level of residual waste, which could be zero) will be specified as part of the closure plans for these tanks. Development of closure plans for these tanks is identified on the retrieval program element schedule. Interface acceptance requirements for solid waste are specified in the *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063, therefore no activities are planned to further define these requirements. The development of interface acceptance requirements for liquid effluents and excess facilities is identified on the pretreatment program element schedule as activity numbers PSW04850; Prepare White Paper Documenting Trade Study 4.2.3, and PSW04850A; Issue White Paper Documenting Trade Study 4.2.3.

DECISION

a. PLANNING BASIS

As a planning basis, programmatic responsibility for treatment of system generated waste & excess facilities has been assumed to be assigned to TWRS. Programmatic responsibility for the final disposition of immobilized low-level waste resulting from processing of tank wastes is assigned to the TWRS. Final disposition of other system generated wastes and excess facilities is assigned to Hanford Site functions Manage Aqueous Waste (liquid effluents), Remedy Solid Waste (solid waste), Deactivate Facilities (excess facilities), and Remedy/Restore Sites, Facilities, and Ground Water (DSTs, SSTs and MUSTs).

b. FORMAL DECISION

A formal decision will be made following completion of the identified analyses.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

A systems engineering process is being used to define functions, specific requirements and select architectural solutions for accomplishing the cleanup of the Hanford Site. The preliminary definition of Hanford Site cleanup functions is specified in WHC-EP-0722 *Systems Engineering Functions and Requirements for the Hanford Cleanup Mission: First Issue*.

Utilizing the systems engineering methodology, common "products" (e.g. immobilized low-level waste resulting from processing of tank waste, low-activity waste derived from management of aqueous wastes, etc.) produced from the cleanup of Hanford would be logically grouped together to develop an architecture for managing these common products. Subsequent decomposition of functions, requirements and architectures as well as programmatic responsibility to manage this common set of products would be assigned to a single organization. Allocation of Hanford site functions to programs has not been conducted as of June 1, 1994. Therefore, it has not been established whether TWRS should conduct treatment and disposition of system generated waste & excess facilities.

The Hanford Site systems engineering effort has identified five functions for dispositioning system generated wastes (e.g. low-activity fraction of tank waste, liquid effluents, solid waste; gaseous effluents are treated and released to environment) and excess facilities: Remediate Tank Waste (low-activity fraction of tank waste), Manage Aqueous Waste (liquid effluents), Remedy Solid Waste (solid waste), Deactivate Facilities (excess facilities), and Remedy/Restore Sites, Facilities, and Ground Water (closure of DSTs, SSTs and MUSTs).

It has been assumed the TWRS has programmatic responsibility for the function Remediate Tank Waste. Furthermore, it has been assumed the TWRS will not provide final disposition of liquid effluents, solid wastes, excess facilities, and tank systems. Instead, it has been assumed the TWRS will treat these materials to the extent necessary for the Manage Aqueous Waste, Remedy Solid Waste, Deactivate Facilities, and Remedy/Restore Site, Facilities, and Ground Water functions to accept these materials for final disposition. The extent of treatment required prior to transfer of system generated waste (e.g. liquid effluents, solid waste) and excess facilities to these other Hanford Site functions has not been established.

b. Impacts and Mitigation

The TWRS program technical scope, cost estimate and schedule have been developed assuming programmatic responsibility for treatment of system generated waste & excess facilities. Closure of the immobilized low-level waste sites has also been included in the scope of the TWRS program. If a decision is reached to assign programmatic responsibility to another Hanford Site program, the TWRS program can be readily modified to remove scope and cost associated with these activities.

Regardless of the organization assigned programmatic responsibility for treatment and disposition of system generated wastes and excess facilities, the Remediate Tank Waste function will produce these "secondary waste products". Interface acceptance requirements need to be established to determine the extent of treatment required prior to transfer of system generated waste (e.g. liquid and solid effluents) and excess facilities to these other Hanford Site functions.

These interface acceptance requirements will effect the scope of tank waste treatment and disposal facilities. TWRS is presently conducting pre-conceptual engineering activities for tank waste treatment and disposal facilities. If interface acceptance requirements are established prior to completing conceptual design efforts (fiscal year 1997), then the schedule and financial risks can be minimized.

4.2.3.b DECISION: DETERMINE WHETHER IMMOBILIZED LLW CAN BE DISPOSED IN 200 AREAS

DESCRIPTION:

LLW generated during remediation of Hanford Site tank waste must be disposed of either onsite or offsite. If onsite disposal is acceptable, then the specific site location must be decided. Presently, LLW generated from Hanford site cleanup and restoration is being disposed in the 200 Area. All of the SST's, DST's, and contaminated production facilities reside within the 200 Area. Allowances for disposal of LLW within the 200 Area eliminates the need for retrieval, waste handling, packaging, shipment, and offsite disposal of low-level solid waste, including underground tanks and associated equipment.

