

SECTION C
STATEMENT OF WORK

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SECTION C

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C.1 INTRODUCTION

Hanford tank waste consists of approximately 190 million curies in 54 million gallons of highly radioactive and mixed hazardous waste stored in underground storage tanks at the Hanford Site. The tank waste includes solids (sludge), liquids (supernatant), and salt cake (dried salts that will dissolve in water forming supernatant). The tank waste will be remediated through treatment and immobilization to protect the environment and meet regulatory requirements.

The U.S. Department of Energy (DOE) determined that the preferred alternative to remediate the Hanford tank waste is to:

- Pretreat the waste to separate it into two fractions, Low-Activity Waste (LAW) and High-Level Waste (HLW);
- Immobilize the LAW for on-site disposal; and
- Immobilize the HLW for ultimate disposal in the national repository.

The first fraction, LAW, is comprised of the tank waste liquids (and dissolved salt cake) and contains the bulk of the tank waste chemicals and certain radionuclides (e.g., cesium, technetium, strontium, and transuranics) that must be mitigated prior to immobilizing the waste. LAW is a mixed, characteristic, and listed waste regulated under the *Resource Conservation and Recovery Act of 1976* (RCRA), and must meet certain treatment standards and performance standards for on-site disposal of the final waste form.

The second fraction, HLW, is comprised of the long half-life radioactive tank waste solids and the radionuclides separated from the LAW fraction. HLW is a mixed, characteristic, and listed waste regulated under RCRA, and must meet specific treatment and performance standards for storage and repository disposal of the final waste form.

To perform the activities necessary to remediate the Hanford tank waste, DOE assigned responsibility to the Office of River Protection (ORP) in Richland, Washington. Through this Contract, ORP will manage and oversee the design, construction, and commissioning of a new Waste Treatment and Immobilization Plant (WTP) that will treat and immobilize the waste for ultimate disposal. The WTP is comprised of four major elements, pretreatment, LAW immobilization, HLW immobilization, and balance of plant facilities.

The Statement of Work for this Contract is divided into nine sections: (1) introduction; (2) summary of contract approach; (3) summary of interactions with the Contractor; (4) summary of environment, safety, quality, and health requirements; (5) description of Contract requirements and deliverables; (6) detailed identification of standards/requirements; (7) description of facility design specification; (8) detailed operational specifications; and (9) summary of the Interface Control Documents (ICD).

C.2 CONTRACT APPROACH

To accomplish the ORP mission, DOE established the River Protection Project (RPP). RPP consists of two main contractors responsible for performing work necessary to complete the mission. The first is the current Tank Farm Contractor, responsible for ensuring safe storage, retrieval, storage and disposal of the immobilized waste, decontamination and decommissioning, and initiation of post closure monitoring of the tank farms. The second includes a Contractor responsible for designing, constructing, commissioning, and supporting the transition of the WTP.

The WTP Contractor (hereinafter referred to as the "Contractor") has full responsibility for the WTP from the transition of an existing Conceptual Design through the completion of transition to a future operations contractor. The WTP Contract will focus on an initial Contract award for design and construction of the WTP. Following Contract award, the WTP Contractor will subcontract for operability and commissioning support.

Schedule performance is an important consideration for RPP, and, specifically, the WTP. After commissioning, DOE will, under a separate contract, operate the WTP and treat and immobilize a minimum of 10 percent of the Hanford tank waste by mass and 25 percent of the Hanford tank waste by activity by 2018.

The WTP Conceptual Design and supporting information are provided to the Contractor. In the interim period prior to Contract award, the Tank Farm Contractor will maintain the WTP Conceptual Design and supporting information, conduct limited additional design and optimization, and transition the WTP Conceptual Design to the Contractor. Additional information developed for the WTP Conceptual Design will be transitioned from the Tank Farm Contractor to the Contractor subsequent to Contract award.

The Contractor will review the WTP Conceptual Design and supporting information, complete process and facility design, manage construction and procurement, conduct acceptance testing, select and integrate a subcontractor into the project team to provide the necessary operability and commissioning capability, and conduct all required environmental, safety, quality, and health actions. From Contract Award, the Contractor will be the design authority responsible for the WTP design. DOE will expect full Contractor accountability for performance, cost, and schedule throughout the Contract period of performance.

The WTP Conceptual Design provides a reference solution that appears to meet project requirements, but has significant potential for optimization. DOE will seek to improve the WTP by incentivizing the Contractor to optimize life-cycle performance, cost, and schedule of the WTP, including the process design, facility design, and technologies. DOE will evaluate Contractor performance against Contract requirements and review Contractor proposed changes to Contract requirements, but will not accept performance or approve changes that adversely impact overall system-level performance, life-cycle cost, or schedule. DOE reserves the unilateral right to disapprove any adverse change.

C.3 INTERACTIONS WITH THE WASTE TREATMENT AND IMMOBILIZATION CONTRACTOR

- (a) DOE and the Tank Farm Contractor have specific responsibilities and defined interactions with the Contractor. DOE will use a partnering approach to manage interactions between DOE, the Contractor, the Tank Farm Contractor, and other Hanford Site contractors. This approach will: encourage a common vision with supporting goals and missions for each participant; promote the principles of teamwork, mutual respect, openness, honesty, trust, professionalism, and understanding; and include joint commitments to:
- (1) Maintain high safety performance;
 - (2) Complete the WTP on schedule and within cost;
 - (3) Eliminate barriers to an efficient and more cost-effective project;
 - (4) Promote innovation;
 - (5) Improve communication and understanding;
 - (6) Provide early identification and recovery from performance problems;
 - (7) Resolve conflicts through a coordinated work effort that avoids adversarial relationships; and
 - (8) Reinforce the partnered relationship through honest feedback and continual improvement.

The Contractor shall provide resources necessary to establish and implement the partnering approach, including the requirements of Section H Clause entitled, *Alternative Dispute Resolution*, throughout the Contract period of performance. The Contractor shall be responsible for actively participating in the partnering approach in a constructive manner.

- (b) DOE is responsible as the "Owner" and "Regulator" of the WTP.
- (1) As the Owner, DOE will:
 - (i) Establish requirements, administer the Contract and confirm that the Contractor meets Contract requirements;
 - (ii) Integrate the WTP into the overall RPP;
 - (iii) Approve all changes to the system-level flowsheet, interface control documents (bolded items in Responsibilities Section), feed characteristics, and product specifications and future operations baseline;
 - (iv) Perform design, construction and operability oversight of the WTP, and, where required, engage other contractors to provide design and construction and operability oversight of the WTP;
 - (v) Perform review (and where required, engage other contractors) of Contractor environmental, safety, quality, and health actions for compatibility and integration with site wide Environment, Safety, Quality, and Health (ESQ&H) activities;
 - (vi) Inspect and accept the WTP;

- (vii) Manage project progression through the critical decision process (DOE Order 413.3A *Program and Project Management for the Acquisition of Capital Assets* and DOE Manual 413.3-1 *Project Management for the Acquisition of Capital Assets*) **(M076)**;
 - (viii) Provide Quality Assurance (QA) oversight; and
 - (ix) Require compatibility of reporting and management systems.
- (2) As the Regulator, DOE will regulate radiological, nuclear, and process safety, and non-radiological worker safety and health.
- (c) The Tank Farm Contractor will transition the WTP Conceptual Design to the Contractor upon Contract award.
- (d) DOE, the Tank Farm Contractor, and other Hanford Site contractors provide site services to the Contractor as directed by DOE (see Section C.9, *Interface Control Documents*).
- (e) The WTP Contractor shall:
 - (1) Perform the requirements of this Contract, integrating activities with DOE, the Tank Farm Contractor, and other Hanford Site contractors, as needed.
 - (2) In cooperation with DOE (as lead), Tank Farm Contractor, and the other Hanford Site contractors, establish an interface management process to assure effective control of technical, administrative, and regulatory interfaces.
 - (3) Support DOE in external communications on the WTP Project with stakeholders, regulators, Tribal Nations, and other special interest groups.
 - (4) Transition the commissioned WTP to a future operations contractor.
 - (5) Provide DOE or its designee(s) access to and the right to conduct assessments, audits, and/or surveillance of the Contractor (and its subcontractors/suppliers, at any level) records, premises, activities, and of radioactive materials in possession or use related to the WTP, as necessary to effectuate the responsibilities of DOE.

C.4 ENVIRONMENT, SAFETY, QUALITY, AND HEALTH

- (a) The Contractor will provide a WTP that processes DOE-owned highly radioactive and dangerous waste. In order to deliver the WTP within the appropriate level of controls consistent with the hazards to be encountered, the Contractor shall establish and maintain an Integrated Safety Management System (ISMS).

The Contractor shall be responsible for protecting human health and the environment from radioactive chemicals, hazardous materials, and dangerous waste contamination; and non-radiological worker safety and health from conventional, construction, industrial and occupational hazards. The Contractor shall also provide safe and healthful working conditions for employees, subcontractors and all other personnel under the Contractor's control who work in the general vicinity of the Contractor site and facilities.

The Contractor shall comply with applicable Federal, DOE, State, and local regulations and requirements for:

- (1) Non-radiological worker safety and health;
 - (2) Radiological, nuclear, and process safety;
 - (3) QA; and
 - (4) Environmental protection.
- (b) DOE will provide existing ESQ&H documentation with the WTP Conceptual Design and supporting information, to allow the Contractor to review, modify, and implement required ESQ&H actions under this Contract.
- (c) The regulatory environment for this Contract is structured into four principal areas of responsibility and requirements on Contractor performance. Detailed Contractor performance requirements are provided in Standard 7.
- (1) Non-Radiological Worker Safety and Health: DOE will regulate non-radiological worker safety and health. The Contractor shall develop and implement the WTP specific worker safety and health program.
 - (2) Radiological, Nuclear, and Process Safety: DOE will regulate radiological, nuclear, and process safety to ensure that the Contractor provides for and operates within the required levels of public and worker protection. The Contractor shall develop and implement WTP specific radiological, nuclear, and process safety program.
 - (3) Quality Assurance: DOE will oversee all Contractor performance in accordance with a Contractor-developed DOE-approved program. The Contractor shall develop and implement an integrated WTP specific QA Program, supported by documentation that describes overall implementation of QA requirements.
 - (4) Environmental Protection: The Contractor shall develop and implement a WTP specific environmental protection program, prepare all required permit applications, and obtain, in conjunction with DOE, all necessary permits for the WTP.
 - (A) DOE is responsible for meeting compliance obligations under the *National Environmental Policy Act of 1969* (NEPA). If proposed Contractor actions are outside the analysis performed for the *Final Environmental Impact Statement for the Tank Waste Remediation*

System (April 1996), *Record of Decision for the Tank Waste Remediation System*, and/or related supplement analyses, then the Contractor shall provide technical information and support to DOE for NEPA compliance on the proposed Contractor actions.

- (B) The U.S. Environmental Protection Agency (EPA), State of Washington Department of Ecology (Ecology), and/or the State of Washington Department of Health (WDOH) will regulate radioactive and non-radioactive air emissions. The Contractor shall support integration within the Hanford Site-wide air compliance framework, including the Hanford Air Operating Permit.
- (C) EPA and Ecology will regulate and administer all permits for treatment and storage operations under the RCRA and the *State of Washington Hazardous Waste Management Act* (HWMA). Contractor actions shall support integration with the Hanford RCRA Permit (WA7890008967).
- (D) Ecology, WDOH, and/or local agencies will regulate liquid effluent and solid waste. The Contractor shall provide technical and regulatory support for all required permitting and compliance activities associated with WTP liquid effluent and solid waste.
- (E) EPA regulates certain substances under the *Toxic Substances Control Act of 1976* (TSCA). TSCA regulations are applicable to Hanford tank waste. Portions of the Hanford tank waste contain polychlorinated biphenyls (PCB) at concentrations below 50 parts per million (ppm) which are regulated under TSCA as PCB bulk remediation waste. The presence of PCBs may be concurrently regulated under other environmental regulations including RCRA, *Clean Air Act*, and the *Clean Water Act*. Certain vitrification secondary waste stream disposal activities (e.g., waste water discharges to the Effluent Treatment Facility) may be subject to existing PCB discharge limitations.

DOE is pursuing a PCB regulatory strategy with EPA, Region 10, and Ecology under risk based disposal pathway in accordance with 40 CFR 761.61(c). DOE has established an initial engineering basis of 50 ppm total PCBs as PCB bulk remediation waste for the WTP waste feed envelope. DOE is also pursuing a radiological exemption for waste under 40 CFR 761.50.

The Contractor shall provide technical and regulatory support for WTP activities, and product and secondary waste disposition related to TSCA regulation.

- (d) The Defense Nuclear Facilities Safety Board (DNFSB) is responsible for nuclear safety oversight authority of DOE and its activities related to the WTP. As directed by the Contracting Officer, the Contractor shall conduct activities in accordance with DOE commitments to the DNFSB, which are contained in implementation plans and other DOE correspondence to the DNFSB. The Contractor shall support preparation of DOE responses to DNFSB issues and recommendations that affect Contract scope. As directed by the Contracting Officer, the Contractor shall fully cooperate with DNFSB and provide access to work areas, personnel, and information, as necessary. The Contractor shall maintain a document process consistent with the DOE Manual on interface with the DNFSB (DOE Manual 140.1-1B, *Interface with the Defense Nuclear Facilities Safety Board*) and shall ensure that these requirements flow down to the lowest-tier subcontractors.

C.5 DESCRIPTION OF CONTRACT REQUIREMENTS AND DELIVERABLES

The Contractor shall perform five major activities: (1) Design Transition; (2) Facility and Process Design; (3) Construction Management and Procurement; (4) Acceptance Testing; and (5) Facility Commissioning. Summary-level requirements for each of these activities are provided in this section, with additional requirements provided in Sections C.6, *Standards*; C.7, *Facility Specification*, C.8, *Operational Specifications*; and C.9, *Interface Control Documents*. Best commercial practices shall apply when a Standard, Specification, or Interface Control Document (ICD) is not provided.

- (a) Design Transition: The Contractor shall update the plan for transition submitted as part of the Contractor's proposal, install Contractor management systems and evaluate the WTP Conceptual Design and supporting information.
- (1) Plan for Transition: The Contractor shall submit a plan for transition to DOE in accordance with Standard 1, *Management Products and Controls*.
 - (2) Receive the Waste Treatment and Immobilization Plant Conceptual Design: The Contractor shall receive the WTP Conceptual Design and supporting information from the Tank Farm Contractor as described in Section J, Attachment K, *Listing of WTP Conceptual Design and Supporting Information*, additional information shall also be provided.
 - (3) Due-diligence Reviews: The Contractor shall evaluate the WTP Conceptual Design and supporting information as part of the Contractor's responsibility as design authority. Key areas of review include:
 - (i) All process and facility design documentation and analyses;
 - (ii) Technology planning and testing information;
 - (iii) Waste form qualification strategies;
 - (iv) Environmental permitting documentation (e.g., Dangerous Waste Permit Application, Air Permits);
 - (v) ISMS, hazards and safety analysis information, authorization basis, and safety standards;
 - (vi) Limited Construction Authorization Request;
 - (vii) Safeguards and Security (SAS) requirements;
 - (viii) ICDs; and
 - (ix) Cost and schedule baseline.
 - (4) The Contractor shall select and integrate a subcontractor into the WTP Project team to provide the necessary operability and commissioning capability. Selection of the subcontractor shall be completed by April 15, 2001, (Table C.5-1.1, Deliverable C5.1) and is subject to DOE concurrence. This deliverable shall describe the basis for selection, including the subcontractor's qualifications and experience.
 - (5) Project Baseline: The Contractor shall use the WTP Project Baseline information provided as part of the WTP Conceptual Design and supporting information and

provide a WTP baseline in accordance with requirements in Standard 1, *Management Products and Controls*.

- (b) Facility and Process Design: The Contractor shall prepare all design documents and required supporting information.
 - (1) Design Process: The Contractor shall prepare all design documents and required supporting information.
 - (2) Design Requirements: The Contractor shall ensure that the facility is designed to meet all requirements, and that these requirements are captured in a single location to achieve a systematic approach to design.
 - (3) Design Documents: The Contractor shall design the WTP (Pretreatment, HLW Vitrification, LAW Vitrification, Laboratory Facilities, and balance of plant facilities) consistent with the functional requirements identified in Standard 2, *Research, Technology, and Modeling*, Standard 3, *Design*, Section C.7, *Facility Specifications*, Section C.8, *Operational Specifications*, and Section C.9, *Interface Control Documents*.
 - (4) Waste Treatment and Immobilization Plant Optimization: The Contractor shall perform optimization as described in Standard 3, *Design*.
 - (5) Design Reviews: The Contractor shall conduct periodic design, constructability, and operability reviews to status the design activities, and resolve design oversight comments from DOE in accordance with Standard 3, *Design*.

Additional requirements are provided in Standard 3, *Design*.

- (c) Construction Management and Procurement: The Contractor shall plan and execute all construction, procurement, and acceptance testing.
 - (1) Provide a Construction, Procurement, and Acceptance Testing Plan;
 - (2) Identify all long lead procurement actions and describe the contracting approach and method of performance;
 - (3) Procure all required material and equipment;
 - (4) Prepare bid and work packages;
 - (5) Manage or perform all required construction; and
 - (6) Manage the construction site and provide all required construction support services.

Additional requirements are provided in Standard 4, *Construction, Procurement, and Acceptance Testing*.

- (d) Acceptance Testing: The Contractor shall provide integrated construction acceptance test plans and procedures for DOE concurrence.

Additional requirements are provided in Standard 4, *Construction, Procurement, and Acceptance Testing*.

- (e) Facility Commissioning: The Contractor shall commission, demonstrate operational performance, and transition the WTP to the future operations contractor(s).

Additional requirements are provided in Standard 5, *Commissioning*.

- (f) Limitations on the amount of Contractor self-performed work are contained in Section H, Clause H.13, *Self-Performed Work*.
- (g) Table C.5-1.1, *Deliverables*, summarizes the specific deliverables the Contractor shall provide to DOE and the subsequent DOE actions. Neither the DOE review of the deliverables nor the decision of the DOE to proceed with construction or commissioning shall impose any responsibility on the DOE for adequacy, quality or completeness of the deliverables. The Contractor remains solely responsible for the adequacy, quality and completeness of such work and the performance of the WTP under this Contract.

Unless otherwise specified, DOE will provide written comments to the Contractor within 30 days of receipt of the deliverable identified in Section C, *Statement of Work*.

If requested in writing by DOE, the Contractor shall address all DOE mandatory comments and resubmit the deliverable within 30 days after receipt of DOE comments.

Table C.5-1.1, Deliverables

Solicitation Note: Contract due dates shown assume a Contract award of 1/15/2001 or earlier.

Item No.	Deliverable	Reference	Action Required	DOE Action Party	Point of Delivery	Contract Due Date
C.5.1	Select a Commissioning Contractor	Section C.5 [C.5(a)(4)]	A	D	COR (M131)	4/15/01
1.1	Plan for Transition	Standard 1 [Std. 1(a)]	K	D	COR (M131)	2/15/2001
1.2	Project Execution Plan	Standard 1 [Std. 1(b)]	K	D	COR (M131)	4/15/2001 and updates as required
1.3	Project Control System Description	Standard 1 [Std. 1(c)(2) & (3)]	K	D	COR (M131)	4/15/2001 with updates as required
1.4	Interface Management Plan	Standard 1 [Std. 1(c)(4)]	K	D	COR (M131)	6/29/2001 with updates as required
1.5	WTP Project Baseline	Standard 1 [Std. 1(d)(1) & (4)]	K	D	COR (M131)	4/15/2001
1.6	WTP Risk Assessment	Standard 1 [Std.1(d)(3)]	K	D	COR (M131)	7/1/2001 with updates as required (M033)
1.7	Monthly Status Report	Standard 1 [Std. 1(d)(4), Std. 4(f)(2)]	I	D	COR (M131)	Last Tuesday of each month.
1.8	Occurrence Reporting	Standard 1 [Std. 1(f)(3)]	K	D	COR (M131)	as required
1.9	ES&H Reporting	Standard 1 [Std. 1(f)(4)]	K	D	COR (M131)	as required
1.10	Reserved					
1.11	WTP Baseline Change Control Program Plan	Standard 1 [Std. 1(e), (d)(4)]	K	D	COR (M131)	05/15/03 with updates as required
2.1	Updated Research and Technology Program Plan	Standard 2 [Std. 2 (a)(1)(ii)]	K	D	COR (M131)	4/15/2001 with annual updates through 2004
2.2	R&T Test Plans	Standard 2 [Std. 2 (a)(2)(i), (a)(3)(ix)]	I	D	COR (M131)	as required
2.3	R&T Test Reports	Standard 2 [Std. 2 (a)(2)(ii), (a)(3)(ix)]	C	D	COR (M131)	as required

Item No.	Deliverable	Reference	Action Required	DOE Action Party	Point of Delivery	Contract Due Date
2.4	Regulatory Data Quality Objective (DQO)	Standard 2 [Std. 2 (3)(i)(D)]	K	D	COR (M131)	TBD as negotiated
2.5	Operations Research Assessment	Standard 2 [Std. 2 (b)1.]	C	D	COR (M131)	12/19/2002, with annual updates thereafter
2.6	WTP Tank Utilization Assessment	Standard 2 [Std. 2 (b)2.]	C	D	COR (M131)	12/19/2002, with annual updates thereafter
2.7	Material Balance and Process Flowsheet	Standard 2 [Std. 2 (b)3.]	C	D	COR (M131)	12/19/2002, with annual updates thereafter
2.8	Technical Report on Oxidative Leaching	Standard 2 [Std. 2 (a)(3)(ix)]	C	D	COR (M131)	TBD
2.9	Test Report on Oxidative Leaching	Standard 2 [Std. 2 (a)(3)(ix)]	C	D	COR (M131)	TBD
3.1	Design Process	Standard 3 [Std. 3(a)(2)]	I (M033)	D	COR (M131)	2/15/2001 1/15/2004 (M033)
3.2	Functional Specification	Standard 3 [Std. 3(b)(1)]	I (M033)	D	COR (M131)	8/20/2001 and update as required
3.3 (a)	Basis of Design	Standard 3 [Std. 3(b)(2)]	K	D	COR (M131)	8/20/2001 and update as required
3.3 (b)	Design Criteria Database	Standard 3 [Std. 3(b)(3)]	M	D	COR (M131)	30 days after issue of Basis of Design, and update as required
3.4	Operations Requirements Document	Standard 3 [Std. 3(b)(4)]	K for bolded document text and M for non-bolded document text	D	COR (M131)	8/20/2001
3.5	(M033)	(M033)	(M033)	(M033)	COR (M131)	(M033)
3.6	Analytical Laboratory Design Requirements	Standard 3 [Std. 3 (c)(18) & C.7(a)(9)]	K (M033)	D	COR (M131)	10/1/2001 and as required thereafter

3.7	Site Layout Drawings	Standard 3 [Std. 3 (c)(19)]	K (M033)	D	COR (M131)	4/15/2001 and as required thereafter
3.8	Optimization Study	Standard 3 [Std. 3(d)]	K	D	COR (M131)	3/15/2001
3.9	Deleted (M033)	(M033)	(M033)	(M033)	(M033)	(M033)
3.10	Deleted (M033)	(M033)	(M033)	(M033)	(M033)	(M033)
4.1	Construction, Procurement, and Acceptance Testing Plan	Standard 4 [Std. 4(a), (f)(3) & (i)]	K on initial Deliverable and I for any subsequent updates	D	COR (M131)	As Required
4.2	Purchasing System	Standard 4 [Std. 4(b)(2)]	A	D	COR (M131)	As required
4.3	Construction Bid and Work Packages	Standard 4 [Std. 4(c)]	I	D	COR (M131)	As required
4.4	Construction and Acceptance Testing Program	Standard 4 [Std. 4(f)(1)]	K	D	COR (M131)	Prior to start of construction
4.5	Construction Overview Meetings	Standard 4 [Std. 4(h)]	M	D	COR (M131)	Ongoing
4.6	Construction Emergency Response Plan	Standard 4 [Std. 4(j)]	I	D	COR (M131)	Prior to Start of Limited Construction
5.1	Commissioning Plan	Standard 5 [Std. 5(b)]	K	D	COR (M131)	12 (M033) months prior to start of commissioning, as required thereafter
5.2	Deleted (M033)	(M033)	(M033)	(M033)	(M033)	(M033)

5.3	Waste Form Qualification Tests	Standard 5 [Std. 5 (f)(1)(i)]	P	D	COR (M131)	during cold commissioning
5.4	Design Capacity Performance Tests	Standard 5 [Std. 5 (f)(1)(ii)]	K	D	COR (M131)	during cold commissioning
5.6	Resultant Products from Cold Commissioning	Standard 5 [Std. 5 (f)(1)]	P	D	COR (M131)	during cold commissioning
5.7	Environmental Performance Test	Standard 5 [Std. 5(f)(5)]	K	D	COR (M131)	during cold commissioning
5.8	Cold Commissioning Results	Standard 5 [Std. 5(f)(8)]	K	D	COR (M131)	prior to hot commissioning
5.9	Certification of Completion of Cold Commissioning	Standard 5 [Std. 5(f)(9)]	K	D	COR (M131)	when complete
5.10	Certification of Readiness for Hot Commissioning Start	Standard 5 [Std. 5(g)(1)]	K	D	COR (M131)	prior to hot commissioning
5.11	Certification of Hot Commissioning Start	Standard 5 [Std. 5(g)(3)]	K	D	COR (M131)	Upon receipt of Tank Farm waste feed
5.12	Hot Commissioning Performance Tests	Standard 5 [Std. 5(g)(4)]	K	D	COR (M131)	during hot commissioning
5.13	Reserved					
5.14	Hot Commissioning Results and Documentation	Standard 5 [Std. 5(g)(5)]	K	D	COR (M131)	upon completion of hot commissioning
5.15	Certification of Completion of Hot Commissioning	Standard 5 [Std. 5(g)(6)]	K	D	COR (M131)	when complete
5.16	Facility Turnover	Standard 5 [Std. 5(k)]	K	D	COR (M131)	after successful commissioning
5.17	WTP Commissioning Methodology for Demonstrating Plant Performance,	Standard 5 [Std. 5 (g)(4)]	A	D	COR (M131)	04/15/03 and as required
6.1	Secondary Wastes Compliance Plan	Standard 6 [Std. 5 (f)(1)(ii), Std. 6(b), (c)(3), C.7(d)(3)(i), Spec. 9. 2.2.5, Spec 13.1]	K	D	COR (M131)	2004, 2006, 2008, and as required thereafter (M033)

6.2	IHLW Product Compliance Plan	Standard 6 [Std. 2 (a) (3)(vii)(B), Std. 6 (b), (c)(2) & (4), Std. 5 (f)(1)(ii), C.7(d)(2)(i), Spec. 1 (1.4)]	K	D	COR (M131)	2004, 2005, 2007, and as required thereafter (M114)
6.3	ILAW Product Compliance Plan	Standard 6 [Std. 2 (a)(3)(v)(B), Std. 5 (f)(1)(ii), Std. 6(b) & (c)(1) & (4), Spec. 2.2.2.11, Spec. 2.4, Spec. 13.2]	K	D	COR (M131)	2004, 2006, 2008, and as required thereafter (M033)
6.4	IHLW Product Qualification Report	Standard 6 [Std. 6 (c)(5) & (6),	C/K	D	COR (M131)	Plan in 2004, report in 2008 and as required thereafter (M114)
6.5	Production Documentation for IHLW Product	Standard 6 [Std 6 (c)(9)]	K	D	COR (M131)	at time of production
6.6	ILAW Product Qualification Report	Standard 6 [Std. 6(c)(5) Spec. 2.2.2.6 & 7]	C/K	D	COR (M131)	Plan in 2004, report in 2007 and as required thereafter (M033)
6.7	Production Documentation for ILAW Product	Standard 6 [Std 6(c)(9) Spec. 2.2.2.7]	C/K	D	COR (M131)	at time of production
6.8	CANCELLED (M134)					
6.9	Reserved					
6.10	Secondary Wastes Production Documentation	Standard 6 [Std. 6(c)(9)]	C/K	D	COR (M131)	at time of production
6.11	Deleted (M066)	Deleted (M066)	Deleted (M066)	Deleted (M066)	Deleted (M066)	Deleted (M066)
7.0	Non-radiological Worker Safety and Health	Standard 7 [Std 7(e)(1)]	R	D	COR (M131)	per Standard 7.a(1)
7.1	Radiological, Nuclear and Process Safety	Standard 7 [Std 7(e)(2)]	R	D	COR (M131)	per Table S7-1
7.2	Quality Assurance	Standard 7 [Std 7(e)(3)]	A/R	D	COR (M131)	4/15/01
7.3	Environmental Plan	Standard 7 [Std 7(e)(4)]	K	D	COR (M131)	3/15/2001 and as required (M033) thereafter

7.4	Dangerous Waste Permit Application Implementation Plan	Standard 7	K	D	COR (M131)	Requirement Deleted
7.5	Dangerous Waste Permit Application	Standard 7 [Std 7 (e)(4)(vi)(B)]	K	D	COR (M131)	as required
7.6	Risk Assessment Work Plan	Standard 7 [Std 7 (e)(4)(vi)(C)]	K	D	COR (M131)	as required
7.7	Notice(s) of Construction	Standard 7 [Std 7 (e)(4)(vi)(D)]	K	D	COR (M131)	150 days prior to submission to the regulators
7.8	Prevention of Significant Deterioration (PSD) Permit Application	Standard 7 [Std 7 (e)(4)(vi)(E)]	K	D	COR (M131)	150 days prior to submission to the regulators
7.9	Petition for Exemption or Exclusion for IHLW	Standard 7 [Std 6(c)(7), Std 7 (e)(4)(vi)(F)]	K	D	COR (M131)	06/2005 (M039)
7.10	Petition for a New Treatment Standard	Standard 7 [Std 6 (c)(8), Std 7 (e)(4)(vi)(G)]	K	D	COR (M131)	8/2003
8.0	Safeguards and Security	Standard 8	K	D	COR (M131)	see Table S8-1
C.9.1	Interface Control Documents	Section C.9	J	D	COR (M131)	7/15/2001, 3/15/2002, and (M033) as described below
	- Product Delivery Group - IDCs 14 and 15	Section C.9				11/15/03 and as required (M033) thereafter
	- Infrastructure Group - ICDs 1, 2, 9, 11, 12, and 28	Section C.9				11/15/03 and as required (M033) thereafter
	- Waste Management Group - ICDs 3, 5, & 6	Section C.9				8/15/2003 and as required (M033) thereafter
	- Waste Feed Group - ICDs 19, (M033) and 23	Section C.9				8/15/2003 and as required (M033) thereafter
H.1	Environmental Permit Applications	Clause H.26	K	D	COR (M131)	ongoing
H.2	Litigation Management Plan	Clause H.33	A	D	COR (M131)	4/15/01
H.3	Plan for Transition to Operations	Clause H.36	K	D	COR (M131)	start of commissioning

H.4	Property Management System (M120)	Clause H.51	K	D	COR (M131)	10/1/2008, with annual updates thereafter
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Legend Definitions:

- A Approval — The deliverable shall be provided to DOE for review and approval. DOE will review the deliverable and provide comments in writing. Comments will be discussed through the partnering process and the Contractor is required to provide written responses using Review Comment Records. Documents shall be re-written to incorporate all DOE mandatory comments. Once a deliverable or document has been approved by DOE, it shall be placed under change control and no changes to that document shall be made, without DOE approval.
- C Review and Comment — The deliverable shall be provided to DOE for review and comment. DOE will have the option for reviewing the information and providing comment. The Contractor shall respond to all written comments in Review Comment Records form. DOE comments that cannot be resolved in the appropriate partnering team shall be elevated to the Project Management Team for resolution.
- D U.S. Department of Energy, Office of River Protection.
- F Provisional Fee Determination — The deliverable shall be provided to DOE. DOE will review the deliverable as part of the process of determining that acceptable invoices for Provisional Fee payments are provided by the Contractor, as well as for assessing the need for adjustments to the Provisional Fee payments.
- COR Contracting Officer’s Representative (M131)
- I Information — The deliverable shall be provided for information purposes only. DOE will have the option of reviewing the information and providing comments through the partnering process. Such comments do not require resolution under the Contract.
- J Jointly Developed, Review and Comment — The ICDs shall be jointly developed with DOE, the Tank Farm Contractor, and Hanford Site contractors. The deliverable shall be provided to DOE for review and comment. DOE will have the option for reviewing the information and providing comment. The Contractor shall respond to all written comments. The DOE Contracting Officer can issue the ICDs with outstanding comments. These outstanding comments would be resolved during the regular ICD update process. DOE comments that cannot be resolved in the appropriate partnering team shall be elevated to the senior management for resolution.
- K Concurrence — The deliverable shall be provided to DOE for review and concurrence. DOE will review the deliverable and provide comments in writing. Comments will be discussed through the partnering process and the Contractor is required to provide written responses using Review Comment Records. Documents shall be re-written to incorporate all DOE mandatory comments. Once a deliverable or document has been concurred upon by DOE, it shall be placed under change control and no changes to that document shall be made, without DOE concurrence.
- M Monitor — The deliverable shall be developed with input from DOE. DOE will be highly involved as the deliverable is developed, and will monitor the progress of the deliverable. DOE comments shall be discussed in the partnering teams as the deliverable develops. If DOE direction is determined to be appropriate, DOE shall provide such direction in writing.
- P Product Acceptance — As defined in Specification 13.
- R Regulatory Deliverable Approval — Will be performed in accordance with Standard 7.

C.6 STANDARDS

This Section consists of the following Standards, which describe requirements for managing, constructing, commissioning the WTP, and related activities:

- Standard 1: Management Products and Controls
- Standard 2: Research, Technology, and Modeling
- Standard 3: Design
- Standard 4: Construction, Procurement, and Acceptance Testing
- Standard 5: Commissioning
- Standard 6: Product Qualification, Characterization, and Certification
- Standard 7: Environment, Safety, Quality, and Health
- Standard 8: Safeguards and Security

1.0 References

The following listed References are not included in Section J, Attachment E - List of Applicable Directives (List B-DEAR 970.5204.78)

- 1.1 HNF-3638, Revision 1 – Standard Electronic Format Specification for Tank Waste Characterization Data Loader: Version 2.4
- 1.2 PNNL-12040 – Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project, KD Wiemers, et al, Dated December 1998, Revision 0
- 1.3 Letter 01-OSR-0280, Clause I.82, “Changes – Cost Reimbursement – Alternate III;” Clause I.117, “Laws, Regulations, and DOE Directives”; and Section J, Attachment E, “List of Applicable Directives”, (List B), CCN 021926, Dated July 30, 2001
- 1.4 HFID 232.1B, *Notification and Reporting of Operations Information*
- 1.5 PL-W375-EN00003, Revision 1, Environmental Performance Demonstration Plan, JR Markillie, Dated April 28, 2000
- 1.6 HNF-SD-WM-SP-012, Revision 3A – Tank Farm Contractor Operation and Utilization Plan
- 1.7 Washington Administrative Code (WAC) 173-303 – Dangerous Waste Regulations
- 1.8 SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.
- 1.9 *National Consensus Standard ASME/NQA-1, 2000* **(M066)**

Standard 1: Management Products and Controls (M096)

This Standard describes the required management products and controls. The Contractor shall provide all necessary management and technical information and support necessary to meet the requirements of U.S. Department of Energy (DOE) Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and its associated manual, DOE M 413.3-1, to enable DOE to meet the data requirements of the Integrated Planning, Accountability, and Budgeting System (IPABS), and to ensure transparency in project performance and efficiency in project execution. The Contractor shall also support the DOE Office of River Protection (ORP) in developing and maintaining the integrated River Protection Project (RPP) Baseline. All management and technical information developed under this contract shall be accessible electronically by the Government.

(a) Baseline Description and Requirements:

The Contractor shall develop and maintain a contract-compliant integrated and traceable technical scope, schedule, and cost baseline for the Waste Treatment and Immobilization Plant (WTP) Project. The baseline and subsequent baseline changes shall be submitted for Government approval (Table C.5-1.1, Deliverable 1.5). The baseline and management thereof shall comply with this standard; ANSI/EIA-748A-1998, *Earned Value Management Systems (EVMS)*; DOE O 413.3A; and DOE M 413.3-1. The baseline shall include:

- WTP project technical requirements as delineated in (a)(1);
- Schedule to implement project work scope as described in (a)(2); and
- Project cost to implement project work scope on the projected schedule as described in (a)(3).

The technical scope, schedule, and cost baseline (WTP baseline) shall be maintained using a baseline change control process as described in (a)(4).

(1) Technical Baseline: The contract technical baseline is represented by a series of documents which define the basis for current cost or schedule estimates. Changes to these documents shall be evaluated for impact to project cost and/or schedule and captured by a baseline change proposal where necessary. The following documents shall be viewed collectively as the baseline technical scope for the cost/schedule control system:

- (i) Contract Statement of Work;
- (ii) Approved Functional Specification pursuant to Contract Standard 3, paragraph (b)(1);
- (iii) Approved Basis of Design pursuant to Contract Standard 3, paragraph (b)(2);
- (iv) Approved Authorization Basis pursuant to 10 CFR 835;
- (v) Approved Operations Requirements Document (bolded text);
- (vi) Approved Interface Control Documents;
- (vii) Permit Requirements; and
- (viii) Approved Level 2 Work Breakdown Structure (WBS) Dictionary Sheets.

(2) Schedule Baseline: The WTP baseline schedule is an integrated schedule hierarchy containing the networked, detailed tasks necessary to ensure successful project execution from Level 1, Project Summary Schedule, Level 2, Executive Level Schedule, Level 3, Project Intermediate Schedule, to the Level 4, Detailed Working Schedule. The scheduled activities shall be vertically traceable to the RPP Integrated Master Plan (IMP), the WBS, and EVMS control accounts. The WTP schedule shall be used to verify attainability of contract level milestones defined in Contract section F.1(b), to evaluate progress toward meeting program objectives through tracking interim gatepost milestones, and to integrate the program schedule activities with all related work activities and milestones.

Gatepost milestones are interim milestones at the project and subproject level which shall serve

as leading indicators to overall contract schedule compliance. These gatepost milestones shall be mutually agreed to between DOE and the Contractor; be used as the basis for monthly status reporting; have milestone dictionary descriptions; and not be changed without DOE approval. Gatepost milestones shall focus on near term activities (30 months) including *Resource Conservation and Recovery Act of 1976* (RCRA) permitting requirements; major procurement actions; significant construction events; critical equipment installs/deliveries; and major design deliverables, etc., and preferably be "completion" type milestones. DOE may elect to designate one or more gatepost milestones for fee incentive purposes; if so, they will be controlled by the Contracting Officer.

The Government will use the Level 3, Project Intermediate Schedule, for oversight and monitoring progress, but reserves the right to request lower level schedule data when necessary. The following requirements shall be addressed at the appropriate level within the schedule hierarchy:

- (i) Scheduling Requirements: The WTP schedule shall be developed using a 30-month rolling schedule concept which is statused monthly and extended semi-annually. The near-term schedule shall be more detailed than activities past the 30-month cutoff.
 - (A) The schedule shall include all significant external interfaces and critical items from suppliers, teammates, or other detailed schedules that depict significant and/or critical elements and Government furnished equipment or information dependencies. The determination of significant and critical Government interface requirements shall be mutually defined and documented.
 - (B) The schedule shall be updated according to the Contractor's management control system and shall be submitted no less frequently than monthly. The schedule may reflect data either as of the end of the calendar month or as of the Contractor's accounting period cutoff date, provided it is consistent and traceable to the Monthly Status Report.
 - (C) The schedule shall contain the contract milestones, gatepost milestones, and discrete tasks/activities through contract completion.
 - (D) Monthly schedule analysis shall be performed to assess schedule progress to date and included as part of the monthly status report. The analysis shall include changes to schedule assumptions, variances above agreed thresholds to the baseline schedule, causes for the variances, potential impacts, and recommended corrective actions to minimize schedule delays. The analysis shall also identify potential problems and an assessment of the critical path and near-critical paths for the five subprojects and the overall contract.
 - (E) The schedule shall be created using a Critical Path Method (CPM), network capable Commercially Off-The-Shelf (COTS) scheduling software application. The schedule shall be delivered electronically in the native digital format (i.e., an electronic file produced within the contractor's scheduling tool) as part of the monthly report.
 - (F) The level of detail in the schedule (including number and duration of tasks/activities) shall follow the contractor's Project Controls System Description, program directives, etc. A sequence of discrete tasks/activities in the network that has the longest total duration through each subproject and the overall WTP contract shall be identified as the subproject and project critical paths, respectively.
- (ii) In addition, the Contractor shall develop the necessary modeling capability at a rough order of magnitude (ROM) level of accuracy to support "what-if" evaluations within

5 working days of request. This modeling system shall provide model by dollars and reasonably represent planned expenditures by month for the first fiscal year and each fiscal year thereafter. Level of effort activities shall be added to the model as well as undistributed budget in planning packages so that each fiscal year can balance against known funding.

- (3) Cost Baseline: The WTP cost baseline is the latest DOE-approved Performance Measurement Baseline (PMB) including any negotiated or directed changes and approved baseline change proposals, together with the following PMB supporting documentation:
- (i) Total contract cost and subproject costs including a summary description of facility design, process design, operational concept, and schedule.
 - (ii) Status of facility design, construction, and related procurements.
 - (iii) Description of the methodology of how the estimate was developed.
 - (iv) A WBS dictionary which includes: a detailed technical description of the scope to be performed at each WBS level; the work activities required; identification of any work specifically excluded; any constraints; special conditions; or other criteria.
 - (v) Backup materials necessary to understand the estimate shall be agreed to prior to submittal of the estimate. Examples include quantity takeoffs, equipment lists, detailed specifications, plans and drawings, calculations, databases used, historical data, cost estimating relationships, and actual quotes.
 - (vi) Details of distributable costs, methods of allocation, and a description of the work covered by distributable costs and how they were estimated and developed.
 - (vii) Explanation and description of Defense Contract Audit Agency (DCAA)-validated overhead and general and administrative rates used.
 - (viii) Examples of how standard base rates are burdened to arrive at estimated hourly rates.
 - (ix) Definitions and delineation for and categorization of costs into labor, material, equipment, travel, taxes, contingency, and other.
 - (x) Full delineation of any use of productivity or related factors that clearly identifies when and where used and basis for the utilization.
 - (xi) Written analysis of how cost and schedule contingency was determined. This includes all pertinent information necessary to understand and perform the calculations.
 - (xii) Estimate history; if the current estimate is a revision to an earlier estimate, provide reconciliation between estimates.
 - (xiii) Basis of escalation.
 - (xiv) Subcontractor cost estimates, traceable to the WTP cost estimate and WBS, if available, shall be provided upon request.
 - (xv) Risk mitigation plans and activities.
- (4) Baseline Change Process: The baseline change process will be rigorous and disciplined to ensure that the baseline is accurate, up-to-date, and capable of providing meaningful data and

information. The Contractor change control process shall align and support the DOE change control process. The Contractor change control process, including routinely scheduled meetings, shall be open to Government oversight. The WTP baseline change process will be managed in a timely manner. Baseline changes may be triggered when:

- (i) Controlled documents as outlined in paragraph (a)(1) require changing;
- (ii) Contract or gatepost milestones need revision;
- (iii) Cost thresholds are in jeopardy; or
- (iv) Changes within BNI approval authority occur.

(5) **Baseline Change Approval Thresholds:** In addition to DOE O 413.3A requirements, baseline change control approval thresholds for technical, schedule, and cost changes have been established as follows:

THRESHOLD	DOE APPROVAL REQUIRED
Schedule	Contract Milestone Changes
	Gatepost Milestone Changes
Cost	Changes exceeding the \$30M cumulative fiscal year management reserve. Any individual change to a WBS Level 2 budget at completion exceeding \$5M [absolute sum] including schedule impact cost
Technical	Changes to baseline documents in paragraph 1(a)

(6) **Spending at Variance:** In some circumstances, the Contractor may exceed authorized budget levels for a specific control account when a baseline change is not warranted, such as for cost overruns. The Contractor's change control system shall track and manage changes in estimates at completion (EAC) as a separate but integrated part of the overall change control process. Change control records shall maintain clear distinction between approved baseline and EACs.

(7) **Estimate at Completion (EAC):** The Project and subproject EACs shall be maintained and reported monthly.

(b) **Project Funding:**

The Contractor shall use the DOE-approved WTP Project cost baseline as the basis for the subproject and total project funding profile that is required to complete the contract scope. The WTP baseline funding profile shall comply with Congressional appropriations for subproject and total project cost. The funding profile includes engineering, procurement, and construction baseline costs (including management reserve and contingency), and estimated fees that will be paid to the Contractor. The Contractor shall provide on a monthly basis, Form DD 1586, Aug 96, DID-MGMT-81268, Contract Funds Status Report (CFSR), or approved equal for each control point.

Contractor utilization of management reserve shall be reported monthly and shall include the impact on the life cycle of the contract.

(c) Controlled Management Documents: The following documents shall be submitted for approval by DOE in accordance with the schedule in Table C.5-1-1, Deliverables:

- (1) Interface Management Plan: DOE (as lead), the Tank Farm Contractor, and the WTP Contractor shall develop and implement an interface management plan (Table C.5-1.1, Deliverable 1.4). The interface management plan shall:
 - (i) Recognize the DOE role as the owner of the WTP and as the final decision authority for any interface issues that are not resolved between the other parties.
 - (ii) Define the scope of each interface and provide a brief description of the required deliverables (products, documents, procedures, services, etc.) through interface control documents (ICD).
 - (iii) Define organizational points of contact for participants.
 - (iv) Define interface requirements, controls, and applicable source documents for each interface.
 - (v) Involve appropriate RPP organizations and Hanford Site contractors in the integration, review, and approval process of ICDs and implement changes to ICDs through the appropriate change control process and, if necessary, contract changes.
 - (vi) Involve individuals with the appropriate level of organizational responsibility and authority to assure the interface is implemented and functioning. DOE/ORP will identify points of contact for each interface document.
 - (vii) Identify, track, and elevate issues for management review in the Monthly Status Report.