RELATED WBS ELEMENT: 1.1.1.1.01.02
RELATED FUNCTION: 4.2.3 MANAGE SYSTEM GENERATED WASTE & EXCESS FACILITIES

DECISION DATE: October 1996

Formal evaluation of this decision will be conducted through the preparation of an environmental impact statement for TWRS proposed actions in accordance with the National Environmental Policy Act. A record of decision will be issued to document this decision.

PUBLIC INVOLVEMENT PLAN:

The National Environmental Policy Act requires the solicitation of public comments throughout the preparation for this decision. Public and stakeholder groups participation in the selection and evaluation of alternatives will be obtained while preparing this environmental impact statement.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternative strategies for Hanford Tank Waste Remediation will be formulated through involvement of the public. A notice of intent to prepare an environmental impact statement (EIS) for proposed actions relating to the disposition and processing of Hanford tank waste has been prepared. Alternatives for dispositioning LLW waste generated from remediation of tank waste will be developed through solicitation of public comment and technical considerations.

Two preliminary alternatives have been proposed by various stakeholder groups and technical experts for the processing of Hanford tank wastes, pending completion of the EIS scoping period. These alternatives are discussed below.

- a. Disposal of all LLW offsite. All low-level waste generated from remediation of tank waste would be treated (if necessary), packaged, transported offsite, and dispositioned offsite. A new low-level waste treatment facility would be constructed for treatment of tank wastes.

The treated low-level waste (i.e. immobilized) would be packaged and transported offsite for disposal at an approved facility. (Although not part of the TWRS program scope, this alternative could require excess TWRS facilities which contain low-level waste to be decontaminated, demolished, and packaged for offsite disposition. These actions would be addressed by the Deactivate Facilities function).

b. Disposal of all LLW within the 200 Area plateau. A new low-level waste treatment facility would be constructed for treatment of tank wastes. The low-level tank wastes would be immobilized and disposed in an approved site within the 200 Area of the Hanford site. (Excess TWRS facilities would be transferred to the Deactivate Facilities function for dispositioning in the 200 Area.)

INFORMATION AVAILABLE TO SUPPORT DECISION:

Stakeholder groups met during 1992 to develop planning guidance for use by DOE when selecting alternatives for remediation actions at the Hanford Site (DOE 1992a). The majority opinion of stakeholder groups was to allow the continued disposal of Hanford Site LLW within the 200 Area.

The Hanford Tank Waste Task Force stated in their September 1993 report "safe" low-level waste could be disposed in the 200 Area. A retrievable waste form should be used when potential hazards from the waste may require future retrieval and when retrievability does not cause inordinate delays in getting on with cleanup. The task force also stated all stakeholder groups do not necessarily agree with this majority opinion.

The Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Waste, Hanford Site, Richland Washington and accompanying record of decision indicates disposal in the 200 Area of the immobilized low-level waste resulting from the treatment of DST waste. No decision was made concerning the SST waste (DOE 1988). The Tri-Party Agreement specifies actions which would result in the construction and operation of an Environmental Restoration Disposal Facility (milestone M-70-00) for disposal in the 200 Area of large volumes of hazardous, radioactive, and mixed waste derived from record of decisions for disposition of 100 and 300 Area operable units. Although these wastes are different from tank wastes, these actions do tend to support disposal of low-level tank wastes in the 200 Area.

A new environmental impact statement for the proposed TWRS actions is being prepared and will address disposal of low-level waste resulting from treatment of all tank waste.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

A new environmental impact statement for the TWRS will be prepared by October 1996, addressing proposed actions for the SST waste and revised actions proposed for the DST waste. The Program management program element schedule presently identifies the preparation of the TWRS EIS and issuance of the associated record of decision (see decision 4.2).

DECISION

a. PLANNING BASIS

A Record of Decision has not been formalized. It has been assumed that LLW disposal will be allowed within the 200 Area plateau.

b. FORMAL DECISION

A formal decision regarding the disposition of LLW generated from the remediation of tank waste will be obtained by October 1996.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

This decision is influenced by the decisions which will be made with respect to the closure of all SST and DST farms, as well as disposition of all LLW presently buried on the Hanford Site.

b. Impacts and Mitigation

This decision could have a significant impact on the TWRS program. Current plans do not include offsite disposal of LLW. If the decision is made to dispose LLW offsite, then the scope of the TWRS program will have to be expanded to include such actions. This will significantly increase costs and extend the Hanford site cleanup schedule. Additionally, public acceptance may not be forthcoming for the disposal of Hanford Site low-level waste at a location other than Hanford. Transportation and radiological hazards may exist with shipment of LLW from the Hanford Site to another location for disposal.