- (2) Project Execution Plan (PEP): The Contractor shall prepare a PEP that describes the approach for managing and controlling the project at the Contractor level. The PEP shall be approved by DOE (Table C.5-1.1, Deliverable 1.2), and shall focus on Contractor policies, methods, and approaches for the integration of project scope, schedule, and cost information in assuring compliance with Contract and regulatory requirements. The Contractor PEP shall address the approach the Contractor will use to implement the requirements pertaining to project control processes including:
 - (i) Management structure, responsibilities, and authorities;
 - (ii) Integrated safety management;
 - (iii) Quality assurance;
 - (iv) Safeguards and security;
 - (v) Permitting;
 - (vi) Construction acceptance, test, and evaluation;
 - (vii) Acquisition planning;
 - (viii) Contract management;
 - (ix) Systems engineering;
 - (x) Configuration management;
 - (xi) Waste Treatment process change control;
 - (xii) Information management and reporting;
 - (xiii) External Interface management;
 - (xiv) Work management;
 - (xv) Risk management;
 - (xvi) Construction project management; and
 - (xvii) Communications and stakeholder involvement.

- (3) Project Control System Description: The Contractor shall provide for DOE approval (Table C.5-1.1, Deliverable 1.3) a Project Control System Description meeting the requirements of DOE O 413.3A, DOE M 413.3-1, and ANSI/EIA-748-A-1998. The system description shall describe the management processes and controls that will be utilized to manage and control work and complete contract requirements. Upon approval by the Contracting Officer, the Contractor shall fully implement the project control system. The Contractor shall obtain Contracting Officer approval prior to implementing materially significant changes to the system description. The Contracting Officer may direct compliance reviews to determine whether the Contractor is operating in accordance with the approved system description and producing accurate planning, budgeting, reporting, and change control data. The Contractor shall provide the Contracting Officer or designated representatives with access to all pertinent records, data, and plans for purposes of initial approval, approval of proposed changes, and the ongoing operation of the project control system.

The Project Control System Description shall, at a minimum, include:

- (i) A Work Breakdown Structure (WBS) including companion “dictionary” descriptions of work for each Level 2 WBS element. The WBS shall provide the basis for all project control system components, including estimating, scheduling, budgeting, performing, managing, and reporting, as required under this contract. Control accounts below Level 2 shall be identified.
- (ii) The authorized contract Level 2 WBS for this project is as follows:

WBS	TITLE
1	WTP Contract DE-AC27-01RL14136
1.01	Pretreatment
1.02	Low-Activity Waste
1.03	High-Level Waste
1.05	Balance of Facilities
1.06	Analytical Laboratory
1.08	Plant Wide EPCC*
1.90	Shared Services
*Currently being evaluated for elimination or significant reduction.	

- (iii) The organizational breakdown structure with identification of key management positions. A control account shall be assigned to a manager with responsibility and authority to plan and budget the work, and control the resources and work activities within the approved technical, schedule, and cost baselines. The Control Account Manager is also responsible to report status to allow complete project rollup of technical, schedule, and cost performance for current reporting periods, cumulative to-date, and at-completion. The Contractor shall maintain and provide a current list of Control Account Managers.
- (iv) A description of the technical scope, cost, and schedule baseline development process, and the hierarchy of documents that will be used to describe and maintain that baseline.
- (v) Documentation of the process the Contractor intends to use for document control, configuration control, and change control.
- (vi) A brief summary of any supporting project control procedures that will be used.

(d) Risk Management:

- (1) The Contractor shall implement the risk management process defined in the Contractor's PEP, DOE O 413.3A, and DOE M 413.3-1. The Contractor shall provide a Risk Management Plan documenting Contractor budget base risks (scope, schedule, and cost) and associated management reserve for DOE approval. The WTP Risk Management Plan shall identify the major risks to completing the project within the approved contract baseline; the Contractor's risk management strategies, and mitigation action plans. The Contractor shall submit quarterly the status of the WTP Risk Management Plan and Management Reserve utilization (Table C.5-1.1, Deliverable 1.6). The WTP Risk Assessment shall meet the following requirements:
 - (i) Project risks shall be identified and their probabilities and consequences;
 - (ii) Risks identified as Critical (Critical Risk List) shall be evaluated with each submittal for change in the unmitigated and residual risk levels.
 - (iii) Management reserve utilization shall be documented by facility.
- (2) The Contractor shall provide a monthly status of work scope actions directly attributed to DOE-owned risks (Technology, Programmatic, and Operational) as identified in the RPP Risk Management Plan. The Contractor shall also support the identification, categorization, and development of risk-handling strategies for newly identified DOE-owned risks, and support the annual update to the RPP Risk Management Plan.
- (3) Risk and decision management activities shall be coordinated on a continuing basis with DOE (as lead), Tank Farm Contractor, and Hanford Site contractors. Contractor risk analysis information pertaining to "cross-cutting" decisions shall be communicated to DOE, the Tank Farm Contractor, and Hanford Site contractors, including agreement as to who should have the lead for managing each risk. The Contractor shall document risks associated with ICDs and prepare issue resolution plans for DOE approval.
- (4) The Contractor shall include forecasts of expected changes to risk assessment status in the Monthly Status Report (Table C.5-1.1, Deliverable 1.7).

(e) Project Reporting: The Contractor shall develop a reporting system that reports project performance on the technical scope, schedule, and cost profile. The requirements and procedures for this system shall be defined in the Project Control Systems Description. The following routine reports are required:

- (1) Monthly Status Report: The Contractor shall prepare a monthly status report representing the prior month's performance and transmit it to DOE by the first Tuesday of the second month following data cutoff (Table C.5-1.1, Deliverable 1.7). The Monthly Status Report shall be a written report that includes, but is not limited to, the following:

Management Overview:

- (i) Project manager narrative assessment;
- (ii) Safety statistics;
- (iii) Quality issues;

- (iv) Significant accomplishments and progress towards completion of project gatepost milestones and objectives;
- (v) Potential problems, impacts, and alternative courses of action; for example staffing issues, assessment of the effectiveness of actions taken previously for significant issues, or the monitoring results of recovery plan implementation;
- (vi) Status of decisions, including DOE decisions, and information requirements for those decisions;

Project Control Information

- (vii) Unless otherwise approved by the Contracting Officer, EVMS information by WTP project and subproject in the following Office of Management and Budget (OMB) Contract Status Report formats (DID-MGMT-81466):
 - (a) Format 1, DD Form 2734/1, Mar 05, Work Breakdown Structure
 - (b) Format 2, DD Form 2734/2, Mar 05, Organizational Categories
 - (c) Format 3, DD Form 2734/3, Mar 05, Baseline
 - (d) Format 4, DD Form 2734/4, Mar 05, Staffing
 - (e) Format 5, DD Form 2734/5, Mar 05, Explanations and Problem Analysis;
- (viii) Monthly EVMS analysis;
- (ix) Variance reports;
- (x) Change control section that summarizes the scope, technical, cost, and/or schedule impacts resulting from any implemented actions for approved baseline changes, and that discusses any known baseline changes and utilization of management reserve;
- (xi) Updated Trend register (provided with the Electronic Data in xviii, below);
- (xii) Project and subproject cost avoidance actions taken;
- (xiii) Performance, using schedule, earned value, and critical path methods, to identify potential schedule deviations and needed corrective actions before they impact the baseline;
- (xiv) Forecasted changes to last risk assessment;

Schedule Data:

- (xv) Ninety-day forecast for major activities and milestones (gatepost and contract level milestones);
- (xvi) Report of proposed changes that impact DOE, site interfaces, or gatepost and/or contract level milestones;
- (xvii) Stated Level 3 schedule (together with the status report or under separate cover) for each sub facility that reflects progress against the baseline. The schedule shall incorporate all approved changes to date and include a critical path analysis derived from Level 4 for each subfacility and the total project;

Electronic Data:

- (xviii) Earned value data provided via compact disc for the following: (a) Engineering Performance and Progress Report data files; (b) Quantity Unit Rate Report data files; (c) COBRA data files and reports; (d) baseline P3 schedule; (e) Current P3 schedules; (f) and Cost and Commitment Log; (g) Earned Purchase Order Value (EPOV) data; (h) Bechtel Estimating Tool Kit (BETK); (i) Commodity Curves; and (j) Trends and Trend reports. Earned value data is to be provided on the last Tuesday of the month following the data cutoff to the Contracting Officer and the Contracting Officer's Representative:
- (2) Occurrence Reporting: The Contractor shall adhere to DOE O 231.1A, *Environment, Safety, and Health Reporting*, with Hanford Site-specific requirements and methods for notification (Table C.5-1.1, Deliverable 1.8). The Contractor shall also adhere to the requirements of the Contractor Requirements Document (CRD) of DOE Manual (M) 231.1-2 and the ORP Supplemental (S) CRD to DOE M 231.1-2. **(M114)**
- (3) Environment, Safety, and Health Reporting: In addition to *Occupational Safety and Health Act of 1970*, and the *Price Anderson Amendments Act of 1988* (10 CFR 820) reporting requirements, the Contractor shall report all events and information specified in DOE O 231.1A. The process and form of reporting will meet the requirements of this Order and DOE M 231.1-1A, Change 2, *Environment, Safety and Health Reporting Manual*. The Contractor process will specify this requirement in contracts down to the lowest-tier subcontractor. The Contractor process will accumulate and provide a single report responding to required information for both the Contractor and all subcontractors (Table C.5-1.1, Deliverable 1.9). The Contractor shall also adhere to the requirements of the Contractor Requirements Document (CRD) of DOE Manual (M) 231.1-2 and the ORP Supplemental (S) CRD to DOE M 231.1-2. **(M114, M127)**
- (4) Accident Investigation: The Contractor and, as necessary, all subcontractors shall support Type A and Type B accident investigations for accidents that may occur during Contractor activities. The Contractor and all its subcontractors shall establish and maintain readiness to respond to accidents, mitigate potential consequences, assist in collecting and processing evidence, and assist with the accident investigation. This shall include preserving the accident scene and providing support to the accident investigation board.

Standard 2: Research, Technology, and Modeling

This Standard describes the Research and Technology (R&T) Testing Program requirements and process and facility modeling requirements.

(a) Research and Technology Testing Program:

(1) Research and Technology Program Plan:

- (i) A WTP R&T Program Plan was developed as part of the WTP Conceptual Design and supporting documentation. The R&T Program Plan describes the research and testing work activities that will be conducted to support process and facility design, qualification testing of the waste forms (IHLW and ILAW) and secondary wastes, and provide information to support environmental permitting and the authorization basis.
- (ii) The Contractor shall submit for DOE concurrence, the revised R&T Program Plan (Table C.5-1.1, Deliverable 2.1). All Contractor proposed changes shall be clearly identified. The R&T Program Plan activities will be logically tied to the project baseline and baseline risk assessment described in Standard 1, *Management Products and Controls*. For each testing activity, the R&T Program Plan shall identify the following summary level information: purpose and scope of the test, performing organization, and method to test and analyze information used to support the design process, permitting, operations, and/or waste qualification activities.
- (iii) The R&T Program Plan will be updated annually through 2004 and as needed to closeout technical risks. All Contractor proposed changes to the R&T Program Plan shall be traceable to the driver for the change; for example, if an optimization change in Standard 3, *Design*, results in the need to change planned research and technology, the driver for the change shall be identified in the revised R&T Program Plan.

(2) Research and Technology Requirements:

- (i) The Contractor shall provide DOE copies of the Contractor-approved draft test plans for all process verification and product qualification testing at least 15 calendar days in advance of conducting the test for information. Approved test plans shall be provided to DOE (Table C.5-1.1 Deliverable 2.2).
- (ii) DOE will be provided draft copies of test reports for comment during the Contractor report review period and the Contractor shall provide to DOE completed test reports for process verification testing and product qualification within 2 months after the approval by R&T Program Manager (Table C.5-1.1, Deliverable 2.3). At DOE's request, for tests lasting more than 6 months, an interim report or update via presentations shall be provided at approximately the halfway point of the test. When a test is run with simulants rather than actual tank waste, the report shall compare the results to work performed with tank waste, if data is available.

- (iii) The Contractor shall utilize the results of completed and ongoing testing activities performed as part of the WTP Conceptual Design and supporting documentation in estimating facility and unit operations performance. The Contractor shall not reinitiate or repeat a test unless the scope of the test plan is presented to DOE in writing, and DOE agrees to the conduct of the testing.
- (iv) The Contractor shall use the process verification test results to verify the associated design calculations and design basis, when appropriate. Specifically, the process verification results and subsequent calculations relating to the design shall be referenced within the appropriate system descriptions and other design control documentation.
- (v) The integrated process flowsheet and material balances shall be supported by the process verification test results. All process verification and product qualification tasks shall be conducted in accordance with the DOE concurred upon QA Program.
- (vi) All IHLW qualification work shall be conducted in accordance with a DOE concurred upon QA Program that complies with the requirements of the QARD, DOE/RW-0333P. No HLW glass testing scoping work will be performed without prior agreement by DOE.

(3) Required Research and Technology Testing:

- (i) Characterization of Low-Activity Waste and High-Level Waste Feeds: The Contractor shall characterize Hanford tank waste for purposes of determining that feed meets feed specification requirements, supporting WTP environmental permitting activities, establishment of the WTP authorization basis, process verification testing, and product qualification testing. The Contractor shall request tank waste samples for this scope through ICD 23, *Waste Treatability Samples*, in order to perform the studies.

The analysis requirements for the as received and treated tank waste samples shall be defined by the Contractor in Contractor test plans. The Contractor shall provide test plans, and interim reports to DOE at appropriate intermediate steps, and final reports in accordance with the requirements of Standard 2. All analytic results shall be reported to DOE in accordance with *Standard Electronic Format Specification for Tank Waste Characterization Data Loader: Version 2.4* (HNF-3638, Revision 1), Lockheed Martin Corporation, Richland, Washington.

Characterization information for the samples shall include: viscosity, density, particle size distribution (if sufficient solids are present in samples), chemical composition, radiochemical composition, hazardous materials composition consistent with the analysis requirements of the Dangerous Waste Permit, authorization basis, and solids solubility versus concentration (if sufficient solids are present in samples).

- (A) The Contractor shall compare actual tank waste analytical data to waste stream-modeling results to validate modeling results. If errors in modeling are observed the models shall be adjusted appropriately.
- (B) The Contractor shall use tank waste samples to analyze, test, and assess the capability of the proposed waste treatment processes to meet the requirements for producing an IHLW form that can meet

HWMA and RCRA de-listing technical requirements in accordance with Specification 1, *Immobilized High-Level Waste* and for producing a Land Disposal Restrictions (LDR)-compliant ILAW form in accordance with Specification 2, *Immobilized Low-Activity Waste*.

- (C) The Contractor shall determine if the sample materials meet Specification 7, *Low-Activity Waste Envelopes Definition*, limits for LAW samples and Specification 8, *High-Level Waste Envelope Definition*, limits for HLW samples. The entrained solids in the LAW feed samples shall be characterized (where solids of sufficient quantity are available in the treatability samples) in accordance with Specification 7.2.2.1.
- (D) The Contractor shall implement and execute the Regulatory Data Quality Objectives (DQO) entitled *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project*, KD Wiemers, et al, dated December 1998, Revision 0, No. PNNL-12040 (Table C.5-1.1, Deliverable 2.4).

During the Contract period, the Contractor shall propose to DOE methods to optimize the DQO, and develop the test specifications and plans consistent with the DOE revised DQO. As available, data and data needs identified during the treatment facility permitting process, the Risk Assessment Work Plan, and LDR/Delisting efforts will be used as inputs to the optimization process.

- (E) The DQO characterization scope for R&T Testing shall include characterization of the following feed tanks (unless agreed to otherwise with DOE through optimization of the DQO):
- LAW Feed: AP-101, AZ-101, AZ-102, AN-102, AN-103, AN-104, AN-105, and AP-104/SY-101.
 - HLW Feed: AZ-101, AZ-102, AY-102/C-106, and AY-101/C-104 and SY-102.
- (ii) Waste Separations Processing Testing: The Contractor shall continue to test and validate the capability of LAW pretreatment processes for removal of entrained solids (where solids of sufficient quantity are available in the treatability samples), ^{137}Cs , ^{90}Sr and TRU elements to meet ILAW product requirements. Activities shall address ability to meet contract requirements, operating requirements, plant throughput requirements and information for regulatory permits and the authorization basis. Radioactive testing shall be used to validate simulants and the results from simulant testing. Process scale-up shall be demonstrated with tank waste or appropriate simulants, as described below.
- (A) Ion exchange chemical and radiological durability and regeneration properties shall be demonstrated. Determination of gas generation from the columns shall be determined. Scale-up of resin manufacturing shall be demonstrated and batch-to-batch consistency requirements shall be determined and the impacts addressed.
- (B) The Sr and TRU removal precipitation reaction mechanism shall be characterized via testing.

- (iii) Validation of Sludge-Washing Processes: The Contractor shall conduct testing of sludge washing processes using samples provided by DOE to demonstrate the specific procedures for implementing Specification 12, *Number of High-Level Waste Canisters Per Batch of Waste Envelope D*. Test size may be adjusted to account for the amount of material provided.

- (iv) Immobilized Low-Activity Waste Process Testing: The Contractor shall conduct testing to determine the appropriate operating conditions for the LAW melter. Information to be obtained shall include:
 - (A) Determination of maximum waste loading (including sulfate incorporation) and melter throughput rates for waste envelopes A, B, and C. The Contractor shall continue to investigate glass formulations optimized to incorporate sulfate. These glasses prepared from simulants shall be subjected to the Product Consistency Test and Vapor Hydration Test in accordance with ILAW Specification 2.2.2.17, *Waste Form Testing*. In addition, the process ability of the glass formulation shall be assessed.
 - (B) Determination of off-gas compositions for regulatory purposes and effects on the mass material balance due to recycle streams and secondary waste streams.
 - (C) Confirmation of the design concept for selected off-gas equipment.
 - (D) Determination of operating conditions or melter feed additive requirements to minimize foaming and process-upset conditions.
 - (E) Monitor testing to assist in estimating maximum off-gas flow requirements in an upset condition.
 - (F) Determination that glasses produced from a continuously fed melter produce glass that meets product specifications and requirements.
 - (G) Ability to remotely fill and seal full scale packages to Contract requirements (Specification 2).

- (v) Immobilized Low-Activity Waste Qualification Testing:
 - (A) The Contractor shall prepare laboratory scale samples of ILAW glasses from the waste samples provided by DOE. The waste samples shall have been pretreated in accordance with the Contractor's LAW feed pretreatment processes.
 - (B) The Contractor shall use glasses prepared from DOE supplied samples and Contractor prepared simulants to demonstrate that Contract requirements can be met (Specification 2). The tests shall be consistent with the DOE concurred upon ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3). Glass composition ranges that meet operating and contract requirements shall be identified with non-radioactive glass testing. A planned target composition shall be identified for each glass composition range.

- (C) For target glass compositions, radioactive glasses prepared with pretreated tank waste shall be used to demonstrate the ILAW durability requirements of Specification 2.2.2.17, *Waste Form Testing*. For Specifications 2.2.2.17.1 and 2.2.2.17.3, non-radioactive glasses may be used provided that the results from 2.2.2.17.2 are consistent for the non-radioactive glass and the radioactive glass.
 - (D) The Contractor shall obtain sufficient information for determining that the products meet LDR requirements in accordance with Standard 6, *Product Qualification, Characterization, and Certification*, and as needed to implement the DOE concurred upon *Final Approach for ILAW LDR Compliance*, and to support the Standard 7 Contractor prepared petitions for Hanford tank waste treatment standards.
 - (E) The Contractor shall provide samples, testing data, and compositional analysis to DOE for performance assessment analysis. Samples will only be provided when requested in advance by DOE; archiving of these samples is not required. The Contractor shall actively participate in the performance assessment effort to arrive at suitable compositions for processing and disposal purposes.
- (vi) Immobilized High-Level Waste Process Testing: The Contractor shall conduct testing to determine the appropriate operating conditions for the HLW melter. Information to be obtained shall include:
- (A) Determination of maximum waste loading and melter throughput rates for waste Envelope D and the products resulting from pretreatment of the LAW feed.
 - (B) Determination of offgas compositions for regulatory purposes and effects on the mass material balance due to recycle streams.
 - (C) Confirmation of the appropriateness of selected offgas equipment.
 - (D) Determination of operating conditions or melter feed additive requirements to minimize foaming and process-upset conditions.
 - (E) Determination of maximum offgas flow requirements, in an upset condition.
 - (F) Determination that glasses produced from a continuously fed melter produce glass that meets product specifications.
 - (G) Ability to fill full-scale packages to Contract requirements (Specification 1).
- (vii) Immobilized High-Level Waste Qualification Testing:
- (A) The Contractor shall prepare laboratory scale samples of IHLW glasses from the waste samples provided by DOE. The waste samples shall incorporate pretreatment Envelope D products from the pretreatment of the LAW samples provided by DOE.

- (B) The Contractor shall use glasses prepared from DOE supplied samples and Contractor prepared simulants to demonstrate that Contract requirements can be met (Specification 1). The tests shall be consistent with the DOE concurred upon IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2) and relevant documents. Glass composition ranges that meet operating and contract requirements shall be identified with non-radioactive glass testing. A planned target composition shall be identified for each glass composition range.
- (C) For target glass compositions radioactive glasses prepared with pretreated tank waste shall be used to demonstrate the IHLW durability requirements described in Specification 1.
- (D) The Contractor shall provide IHLW glass properties data and information in a form that allows DOE to further develop glass properties models. These models will include: (1) liquidus temperature; (2) volume fraction of crystals below the liquidus temperature; (3) viscosity as a function of temperature; (4) Toxicity Characteristic Leach Procedure; and (5) Product Consistency Test.
- (E) The Contractor shall obtain sufficient information for determining that the products meet LDR and can be delisted in accordance with Standard 6, *Product Qualification, Characterization, and Certification*, and as needed to implement the DOE concurred upon *Final Approach for IHLW Delisting*, and to support the Contractor developed Standard 7 petitions for exemption or exclusion of IHLW from RCRA.

The Contractor shall prepare full-scale prototype IHLW canister waste forms composed of simulated IHLW glass within the 4.5-meter tall, austenitic stainless steel canister. After filling the canister with simulated IHLW glass and canister closure, the Contractor shall test the IHLW canister to demonstrate compliance with the Waste Acceptance System Requirements Document (WASRD), Specification 4.8.3, Dimensional Envelope for HLW Canisters, and 4.8.4, Filled HLW Canister Weights. Drop tests shall be conducted to demonstrate compliance with WASRD Specification 4.8.8, HLW Canister Drop. **(M047)**

- (viii) Effects of Separable Organics: The Contractor shall evaluate the effects of trace quantities (~25 ppm) of separable organics (tributyl phosphate and normal paraffin hydrocarbon) in the tank waste liquid feed to the WTP and the fate of the separable organics within the system. Each potentially affected unit operation (including ion exchange elution and evaporation) shall be examined for process, safety, and permitting implications. Based upon the results of these tests, the Contractor shall propose a de minimus concentration level for separable organics that could be sent to the WTP without adversely affecting the WTP.
- (ix) Oxidative Leaching: The Contractor shall conduct a literature review and prepare a technical report (Table C.5-1.1, Deliverable 2.8 Technical Report on Oxidative Leaching) that evaluates the treatment processes for the oxidative leaching of chemical components (principally Cr and associated components, i.e. sulfate) that limit the loading of HLW solid oxides in the HLW glass waste form. The literature review shall summarize existing

experimental results and data, and present conceptual and realistic process flowsheets including the identification of process equipment and operating conditions. Based upon the study results, the Contractor shall provide a recommendation on the preferred process to conduct required separations.

The Contractor shall conduct technology testing work using simulants and actual waste testing to provide design and process operational information on the process used to remove Cr from the HLW waste stream. The process should have the capability to remove Cr from the pretreated HLW stream such that this chemical component, or reagents added to remove this component does not limit the HLW waste loading in the glass waste form. The Contractor shall test a minimum of (2) radioactive tank waste samples. (SY-102 and a second sample that must be provided so that analysis with sample SY-102 can be run concurrently) The test shall be conducted to provide proof of process demonstration (part of Deliverable 2.2 and 2.3) and to determine any impacts to the facility throughput and/or availability. The Contractor shall make recommendations to ORP for the modification of Specification 12, Number of High-Level Waste Canisters Per Batch of Waste Envelope D and Specification 1, Immobilized High-Level Waste, Table TS-1 limits for Cr₂O₃ and sulfate, based upon the results of this experimentation. (Table C.5-1.1 Deliverable 2.9 Test Report on Oxidative Leaching)

(b) Process and Facility Modeling Requirements:

The Contractor shall develop and use analytical models to support the design of the process and facility system, support pre-operational planning assessments, and provide technical integration with Tank Farm Contractor waste feed staging and product acceptance activities. The Contractor will, at a minimum, use the following models:

- (1) Operations Research Assessment of the Waste Treatment and Immobilization Plant: The Contractor shall conduct Operations Research assessments based on the WTP for the Pretreatment/HLW Vitrification Plant and LAW Vitrification production facilities and the Analytical Laboratory to determine that the facility design concept incorporates appropriate design and operational features to meet plant capacity requirements and reduce construction and/or operations costs. The scope of the assessments shall include: sampling and analysis requirements including sample turnaround times; tank capacities and times to conduct individual process steps in unit operations; time for mechanical handling steps; equipment reliability; time estimates for maintenance and repair of facility and process systems; estimated spare equipment inventory; and recommendations to improve reliability and throughput of the production facilities. The Operations Research Model shall also ensure appropriate reliability, availability, maintainability, and inspectability (RAMI) for the WTP balance of facility. The Operations Research Model results, assumptions, and model input parameters shall be clearly documented and provided to DOE for (Table C.5-1.1, Deliverable 2.5). The Operations Research Model and outputs shall be updated at least annually, or more often, as necessary, to support design change assessments and reflect the latest design and information from R&T.
- (2) Waste Treatment and Immobilization Plant Tank Utilization Assessments: The Contractor shall develop, document, and use G2 based on the WTP Design. The primary software used to run the dynamic flowsheet shall be agreed to by DOE. The Contractor shall assess utilization of process tank capacity and supporting equipment capability and operational characteristics, to ensure that the tanks are appropriately sized to support process operations, sampling and analysis turnaround times, process control requirements and waste form qualification needs. The assessments shall include the baseline plant capacity and the expanded plant capacity. Results shall be provided to DOE for review and comment at least

annually (Table C.5-1.1, Deliverable 2.6) or more often, as necessary, to support design change assessments and reflect the latest design and information from R&T.

- (3) Material Balance and Process Flowsheet: The Contractor shall use the ASPEN model to conduct and document process and flowsheet material balance analyses for the treatment of tank waste Envelopes A/D, B/D and C/D. The data sources for the material balances will be reviewed by DOE for acceptability and will be based upon the compositional limits defined in Specification 7, *Low-Activity Waste Envelopes Definition* and Specification 8, *High-Level Waste Envelope Definition*, tank waste inventory estimates, and the results of testing with actual tank waste samples. The flowsheet and material balances shall estimate the quantity of ILAW, IHLW, and relevant secondary streams on a feed tank-by-feed tank basis, as well as, annual estimates. The material balances will be based on three standards for chemical composition estimation. The Standards are:
- (i) Best available information that is based upon the analysis of tank waste samples planned to be treated in the WTP;
 - (ii) Agreed to waste input inventory; and
 - (iii) Specification 7, *Low-Activity Waste Envelopes Definition* and Specification 8, *High-Level Waste Envelope Definition* concentration maximums.

The flowsheet and material balances shall be sufficiently detailed to support permitting and safety activities under Standard 7, *Environment, Safety, Quality, and Health*, and to track DOE-supplied feed through the Hanford system for product acceptance and establishing that the waste treatment was performed.

The Material Balance and Process Flowsheet shall be updated at least annually, as significant changes occur and provided to DOE for review and comment (Table C.5-1.1, Deliverable 2.7). The material balance shall be maintained consistent with the latest process verification testing, product qualification activities, and feed characterization information, as appropriate. The flowsheet and material balances shall also be updated during cold commissioning, and prior to and following hot commissioning operations.

As part of Deliverable 2.7, an electronic copy of the modeling data for the flowsheet and material balance shall be provided to DOE for review and comment at initial issuance and upon each revision, thereafter.

- (4) Configuration Control: The Contractor will establish and maintain a configuration control system to manage the models and analyses. The models and analyses will be subject to the QA and configuration control requirements imposed upon the Design Process in Section C.4, *Environment, Safety, Quality, and Health*, and Standard 1, *Management Products and Controls*.

Standard 3: Design

This Standard describes the Contractor's responsibilities for conducting facility design functions, maintaining design documentation and conducting design reviews. The intent is to ensure that the Contractor has the necessary systems, processes, information and deliverables in place to allow DOE evaluation that the WTP Project is proceeding appropriately.

(a) Design Process:

The Contractor shall perform the following activities:

- (1) Acquire and place under configuration control all records from previous contractors within 1 month of Contract award. The Contractor shall transition the WTP Conceptual Design and supporting information developed through Contract award.
- (2) Provide to DOE for information the Contractor's design process (Table C.5-1.1, Deliverable 3.1). The process shall meet all requirements; laws and regulations; ensure that design is performed in controlled, safe, and efficient manner; and implement best industry practices. As changes to the process are made, the changes shall be provided to DOE for information.

(b) Establish and Maintain Facility Design Requirements: The Contractor shall comply with the Contract design process and the following:

- (1) Functional Specification: The Contractor shall prepare for DOE information (Table C.5-1.1, Deliverable 3.2), a Functional Specification that defines the technical operational requirements of the WTP based on the WTP Conceptual Design and supporting documentation. This document shall define the waste treatment requirements, environmental compliance requirements, and authorization basis requirements of the facility as currently known and understood. The Functional Specification shall describe the process/functional requirements of the WTP, including:
 - (i) WTP feed characteristics including quantities, treatment rates and mechanical, physical, chemical, radiological properties (by ranges, envelopes, tanks, or transfer batches);
 - (ii) ILAW and IHLW product characteristics such as quantities, mechanical, physical, chemical, radiological properties (by ranges, envelopes, tanks, or transfer batches);
 - (iii) Services and utility requirements, operating materials and supplies, and other inputs;
 - (iv) Estimates of effluents, emissions, solid wastes, by-products, and other outputs; and
 - (v) WTP operations limits.
- (2) Basis of Design: The Contractor shall prepare for DOE review and concurrence (Table C.5-1.1, Deliverable 3.3(a)) and as significant changes occur, a Basis of Design Document that identifies directly or by reference design requirements and design codes and standards that will serve as a basis for the continued design of the WTP. The Basis of Design shall be based on the WTP Conceptual Design, (including the Basis of Design directly developed in that phase), and supporting

documentation. The Basis of Design shall be generally organized by discipline and, at a minimum identify:

- (i) Environmental permitting requirements from State laws and regulations, the DWPA, NOCs, PSD, etc.;
 - (ii) Summary of the WTP site characteristics, including climatic, geotechnical, and natural phenomena data (with numerical values specifically preferred where practical; otherwise, referenced to identified source);
 - (iii) Design requirements for the WTP;
 - (iv) Allowable process and atmospheric temperatures, pressures, flow rates, for design conditions (with numerical values specifically preferred where practical; otherwise, reference to identified source); and
 - (v) Applicable codes and standards, regulations and guidelines.
- (3) The Contractor shall prepare for DOE review a Design Criteria Database (DCD) (Table C.5-1.1, Deliverable 3.3(b)). The DCD shall be used to identify potential design inputs from the design criteria contained in the source documents. The DCD shall be based on the WTP Conceptual Design and supporting documentation and updated as source documents are revised. The DCD shall contain design criteria extracted verbatim from the following source documents (and others as appropriate):
- (i) Initial Safety Analysis Report (PSAR/FSAR when submitted/approved);
 - (ii) Integrated Safety Management Plan;
 - (iii) Radiation Protection Plan for Design and Construction;
 - (iv) Safety Requirements Document-Volume II;
 - (v) Quality Assurance Manual;
 - (vi) RPP-WTP Contract;
 - (vii) Basis of Design;
 - (viii) Functional Specification;
 - (ix) Operations Requirements Document;
 - (x) Limited Construction Authorization Request(s);
 - (xi) Partial Construction Authorization Request(s) (when submitted/approved);
 - (xii) Construction Authorization Request(s) (when submitted/approved);
 - (xiii) Dangerous Waste Permit Application (when submitted/approved);
 - (xiv) Notices of Construction (when submitted/approved);
 - (xv) Prevention of Significant Deterioration to the Environment (when submitted/approved); and
 - (xvi) Interface Control Documents.

- (4) Operations Requirements Document: The Contractor shall prepare an Operations Requirements Document for DOE review and concurrence (Table C.5-1.1, Deliverable 3.4) based on the WTP Conceptual Design and supporting documentation. The operations requirements document shall define requirements for WTP life-cycle operations, including commissioning. These requirements will influence WTP design features to ensure cost efficient operations and provide for accurate life-cycle cost estimates, planning, and informed decision-making. The Operations Requirements Document shall include at a minimum:
- (i) The operations and maintenance philosophy and requirements for the WTP, including requirements for reliability, availability, maintainability, and inspectability;
 - (ii) Description of the operations and maintenance philosophy for each of the WTP (Balance of Facilities, Pretreatment, HLW Vitrification and LAW Vitrification);
 - (iii) Requirements for change rooms, first aid stations, decontamination facilities, lunch rooms, training facilities, control rooms, and operating galleries;
 - (iv) Requirements for facilities and computer based (simulator) training facilities;
 - (v) Equipment accessibility for maintenance and operations including both contact and remotely maintained systems, clearances and tolerances allowed in mechanical systems, and housekeeping features;
 - (vi) Instrument and control requirements for control room and local instruments;
 - (vii) General sampling and analyses requirements;
 - (viii) Ergonomics and human factors requirements for operations and maintenance;
 - (ix) Maintenance and spares philosophy and requirements (including items to be present at transition to the future operations contractor);
 - (x) Environmental compliance requirements; and
 - (xi) Health, safety, and site emergency services requirements.

Upon concurrence of the Operations Requirement Document, DOE will control the Operations Requirement Document and will consider any proposed changes.

- (c) Establish and Maintain Design Documentation: The Contractor is encouraged to use established design practices and shall ensure that design documentation and media comply with best industry practices. DOE shall have access to all Contractor-developed design documents and information, paper and electronic files. When determined to be necessary to support a design change, proposed design changes shall also require a technical analysis using an operations research model and tank utilization model to assess the impact on plant capacity, operability, and throughput. (See Standard 2, *Research, Technology, and Modeling*.) The information shall be in the form of controlled

copies updated by the Contractor. Information shall include, but not be limited to, the information described below.

Information shall contain relevant references, such as, system descriptions, process data sheets, and equipment data sheets and shall address Balance of Facility, Pretreatment, LAW Immobilization, Analytical Laboratory, and HLW Immobilization. Changes to the products shall be documented in accordance with approved engineering procedures. DOE shall be invited to attend meetings where design products are updated, revised or changed and DOE will be provided with copies of Design Change Applications.

- (1) System Descriptions: The system descriptions shall include references to all design documents (process flow diagrams, piping and instrumentation diagrams, engineering calculations, process data sheets, R&T development work and test reports, material handling diagrams, mechanical flow diagrams, design proposal drawings, etc.) associated with the applicable systems.
- (2) Process Data Sheets (Equipment): Provide unrestricted access to a complete file that includes every piece of equipment as an electronic sortable file of all process data sheets with all available information including: the equipment identification number; equipment name and description; the piping and instrument diagrams where the equipment is shown; capacity and operation parameters and materials of construction.
- (3) Process Data Sheets (Instrument Database): Provide unrestricted access to a complete file that includes every instrument as an electronic sortable file of all instrumentation process data sheets, with all available information, including:
 - (i) The instrument identification number;
 - (ii) The instrument name and/or description;
 - (iii) The piping and instrument diagrams where the instrument is shown; and
 - (iv) The associated R&T test plan results and references to the applicable test plans tied to design decisions via the design requirements documents.
- (4) Calculations for Equipment Sizing: The calculation and technical basis for the capacity of major vessels, equipment and piping shall be provided. The basis shall include, as applicable, sample analysis turnaround times and address reliability, availability, maintainability, and inspectability.
- (5) General Arrangement Drawings: General arrangement drawings for the WTP (e.g., Balance of Facility, Pretreatment, LAW Conditioning, Analytical Laboratory, HLW Vitrification and LAW Vitrification). The general arrangement drawings shall identify plan and elevation views of the facilities in sufficient detail to understand facility layout and the preliminary layout of major equipment components.
- (6) Equipment Item List:
 - (i) The equipment list must be provided in an electronically sortable format with all records and fields shown.
- (7) 3-Dimensional Design Model (3-D Model): The Contractor shall provide access to all files of the 3-Dimensional Design Model (3-D Model). Access is required to support DOE awareness of current and contemplated changes to the design layout and assess proposed changes to the WTP and associated processes.

- (8) Process Flow Diagrams and Material Balances: The Contractor shall prepare process flow diagrams for the Pretreatment Plant, HLW Vitrification Plant, and LAW Vitrification Plant. The process flow diagrams shall identify all main process equipment including in-cell equipment and supporting equipment for cold chemical makeup. Identification shall include names, functions, capacities, identification numbers, and include material balance line identifiers in the process flow lines using the numbers traceable to the material balance deliverable. Supporting documentation shall specify the capacity and duty of the equipment systems, the process scheme and sequence description and operating conditions.
- (9) Material Balance: See Standard 2, *Research, Technology, and Modeling*.
- (10) Piping and Instrument Diagrams: The Contractor shall prepare the piping and instrument diagrams for the Pretreatment, HLW Vitrification, Analytical Laboratory, and LAW Vitrification and balance of all other facilities and systems in the WTP. The piping and instrument diagrams shall identify all process and support equipment, instrument requirements, and pipe sizes and line numbers. Simplified control system information shall be presented on piping and instrument diagrams.
- (11) Instrument and Control Documents: The Contractor shall prepare the instrument and control documents for the Pretreatment, HLW Vitrification, Analytical Laboratory, and LAW Vitrification and balance of all other facilities and systems in the WTP. These design documents shall include control system specifications, data sheets, software design specifications and instrument databases. This design shall include features to address process safety and process control for product quality.
- (12) Electrical Diagrams: The Contractor shall prepare electrical one-line diagrams for all process and facility systems. Electrical loads and systems, and the basis to support specification of the electrical systems shall be identified.
- (13) Equipment Design/Equipment Arrangement Diagrams: The Contractor shall prepare the design of all process and mechanical handling equipment for the Pretreatment, HLW Vitrification, Analytical Laboratory, Balance of Facilities, and LAW Vitrification facilities. Equipment design data sheets shall be completed for all process equipment components. Equipment general arrangement drawings shall specify plan and elevation views.
- (14) Equipment Arrangement and Piping Diagrams: The Contractor shall perform all physical design in the 3D model for the Pretreatment, HLW Vitrification, Analytical Laboratory, and LAW Vitrification facilities.
- (15) Facility Ventilation System Design: The Contractor shall prepare the ventilation flow diagrams and heating, ventilation, and air conditioning system design for the Pretreatment, HLW Vitrification, LAW Vitrification, Analytical Laboratory, and balance of plant facilities. The diagrams shall identify the individual systems, all equipment components, and flows in the facilities. Sample locations and methods shall be specified. Equipment to provide motive force and ventilation control shall be identified.
- (16) Facility Civil, Structural, and Architectural Design: The Contractor shall prepare the civil, structural and architectural designs of the Balance of Facility, Pretreatment, HLW Vitrification, Analytical Laboratory, and LAW Vitrification facilities. The building sizes, location and requirements of load-bearing, shielding and internal walls shall be identified. Major penetrations in walls and floors shall

be identified. All crane structures, filter housings, and facility mechanical systems shall be identified. Seismic analysis for the facilities for Pretreatment, HLW Vitrification, LAW Vitrification, and support facilities shall be completed in accordance with DOE and Ecology requirements to support structural analysis, definition of the facility, the Limited Work Authorization Request, and Construction Authorization Request.

- (17) Mechanical Flow Diagrams: The Contractor shall prepare mechanical handling diagrams for the Pretreatment, HLW Vitrification, LAW Vitrification, Analytical Laboratory, and balance of plant facilities. The diagrams shall be prepared with sufficient detail to support the hazards analysis review and the operations research model. The diagrams shall identify mechanical equipment and each step and sequence of the operation.
- (18) Analytical Laboratory Facility Design: The Contractor shall further develop and provide the sampling and analysis requirements to support process control, environmental compliance and waste form qualification for DOE concurrence (Table C.5-1.1, Deliverable 3.6). The information shall include sample locations, sample purpose, analysis requirements and frequency and turnaround times. Results of the assessment of process tank capacities and process operations will be used to verify and establish the specification and design of the Analytical Laboratory to support the WTP.

Reserve capacity in the Analytical Laboratory shall be utilized for "limited technology testing". Limited technology testing includes investigation of WTP operational anomalies or process upsets, process improvements, analytical methods optimization, and qualification of new instruments .

The Contractor shall identify samples from WTP operations, that will be analyzed at non-WTP Analytical facilities. The definitions of the out-sourced samples shall include sample type and analyses required. The identification of the out-sourced samples is to be included in the Sampling and Analyses Plan used to support the requirements definition for the Analytical Laboratory.

The Analytical Laboratory Facility design shall incorporate features and capability necessary to ensure efficient WTP operations and meet all permitting, process control, authorization basis and waste form qualification requirements. The design should be validated with information from tank utilization modeling of the process tankage, and operational research modeling of the treatment process, as appropriate.

- (19) Site Layout Drawings: The Contractor shall complete all site layout drawings, which shall include the exterior arrangement of all facilities and structures on the site in relation to one another, and their exterior interface points with all piping and electrical systems. The drawings shall identify all above-grade and below-grade structures, piping, and electrical systems. The drawings will reflect requirements during the construction and operations activities. Site drawings and documents shall be updated and provided to DOE for review and concurrence (Table C.5-1.1, Deliverable 3.7).
- (20) Other Applicable Design Products Including:
- (i) Ventilation and instrumentation diagrams;
 - (ii) Instrument schedules;
 - (iii) Electrical single line diagrams;
 - (iv) Electrical load schedules;

- (v) Mechanical flow diagrams;
 - (vi) Material handling diagrams; and
 - (vii) Design proposal drawings (equipment procurement drawings).
- (21) Oxidative Leaching: The Contractor shall complete the necessary design products, including process flowsheets, material balances and equipment designs to implement the recommended process for the oxidative leaching of HLW sludge and entrained solids.
- (d) Waste Treatment and Immobilization Plant Optimization Study: The Contractor shall prepare for DOE review and concurrence (Table C.5-1.1, Deliverable 3.8) a proposed set of optimization studies that improve life-cycle performance, cost, and schedule of the WTP, including process design (such as, improved radiochemical separations), facility design (such as, improved space utilization), and technologies (such as, second generation treatment and immobilization technologies that are ready for demonstration and application), and affect the Contract requirements. Optimization studies that do not affect the contract requirements are the Contractor's responsibility and are separate from this activity. The Contractor shall seek input from DOE and the Tank Farm Contractor in developing the list of proposed studies. DOE and the Contractor shall jointly agree upon which studies shall be performed. All optimization studies shall address the following:
- (1) Description of item, process, system, or facility to be optimized and the basis for such optimization;
 - (2) Description of the research and technology program elements that are required to validate the required performance prior to incorporating the change into the baseline;
 - (3) Description of the design changes that are required to incorporate the change into the baseline;
 - (4) Effects of the proposed optimization on the tank farm operator authorization basis and the authorization basis interfaces between the WTP and the Tank Farm Contractor;
 - (5) Affects on WTP cost, schedule, plant capacity, and waste loading;
 - (6) Near-term impacts for Tank Farm Contractor;
 - (7) Estimated life cycle cost impacts to ORP;
 - (8) An evaluation of potential impacts on long-term interfaces with the Tank Farm Contractor;
 - (9) Technical risks eliminated, changed, or amplified by the proposed change;
 - (10) Regulatory issues, eliminated, changed, or amplified by the proposed change;
 - (11) Potential changes in secondary waste and on returnable material volume and type; and
 - (12) An evaluation of the potential changes in energy needs and other ORP supplies material quantity.

The Contractor shall involve all affected parties to ensure a balanced and complete picture. DOE will evaluate the studies and consider changes to the Contract requirements if they are found to be in the best interest of the Government.

- (e) U.S. Department of Energy Participation in Design Process: DOE staff and other Hanford Site Contractor staff identified by DOE, shall be invited to participate in all Design Overview activities. Design overview activities include any meeting that discusses significant issues associated with the establishment, development and/or progress of the technical requirements for the design. A multi-disciplined design overview shall be scheduled, conducted and documented bi-monthly through December 2003. Thereafter, design reviews and multi-disciplined topical overviews will be conducted on an as needed basis. The Contractor shall develop a list of systems and items for DOE review and concurrence at least 30 days in advance of the design overview. In order to improve communications, the Contractor shall provide dedicated office space in the Contractor's design facility for five DOE staff.

Standard 4: Construction, Procurement, and Acceptance Testing

The purpose of this Standard is to describe additional requirements for Construction, Procurement, and Acceptance Testing. In the context of this Standard, the terms “acceptance testing” and “acceptance” refer to the Contractor’s testing and acceptance of systems, components, equipment, etc., as needed for mechanical completion of the WTP. Acceptance does not refer to DOE acceptance of the WTP from the Contractor; DOE acceptance of the WTP will not occur until “Completion of Hot Commissioning”.