4.2.3.c DECISION: NRC DETERMINES CLASSIFICATION OF SST WASTE

DESCRIPTION:

The NRC determines the classification of pretreated SST waste fraction intended for immobilization and onsite disposal.

RELATED WBS ELEMENT: 1.1.1.3.02.04.01
RELATED FUNCTION: 4.2 REMEDIATE TANK WASTE
4.2.3.1 IMMOBILIZE AND DISPOSE LLW

DECISION DATE: July 1996

The U. S. NRC has requested that DOE prepare NEPA documentation and complete characterization of SST wastes, with results provided to the NRC, prior to NRC conducting this decision.

PUBLIC INVOLVEMENT PLAN:

The states of Oregon and Washington and the Yakama Indian Nation have previously expressed interest in the classification of tank wastes. The U. S. NRC will hold public hearings before ruling on the classification of pretreated SST wastes intended for immobilization and onsite disposal.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

The U. S. NRC has not determined the classification of the pretreated SST waste fraction intended for immobilization and onsite disposal. There are two possible alternatives for this classification. These alternatives are discussed below.

- a. SST LLW fraction incidental. This alternative is based upon the decision that the LLW fraction is incidental, and consequently acceptable for on site disposal.
- b. All SST waste is HLW. This alternative is based upon the decision that all SST waste is HLW, and consequently it must be treated and disposed in a manner consistent with that proposed for the DST HLW.

INFORMATION AVAILABLE TO SUPPORT DECISION:

Previous assessment of the DST waste pretreatment plans by the NRC resulted in the NRC agreement that the criteria used by the DOE for classification of the specific tank wastes as LLW are appropriate (Bernero 1989). This agreement was predicated on the NRC's understanding that DOE would segregate the largest practical amount of the total site activity attributable to first-cycle solvent extraction, or equivalent, for disposal as HLW, leaving behind only a small fraction of moderately radioactive material. The NRC stated that the residual fraction from processing DST wastes would be regarded as "incidental" waste based upon: (1) it has been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical; (2) it will be incorporated in a physical form at a

concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR Part 61; and (3) it will be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR Part 61 are satisfied (Bernero 1993, Incidental Waste Ruling).

The NRC's decision on DST waste does not reflect a decision on disposal of SST waste. The NRC intends to defer judgment on the classification of SST waste until after DOE completes its program to characterize these wastes and completes an environmental impact assessment for proposed SST waste disposition actions.

A technical assessment characterizing TWRS tank waste and selected pretreatment process assumptions needs to be completed to provide data necessary for the NRC to evaluate DOE's proposed actions. A request must be sent to the NRC seeking concurrence with the DOE's plans for treatment and disposal of the SST waste.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

Characterization of both SST waste and DST waste has been identified as a requirement under the fourth amendment to the Hanford Federal Facility Agreement and Consent Order (milestone M-44-00) and reflected in the tank waste characterization program. Preparation of the TWRS EIS is identified in the TWRS Program Multi-Year Work Plan as activities ES950402 through ES960401 (WHC 1994a). The low-level waste program element schedule has identified activity number L4010501; Determine NRC Classification of SST LLW Fraction, as support in assisting the NRC in determining the classification of the SST wastes (WHC 1994a).

DECISION

a. PLANNING BASIS

The TWRS program is assuming, for planning purposes, that the selected pretreatment processes will adequately treat the SST waste such that after vitrification, the waste will meet the NRC's criteria for incidental waste.

b. FORMAL DECISION

To be provided once the NRC reviews requested information and documents decision.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Establishment of the classification of this waste may effect decisions for Waste Processing Strategy (decision 4.2.2) and whether or not the LLW fraction for pretreatment of double-shell tank wastes would be immobilization and disposed onsite.

b. Impacts and Mitigation

If the NRC decides that all of the SST waste must be treated as HLW, it will have a very significant impact to the TWRS program and Hanford site cleanup activities. Either additional and/or alternate pretreatment technologies will have to be utilized, or the pretreatment and LLW vitrification facilities must be eliminated in favor of a much larger HLW vitrification facility. In either case, this may significantly increase the volume of HLW, TWRS program cost and schedule duration.

4.2.3.1.a DECISION: DETERMINE LLW FORM

DESCRIPTION:

A material form is selected for immobilization and disposal of the low-level waste fraction derived from pretreatment of Hanford Site tank wastes. This decision assumes the preferred alternative for processing tank wastes (decision 4.2.2) is to separate the tank wastes into low-activity and high-activity fractions. Additionally, it is assumed the U.S. Nuclear Regulatory Commission will concur with disposal plan for the SST waste which result in the onsite disposal of the low-activity (i.e., incidental waste) fraction (decision 4.2.3.c).