- (a) Construction, Procurement, and Acceptance Testing Plan: The Contractor shall prepare and submit a Construction, Procurement, and Acceptance Testing Plan for DOE concurrence (Table C.5-1.1, Deliverable 4.1) and update the Plan as required after initial submission. The Plan shall include:
 - (1) Description of procurement, construction bid, and work packages;
 - (2) Construction management and force account construction;
 - (3) Construction site management;
 - (4) Acceptance testing; and
 - (5) Descriptive linkage to the Project Execution Plan described in Standard 1 and the Environment, Safety, Quality, and Health program described in Standard 7.
- (b) Procurement:
 - (1) The Contractor shall procure all required material and equipment, including: prepare bid packages and solicitations; evaluate, award, and manage subcontracts; accept subcontractor materials and equipment; and verify subcontractor acceptance tests.
 - (2) The Contractor shall submit a Purchasing System for DOE approval in accordance with Section I Clause entitled, *Subcontracts* (Table C.5-1.1, Deliverable 4.2 Purchasing System).
- (c) Construction Bid and Work Packages: The Contractor shall prepare bid and work packages; solicit, evaluate, award, and manage subcontracts; accept subcontractor construction; and verify subcontractor acceptance tests (Table C.5-1.1, Deliverable 4.3).
- (d) Construction Management and Force Account Construction: The Contractor shall manage or perform all: supervision; required construction; furnish labor, equipment, and materials, management, and supervise construction and acceptance testing; and provide required systems and support for environmental protection, safety, quality, labor relations, and security.
- (e) Construction Site Management: The Contractor shall manage the construction site and provide all required construction support services, construction site security, industrial hygiene, and temporary and permanent construction facilities.
- (f) Construction and Acceptance Testing:
 - (1) The Contractor shall maintain an adequate construction inspection system and acceptance testing system, and perform such inspections and testing, as well as ensure that the work performed under the Contract conforms to Contract requirements. The Contractor shall maintain complete inspection and testing records and make them available to DOE. The Contractor shall develop and

submit an integrated Construction and Acceptance Testing Program to DOE for concurrence (Table C.5-1.1, Deliverable 4.4) that includes the following elements:

- (i) Checking and approval of all vendor's shop drawings to assure conformity with the approved design and working drawings and specifications;
 - (ii) Acceptance test plans and procedures for on-site Contractor/subcontractor inspection of construction workmanship, compliance with design drawings and specifications, management of the design construction changes, and criteria for acceptance of fabricated and constructed items;
 - (iii) Identification and description of Contractor and vendor components to be tested and accepted including the identification of component, systems, and integrated facility testing;
 - (iv) Inspection of construction to assure adherence to approved working drawings and specifications;
 - (v) Identification of Contractor proposed and DOE specified construction witness or hold points;
 - (vi) Methods to complete field and laboratory tests to verify construction workmanship and materials, and equipment, and approved working drawings and specifications;
 - (vii) Approaches and methods to troubleshoot and correct material acceptance and construction deficiencies;
 - (viii) Preparation of partial, interim, and final estimates and reports of quantities and values of construction work performed, for payment or other purposes;
 - (ix) Approach to transition from acceptance to facility cold commissioning and hot commissioning; and
 - (x) Providing set(s) of reproducible "as-built" record drawings of the type specified by DOE and set(s) of marked-up specifications, showing construction as actually accomplished.
- (2) The Contractor shall prepare, as part of the monthly report defined in Standard 1, *Management Products and Controls* (Table C.5-1.1, Deliverable 1.7), a monthly Construction Inspection and Acceptance Status Report that will document the progress of construction and facility acceptance and include the following information:
- (i) Status on the deliverables of materials and fabricated items;
 - (ii) Estimates and reports on the quantities, value, and type of construction work completed for payment or other purposes; and
 - (iii) Status on the performance of the acceptance program and level of rework/non-conforming items received/constructed and identification of corrective actions.

- (3) During the construction and acceptance phase, the Contractor shall remain current on the process and facility as-built program. The status on the as-built program is to be reported in accordance with the process defined in the Construction, Procurement and Acceptance Testing Plan (Table C.5-1.1, Deliverable 4.1).
- (4) The Contractor shall provide all necessary labor, equipment, materials, test equipment, and other related resources for the acceptance test.
- (g) Certification for Start of Construction: The Contractor shall certify to DOE that construction has been initiated. Start of Construction is defined as the first pour of structural concrete for one of the three WTP elements, Pretreatment, LAW Vitrification, or HLW Vitrification.
- (h) U.S. Department of Energy Participation in Construction Review: The DOE staff, Tank Farm Contractor and other Hanford Site Contractor staff identified by DOE, shall be invited to participate in all overview activities (Table C.5-1.1, Deliverable 4.5 Construction Overview Meetings). Construction overview activities include any meeting that discusses significant issues associated with the establishment, development, and/or progress of the WTP construction.
- (i) Certification of Facility Acceptance Completion: The Contractor shall certify to DOE that facility acceptance has been completed. Completion of Facility Acceptance is defined when all components and systems associated with the Pretreatment, LAW Vitrification, and HLW Vitrification, have been installed, functionally tested and the facility design as-built in accordance with the Construction, Procurement, and Acceptance Testing Plan (Table C.5-1.1, Deliverable 4.1)
- (j) Construction Emergency Response Plan: The Contractor shall develop and adhere to a Construction Emergency Response Plan that is compliant with the applicable requirements of Hanford Emergency Management Plan, DOE/RL-94-02, and the operational emergency and abnormal event reporting requirements of HFID 232.1B (attachment to letter 01-OSR-0280 [CCN 021926] provided the requirements for the Construction Emergency Response Plan to be compliant with HFID 232.1B and DOE/RL-94-02, provided it meets the definition of an Administrative Facility), and the emergency and fire prevention requirements of 29 CFR 1910.38 and 29 CFR 1926.35 as required by RL/REG-2000-04 (see Section J, Attachment E(a)). (Table C.5-1.1, Deliverable 4.6)

Standard 5: Commissioning

The purpose of this Standard is to describe the requirements and deliverables to commission the WTP. Commissioning, as used in Standard 5, is defined as the work performed by testing, operations, maintenance, procedures, and training organizations to complete the requirements contained in this Standard. Commissioning of the WTP Facilities begins with the turnover of individual facility systems from construction and continues through to turnover to DOE and/or the future operations contractor. Commissioning of the WTP shall comply with DOE Order 425.1C, *Startup and Restart of Nuclear Facilities*, using a graded approach.

The process begins with simple component tests and progresses through system level tests, water runs, testing during Cold Commissioning making production runs using agreed simulant waste, and completes with Hot Commissioning using actual tank waste. Initial component tests and system tests will be performed in a planned sequence at each facility. The Contractor may chose to commission the Facilities in a sequential order or a parallel order.

- (a) Objectives: The objectives of the Commissioning period for the entire WTP are to demonstrate:
- (1) Waste treatment performance meets facility performance requirements;
 - (2) Adequate procedures for commissioning have been implemented and are consistent with system design;
 - (3) Training programs for commissioning personnel are established, documented, and implemented. The training and qualification program encompasses the required range of duties and activities;
 - (4) WTP safety and environmental compliance documentation is in place and describes the safety and environmental compliance basis of the WTP and WTP will meet environmental permitting and safety requirements.
 - (5) Program(s) are in place to confirm and periodically reconfirm the condition and operability of systems as required by the technical safety requirements.
 - (6) Processes are established to identify, evaluate, and resolve deficiencies and recommendations made by DOE oversight groups, official review teams, and audit organizations;
 - (7) Management programs are established, sufficient numbers of qualified personnel are provided, and adequate facilities and equipment are available to support those functions required for commissioning of the facilities. Commissioning activities shall continue through the Contractor's turnover to DOE and/or the operations contractor.
 - (8) Functions, assignments, responsibilities, and reporting relationships are clearly defined, understood, and effectively implemented;
 - (9) WTP systems and procedures, as affected by any facility modifications, are consistent with the description of the facility, procedures, and accident analysis included in the authorization basis; and
 - (10) Modifications to the facility have been reviewed for potential impacts on procedures, training, and qualification as required. Procedures have been revised to reflect these modifications and training has been performed, and that design documentation is complete.

- (b) Commissioning Plan: The Contractor shall prepare a detailed Commissioning Plan for DOE review and concurrence (Table C.5-1.1, Deliverable 5.1), a minimum of 12 months prior to the introduction of waste feed simulant to a processing facility. The Plan shall, at a minimum, meet the above objectives and define the WTP organization, tests, and procedures for commissioning each of the major facilities and supporting facilities.

The Commissioning Plan shall identify criteria and sequence by which systems will be released to support other systems. The Commissioning Plan shall be updated and provided to DOE for concurrence as required.

- (c) Training and Qualification of Commissioning Staff: The Contractor shall establish a commissioning organization that will:
- (1) Establish a commissioning organization and prepare a staffing analysis for the WTP that identifies the types of skills, skill level, and number of personnel needed to commission the WTP. The analysis shall include system operations, maintenance, environmental safety and health, QA/QC, and facility engineering;
 - (2) Identify training and qualification requirements for the Contractor's commissioning staff;
 - (3) Prepare training and qualification procedures, tests, and other documentation methods to conduct training;
 - (4) Prepare maintenance manuals and procedures for WTP commissioning (cold and hot), system operations, and maintenance activities;
 - (5) Establish a system and procedures to schedule and manage WTP maintenance requirements and activities;
 - (6) Conduct training and qualify staff responsible for commissioning the WTP; and
 - (7) During Cold and Hot Commissioning, the DOE may desire the Contractor to support the training of the future operations contractor's operating personnel using the Contractor's WTP training staff. If support for training is requested by DOE, the DOE shall provide the Contractor with sufficient notification of the timing and number of personnel to be trained. The Contractor shall use its best effort to fully utilize the capacity of its training staff to minimize the cost for DOE. A request for training shall be in accordance with Section I Clause *Changes*.

At the completion of any training of the future operator's staff, the Contractor shall provide training documentation to the future operations contractor. The future operations contractor is required to certify, as required, their own personnel for their assigned positions.

- (d) Commissioning Review Board: The Contractor will chair a Commissioning Review Board with DOE as a voting member. The Board will review barriers and commissioning progress, and results. The Board shall be conducted monthly with DOE participation and, as necessary, until facility turnover to DOE and/or the future operator. The Contractor shall be responsible for testing and commissioning the equipment and systems, as follows:
- (1) Demonstrate the correct functioning of systems important to safety, plant, and equipment;
 - (2) Demonstrate site emergency procedures;

- (3) Test radiation instruments;
 - (4) Sample and analyze systems;
 - (5) Validate commissioning procedures and instructions as necessary;
 - (6) Evaluate Shielding.
 - (7) Perform system environmental performance tests in concert with Cold Commissioning Performance Testing, Table C.6-5.1;
- (e) Operational Readiness Review: Operational Readiness Review (ORR) will be comprised of a hazard(s) and risk based approach with scope limited to Commissioning. Both the Contractor and DOE will conduct an ORR and will tailor the review to the scope of this Contract using DOE Order 425.1C, on a graded approach. In tailoring the application of this Order to the WTP, the scope of ORR will be limited to Commissioning and to the Authorization Basis included in the Contract. Hazard and risk based tailoring will provide the basis for the graded approach (e.g., ORR, RA, etc.) in determining commissioning readiness for each facility.

The ORR focus areas will be phased. Programs, Personnel (Training & Qualification) and Plant (Evolutions, Drills, etc) may be performed at different times. This series of smaller reviews, conducted when the focus area is ready to be assessed will be conducted prior to, or during, cold commissioning and may replace, as determined by the Contractor, a single large review prior to Hot Commissioning. Implementation of tailoring and sequencing the ORR includes:

- (1) Early identification of the scope of the ORR Team's assessment. The Team's scope of assessment will be available as far in advance as possible prior to the activities that it covers, but no later than 6 months prior to the start of the assessment; and
 - (2) The requested activities, evolutions, etc will be selected from the facility's normal sequence of commissioning. Selection will utilize the scheduled activities that are in progress during particular system(s) testing. Special ORR requests require both the DOE ORR Team and Contractor to concur.
- (f) Cold Commissioning: During the cold commissioning test period, the Contractor shall conduct necessary testing operations to verify that the WTP will perform in accordance with design specifications, using DOE approved non-radioactive simulated waste feeds that demonstrate the ability of the facility to treat tank waste. The cold commissioning test periods will also be used to train WTP Contractor staff, and demonstrate that the WTP can safely receive and treat radioactive waste feed (hot commissioning). Prior to cold commissioning, the Contractor shall have in-place necessary permits, licenses, and interfaces to support cold commissioning.
- (1) Testing Strategy: The Contractor shall provide a strategy to achieve the cold commissioning performance test objectives in the WTP Commissioning Plan. Objectives may be performed sequentially or in parallel. Representative temporary analytical facilities may be used to perform elements of these demonstrations. Additionally, where instrument procurements are allowed to be deferred (see Facility Specification, Section C.7.(a).(9)), demonstration of the analytical systems at the continuous peak throughput tests will be based upon extrapolation from the initial production rate tests. Resultant products from Cold Commissioning (Table C.5-1.1, Deliverable 5.6) shall be transferred to DOE in accordance with the Section C.9, Interface Control Documents. During the tests, the Contractor shall provide documentation of the waste form products and

secondary wastes for DOE acceptance in accordance with Specification 13, Commissioning Waste Product Inspection and Acceptance. No credit will be provided for non-conforming product, and if any out of specification product is produced during a test. Durations in Table C.6-5.1 represent consecutive days once Cold Commissioning Performance Testing has commenced. Should the Contractor choose to extend the testing period beyond the requisite 20 or 30 days (as applicable), the Contractor may choose any 20 or 30 day consecutive window within that period to report against.

- (i) Waste Form Qualification Tests: The Contractor shall complete WTP waste form qualification testing during cold commissioning to demonstrate the production of qualified non-radioactive products (ILAW and IHLW) and secondary wastes. Process unit operations, sampling and analysis (or equivalent), and process control systems shall be utilized in these qualification tests. Test results will be evaluated and documented as part of the waste form qualification reports identified in Standard 6, Product Qualification, Characterization, and Certification (Table C.5-1.1, Deliverable 5.3).
 - (ii) Design Capacity Performance Tests: During the cold commissioning tests, testing shall be conducted to demonstrate the treatment capability of the WTP as noted in Table C.6-5.1. Waste form products and secondary wastes will be produced in accordance with the qualification strategies and requirements identified in the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1) ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3) and the IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2), and meet the relevant specification and interface requirements. The results shall be provided to DOE for review and concurrence. (Table C.5-1.1, Deliverable 5.4).
- (2) Simulant Testing: Simulant testing will be used to demonstrate the normal flow of feed material, material production, and product quality. Simulant waste feeds shall be formulated for each facility such that simulant constituents shall be based upon the definition of A and D waste envelope definitions. The waste feed simulants shall be mutually developed and agreed to by both the DOE and Contractor to represent typical feed to a facility. The tolerances of composition and method of determining any significant variance, including variance consequences on facility performance, shall be mutually established prior to the start of Cold Commissioning. Cold commissioning begins with introduction of simulants into a process facility. One month prior to the date that the Contractor plans to introduce simulants into a process facility, DOE shall be notified in writing indicating the status of procedures, personnel qualification, and any remaining construction scope that requires completion before simulant introduction. The Contractor shall not proceed with introduction of simulants without DOE approval and that approval shall not be unreasonably withheld. The Contractor shall notify DOE that Cold Commissioning has commenced with the introduction of simulants into a process facility.
- (3) Commissioning Team: The Contractor may choose to commission the facilities in a sequential order or in parallel. A commissioning staff will be established as determined by the Contractor to complete commissioning.
- (4) Operating Characteristics Test: The Contractor shall determine the operating characteristics of WTP processes under routine operating conditions including: demonstration of remote and hands on maintenance activities; access to equipment; ability to install, connect, disconnect and reconnect replaceable

components and calibrations of instruments. This may be demonstrated and documented prior to commencing cold commissioning. These tests must all be complete by the end of cold commissioning. **(M047)**

- (5) Environmental Performance Test: The Contractor shall complete environmental testing as required under the Dangerous Waste Permit Application, Air Permitting Requirements, and applicable Federal, State, and local laws, regulations, and permits to demonstrate the operation of the WTP in accordance with the flowsheet design. The testing requirements shall be based upon the Environmental Performance Test Plan described in the WTP conceptual design and supporting information and as modified by the Dangerous Waste Permit Application permitting process.

The Contractor shall produce an environmental performance test report(s) after the completion of each performance test trial (Table C.5-1.1, Deliverable 5.7). The report shall, at a minimum, provide the required information identified in the Risk Assessment Work Plan, including a description of the sampling and analysis activities conducted during the testing, definition of the simulants, and assess the performance of the LAW and HLW Melter Treatment Units. The report shall also provide recommended operating conditions for the WTP.

- (6) Waste Treatment Performance Testing:

Table C.6-5.1 Cold Commissioning Performance Testing

Facility	Minimum	Expected	Goal
PT H	5 days @ average of 4.2 MTG/day and 20 days @ average of 3.2 MTG/day	5 days @ average of 5.4 MTG/day and 20 days @ average of 4.2 MTG/day	5 days @ average of 6 MTG/day and 20 days @ average of 4.8 MTG/day
PT L	5 days @ average of 64 MTG/day and 20 days @ average of 48 MTG/day	5 days @ average of 80 MTG/day and 20 days @ average of 64 MTG/day	5 days @ average of 90 MTG/day and 20 days @ average of 84 MTG/day
HLW	5 days @ average of 4.2 MTG/day and 30 days @ average of 3.2 MTG/Day	5 days @ average of 5.4 MTG/day and 30 days @ average of 4.2 MTG/Day	5 days @ average of 6 MTG/day and 30 days @ average of 4.8 MTG/day
LAW	5 days @ average of 24 MTG/day and 20 days @ average of 18 MTG/day	5 days @ average of 32 MTG/day and 20 days @ average of 24 MTG/day	5 days @ average of 36 MTG/day and 20 days @ average of 30 MTG/day

Table C.6-5.1 defines a range of facility waste treatment performance levels. Performance at the Minimum waste treatment performance level is required to satisfy Contract requirements, except as otherwise provided in paragraph (h).. The 5-day sprint runs may be embedded in any of the 20 or 30 days of productions.

- (7) Completing Cold Commissioning: Cold commissioning is considered complete, for Operational Performance Fee determination purposes, at the point in time when the performance tests for cold commissioning described in Table C.6-5.1 are complete, and at least Minimum waste treatment performance levels are demonstrated (except as otherwise provided in paragraph (h)). The Contractor shall exercise best efforts to achieve Expected and Goal waste treatment performance.

- (8) Cold Commissioning Results and Documentation: The Contractor shall provide results from cold commissioning testing to DOE for review and concurrence (Table C.5-1.1, Deliverable 5.8). The information shall be in the form of controlled copies maintained and updated by the Contractor. Information shall include, but not be limited to:
- (i) System start-up plans, work packages, and system verification reports;
 - (ii) Test plans and outputs for demonstrating and/or establishing permitting conditions; and
 - (iii) Test plans and outputs for process verification, product qualification.
- (9) Certification of Completion of Cold Commissioning: The Contractor shall certify to DOE that cold commissioning is complete and that the Contractor met the requirements contained in Standard 5(f) (Table C.5-1.1, Deliverable 5.9).
- (g) Hot Commissioning: The hot commissioning period begins immediately following facility cold commissioning, completion of an ORR, receipt of required permits, and receipt of radioactive waste. DOE approval is required for the introduction of radioactive waste into the WTP. This approval shall not be unreasonably withheld. Hot commissioning includes testing the facility using radioactive materials transferred from the tank farms. Similar to cold commissioning, hot commissioning of facilities may be performed sequentially or in parallel. PT will be tested to demonstrate the flow of radioactive feed material through the facility to produce LAW and HLW feed, which may be placed into lag storage or fed forward to support coincident LAW and/or HLW hot commissioning. Similar to cold commissioning, each processing facility will be tested individually to demonstrate that the facility performs in accordance with operational, safety, and Contract performance requirements.

Certification of Readiness for Hot Commissioning Start: The Contractor shall certify to DOE that the facility is ready to receive waste feed (Table C.5-1.1, Deliverable 5.10).

- (2) Waste Transfer Notification: For hot commissioning, the Contractor shall provide a written notice to the DOE Contracting Officer, specifying the date the Contractor requests the start of a transfer of a batch of feed, herein referred to as the waste transfer date. The written notice shall be provided to the DOE Contracting Officer at least 2 months prior to the requested waste transfer date;
- (3) Certification of Hot Commissioning Start: The Contractor shall certify to DOE that the facility hot commissioning has started (Table C.5-1.1, Deliverable 5.11). Start of hot commissioning is defined as receiving actual tank farm waste feed into one of the WTP processing facilities.
- (4) Hot Commissioning Performance Tests: The Contractor shall perform hot commissioning performance tests as defined in Table C.6-5.2 below. The plant performance tests shall be demonstrated using the plant instrumentation, and sampling and analyses systems. The results shall be provided to DOE for review and concurrence (Table C.5-1.1, Deliverable 5.12).
- (i) Hot Commissioning shall be considered completed for Cost Performance Fee purposes when the production quantities noted in Table C.6-5.2 below have been met for all Facilities and the final can or canister of vitrified waste has been processed in accordance with paragraph (vi) and/or (vii) below, regardless of whether Duration rates have been

achieved, and regardless of date of achievement.

- (ii) Hot Commissioning shall be considered completed for Schedule Performance Fee purposes when the production quantities noted in Table C.6-5.2 below have been met for all Facilities and the final can or canister of vitrified waste has been processed in accordance with paragraph (vi) and/or (vii) below, regardless of whether Duration rates have been achieved.
- (iii) Hot Commissioning shall be considered completed for Operational Performance Fee purposes when the Production quantities noted in Table C.6-5.2 below have been met for the respective Facility and the final can or canister of vitrified waste has been processed in accordance with paragraph (vi) and/or (vii) below, and the applicable Duration rates have been achieved for the respective Facility, regardless of date of achievement. Production is measured as the total production in the specified number of days of production (duration). Such completion of Hot Commissioning as provided in this paragraph (iii) shall signify commencement of the transition period for turnover to DOE and/or the future operations contractor.

Table C.6-5.2 Hot Commissioning Performance Testing

Facility	Production	Duration (Days)	
		Minimum	Expected
PT H	84 MTG Equivalent	27	20
PT L	1280 MTG Equivalent	27	20
HLW	56 canisters	56	43
LAW	188 containers	63	47

Hot Commissioning Notes:

1. Production quantities in Table C.6-5.2 are based on waste feed waste from tanks AY-102(C-106) and AP-101. If the characterization of AY-102 or AP-101 changes from the referenced revision of the "Tank Farm Contractor Operation and Utilization Plan" (TFCO&UP), or the actual feed is taken from different tanks, then the production capabilities for Table C.6-5.2 above will be re-established based on utilization of the same calculation method used in preparation of the current table. The calculation method is documented in *WTP Commissioning Methodology for Demonstrating Plant Performance*, (Table C.5.1-1 Deliverable 5.17) and the Contract will be modified to incorporate the revised Table.
2. Assumed feed characterization and wash/leach factors for above performance testing is baselined on tanks AY-102(C-106) and AP-101 as documented in HNF-SD-WM-SP-012 Rev 3A, "Tank Farm Contractor Operation and Utilization Plan (TCO&UP)" See Note 1 above.
3. Waste actually received from tanks AY-102 (C-106) and AP-101 and the resultant leachate solution is assumed to meet the definition of envelope A for the LAW fraction and envelope D for the HLW fraction as defined by Specification 7 and 8
4. Production quantities assume one campaign waste transfer from tank farm.

- (iv) HLW Pretreatment Production Measurement: The HLW Pretreatment line shall be operated in order to produce feed to the HLW that results in IHLW in compliance with Specification 1, the HLW Pretreatment line product may be accumulated in PT tanks. Measurement of volume and removal of samples for analysis will take place to demonstrate a compliant product. Alternatively, the HLW PT product may be sampled and fed in measured batches to the HLW facility to allow concurrent HLW Hot Commissioning performance testing runs. Compliance may be determined by either analysis of feed to the HLW or by IHLW product.
 - (v) LAW Pretreatment Production Measurement: The LAW Pretreatment line shall be operated to produce feed to the LAW that results in ILAW in compliance with Specification 2. The LAW Pretreatment line product may be accumulated in PT tanks to measure volume and remove samples for analysis that demonstrate a compliant product. Alternatively, the LAW PT product may be sampled and fed in measured batches to the LAW facility to allow concurrent LAW Hot Commissioning performance testing runs. Compliance may be determined by either analysis of feed to the LAW or by ILAW product.
 - (vi) Low-Activity Waste Vitrification: The LAW Vitrification Facility shall produce containers of ILAW. Each container shall be routed through the complete process and equipment system, including level measurement, sampling as required, inert fill as required, lid closure, decontamination, and placement in position for shipment.
 - (vii) High-Level Waste Vitrification: The HLW Vitrification Facility shall produce canisters of IHLW. Each canister shall be routed through the complete process and equipment system, including level measurement, sampling, lid closure, decontamination, and placement of the canister in HLW storage.
- (5) Hot Commissioning Results and Documentation: The Contractor shall provide Contractor-operated hot commissioning planning information and information resulting from hot commissioning to DOE for review and concurrence (Table C.5-1.1, Deliverable 5.14). The information shall be in the form of controlled copies updated by the Contractor, or electronic access at the Contractor's discretion. System information shall include, but not limited to:
- (i) Test plans and outputs for demonstrating and/or establishing permitting conditions (RCRA, authorization basis, air, performance test plan, etc.);
 - (ii) Test plans and outputs for process verification and product qualification, including documentation and certification, that the products meet requirements per Specification 13;
 - (iii) Updated model assessments based on hot/cold commissioning data reconciliation will demonstrate analytically that the WTP has the capability to deal with the feed compositional variations that will be provided by the Tank Farm;
 - (iv) Verify waste treatment services per Standard 6, *Product Qualification, Characterization and Certification* through implementation of the Waste Compliance Plan;
 - (v) Information sufficient to verify quantities subject to waste minimization; and

- (vi) Copies of required information sent to regulators (RCRA, air, authorization basis, etc.), and as required elsewhere in the Contract.
- (6) Certification of Completion of Hot Commissioning: The Contractor shall certify to DOE that the hot commissioning is complete and that the Contractor met the requirements contained in Standard 5 (g) (Table C.5-1.1, Deliverable 5.15).
- (h) Cold and Hot Commissioning Performance Deficiency Remedial Actions: The Contractor and the DOE agree that the Contractor shall be allowed to exercise best efforts to achieve the Minimum, Expected and goal waste treatment performance levels for each Facility. However, in the event that a significant deficiency is encountered during commissioning that degrades the performance of any Facility so significantly that the Minimum performance levels of any Facility cannot be achieved, the Contractor shall notify the DOE of the need to expend additional time and funds to correct the deficiency. The DOE must concur in the expenditure of the additional funds required to mitigate the deficiency.

It is the Contractor's responsibility within the scope of Commissioning to provide a realistic estimate of the cost and schedule for any such requisite remedial response. If the DOE does not wish to fund additional remedial expenses, the related testing is consequently accepted as completed. If both parties agree that a deficiency exists and that remedial measures are necessary then:

- (1) If the deficiency results from an inadequate and/or incomplete test procedure, the Contractor shall re-test within its scope of Commissioning until the deficiency is corrected;
- (2) If the deficiency results from a design or construction nonconformance, the Contractor shall correct the nonconformity and re-test within its scope of Commissioning;
- (3) If the cause of a deficiency cannot be determined, the Contractor shall propose a reasonable investigation program to determine the cause and, pending ORP concurrence with the investigation cost and schedule, shall implement the investigation program within its scope of Commissioning.
- (4) If the DOE does not wish to fund additional remedial expenses, the related testing is consequently accepted as completed at the Minimum level (per Table B.1C).
- (i) Scope Prior To Completion Of Final Facility Commissioning: Facilities that have completed required testing will be placed in hot standby (i.e. facility condition in which melters are maintained hot, but there is no processing) or operated only as required by the Contractor to complete testing of facilities. Only those systems required to support the commissioning program will be staffed and operated. [Example: The Laboratory will be staffed by the Contractor to support only those analyses required for commissioning] Pretreatment will be staffed by the Contractor to support required operations to complete HLW and LAW hot commissioning (e.g., evaporator operations, waste transfers, and surveillance). PT tank waste processing will be placed in standby. The first vitrification facility tested will be placed in standby and supported by a minimum surveillance staff. The second vitrification facility will be in the final stages of commissioning and will be operated by a minimal staff.
- (j) Post Commissioning Services: During hot commissioning, the Contractor shall conduct necessary activities to ensure that the facility is ready for hot operations and facility turnover. Following successful hot commissioning of either LAW Vitrification or HLW Vitrification pursuant to subparagraph (g), but prior to completion of hot commissioning of both facilities, DOE may request the Contractor to provide additional waste treatment from

the successfully commissioned facility.

- (1) Facility Standby / Waste Treatment: At the completion of commissioning, facilities will either be placed in standby by the Contractor, or extend waste treatment. Beyond the scope of work outline in subparagraph (k) below, the DOE may desire to conduct standby operations, or have the Contractor conduct further waste treatment. If DOE requests continued standby or additional waste treatment beyond that required for hot commissioning, such requests will be pursuant to the Section I Clause entitled, *Changes*.

If standby waste treatment is requested, the Contractor shall provide minimal crew to remain as required and determined by the Contractor to provide surveillance requirements and maintenance support, and to operate systems required for standby. Similarly, the DOE may desire to continue waste treatment in one or more facilities by transitioning the facilities to the operational phase. Both standby and any additional waste treatment scope of work will be evaluated jointly by DOE and Contractor pursuant to the Section I Clause entitled, *Changes*.

- (k) Completion of Contract Workscope Requirements. Following the successful completion of the hot commissioning testing as certified by the Contractor to DOE, the Contractor shall complete, at a minimum, the following activities to ensure the effective and efficient transition of the WTP facilities to the future operations contractor. The transition is complete when the Contractor has performed the following activities. Items 1, 2, 3, and 5 are deliverables and must be completed. Items 4 and 6 through 10 are level of effort tasks and will be limited to a maximum of six months after completion of hot commissioning, as provided in Standard 5(g)(4)(iii).

- (1) Submit the as-built design of the WTP process and facility;
- (2) Complete, as appropriate, the closeout of punch list items that arise from the cold and hot commissioning tests. These items can include equipment and facility modifications and repairs, operations procedure revision, replenishment of spare parts, etc.;
- (3) Resolve any waste form quality issues for the waste form products and/or secondary waste generated during cold and hot commissioning. This can include revision to the IHLW Product Compliance Plan, Secondary Wastes Compliance Plan, and/or revisions to specific operations procedures and equipment systems;
- (4) Provide support for any modifications to the environmental compliance and/or safety authorization basis documentation as a result of the information obtained in the hot commissioning testing;
- (5) Ensure documents, records, and procedures are complete and accurate and turned over to the DOE or future operations contractor, as instructed by DOE;
- (6) Respond to technical questions from the DOE or future operations contractor, as instructed by DOE;
- (7) Provide technical advice on proposed repairs and modifications to the WTP facilities;
- (8) Assure the resolution of all equipment warranty issues;
- (9) Provide support to DOE in the conduct of internal and external technical reviews and presentations; and

- (10) Assure operations, maintenance, engineering, licensing, and purchasing activities are transitioned to the DOE, or to the future operations contractor, as instructed by DOE.
- (11) Spare parts (to the extent usable by the future operator) will be transitioned to the DOE or to the operating contractor, as instructed by the DOE.

Standard 6: Product Qualification, Characterization, and Certification

The purpose of this Standard is to describe the requirements for documentation that describes the strategies for qualifying the immobilized waste products (IHLW and ILAW) and secondary wastes (solid waste, non-radioactive non-dangerous liquid effluents, radioactive dangerous liquid effluents, and air emissions).

Product qualification, characterization, and certification activities and deliverables shall be integrated with all technical, regulatory, and operability aspects of the WTP.

- (a) The Contractor shall:
- (1) Identify, quantify, and describe each immobilized waste product, and secondary waste to be produced or generated by the WTP.
 - (2) Conduct activities necessary to qualify each immobilized waste product and to provide confidence, prior to commissioning operations, that the products will conform to the specifications and requirements in this Contract.
 - (3) Conduct activities necessary during commissioning to characterize and provide a basis for certifying that the immobilized waste products, and secondary wastes conform to the specifications and requirements in this Contract.
 - (4) Issue a certification document for each filled and sealed canister that the canister meets product specifications and the basis for the certification.
 - (5) Perform all product qualification, characterization, and certification activities in accordance with the requirements of Section C.4.
- (b) The Contractor shall update the IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2), the ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3), and the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1) describing the plan for qualification, characterization, and certification of each immobilized waste product, and secondary wastes included under this Contract. These Plans shall provide the following information:
- (1) Identification, quantification, and description of each immobilized waste product, and secondary waste. The description shall include chemical and radiochemical composition, physical properties, and a comparison to Contract requirements.
 - (2) Planned methods and documentation to qualify each immobilized waste product, and secondary waste.
 - (3) Planned methods and documentation to characterize and provide a basis for certifying that each immobilized waste product, and secondary waste meets Contract requirements.
 - (4) Planned methods and documentation to comply with dangerous and hazardous waste regulations as required under law and in the Contract.
 - (5) Identification and description of documentation to be provided with each product package submitted for acceptance, and secondary waste submitted for transfer that describes the product, documents characterization activities, and provides a basis for certifying that the product or waste conforms to the Contract requirements.

- (c) The Contractor shall complete the following activities and prepare the documentation identified in Table S6-1, *Product Qualification, Characterization, and Certification Documentation*:
- (1) Update the ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3) for DOE review and concurrence.
 - (2) Update the IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2) for DOE review and concurrence that addresses the requirements of the WASRD and identified in Specification 1, *Immobilized High-Level Waste Product*, for DOE concurrence. The Contractor shall provide documentation and technical support to DOE during the concurrence process. **(M047)**
 - (3) Update the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1) for DOE review and concurrence.
 - (4) Implement the DOE-concurred upon ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3) and IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2), and the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1), including all planned qualification, certification, and characterization activities.
 - (5) Prepare qualification documentation for DOE review and comment related to ILAW, and IHLW products. Qualification documentation (Table C.5-1.1, Deliverables 6.4 IHLW Product Qualification Report and 6.6 ILAW Product Qualification Report) shall be submitted for DOE concurrence during the facility cold and hot commissioning activities. The qualification documentation shall address each requirement of each specification, and shall compile the results of testing, analyses, demonstrations, and inspections to demonstrate that each product will comply with Section C.8, *Operational Specifications*, of the Contract.
 - (6) The IHLW Product Qualification Report shall be submitted for DOE concurrence during the facility cold and hot commissioning activities. The Contractor shall provide documentation and technical support to DOE during the concurrence process.
 - (7) In accordance with Standard 7, DOE will be responsible for submitting the Contractor developed petition for exempting or excluding the IHLW product from RCRA and HWMA regulation (Table C.5-1.1, Deliverable 7.9). The Contractor shall develop the petition and support DOE in the petitioning process. If the exemption or exclusion is obtained, the Contractor shall implement the necessary procedures to provide IHLW that is exempted or excluded from RCRA and HWMA.

Table S6-1. Product Qualification, Characterization, and Certification Documentation

Item #	Deliverable Description	Reference	Status at Contract Award			
6.1	Secondary Wastes Compliance Plan	Standard 6	DOE Concurred upon final			
6.2	IHLW Product Compliance Plan	Standard 6 and Specification 1	DOE Concurred upon final			
6.3	ILAW Product Compliance Plan	Standards 2, 5, & 6 and Specifications 2 & 13	DOE Concurred upon final			
6.4	IHLW Product Qualification Report	Standard 6 and Specification 1	Preliminary IHLW Product Qualification Report			
6.5	Production Documentation for IHLW Product	Standard 6, Specification 1 and ICD 14				
6.6	ILAW Product Qualification Report	Standard 6 and Specification 2	Preliminary ILAW Product Qualification Report			
6.7	Production Documentation for ILAW Product	Standard 6, Specification 2 and ICD 15				
6.8	Compliance Report for Estimated Quantities of IHLW and ILAW Products per Envelope D Batches	Standard 6, Specification 12				
6.10	Secondary Wastes Production Documentation	Standard 6 and ICDs 3, 4, 5, 6, 7, 8, and air emissions				
6.11	Quality Assurance Provisions Document	Standard 6	DOE Approved Final Contractor to Update Within 60 Days of Contract Award			

- (8) In accordance with Standard 7, DOE will be responsible for submitting the Contractor developed petition for a new treatment standard, specific to Hanford tank waste. The Contractor shall support DOE during the petitioning process, in accordance with Standard 7 (Table C.5-1.1, Deliverable 7.10). If the petition is approved, the Contractor shall implement the necessary procedures to treat the waste in accordance with the new treatment standard.
- (9) Prepare production documentation for ILAW (Table C.5-1.1, Deliverable 6.7) and IHLW (Table C.5-1.1, Deliverable 6.5) products, and secondary wastes (Table

C.5-1.1, Deliverable 6.10). The production documentation shall verify that the testing, analyses, demonstrations, and inspections characterize each product package, canister, or liquid stream for transfer and provide a basis for certification that each product and secondary waste complies with Section C.8, *Operational Specifications*, and requirements of this Contract.

- (10) Submit to DOE all required documentation that qualifies, characterizes, quantifies and certifies each immobilized waste product, and secondary wastes conforms to Contract requirements.

Proposed ILAW glass composition ranges shall be provided to DOE for concurrence no less than 2 years before production of glasses in that range. DOE concurrence (or non) will be provided within 6 months of the proposal. The Contractor shall only produce glasses that have received DOE concurrence.

(d) Dangerous and Hazardous Waste Requirements for the Immobilized High-Level Waste Product (Specification 1):

- (1) The Contractor shall plan and perform process and product development testing, sampling and analysis, reporting, and certification necessary to: (1) characterize and designate the IHLW product for dangerous waste characteristics, dangerous waste criteria and dangerous waste sources pursuant to WAC 173-303-070 and demonstrate that the IHLW product does not exhibit any dangerous waste characteristics, WAC 173-303-090, and does not meet any dangerous waste criteria, WAC 173-303-100; (2) support the petition for exemption or exclusion of the IHLW product from RCRA and HWMA and the implementing regulations; and (3) comply with required applicable laws or regulations. The sampling, preparation and testing methods shall conform to the requirements in WAC 173-303-110.
- (2) The Contractor shall plan, develop and obtain, report, and certify the information required: (1) to demonstrate that the IHLW product does not exhibit any dangerous waste characteristics, WAC 173-303-090, and does not meet any dangerous waste criteria, WAC 173-303-100; (2) to demonstrate that the treated waste in the IHLW product is not prohibited from land disposal pursuant to WAC 173-303-140 and 40CFR268, *Land Disposal Restrictions*; (3) to petition EPA and Ecology for an exemption from RCRA and HWMA, and the implementing regulations; (4) to show that the IHLW meets the TSCA radioactive waste exemption criteria in 40CFR761.50 (b)(7)(ii); and (5) to comply with applicable laws, regulations, permits, licenses, other regulatory authorizations and approvals, and this Contract.

(e) Dangerous and Hazardous Waste Requirements for the Immobilized Low-Activity Waste Product (Specification 2):

The Contractor shall plan and perform process and product development testing, sampling, analysis, reporting, and certification necessary to:

- (1) Characterize, support, and designate the ILAW product for dangerous waste characteristics, dangerous waste criteria and dangerous waste sources pursuant to WAC 173-303-070 and demonstrate that the ILAW product does not exhibit any dangerous waste characteristics, WAC 173-303-090, and does not meet any dangerous waste criteria, WAC 173-303-100.
- (2) The Contractor shall plan, develop and obtain, report, and certify the information required to:

- (i) Demonstrate that the treated waste in the ILAW product is not prohibited from land disposal pursuant to WAC 173-303-140 and 40CFR268, *Land Disposal Restrictions*;
 - (ii) Demonstrate that the ILAW product does not exhibit any dangerous waste characteristics, WAC 173-303-090, and does not meet any dangerous waste criteria, WAC 173-303-100;
 - (iii) Show that the ILAW meets the TSCA radioactive waste exemption criteria in 40CFR761; and
 - (iv) Comply with applicable laws, regulations, permits, licenses, other regulatory authorizations and approvals, and this Contract.
- (3) Support the petition for a new treatment standard for Hanford tank waste as described in Standard 7.
- (4) Comply with required applicable laws or regulations.
- (5) The sampling preparation and testing methods shall conform to requirements in WAC 173-303-110.
- (f) The Contractor shall be responsible for characterizing the HLW and LAW Feed. The characterization may be based upon the available historical data and will use analysis of DOE-provided splits of representative samples of the waste feed to support compliance with regulatory, authorization basis and technical requirements for the WTP and as otherwise required by this Contract. The Contractor shall perform analyses of the waste feed based on the analyses and requirements in the applicable DQO.
- (g) The Contractor shall qualify and characterize the immobilized waste products, , and secondary wastes using analysis, testing, inspection, and demonstration as defined for each specification or requirement shown in Table S6-2, *Qualification and Characterization*.

Table S6-2. Qualification and Characterization

Requirement	Qualification	Product Characterization
Chemical and Radiochemical Composition	A, D, I, T	A, D, I, T
Dangerous and Hazardous Wastes	A, D, I, T	A, D, I, T
Waste Loading	A, D, T	A, D, T
Waste Form Leaching/Durability	A, T	A, T
Waste Form Stability	A, D, T	D
Free Liquids, Explosivity, Pyrophoricity, Organic Materials, and Gases	A, D, I	A, D, I
Heat Generation and Surface Temperature	A	A
Dose Rate and Criticality	A	A, I
Package and Canister Dimensions	D, I	D, I
Weight and Mass	A, D, I	D, I
Void Space and Fill Height	D	D, I
Package and Canister Materials	D, I	D, I
Package and Canister Mechanical Strength	A, D, T	D
Labeling	D, I	I
Package and Canister Handling Features	D, I	D, I
Package and Canister Closure and Sealing	D, I	D, I
Surface Contamination	D	D, I

Legend

- A = Analysis
- D = Demonstration
- I = Inspection
- T = Testing

Definition of Terms: The following terms and definitions shall apply to this Standards.

Analysis (A) — As used in the specifications, an analysis is a set of engineering or scientific calculations that demonstrate that a product meets or exceeds a specification requirement. These calculations are typically based upon available data and assumptions regarding process operating conditions or materials. Analysis is required to identify conditions or assumptions, which might limit validity, and to identify specific documentation or measurements made during production to ensure validity (waste loading, container material, process additives, process measurements, etc.). Analyses shall be conducted and documented in sufficient detail that a knowledgeable technical person can review and concur in their accuracy and validity. Evidence of peer review for accuracy for each analysis shall be provided. An analysis will be

considered to demonstrate compliance with specification requirements when: (a) approved by DOE; and (b) when the conditions for validity or assumptions are verified by independent means (e.g., process control records, raw material certifications).

Demonstration (D) — A demonstration is the proof-of-principle of a specimen, article, or process test used to verify conformance to the conditions of an analysis or product specification. Demonstrations are conducted where analysis is insufficient to provide proof-of-product acceptability or where analysis indicates the need for verification of assumptions (e.g., waste loading, explosivity, scale-up, process control). Demonstration reports shall identify: (1) the demonstration being conducted; (2) the limits of the demonstration's validity; and (3) those inspections or tests that will be conducted during operations to confirm that the demonstration results are still applicable to the product being produced. Proposed demonstrations will be submitted as part of the Compliance Plans. A demonstration will constitute verification of compliance with a specification requirement when: (1) it has been approved by DOE; and (2) when the conditions for validity or assumptions have been verified by independent means (e.g., process control records, raw material certifications) during operation.

Inspection (I) — Inspection is a non-destructive examination or measurement of a product characteristic that confirms compliance with product specifications. Inspections are conducted when product characteristics can be easily determined by direct measurement (e.g., weight, dimensions, labeling, external temperature, etc.) or where the results of the calculations leave some doubt as to satisfaction of the product requirements.

Test (T) — A test is the evaluation of a product characteristic in which representative samples are destructively examined or measured to confirm compliance with product specifications. Tests are typically conducted where product characteristics cannot be readily determined by inspections, or where an inspection by itself, does not provide adequate confirmation of compliance (e.g., chemical composition, radionuclide release rate). Upon request by DOE, the Contractor shall split and provide DOE samples obtained from or representative of the delivered products. The Contractor is responsible for defining what constitutes a statistically representative sample (e.g., based on the extent of process control achieved for that product).

Qualification — Qualification is composed of activities conducted by the Contractor to provide confidence, prior to full-scale production operations, that the planned immobilized waste products and secondary wastes will conform to the specifications in the Contract.

Characterization — Characterization is composed of activities conducted by the Contractor to provide confidence that the actual immobilized waste products and secondary wastes produced during production operations conform to the specifications and requirements in the Contract.

Certification — Certification is the endorsement or guarantee by the Contractor that an immobilized waste product or secondary waste conforms to the Contract requirements and specifications.

Validation — Validation is composed of activities conducted by the Contractor with actual wastes or with full-scale process equipment to confirm that the results of the analyses, demonstrations, inspections, and test(s) conducted by the Contractor to qualify a product or process are representative of the product and process characteristics.

Verification — Verification is composed of activities conducted by DOE to confirm that each immobilized waste product or secondary waste conforms to the Contract requirements and specifications.

Standard 7: Environment, Safety, Quality, and Health

The purpose of this Standard is to: (1) define Contractor responsibilities for conventional non-radiological worker safety and health; radiological, nuclear, and process safety; environmental protection; quality assurance; and (2) identify specific deliverables the Contractor shall submit to DOE.

Where this Contract or references contained in this Contract, makes reference to the "DOE Regulatory Unit," in place of "DOE Regulatory Unit," read "DOE" (as the regulator of radiological, nuclear, and process safety).

- (a) The primary objectives of ESQ&H are to:
 - (1) Demonstrate compliance with established requirements;
 - (2) Apply best commercial practices to provide conventional non-radiological worker safety and health protection; radiological, nuclear, and process safety, and environmental protection; and
 - (3) Implement a cost-effective program that integrates environmental protection, safety, quality and health in all Contractor activities.

Environmental protection, safety, quality, and health program activities and deliverables shall be integrated with all technical and regulatory aspects of the WTP Project.