RELATED WBS ELEMENT: 1.1.1.3.02.04.01
RELATED FUNCTION: 4.2.3.1 IMMOBILIZE AND DISPOSE LLW

DECISION DATE: October 1996 - EIS
January 1995 - Verification of Planning Basis

Formal evaluation of this decision will be conducted through the preparation of an environmental impact statement for TWRS proposed actions in accordance with the National Environmental Policy Act. A record of decision will be issued to document this decision. To verify the planning basis, a technical evaluation of alternative LLW forms will be conducted.

PUBLIC INVOLVEMENT PLAN:

The National Environmental Policy Act requires the solicitation of public comments throughout the preparation for this decision. Public and stakeholder groups participation in the selection and evaluation of alternatives will be obtained while preparing this environmental impact statement.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Alternative strategies for processing the Hanford tank waste will be formulated through involvement of the public. A notice of intent to prepare an environmental impact statement for proposed actions relating to the disposition and processing of Hanford tank waste has been prepared. Alternatives for dispositioning and processing Hanford tank waste will be developed through solicitation of public comment and technical considerations.

Three preliminary alternatives have been proposed by various stakeholder groups and technical experts for the processing of Hanford tank wastes pending completion of the EIS scoping period. These alternatives are discussed below.

- a. Grout (ie. mineral, ceramic, salt). The LLW is mixed with grout forming additives or otherwise treated and placed into containers to solidify.

b. Glass. The LLW is vitrified and cast into logs, cullet or some other shape. The vitrified LLW may be mixed with a matrix material to decrease permeability and leach rate of hazardous materials from the LLW.

c. Polyethylene. The LLW is dried to a powder and then mixed with molten polyethylene and cast into containers.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The fourth amendment to the Hanford Federal Facility Agreement and Consent Order (Ecology 1994) specifies that the LLW will be vitrified and that DOE will maintain in standby condition the capability to restart the grout facility if necessary to provide tank space in support of the resolution of safety issues. This decision was made through negotiations among the Washington State Department of Ecology, United States Environmental Protection Agency, United States Department of Energy, the public, stakeholder groups, and other affected parties.

The *Tank Waste Technical Options Report* contains an evaluation of low-level waste forms in section 8.0 (WHC 1993d).

A preliminary performance evaluation will be completed in September 1994 of a vitrified waste form for disposal of the low activity fraction of tank waste resulting from the minimum separations process (see decision 4.2.2.1).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The low-level program element schedule currently identifies the completion of a technical evaluation of LLW forms as activity number L4010301; Product Configuration Trade Study (WHC 1994a).

A new environmental impact statement for the TWRS will be prepared by October 1996, addressing proposed actions for the SST waste and revised actions proposed for the DST waste (see decision 4.2).

DECISION

a. PLANNING BASIS

The vitrification of LLW to produce a glass waste form has been selected as the planning basis for the TWRS. The fourth amendment of the Hanford Federal Facility Agreement and Consent Order incorporates this approach. Performance assessment studies will be completed to evaluate the performance of the glass and the disposal system to meet environmental release standards.

b. FORMAL DECISION

A formal decision will be made via the completion of the TWRS EIS.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

DOE Order 5820.2A, Chapter III, policy states that DOE low-level waste shall be managed on a systematic basis. This allows for the management of LLW such that the most appropriate combination of waste generation reduction and segregation practices, treatment, and disposal technologies are employed so that radioactivity may be contained in a cost effective strategy. Consequently a LLW performance assessment (PA) is to be completed on the storage and disposal of Hanford LLW. An acceptable performance assessment is required for any waste disposal form selected for disposal of LLW.

b. Impacts and Mitigation

The results of the performance assessment may impact the selection of a LLW form. If the PA results are unfavorable, then: (1) the LLW formula may need to be modified, (2) the use of a matrix material may need to be incorporated in the disposal configuration, (3) an alternate disposal form may need to be evaluated and selected, or (4) pretreatment to remove additional radionuclides and/or hazardous materials may need to be conducted.

Development of an acceptable LLW formula and the evaluation of matrix materials are currently being conducted as part of the LLW Program. Similarly, the development of pretreatment technologies for the removal of radionuclides which could effect the environmental performance of the LLW form (i.e. technetium and transuranic elements) is being conducted as part of the Pretreatment Program. The development of these pretreatment technologies will continue until the preliminary assessment of the impacts of the low-level glass waste form on the disposal system performance indicates either an acceptable LLW formulation or a need to deploy the pretreatment technologies.

4.2.3.1.b DECISION: DETERMINE IMMOBILIZED LLW DISPOSAL CONFIGURATION

DESCRIPTION:

This decision assumes immobilized LLW can be disposed in the 200 Area (decision 4.2.3.b). It has been suggested by stakeholder groups the immobilized LLW generated from treatment and disposal of Hanford Site tank waste be configured to allow near term retrieval in the event future requirement or conditions dictate this action. The retrieval period for repackaging of the immobilized LLW has been assumed to be 50 years after start of disposal actions. A decision regarding LLW retrievability is needed to establish the LLW disposal configuration.