- (b) The Contractor shall integrate safety and environmental awareness into all activities, including those of subcontractors at all levels. Work shall be accomplished in a manner that achieves high levels of quality, protects the environment, the safety and health of workers and the public, and complies with all requirements. The Contractor shall identify hazards, manage risks, identify and implement good management practices, and make continued improvements in environment, safety, quality, and health performance.
- (c) The Contractor is responsible for providing safe and healthful working conditions for employees and all other persons under the Contractor's control who work in the general vicinity of the Contractor site, including subcontractors. The Contractor shall develop and implement integrated programs for conventional non-radiological worker safety and health; radiological, nuclear, and process safety; and environmental protection. The Contractor shall implement its program, and submit the deliverables described in paragraphs (d) and (e) of this Standard.
- (d) The Contractor shall develop and implement an integrated standards-based safety management program to ensure that radiological, nuclear, and process safety requirements are defined, implemented, and maintained. The Contractor shall conduct work in accordance with the Contractor developed and DOE approved Safety Requirements Document (SRD). The SRD is the set of ESQ&H tailored requirements as referenced in Section I Clause entitled, *Laws, Regulations, and DOE Directives*.
- (e) The specific deliverables and program requirements are divided into four categories:
 - (1) non-radiological worker safety and health protection; (2) radiological, nuclear, and process safety; (3) quality assurance; and (4) environmental protection. The deliverables shall reflect the current degree of design and project maturity. The following information is provided to support development of deliverables required in each area of the ESQ&H program:
 - (1) Non-radiological Worker Safety and Health (Table C.5-1.1, Deliverable 7.0):
 - (i) The Contractor shall develop and implement an integrated standards-based safety management program. The Contractor's safety

management program shall reflect proven principles of safety management and work planning that promotes accident prevention, employee involvement, and sound hazard analysis and control.

- (ii) The Contractor's non-radiological worker safety and health program shall conform to the DOE oversight program described in RL/REG-2000-04, *Industrial Health and Safety Oversight Plan*. This plan has been superseded by 10 CFR 851, Worker Safety and Health Program, at the effective implementation date of May 15, 2007. **(M114)**
 - (iii) DOE is responsible for the conduct of worker safety and health inspection, and granting variances. **(M114)**
- (2) Radiological, Nuclear, and Process Safety (Table C.5-1.1, Deliverable 7.1):
- (i) The Contractor shall develop and implement an integrated standards-based safety management program to ensure that radiological, nuclear, and process safety requirements are defined, implemented, and maintained. Radiological, nuclear, and process safety requirements shall be adapted to the specific hazards associated with the Contractor's WTP activities.
 - (ii) The Contractor's integrated standards-based safety management program shall be developed to comply with the specific nuclear safety regulations defined in the effective rules of the 10 CFR 800 series of nuclear safety requirements and with the regulatory program established in the following four documents:
 - (A) DOE/RL-96-0003, *DOE Process for Radiological, Nuclear, and Process Safety Regulation of the RPP Waste Treatment Plant Contractor*;
 - (B) DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the RPP Waste Treatment Plant Contractor*;
 - (C) DOE/RL-96-0005, *Concept of the DOE Process for Radiological, Nuclear, and Process Safety Regulation of the RPP Waste Treatment Plant Contractor*; and
 - (D) DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor*.

Changes to the four documents will be analyzed under RL/REG-98-14, *Regulatory Unit Position on New Safety Information and Back-fits*, and, if implemented, dispositioned in accordance with the Section I Clause entitled, *Changes*.

The integrated standards-based safety management program shall integrate the appropriate planning and practices elements specified in 29 CFR 1910.119, *Occupational Safety and Health Act of 1970, Process Safety Management of Highly Hazardous Chemicals*, to the extent that highly hazardous chemicals are present in quantities covered by 29 CFR 1910.119.

- (iii) The Contractor's Integrated Safety Management Plan shall conform with both RL/REG-97-13, *Regulatory Unit Position on Contractor-Initiated Changes to the Authorization Basis*, and RL/REG-98-14, *Regulatory Unit Position on New Safety Information and Back-fits*; and accept:
 - (A) RL/REG-98-05, *Inspection Program Description for the Regulatory Oversight of the RPP-WTP Contractor*, and
 - (B) RL/REG-98-06, *Corrective Action/Enforcement Action Program Description*.

Changes to the four documents in subparagraph (e)(2)(ii) will be analyzed under RL/REG-98-14, *Regulatory Unit Position on New Safety Information and Back-fits*, and, if implemented, will be dispositioned in accordance with the Section I Clause entitled, *Changes*.

- (iv) The Contractor shall prepare and submit to DOE for review and approval, the radiological, nuclear, and process safety deliverables (Table C.5-1.1, Deliverables 7.1) defined in Table S7-1, *Radiological, Nuclear, and Process Safety Deliverables*. Each deliverable is structured around the following six activities:
 - (A) Standards Approval;
 - (B) Initial Safety Evaluation;
 - (C) Authorization for Construction and Cold Commissioning;
 - (D) Authorization for Hot Commissioning;
 - (E) Oversight Process Determination; and
 - (F) Deactivation Safety Assessment.
- (v) The Contractor shall submit a revised Standards Approval Package, excluding the Hazards Analysis Report and Safety Requirements Document, including all necessary supporting documentation, sufficiently in advance of the submission (at least 14 weeks) of the Construction Authorization Request to support DOE review and approval. The Hazards Analysis Report and Safety Requirements Document shall be submitted with the Construction Authorization Request. The required elements of the Standards Approval Package may be incrementally submitted for review.
- (vi) The Contractor shall submit the Construction Authorization Request, with the exception of the Standards Approval Package submitted in paragraph (e)(2)(v) of this *Standard*, 8 months prior to the need for approval of the Authorization to Proceed with construction, for DOE review and approval.
- (vii) Reserved.
- (viii) DOE or the Contractor may request to resolve safety or regulatory issues by means of, topical meetings. The subject and time of the meetings should be held to an agreed prearranged schedule. These meetings will be conducted in accordance with the pre-arranged protocol. DOE will establish the minimum content of the meetings. To the extent

practicable, the outcome of a meeting should result in the regulatory closure of the topic. Closure will result from approval of submitted written correspondence.

These meetings will be held in accordance with DOE RL/REG-97-04, *Policy for Openness and Openness Plan for the Office of Safety Regulation* of the RPP-WTP Contractor, and will not exceed fifteen in number.

- (ix) DOE may observe WTP design reviews (and question the presenters) as ex-officio members. These observations provide DOE with continuing information concerning the safety aspects of the evolving design and do not constitute regulatory approval of the matters discussed.
- (x) An authorization request associated with a particular regulatory action may be segmented and incrementally submitted. The prescribed time frame for DOE review of a deliverable begins with receipt of the last component of the deliverable, and may be shortened at the discretion of DOE based on the quality and content of the components. For each request, the Contractor shall demonstrate the need for the phased authorization and provide sufficient detail in the request for DOE to review the request and reach an approval decision. The Contractor shall notify DOE of the intent to submit a partial Construction Authorization Request, complete with scope and content of the proposed request, not less than 4 months prior to its submission. The Contractor shall notify DOE of the intent to submit a partial Operating Authorization Request, complete with scope and content of the proposed request, not less than 12 months prior to its submission.

The Contractor may provide the following limited authorization requests:

- (A) Limited Construction Authorization for site preparation and excavation; and
- (B) Others, as mutually agreed.

DOE will establish review guidance for these partial authorization requests in advance of the submission of the request. The review guidance will incorporate existing requirements of the contract but will be tailored to the scope of the work that the Contractor proposes to accomplish.

- (xi) DOE developed and provided review guidance for the Construction Authorization Request (RL/REG-99-05) identified in Table S7-1 and for the LCAR (RL/REG-99-17) identified in (2)(x) of this Standard.
- (xii) DOE shall develop and provide additional guidance for the preparation and review of other documents and activities identified in Table S7-1, *Radiological, Nuclear, and Process Safety Deliverables*. The format and content of guidance shall establish the approach and basis that DOE will use to review the Contractor submittals and report the results of the reviews. The Authorization for Hot Commissioning guidance shall be provided to the Contractor no less than 9 months prior to the scheduled submission of the authorization request. Guidance for Deactivation Safety Assessment shall be provided prior to cold commissioning.

- (xiii) DOE and the Contractor shall mutually ensure that the Authorization Basis (Final Safety Analysis Report (FSAR)) is modified during construction to transition to the requirements of 10CFR830 Safe Harbour methodology for the documented Safety Analysis (i.e., DOE-STD-3009, Change Notice 2 Methodology).

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Table S7-1. Radiological, Nuclear, and Process Safety Deliverables

Regulatory Action	Deliverable (Note 1 Applicable to ALL Deliverables)	References	Deliverables included in Conceptual Design and Supporting Documentation	Start of Construction	Start of Commissioning
Standards Approval	Safety Requirements Document, Note 1, Note 4	DOE/RL-96-0003	Final	Revision (Revision Note 3)	Revision
	Integrated Safety Management Plan, Note 1, Note 4	DOE/RL-96-003, 10CFR830, 29CFR1910	Final	Revision	Revision
	Hazards Analysis Report Revision (Note 3) Note 1	DOE-STD-3009-94, 29CFR1910.119	Final	Revision	Revision
	Radiation Exposure Standard for Workers Under Accident Conditions Note 1	DOE/RL-96-0006	Final		
	Quality Assurance Program Note 1	10CFR830.120	Final	Revision	Revision
Initial Safety Evaluation	Initial Safety Assessment Note 1, Note 4	DOE/RL-96-0003	Final		
Authorization for Construction and Cold Commissioning	Construction Authorization Request Note 1, Note 4	DOE/RL-96-0003	Outline	Final	N/A
	Construction Occurrence Reporting Plan Note 1, Note 4	DOE/RL-96-0003	Outline	Final	N/A
	Deactivation Plan Note 1, Note 4	DOE/RL-96-0003	Outline	Revision	Revision
Authorization for Hot Commissioning	Safety Analysis Report Note 1, Note 4	DOE/RL-96-0003, 29CFR1910.119	Initial	Preliminary	Final
	Emergency Response Plan Note 1	See Note 2	Outline	Draft	Final
	Unreviewed Safety Question Plan Note 1, Note 4	DOE/RL-96-0003	Outline	Draft	Final
	Conduct of Operations Plan Note 1	DOE/RL-96-0006, 29CFR1910	Outline	Draft	Final
	Technical Safety Requirements Note 1	DOE/RL-96-0006	Outline	Draft	Final
	Maintenance Implementation Plan Note 1	DOE/RL-96-0006, WAC246-247	Outline	Draft	Final
	Occurrence Reporting Plan Note 1	DOE/RL-96-0006, WAC246-247	Outline	Draft	Final
	Environmental Radiological Protection Program Note 1	DOE/RL-96-0006, 29CFR1910, 40CFR68	Outline	Draft	Final
Radiation Protection Program #1	DOE/RL-96-0006	Outline	Revision	Final	
Oversight Process Determination	Plan for Operational Assessment Reports Note 1, Note 4	DOE/RL-96-0003	Outline	Draft	Final
Deactivation Safety Assessment	Deactivation Safety Assessment Note 1, Note 4	DOE/RL-96-0003		Outline	Draft

(Entire Table revised M033)

- Notes:
- In addition to the deliverables listed, supplemental information for each regulatory action shall be submitted as required by DOE/RL-96-0003, *DOE Process for Radiological, Nuclear, and Process Safety Regulation of the RPP-WTP Contractor*.
 - Shall comply with requirements of 40CFR68, 40CFR355, DOE/RL-94-02, and 29CFR1910.38, and WAC 246-247 (Plan must comply with DOE/RL-94-02, but exposure standards are contained in SRD Vol. II, Section 2.1)
 - The Hazards Analysis Report and Safety Requirements Document will be submitted with the Construction Authorization Request rather than the Standards Approval Package submittal. The Hazards Analysis Report may be submitted as part of the Preliminary Safety Analysis Report.
 - The addition of DOE O 425.1C compliance, applied in a phased graded approach authorization for hot commissioning, will allow removal of redundant assessment requirements presently in the Contract and under the DOE/RL 96-0003 document.

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WTP Request for Proposal
Contract No. DE-AC27-01RV14136

Section C
Modification M134

Prior to implementation of guidance, the Contractor shall notify the Contracting Officer of any impacts that the guidance may have on cost or schedule. Proposed changes that impact cost and/or schedule will be analyzed under RL/REG-98-14, *Regulatory Unit Position on New Safety Information and Back-fits*, and if implemented, will be dispositioned in accordance with the Section I Clause entitled, *Changes*.

- (xiv) All regulatory information submitted will be handled in accordance with RL/REG-97-05, *Regulatory Unit Management Directives*, Directive 2.1, *Information Management*, and shall be made immediately available to the public by DOE, as appropriate.

(3) Quality Assurance (Table C.5-1.1, Deliverable 7.2):

The Contractor shall develop a QA Program, documented in a QA program manual(s), and supported by documentation that describes overall implementation of QA requirements. Supporting documentation shall include procedures, instructions, plans, and manuals used to implement the Contractors QA program within the Contractors scope of work. Specific requirements for process development, waste form qualification and testing are described in Standards 2 and 6. The Contractor's QA program manual(s) shall be submitted to DOE for review and approval (Table C.5-1.1, Deliverable 7.2). The Contractor shall utilize a technically defensible graded approach to develop the QA program based upon the requirements of: **(M066)**

- (i) QA for radiological, nuclear, and process safety shall be conducted in accordance with 10 CFR 830, Subpart A and DOE O 414.1C. **(M066)**
- (ii) QA for process development, waste form qualification and testing shall be conducted as described in Standards 2 and 6. QA program requirements for all HLW and ILAW work shall be covered by the approved QA program. The QA program manual(s) shall address the following requirements: **(M066)**
 - (A) The Contractor shall implement the Office of Civilian Radioactive Waste Management's, *Quality Assurance Requirements and Description Document* (QARD), DOE/RW-0333P, Revision 20, for elements of the Contractor's scope that may affect the Immobilized High-Activity Waste (IHLW) product quality, including but not limited to, waste form development, qualification, characterization, production process control, and certification of the IHLW products. **(M134)**
 - (B) The Contractor shall implement the National Consensus Standard ASME NQA-1-2000, Part I and Part II, Subpart 2.7 for elements of the Contractor's scope that may affect product quality of the Immobilized Low-Activity Waste (ILAW) product, entrained solids, and sludge washing, including, but not limited to, waste form development, qualification, characterization, production process control, certification of ILAW product, entrained solids, and sludge washing. Furthermore, all research and technology activities (other than IHLW – see (A)), shall be conducted in accordance with NQA-1. **(M066)**

- (iii) QA for permitting activities shall be conducted in accordance with all applicable laws and regulations, including RCRA, TSCA (if later directed by DOE), and WAC 173-303 QA requirements.
 - (iv) QA for facilities, projects, and secondary waste not subject to the above requirements shall be done in accordance with DOE Order 414.1C. The Contractor shall maintain its Quality Assurance program in accordance with DOE Order 414.1C. The Contractor has the option to not incorporate the elements of ANSI/ASQ Q 9001-2001, 'Quality Assurance System Requirements (for non-nuclear activities),' which is referenced in the Contractor requirements Document of DOE Order 414.1C. **(M066)**
 - (v) The Contractor may be required to use additional consensus standards in order to describe and implement a fully functional, systematic QA program for nuclear facility construction or for nuclear safety-related work. The RPP adopted the NQA-1-2000 as the primary QA reference document and the Contractor shall utilize this standard to help achieve the quality objectives of this contract, as necessary. **(M066)**
 - (vi) DOE or its designee(s) shall have access to, and the right to conduct assessments, audits, and/or surveillance of the Contractor (and its subcontractors/suppliers, at any level) activities to ensure compliance with the appropriate requirements and the Contractor's QA program, at DOE discretion.
- (4) Environmental Protection (Table C.5-1.1, Deliverable 7.3):
- (i) The Contractor shall develop and implement an integrated environmental protection program. The Contractor shall design, construct, manage, and commission the WTP to assure compliance with environmental requirements, permits, licenses, and other regulatory approvals and agreements.
 - (ii) The Contractor shall develop and implement an integrated program to provide environmental protection and compliance. The Contractor shall integrate all permitting and compliance actions with the future WTP operator.
 - (iii) The Contractor shall identify all necessary permits, licenses and other regulatory approvals and authorizations for the design, construction, commissioning and operation of the WTP, unless otherwise identified in this Contract. The Contractor shall develop the necessary permit applications, license applications, requests for other regulatory authorizations, and supporting materials and documentation in accordance with Clause H.26, *Environmental Permits*. The Contractor shall provide all technical and regulatory information and documentation and support to ensure that permits, licenses, and other regulatory authorizations and approvals are obtained in a timely manner to support the design, construction, commissioning, and operation of the WTP and other Hanford Site facilities that support the WTP.
 - (iv) The Contractor shall implement a program to track and address environmental compliance issues and implement and comply with all requirements (including, but not limited to, permitting, environmental reports, enforcement actions, consent decrees, *Hanford Federal Facility Agreement and Consent Order* milestones/reports/management

commitments, NEPA, pollution prevention, and waste minimization).

(v) The Contractor shall work with the appropriate Hanford Site contractor in providing legally and regulatory required air and liquid effluent and near facility environmental monitoring. The Contractor shall collect, compile, and/or integrate air and liquid effluent monitoring data from operations and activities under their control. The Contractor shall compare the monitoring data with regulatory and/or permit standards applicable to their activities and/or operations and provide the data and analyses to the appropriate Hanford Site contractor for use in preparing the mandatory State and Federal environmental reports for the Hanford Site in a timely manner. In addition, the Contractor shall provide appropriate environmental data for the WTP to support Hanford Site assessments and preparation of the Hanford Site Environmental Report.

(vi) The Contractor shall prepare and submit to the Contracting Officer for review and action the following environmental protection deliverables. The deliverables shall be consistent with the design and schedule for construction and commissioning the WTP. Identification of the following deliverables does not modify or affect the Contractor's responsibilities for environmental permitting, compliance, and protection identified in the Contract or as required under applicable law or regulation. The Contractor shall have the responsibility to identify and develop any necessary modifications to existing permit applications, license applications, requests for regulatory authorizations/approvals and supporting materials to support the design, construction, commissioning, and operation of the WTP.

(A) Environmental Plan (Table C.5-1.1, Deliverable 7.3): The Contractor shall develop a detailed plan that identifies the Contractor's structured approach for environmental protection, compliance, and permitting, including: (1) planned environmental permitting and compliance activities for design, construction, and commissioning the WTP; (2) detailed permitting and compliance schedule integrated and linked to the technical baseline; and (3) environmental monitoring and reporting requirements. The Contractor shall review permit applications, license applications, and other requests for regulatory authorizations/approvals, and supporting materials that are in draft form and/or were submitted to regulatory agencies and identify any modifications necessary to support the design, construction, commissioning, and operation of the WTP in the Environmental Plan.

The Environmental Plan (Table C.5-1.1, Deliverable 7.3) shall be submitted for DOE review and concurrence, and include identification of where and when DOE or other site contractor action is anticipated or required. The Plan shall be submitted within 3 months after contract award. The Plan shall be updated as significant changes to the permitting schedules warrant.

(B) Dangerous Waste Permit Application (Table C.5-1.1, Deliverable 7.5): Prepared as a chapter to the Dangerous Waste Portion of the RCRA Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Permit Number WA 7890008967.

Dangerous Waste Codes are identified in the Double-Shell Tank System Unit Permit Application (DOE/RL-88-21, October 1, 1996). The Contractor facilities shall be permitted to assure that the facility may manage and treat all waste codes applicable to the Hanford Double-Shell Tank system.

The Contractor shall develop and implement a plan for DOE review and concurrence for revising the Dangerous Waste Permit Application and obtaining the final status permit modification. The plan shall be developed in cooperation with DOE and the regulatory agencies. The Contractor shall revise the Dangerous Waste Permit Application (Table C.5-1.1, Deliverable 7.5), support the dangerous waste permitting process, and work with the regulatory agencies and DOE to obtain final status under the Dangerous Waste Regulations to support WTP construction and commissioning activities. Construction of the treatment facility may commence prior to a final status permit being issued provided the regulatory agencies agree.

- (C) Risk Assessment Work Plan (Table C.5-1.1, Deliverable 7.6): The Contractor shall implement the Risk Assessment Work Plan as agreed to with DOE and the regulatory agencies, and conduct environmental performance tests during commissioning to validate the risk assessment and demonstrate WTP performance. The Risk Assessment Work Plan shall be the documented outcome of the Contractor's negotiated agreement with regulators to demonstrate that WTP will meet required environmental performance standards for a thermal treatment facility. The Risk Assessment Work Plan (Table C.5-1.1, Deliverable 7.6) may be a supplement to the Dangerous Waste Permit Application.
- (D) Notice(s) of Construction (Table C.5-1.1, Deliverable 7.7): The Contractor shall prepare Notice(s) of Construction (NOC) for both radioactive and non-radioactive air emissions related to Contractor activities in accordance with applicable regulations. NOCs (Table C.5-1.1, Deliverable 7.7) shall be submitted for DOE concurrence no less than 150 days prior to scheduled submission to the regulators. The Contractor shall also provide draft permit modification language for the air-operating permit to the appropriate site contractor based on regulator approvals of NOC and consistent with the project schedule, Environmental Plan, and provisions of this Contract.
- (E) Prevention of Significant Deterioration Permit Application (Table C.5-1.1, Deliverable 7.8): The Contractor shall prepare a Prevention of Significant Deterioration (PSD) Permit Application for air emissions related to Contractor activities in accordance with applicable regulations. The Permit Application (Table C.5-1.1, Deliverable 7.8) shall be submitted for DOE review, comment, and concurrence no less than 150 days prior to scheduled submission to the regulators. The Contractor shall also be responsible for providing draft permit modification language to the appropriate site contractor for the air-operating permit consistent with the project schedule and provisions of this Contract.

- (F) Petitions for Exemption or Exclusion for Immobilized High-Level Waste (Table C.5-1.1, Deliverable 7.9): The Contractor shall develop a set of documents for DOE use in petitioning Ecology and EPA to exempt or exclude the IHLW from regulation under HWMA and RCRA and their implementing regulations, respectively. The petitions and supporting technical and regulatory materials shall be developed in accordance with applicable law, regulation, and permit. The Contractor shall include DOE-provided information in the petitions, and shall be responsible for establishing a schedule with DOE for when such information is needed. The Contractor shall collect and analyze characterization data and demonstration-scale treated waste product data to support the petition and compliance demonstration. The Contractor shall support DOE in the petitioning process and interactions with the regulators. The petition (Table C.5-1.1, Deliverable 7.9) shall be submitted to DOE for review and concurrence.
- (G) Petition for a New Treatment Standard for Hanford Tank Waste (Table C.5-1.1, Deliverable 7.10): The Contractor shall develop a petition for submittal to the regulatory agencies that proposes vitrification as the specified treatment technology for Hanford tank waste. The Contractor shall collect and analyze characterization data and demonstration-scale treated waste product data to support the petition and compliance demonstration. The Contractor shall support DOE in the petitioning process and interactions with the regulators. The Contractor shall obtain, report, and certify required information to DOE to demonstrate that the ILAW product is acceptable for land disposal. The petition (Table C.5-1.1, Deliverable 7.10) shall be submitted to DOE for review and concurrence.

Standard 8: Safeguards and Security

The purpose of this Standard is to describe the SAS requirements relevant to the WTP facility and operations.

- (a) The Contractor shall develop and implement an SAS Program to ensure the protection of DOE-owned material, property, and information. The Contractor shall maintain and update all relevant aspects of the SAS Program that was previously concurred upon by DOE or part of the WTP Conceptual Design and supporting documentation.
- (b) The SAS Program shall ensure the protection of DOE-owned material, property, and information.
 - (1) The scope of DOE SAS requirements includes:
 - (i) Physical protection;
 - (ii) Material control and accountability if found applicable throughout the period of the contract;
 - (iii) Protection of DOE Information and the Hanford Site access requirements; and
 - (iv) Government property protection.
 - (2) The Contractor's program shall comply with the applicable regulations, DOE Orders, and DOE-provided top-level SAS requirements stipulated in the DOE approved *Safeguards and Security Program Plan*, Revision 0, PL-W375-MG00004. The Contractor shall design the facility in a manner to provide adequate response time for the Hanford Patrol.
 - (3) The SAS deliverables shall be updated per Table S8-1 and as required to reflect known changes.