RELATED WBS ELEMENT: 1.1.1.3.02.04.01

RELATED FUNCTION: 4.2.3.1 IMMOBILIZE AND DISPOSE LLW

DECISION DATE: October 1995

PUBLIC INVOLVEMENT PLAN:

The public and stakeholder groups, through the Hanford Tank Waste Task Force of September 1993, expressed interest in retrievable low-level waste forms. Their continued involvement in this decision is necessary to gain support for the U.S. DOE's plans for treatment and disposal of tank wastes.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Two alternatives have been proposed by various stakeholder groups and technical experts for the disposal of Hanford LLW wastes. These alternatives are discussed below.

- a. Onsite permanent disposal. The immobilized LLW will be disposed in a configuration which is not necessarily amenable to retrieval without significant efforts.
- b. Retrievable for repackaging and onsite disposal. The immobilized LLW will be disposed in a configuration that will allow retrieval for repackaging up to 50 years after disposal.

INFORMATION AVAILABLE TO SUPPORT DECISION:

The Hanford Tank Waste Task Force stated in their September 1993 report "safe" low-level waste could be disposed in the 200 Area. A retrievable waste form should be used when potential hazards from the waste may require future retrieval and when retrievability does not cause inordinate delays in getting on with cleanup. The task force also stated all stakeholder groups do not necessarily agree with this majority opinion.

DOE Order 5820.2A, Chapter III, policy states that DOE low-level waste shall be managed on a systematic basis. This allows for the management of LLW such that the most appropriate combination of waste generation reduction and segregation practices, treatment, and disposal technologies are employed so that radioactivity may be contained in a cost effective strategy. Consequently a LLW performance assessment (PA) is to be completed on the storage and disposal of Hanford immobilized LLW. An acceptable performance assessment is required for any waste disposal form selected for disposal of LLW.

An engineering evaluation of LLW disposal facility concepts needs to be completed. This study will include an identification of the factors that influence retrievability, environmental performance assessments, and an assessment of cost trade-off versus performance for various disposal configurations of interest.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The low-level program element schedule currently identifies the preparation of a preliminary disposal facility concept as schedule activity numbers L4010302; Determine ILLW Disposal / Retrievability, L4010404; LLW Disposal Options Configuration Study, and L4010409; Preliminary Disposal Facility Concept (WHC 1994a).

DECISION

a. PLANNING BASIS

The TWRS program has decided for planning purposes that the vitrified LLW will be placed in an onsite near-surface disposal system in a manner that will allow retrieval for repackaging (for up to 50 years from the time of emplacement), should that become necessary.

b. FORMAL DECISION

A formal decision will be made following evaluation of LLW disposal facility concepts.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

The Record of Decision for the TWRS environmental impact statement and the results of the LLW performance assessment may impact the current program plan if it is determined that disposal of LLW in the 200 Area is acceptable.

b. Impacts and Mitigation

The TWRS program has assumed as a planning basis disposal of LLW in the 200 Area is acceptable and the LLW form will be retrievable for future repackaging if necessary. Stakeholder groups expressed a desire to have the LLW form retrievable when potential hazards from the waste may require future retrieval and when retrievability does not cause inordinate delays in getting on with cleanup. The engineering evaluation of the LLW disposal facility configurations will provide insight into the need and impacts for a retrievable LLW form. Since the TWRS Program has assumed that a retrievable LLW form will be necessary, the impact from determining a retrievable LLW form is not necessary would probably be a reduction in the estimated cost of disposing LLW at Hanford. No schedule impact is anticipated. The engineering evaluation of the LLW disposal facility configurations will be completed prior to initiating definitive design of the LLW immobilization (December 1996) so that resources are properly directed toward the outcome of this evaluation.

4.2.3.2 DECISION: DETERMINE GASEOUS EFFLUENT TREATMENT CONCEPT

DESCRIPTION:

A strategy for gaseous effluent treatment needs to be selected to establish functions and interface requirements.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03

RELATED FUNCTION: 4.2.3.2 DISPOSITION GASEOUS EFFLUENT

DECISION DATE: July 1995

PUBLIC INVOLVEMENT PLAN:

This decision does not effect the degree of treatment for TWRS effluents. This decision establishes evaluates the economics and feasibility of providing centralized or localized treatment of effluents. As such, public participation in determining design concept for gaseous effluents treatment is not deemed to be necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Three alternatives have been proposed for gaseous effluent treatment. These alternatives are discussed below.

a. Local treatment by generator.

Treat and release individual gaseous effluent streams at the point of generation.

b. Centralized treatment.

Collect combined gaseous effluent streams from various facilities and treat and dispose at a central facility

c. Combination of local and centralized treatment.

Treat and dispose most of the gaseous effluents at their point of generation, but collect those that are generated in close proximity of each other for treatment and disposal at a central facility when this is practical and advantageous.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An analysis is needed to identify the sources, composition and volume of gaseous effluents to be generated by TWRS facilities. An economic and feasibility evaluation is required to develop data necessary to establish deployment of a central or local treatment and disposal systems.

The *TWRS Facility Configuration Study* identifies potential facility locations that may benefit from utilization of a centralized treatment and disposal system for gaseous effluents (WHC 1994e).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

A facility configuration study has been identified and work on this activity was completed June 1994. This study evaluated the benefits of combining several facilities into a single facility or co-locating several facilities near one another. In addition, the high-level waste program will conduct a study to analyze the alternatives for treatment of TWRS offgases: schedule activity number SDW7470; Offgas Treatment Evaluation Trade Study (WHC 1994a).

DECISION

a. PLANNING BASIS

A combination of both local and centralized treatment has been adopted for planning by the TWRS. Functions which are dispersed (e.g., 242-A waste evaporator) have local treatment systems for gaseous effluents. Functions which are (or proposed to be) located centrally (e.g., Aging Waste tanks, supernate pretreatment and LLW vitrification) have centralized treatment systems for gaseous effluents. In general, local treatment by generators reduces safety/environmental concerns. Some economic benefits may result from collection of those wastes in close proximity with treatment at a central facility.

b. FORMAL DECISION

A decision will be made following completion of the study identified above.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Recommendations and decisions resulting from engineering evaluations on combining facilities (TWRS Facility Configuration Study) and on facility location will impact the decision to deploy centralized gaseous treatment and disposal.

b. Impacts and Mitigation

Utilization of centralized gaseous treatment and disposal facilities may not be practical if facilities are not located within a reasonable distance from one another. Whatever the final decision, the strategy chosen will need to reflect stakeholder values and be cost effective.

All gaseous effluents presently generated from TWRS activities are treated and discharged to the atmosphere in accordance with applicable federal, state and local regulations. This decision will effect the designs of future facilities for remediation of tank waste. If this decision is made prior to finalizing facility designs, no programmatic impacts are anticipated.

4.2.3.3 DECISION: DETERMINE LIQUID EFFLUENT TREATMENT CONCEPT

DESCRIPTION:

A strategy for liquid effluent treatment needs to be selected to establish necessary functions and interface requirements.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
RELATED FUNCTION: 4.2.3.3 DISPOSITION LIQUID EFFLUENT

DECISION DATE: January 1995

PUBLIC INVOLVEMENT PLAN:

This decision does not effect the degree of treatment for TWRS effluents. This decision establishes evaluates the economics and feasibility of providing centralized or localized treatment of effluents. As such, public participation in determining a design concept for liquid effluents treatment is not deemed to be necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Three alternatives have been proposed for liquid effluent treatment. These alternatives are discussed below.

a. Local treatment by generator.

Treat individual liquid effluent streams at the point of generation and discharge to the 200 Areas Treated Effluent Disposal Facility, or a new facility that performs this function.

b. Centralized treatment.

Collect combined liquid effluent streams for various facilities for treatment at a central facility. Discharge the treated liquid wastes either to the 200 Areas Treated Effluent Disposal Facility or a new facility that performs this function.

c. Combination of local and centralized treatment.

Treat and dispose most of the liquid effluents at their point of generation, but collect those that are generated in close proximity of each other for treatment and disposal at a central facility when this is practical and advantageous. The treated liquid wastes would be discharged to the 200 Areas Treated Effluent Disposal Facility or a new facility that performs this function.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An analysis is needed to identify the sources, composition and volume of liquid effluents to be generated by TWRS facilities. The TWRS Process Flowsheet document provides some information on potential liquid effluents generated during treatment and disposal of tank wastes (WHC 1994d). An economic and feasibility evaluation is required to develop data necessary to establish deployment of central or local treatment and disposal systems.

The *TWRS Facility Configuration Study* identifies potential facility locations that may benefit from utilization of a centralized treatment and disposal system for liquid effluents (WHC 1994e).

PROGRAM ELEMENT SCHEDULE INTEGRATION:

A TWRS facility configuration study has been completed. This study evaluated the potential benefits of combining several facilities into a single facility or co-locating several facilities near one another. In addition, a the waste pretreatment program will conduct a study to analyze the alternatives for treatment of liquid effluents: schedule activity numbers PSW00415; Prepare Trade Study to Determine Liquid Effluent Treatment Concept, and PSW00415A, Issue Determination of Liquid Effluent Treatment Concepts Report (WHC 1994a).

DECISION

a. PLANNING BASIS

A combination of both local and centralized treatment has been adopted for planning by the TWRS. In general, local treatment by generators reduces safety/environmental concerns. Some benefits may result from collection of those waste in close proximity with treatment at a central facility.

b. FORMAL DECISION

A decision will be made following completion of the study identified above.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Recommendations and decisions resulting from engineering evaluations on combining facilities (facility configuration study) and on facility location will impact the decision to employ centralized liquid treatment and disposal.

b. Impacts and Mitigation

Utilization of centralized liquid treatment and disposal facilities may not be practical if facilities are not located within a reasonable distance from one another. Whatever the final decision, the strategy chosen will need to reflect stakeholder values and be cost effective.

All liquid effluents presently generated from TWRS activities are treated and discharged to the environment in accordance with federal, state and local permits. This decision effects the designs of future facilities for remediation of tank waste. If this decision is made prior to finalizing facility designs, no programmatic impacts are anticipated.

4.2.3.4 DECISION: DETERMINE SOLID WASTE TREATMENT CONCEPT

DESCRIPTION:

A strategy for solid waste treatment needs to be selected to establish functions and interface requirements.

RELATED WBS ELEMENT: 1.1.1.3.03.04.03
RELATED FUNCTION: 4.2.3.4 DISPOSITION SOLID WASTE

DECISION DATE: April 1997

PUBLIC INVOLVEMENT PLAN:

This decision does not effect the degree of treatment for TWRS solid wastes. This decision establishes evaluates the economics and feasibility of providing centralized or localized treatment of solid wastes. As such, public participation in determining a design concept for solid wastes treatment is not deemed to be necessary.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Three alternatives have been proposed for solid waste treatment. These alternatives are discussed below.

a. Local treatment by generator.

Treat and package all solid waste at the point of generation before transfer to the Hanford site-level Remedy Solid Waste (4.3) function for disposition.

b. Centralized treatment.

Collect combined solid waste streams for various facilities, treat and package at a central TWRS facility before transfer to the Hanford site-level Remedy Solid Waste (4.3) function for disposition.

c. Combination of local and centralized treatment.

Treat and package most of the solid waste at their point of generation, but collect those that are generated in close proximity of each other for treatment and packaging at a central facility when this is practical and advantageous. All of this waste is then transferred to the Hanford site-level Remedy Solid Waste (4.3) function for disposition.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An analysis is needed to identify the sources, composition and volume of solid wastes to be generated by TWRS facilities. An economic and feasibility evaluation is required to develop data necessary to establish deployment of central or local treatment and packaging systems.

The "Hanford Sitewide Systems Analysis" on storage, processing, and disposal of highly radioactive solid materials (TPA milestone M-33-00, June 1995) needs to be completed. It is thought that this will result in the selection of a centralized (site) complex for dispositioning many of the solid wastes generated by TWRS and other programs. However, localized TWRS packaging for disposal may still be required before transfer to any facility.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The high-level waste program will conduct a study to analyze the alternatives for treatment of solid wastes prior to transfer to the site level function for disposal: schedule activity number SDW7457; Solid Waste Handling Alternatives in HLW Facility Trade Study (WHC 1994a).

DECISION

a. PLANNING BASIS

A combination of both local and centralized treatment has been adopted for planning by the TWRS. In general, local treatment by generators reduces safety/environmental concerns. Some benefits may result from collection of those waste in close proximity with treatment at a central facility.

b. FORMAL DECISION

A decision will be made following completion of studies identified above.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Recommendations and decisions resulting from engineering evaluations on combining facilities (facility configuration study) and on facility location will impact the decision to employ centralized solid waste treatment and packaging systems supporting transfer to solid waste disposal sites.

b. Impacts and Mitigation

Utilization of centralized solid waste treatment and packaging systems may not be practical if facilities are not located within a reasonable distance from one another. Whatever the final decision, the strategy chosen will need to reflect stakeholder values and be cost effective.

All solid waste presently generated from TWRS activities is locally collected, sorted, characterized, and packaged for acceptance by the Hanford Site Remedy Solid Waste function for disposition. This decision would effect future generation of solid waste from facilities designed for remediating tank waste. If this decision is made prior to finalizing facility design, no programmatic impacts are anticipated.

4.2.3.5 DECISION: DETERMINE EXCESS FACILITIES INTERFACE REQUIREMENT

DESCRIPTION:

Acceptance criteria for transfer of excess facilities to the Hanford site-level Deactivate Facilities function (4.1) Environmental Restoration contractor for decommissioning need to be established. The interface requirements will determine scope for each program.

RELATED WBS ELEMENT: 1.1.1.2.05.01.01
RELATED FUNCTION: 4.2.3.5 DISPOSITION EXCESS FACILITIES

DECISION DATE: August 1995

PUBLIC INVOLVEMENT PLAN:

The establishment of interface requirements for transfer of excess facilities to another Hanford Site program for final disposition does not by itself effect the final conditions of the Hanford Site. Public participation in development of these interface requirements is not deemed necessary. Public and stakeholder groups participate is necessary to establish the criteria for the final disposition of excess facilities.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Two alternatives have been proposed for facility interface requirements. These alternatives are discussed below.

- a. Deactivate, then transfer excess facility to Environmental Restoration contractors for decommissioning. Deactivation is the process of removing contamination from facilities or equipment and placing these facilities in a safe standby condition. Decommissioning is the process of removing facilities or equipment from operation; and entombing, dismantling and removing, or converting the facility for another use.
- b. Following cessation of operations, transfer excess facilities to the Environmental Restoration contractor for deactivation and decommissioning.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An engineering analysis is required to establish facility transfer acceptance criteria. An additional analysis is necessary to evaluate the time-phased facility transfer needs to assure the Environmental Restoration contractor is capable of taking all excess facilities when they are generated. Actions need to be developed to deal with any interface problems identified between the Environmental Restoration contractor and TWRS.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

The tank waste retrieval program element schedule identifies activities for establishment of excess facilities interface requirements: ROA100-5C; Issue Determination of Excess Facilities Interface Requirements, and ROA100-5CM; Determination of Excess Facilities Interface Requirements (WHC 1994a).

DECISION

a. PLANNING BASIS

The TWRS program has adopted a strategy of deactivating the facilities before transfer.

b. FORMAL DECISION

A decision will be made following completion of study identified above.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Establishment of these interface criteria will effect other Hanford site functions that generate excess facilities.

b. Impacts and Mitigation

The establishment of requirements for transfer of excess facilities from the TWRS to the Environmental Restoration contractor will effect the scope of each program and the design of facilities for remediation of tank wastes. Since interface requirements will be established prior to finalizing treatment facility designs, no programmatic impacts are anticipated.

4.2.3.6 DECISION: DETERMINE RECYCLE/REUSE CONCEPT

DESCRIPTION:

A strategy needs to be selected for effectively recycling reusable materials to minimize cost and waste generation.

RELATED WBS ELEMENT: 1.1.1.3.01.04.02
1.1.1.2.05.01.01

RELATED FUNCTION: 4.2.3.6 DISPOSITION REUSABLE MATERIALS

DECISION DATE: April 1995 Water Recycle/Reuse Strategy
August 1995 General TWRS Materials Recycle/Reuse Strategy

PUBLIC INVOLVEMENT PLAN:

Public participation in development of this strategy is deemed necessary. The degree to which chemicals and water are recycled can influence the volume of HLW and LLW generated as well as migration of radionuclides in the soil column.

PRELIMINARY LIST OF ALTERNATIVES TO BE EVALUATED:

Three alternatives have been proposed for recycling and reuse of reusable materials. These alternatives are discussed below.

a. Local recycle and reuse.

Treat reusable material for recycle near their point of generation (i.e., within the facility where the material is generated or recovered).

b. Centralizing recycling.

Collect and treat recovered materials for recycle in a central facility.

c. Combination of centralized and local recycling.

Treat and recycle most of the reusable materials at their point of generation, but collect those that are generated in facilities of close proximity of each other at a central facility when this is practical and economically advantageous.

INFORMATION AVAILABLE TO SUPPORT DECISION:

An analysis needs to be completed to summarize the reusable materials and quantities which are anticipated to be generated in TWRS facilities. An economic and feasibility analysis is needed to establish when to employ local versus central recycling/reuse of recoverable materials.

A facility configuration study and facility site selection study are needed to identify potential facility locations which may benefit from utilization of a centralized reusable material collection and treatment facility.

PROGRAM ELEMENT SCHEDULE INTEGRATION:

A TWRS facility configuration study has been completed. This study evaluated the potential benefits of combining several facilities into a single facility or co-locating several facilities near one another. The waste pretreatment program element schedule identifies conducting an evaluation of a water recycle or reuse strategy as activity numbers PSW00360 through PSW00410A. The tank waste retrieval program element schedule identifies conducting an evaluation of a strategy for recycle or reuse of other system materials as activity numbers ROA100-5D and ROA100-5DM.

DECISION

a. PLANNING BASIS

The TWRS program has adopted the concept of a combination of centralized recycling and local recycling of reusable materials.

b. FORMAL DECISION

A decision will be made following completion of studies identified above.

QUALITATIVE RISK DISCUSSION:

a. Interfacing Decisions

Recommendations and decisions resulting from engineering evaluations on combining facilities (facility configuration study) and on facility location will impact the decision to employ centralized reusable material collection and treatment facility.

b. Impacts and Mitigation

Utilization of centralized reusable material collection and treatment facility may not be practical if facilities are not located within a reasonable distance from one another. Whatever the final decision, the strategy chosen will need to reflect stakeholder values and be cost effective.

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