Table S8-1. Safeguards and Security Deliverables

Deliverable Description	Reference	Contract Award	Start of Construction	Start of Cold Commissioning	During Hot Commissioning
Safeguards and Security Program Plan consisting of:					
MC&A Plan	Standard 8 and DOE/RL-96-0002	Not Required ¹	NA	NA	NA
Security Plan	Standard 8 and DOE/RL-96-0002	Existing DOE approved preliminary draft	See Note 2	Annual Revision	Annual Revision
Vulnerability/Risk Assessment Data	Standard 8 and DOE/RL-96-0002	NA	Ongoing	Ongoing	Ongoing
Internal Assessment Reports	Standard 8 and DOE/RL-96-0002	NA	NA	Final	Annual
External Assessment Reports	Standard 8 and DOE/RL-96-0002	Submission of Corrective Action Plan within 30 days of receipt of external review report.			

1. Based upon material attractiveness, it was confirmed that a separate MC&A plan is not required. MC&A requirements (if any) shall be tracked in the Security Plan.
2. Submit final Security Plan for DOE approval within 45 days of receipt of DOE comments to the preliminary draft plan.
3. Provide vulnerability/risk assessment data for the HLW, LAW, Pretreatment, Laboratory, and Balance of Facilities at the 60% and 90% design stages.

C.7 FACILITY SPECIFICATION

The Facility Specification provides minimum functional requirements for the process and facility design and the waste treatment capacity requirements. Additional requirements are contained in Section C.6, *Standards*. DOE will consider changes to the Facility Specifications that improve life-cycle performance, cost, and schedule. Changes shall be proposed in accordance with requirements of Standard 1.

- (a) Functional Design Requirements: The WTP shall include three major processing elements: (1) Pretreatment; (2) LAW Vitrification; and (3) HLW Vitrification and a number of supporting balance of plant facilities (including an analytic laboratory). The WTP shall be designed to:
- (1) Have a 40 year operating life.
 - (2) Separately receive and store LAW feed (defined in Specification 7, *Low-Activity Waste Envelopes Definition*) and HLW feed (defined in Specification 8, *High-Level Wastes Envelope Definition*) in appropriately designed vessels. The DOE will provide waste transfer lines to an interface point described in ICD 19 respectively. The DOE will also provide adequate pumping motive force to transfer the waste to the WTP Receipt Vessels. The motive force agreed to by the WTP and TFC is documented in ICD's 19.
 - (3) Treat and immobilize the low activity fraction (Envelopes A, B and C) and provide the final waste products described in Specification 2, *Immobilized Low-Activity Waste Product*, for return to DOE.
 - (4) Immobilize entrained solids separated from LAW (Envelopes A, B, and C), as either HLW (Specification 1, *Immobilized High-Level Waste Product*) or LAW (Specification 2, *Immobilized Low-Activity Waste Product*).
 - (5) Treat in accordance with Specification 12, *Number of High Level Waste Canisters per Batch of Waste Envelope D*; immobilize the HLW feed and radionuclides separated from LAW feed and any HLW Entrained Solids not returned to DOE, and provide the final waste products described in Specification 1, *Immobilized High Level Waste Product*, for return to DOE.
 - (6) Disposition all secondary wastes in accordance with ICD requirements; secondary wastes are identified in Section C.9, *Interface Control Documents*.
 - (7) The Pretreatment Facility shall have the capability to return back to the Hanford Double-shell Tank Farm process streams in accordance with Specification 9, Liquids or Slurries transferred to DOE Tanks by Pipeline.
 - (8) Provide for safeguards and security of DOE owned materials, property, and information in accordance with Standard 8, *Safeguards and Security*.
 - (9) Include a Radiochemical Analytical Laboratory to support the operations of the facilities, including: process control, waste form qualification testing, environmental analyses, and limited technology testing. The capacity of the Analytical Laboratory shall be sufficiently sized and scoped to support the increased waste treatment capacity of the facilities. The technical basis to support the definition of the Analytical Laboratory facility shall be defined in the Analytical Laboratory Design Requirements (Deliverable 3.6).
 - (10) Have the ability to receive NaOH slightly contaminated with radioactive Na for use as a process chemical.

- (11) Capability to obtain samples of ILAW and IHLW glass to support process and product control needs for WTP.
 - (12) Include process and facility design features to safely and efficiently facilitate deactivation, decontamination, decommissioning, and RCRA closure of the facilities.
 - (13) Comply with applicable Federal, State and local requirements, including environmental permits and other regulatory approvals and authorizations. The WTP shall be designed and operated to ensure that exposure to the maximally exposed off site individual (non-acute) is ALARA but not more than 1.5 mrem per year and hazardous organic emissions are ALARA but not more than 0.375 tons per year from components regulated under 40 CFR 265 Subpart AA.
 - (14) Include office space sufficient for the exclusive use of eight full time DOE personnel and temporary space for ten transient DOE personnel
 - (15) Include process and facility design features that will efficiently minimize the use of services and utilities, generation of secondary wastes and waste products consistent with the constraints specified in the contract. Achievement of this requirement is demonstrated through design reviews and DOE's design oversight:
 - (i) Use of services and utilities including: ICD 1, *Raw Water*; ICD 2, *Potable Water*; ICD 11, *Electricity*;
 - (ii) Generation of secondary wastes, including: *Radioactive Solid Wastes, Dangerous Wastes, Non-Radioactive, Non-Dangerous Liquid Effluents; Radioactive, Dangerous Liquid Effluents*; and
 - (iii) Primary product volumes through improved waste loading greater than the Contract minimums: Specification 1, *Immobilized High-Level Waste Product*, and Specification 2, *Immobilized Low-Activity Waste Product*.
- (b) Waste Treatment Capacity Requirements: Waste treatment capacity requirements are specified below:

Waste treatment capacity for each major facility is defined as a product of the facility design capacity (facility nameplate design capacity) multiplied by the overall individual facility availability factor. The Contractor is to establish the facility design capacity through its engineering processes. The Contractor is to establish the facility availability factor from the Operational Research Assessments as defined in Standard 2 (b) (1) Operational Research Assessments of the Waste Treatment and Immobilization Plant.

During the design process the WTP waste treatment capacity shall be demonstrated using process modeling. The WTP waste treatment capacity will be verified through the plant testing performed during commissioning tests conducted in accordance with Standard 5, Commissioning.

The WTP waste treatment capacity requirements are specified below:

- (1) Pretreatment shall be sized to meet the following waste treatment capacity requirements:

- (i) LAW Pretreatment shall be sized to process an average 2,200 Na waste units per year; (this is equivalent to 2,277 total Na units per year assuming 3.5% non waste sodium additions). The governing unit operation as defined in the Basis of Design (Deliverable 3.3(a)) will yield at least 3400 total Na units per year. The Contractor shall notify DOE if the predicted availability drops below that required to achieve 2950 total Na units/yr or the governing unit operation drops below 3400 total Na units/yr. The contractor shall not intentionally alter the current Pretreatment design in any way that would reduce theoretical capacity below 3400 total Na units/yr without the express written consent of the government.
 - (ii) HLW Pretreatment shall be sized to vitrify waste to produce an average 480 canisters of IHLW per year.
- (2) The LAW Vitrification facility shall be designed to vitrify treated waste Envelopes A, B, and C feed in accordance with Specification 2.2.2.2, *Waste Loading* with an average waste treatment capacity of 733 Na waste units per year. Waste units for Envelopes A, B, and C feed are defined in Specification 7.2.3.
- (3) For (1) and (2) above, the waste treatment capacity is based upon units of LAW originating from waste Na. Waste Na is defined as Na from the following sources: Na from the LAW Feed Envelopes in accordance with Specification 7, *Low Activity Waste Envelopes Definition* and soluble Na from the HLW Envelope in accordance with Specification 8, *High Level Waste Envelope Definition*. In addition, the chemical Na added to wash and leach the solids within the limitations identified in Specification 12, *Number of High-Level Waste Canisters and estimated volume of ILAW glass per Batch of Waste Envelope D* is included in the definition of a Na waste unit.
- (4) The HLW Vitrification facility shall be designed to vitrify waste Envelope D feed in accordance with Specification 1.2.2.1.6, *Product Loading*. The HLW Facility waste treatment capacity shall be capable of producing an average of 480 canisters per year assuming 1.16 cubic meters of glass per canister.
- (5) Capability to receive and store 1.5 Mgal (5680 m³) of LAW feed. The design shall include the capability to receive without interruption 1.125 Mgal (4260 m³) of LAW feed while processing from the remaining capacity of 0.375 Mgal (1420 m³) of LAW feed. The tanks shall be connected to allow blending if necessary.
- (6) The Pretreatment facility shall have sufficient feed forward capability for 60 days of HLW operations, based upon the facility design capacity while capable of receiving without interruption no less than 600 m³ of HLW feed per batch. HLW feed batch receipt facilities shall be designed to allow receipt without interruption to waste feed processing.
- (7) The Pretreatment facility shall have the capability to prepare at least 81,000 gallons of transferable and blended HLW feed within a single vessel for transfer to the HLW Vitrification facility.
- (8) The Pretreatment Facility shall have the established capability to conduct sludge washing, caustic leaching, and oxidative leaching on HLW sludge and entrained solids. The Pretreatment Facility shall include the following capabilities to assure sludge washing, caustic leaching, and oxidative leaching flowsheet and treatment capacity:

- (i) Provide two ultrafiltration trains to support solid-liquid separation, sludge washing, caustic leaching, and oxidative leaching. The ultrafilter surface area for each train shall be approximately 1,500 square feet.
 - (ii) Provide the capability to mix chemical reagents used in the leaching processes, in line with ultrafiltration vessel recirculation pumps, to shorten mixing times.
 - (iii) Perform caustic leaching at 100°C to enhance leaching kinetics.
 - (iv) Include the capability to remove heels from the ultrafiltration vessels to move treated solids forward in the process and minimize recycle.
 - (v) Operate filtration at 45°C or higher to increase filter flux rates and potentially reduce caustic required in leaching.
 - (vi) Add caustic to ultrafilter permeate vessels to prevent post filtration precipitation and reduce the volume of permeate that must pass through the ultrafilters.
 - (vii) Increase the capacity of the cesium ion exchange system to a nominal 30 gallon/minute flowrate. This shall accommodate the increased waste volume resulting from caustic increases required to effectively conduct sludge washing, caustic leaching, and oxidative leaching on HLW sludge and entrained solids.
 - (viii) Provide the capability to perform caustic leaching in the ultrafiltration feed preparation vessel in addition to the ultrafiltration feed vessel.
- (c) Waste Treatment and Immobilization Plant Expandability Requirements: The Contractor shall design the WTP to ensure that the plant is designed and built with features to provide increased waste treatment capacities, or which allow for expansion to support increased treatment capabilities, as follows:
- (1) The LAW facility design shall not preclude installation of a third melter, melter power and control systems, melter feed, offgas treatment, container handling, HVAC, and other systems and components not initially installed. The capability to expand waste treatment shall be consistent with an increase from the design treatment capacity of 733 Na waste units per year to 1100 Na waste units per year.
 - (2) Pretreatment can connect to a potential new facility designed to receive and treat the Hanford Cs and Sr capsules prior to incorporation into the HLW feed for immobilization in the HLW Vitrification Facility. The scope shall be limited to the installation of process piping between an appropriately identified HLW feed preparation vessel and a location adjacent to the Pretreatment Facility where connections to a potential new facility could be easily accomplished.
 - (3) Laboratory analytic capabilities shall be included in the initial design to support an increase in LAW waste treatment capacity described in (c)(1) above.
 - (4) HLW Immobilization can connect to a potential new facility for the interim storage of IHLW canisters. Space on the facility site plan shall be provided to accommodate this additional storage capacity.
 - (5) Routing capability, prior to the pretreatment process, shall be included to allow for transfer of waste, if necessary, to a potential new facility. The routing capability shall

include the installation of piping exterior to the pretreatment building that will allow for tie-in at a later date.

- (6) Provide the capability to install future alternative solids filtering technologies in the Pretreatment facility hot cell. This capability shall be established through the addition of spare wall penetrations.
 - (7) Provide stub-outs from the Pretreatment facility South Tunnel to route HLW feed to a potential future concentration facility. The potential concentration facility may concentrate treated HLW slurry to reduce the ultrafiltration system batch cycle time and enhance HLW melter glass production rate.
 - (8) Provide a second Pretreatment facility hot cell overhead bridge crane to reduce the utilization of the primary hot cell bridge crane and support transfer in of new equipment, maintenance and replacement of equipment, and transfer of failed equipment out of the hot cell.
- (d) Waste Treatment and Immobilization Plant Unit Operation: The WTP treatment process shall include Pretreatment Unit Operations, HLW Vitrification Unit Operations, and LAW Vitrification Unit Operations.
- (1) Pretreatment Unit Operations: Pretreatment shall include the following major process functions:
 - (i) Ultra-Filtration: This operation separates solids from supernatant. Separation is required to allow subsequent immobilization of the waste fractions as IHLW and ILAW respectively.
 - (ii) Sr/TRU Removal: This operation removes ⁹⁰Sr and TRU elements to allow for production of an ILAW waste product that meets Specification 2.2.2.8, *Radionuclide Concentration Limitations*. The technology for the removal of Sr is an isotopic dilution process that uses non-radioactive Sr as the reagent. The removal of TRU is accomplished using sodium permanganate for de-complexation and adsorption of the TRU elements.
 - (iii) Cs Removal: This operation removes ¹³⁷Cs from the filtered supernatant to allow for production of an ILAW waste product that meets the Specification 2.2.2.8, *Radionuclide Concentration Limitations*. In addition, ¹³⁷Cs will be further removed, to achieve a 0.3 Ci/m³ in the ILAW product, to facilitate the maintenance concept established for the ILAW melter system. The Cs removal process shall use the elutable SuperLig® SL-644 resin (registered trademark of IBC Advanced Technologies, Inc.) or DOE approved equivalent. The Contractor shall conduct additional research on alternative resins for use in this process.
 - (iv) TC Removal: This operation removes ⁹⁹Tc (in the sodium pertechnetate form) from the filtered supernatant to allow for production of an ILAW waste product that meets the Specification 2.2.2.8, *Radionuclide Concentration Limitations*. Contractor shall not design or procure equipment relating to the Technetium Ion Exchange System. However, Contractor shall provide space within the Pretreatment Facility for such equipment should it become necessary to provide technetium removal capability in the future. Contractor shall place floor embedments and wall penetrations within the facility to ensure that the option to install the Technetium Ion Exchange System equipment is maintained. Should Tc removal be required in the future, the

Tc removal process shall use the elutable SuperLig® SL-639 resin (registered trademark of IBC Advanced Technologies, Inc.) or DOE approved equivalent. The Contractor shall not conduct additional research on alternative resins for use in this process.

- (v) Radionuclide Concentration: This operation concentrates and recycles process streams that contain the recovered radionuclides and entrained solids recovered from the Envelope A, B, and C supernatants.
 - (vi) Liquid Effluent Treatment: This operation concentrates and recycles waste processing streams resulting from the treatment of HLW and LAW Vitrification system off-gas condensates. Treated condensates will be transferred to the Effluent Treatment Facility on the Hanford Site.
 - (vii) Washing/Leaching Solids: This operation leaches and washes solids separated from the supernatant. Washing is conducted with very mild caustic. Leaching is conducted as a caustic leach in accordance with Specification 12, *Number of High-Level Waste Canisters per Batch of Waste Envelope D*, to prepare the sludge for HLW Vitrification.
- (2) High-Level Waste Vitrification Unit Operations: HLW Vitrification shall include the following major process functions:
- (i) High-Level Waste Feed Preparation: HLW melter feed will be prepared from HLW solids, concentrates from radionuclide recovery processes and glass forming chemicals. The HLW feeds will be prepared, sampled, and qualified prior to the Vitrification operation. The qualification strategy is to be developed and documented in the IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2).
 - (ii) High-Level Waste Vitrification: HLW feed shall be converted to a borosilicate glass in a ceramic lined, joule heated melter. The glass product shall meet Specification 1, *Immobilized High-Level Waste Product*.
 - (iii) High-Level Waste Melter Off-gas Treatment: Off-gas treatment system shall be designed to meet environmental permitting requirements. The primary off-gas system consists of a Submerged Bed Scrubber (SBS), Wet Electrostatic Precipitator (WESP), and High Efficiency Particle Absorber (HEPA) filter. Before exiting the facility, the off-gas is treated by a caustic scrubber, mercury adsorber, and selective catalytic oxidizer.
 - (iv) High-Level Waste Canister Closure, Decontamination, and Inspection: "The HLW canister is sealed via welding. The canister is decontaminated using a chemical etching process that uses Ce (IV) as the chemical reagent." **(M047)**
- (3) Low-Activity Waste Vitrification Unit Operations: LAW Vitrification shall include the following major process functions:
- (i) Low-Activity Waste Feed Preparation: LAW melter feed will be prepared from the pretreated supernatant and glass forming chemicals. The qualification strategy shall be developed and documented in the ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3).
 - (ii) Low-Activity Waste Vitrification: LAW feed shall be converted to a glass that meets Specification 2, *Immobilized Low-Activity Waste Product*, in a ceramic lined, joule heated melter.

- (iii) Low-Activity Waste Melter Off-gas Treatment: The off-gas treatment system shall be designed to meet environmental permitting requirements.
- (iv) Low-Activity Waste Container Closure, Decontamination, and Inspection: Container closure, decontamination, and inspection shall be conducted in accordance with Specification 2, Immobilized Low-Activity Waste Product. The ILAW Product container is sealed, decontaminated, and then the container is weighed and checked for dimensionality. The container is decontaminated using a solid carbon dioxide abrasion process. Temperature and gamma dose rate measurements will be taken on selected containers.
- (e) Plant Operator Qualification and Training Facility Design (simulator): The Contractor shall develop a "limited" full scope simulator. The simulator may be located off-site. The simulator facility will include three (3) control room replications (main control room, LAW control room, and HLW control room), along with the associated infrastructure and office to support the simulator facility operations.

The "limited" full scope simulator is defined as a training environment that closely models the process and associated equipment located in the actual control rooms. This simulator will provide an environment for understanding the process and control strategies to optimize plant performance and to provide training for situations that would not normally be experienced during normal plant operations.

- (f) Application on National Design Codes and Standards: The Contractor shall design and construct the WTP in accordance with the following national codes and standards, as applicable and consistent with the Safety Requirements Document (SRD). The Contractor shall identify and document the specific publication, year, of the applicable code or standard as it applies to each feature of the design or construction of the WTP in the appropriate design and safety basis documents.

UBC	Building Code
NFPA	Fire Protection
NEC	Electrical Code
IEEE	Code for Nuclear Electrical and Instrumentation Systems
ASME B&PVC	Code for Pressure Vessels and Piping Systems
ASME AG-1	Air Cleaning System Components
ANSI B31.3	Piping Code for Chemical Plants
ANSI N690	Design, Fabrication, and Erection of Nuclear Steel Structures
AISC	Design, Fabrication, and Erection of Steel Structures
ASCE	Seismic Analysis and Design Loadings for Nuclear Structural Concrete
ACI	Nuclear and Non-Nuclear Structural Concrete
ISA	Nuclear Instrumentation
TEMA	Heat Exchangers
(ARI) AMCA	Fans and Blowers
OSHA	Industrial Safety and Health in Construction and Operations

C.8 OPERATIONAL SPECIFICATIONS

This section provides the WTP Operational Specifications including LAW and HLW feed characteristics, intermediate waste product requirements, final waste product requirements, and waste product inspection and acceptance.

Specification 1:	Immobilized High-Level Waste Product
Specification 2:	Immobilized Low-Activity Waste Product
Specification 3:	Entrained Solids
Specification 4:	Reserved
Specification 5:	Reserved
Specification 6:	Reserved
Specification 7:	Low-Activity Waste Envelopes Definition
Specification 8:	High-Level Waste Envelope Definition
Specification 9:	Liquids or Slurries Transferred to DOE Tanks by Pipeline
Specification 10:	Reserved
Specification 11:	Reserved
Specification 12:	Number of High-Level Waste Canisters and estimated volume of ILAW glass per Batch of Waste Envelope D
Specification 13:	Waste Product Inspection and Acceptance

Specification 1: Immobilized High-Level Waste Product

1.1 Scope: This Specification defines requirements for the IHLW product, a waste product. The IHLW product is a vitrified borosilicate glass waste form for ultimate disposal in the proposed geologic repository.

1.2 Requirements:

1.2.1 References:

- 1.2.1.1 DOE. May 1998. *Civilian Radioactive Waste Management Systems Requirements Document*, Rev. 4. U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C.
- 1.2.1.2 DOE Manual 435.1-1. July 9, 1999. *Radioactive Waste Management Manual*. U.S. Department of Energy, Washington, D.C.
- 1.2.1.3 WASRD. DOE/RW-0351. Rev. 5. May 31, 2007. Waste Acceptance System Requirements Document (WASRD). U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C. **(M047) (M114)**
- 1.2.1.4 WAPS. DOE/EM-0093. Rev. 2. December 1996. *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)*. U.S. Department of Energy, Office of Environmental Management, Washington, D.C. **(M047) (M114)**
- 1.2.1.5 QARD. DOE/RW-0333P. Rev. 20, Quality Assurance Requirements and Description for the Civilian Radioactive Waste Management Program. (QARD). U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C. **(M099) (M114) (M134)**
- 1.2.1.6 40CFR268. *Land Disposal Restrictions*. Code of Federal Regulations. U.S. Environmental Protection Agency, Washington, DC.
- 1.2.1.7 WAC 173-303. *Dangerous Waste Regulations*. Washington Administrative Code, as amended.
- 1.2.1.8 HWMA. *Hazardous Waste Management Act*.
- 1.2.1.9 RCRA. *Resource Conservation and Recovery Act*.
- 1.2.1.10 IICD. DOE/RW-0511 Integrated Interface Control Document, Volume 1, Rev 3, High-Level Radioactive Waste and U.S. Department of Energy and Naval Spent Nuclear Fuel to the Civilian Radioactive Waste Management System, U.S. Department of Energy, Washington DC. **(M114)**
- 1.2.1.11 MOA. Rev. 2. February 2007 Memorandum of Agreement for Acceptance of Spent Nuclear Fuel and High-Level Nuclear Waste (MOA). between Environmental Management (EM) U.S. Department of Energy (DOE), Washington, DC. and Office of Civilian Radioactive Waste Management (DOE-RW or OCRWM), U.S. DOE, Washington, D.C. **(M114)**

1.2.2 Product Requirements:

1.2.2.1 Immobilized High-Level Waste:

1.2.2.1.1 Product and Disposal Requirements: The IHLW product shall meet the requirements established in the Waste Acceptance Product Specifications (WAPS) , and the supporting documents Waste Acceptance Systems Requirements Document (WASRD) , and Integrated Interface Control Document (IICD). The WAPS, WASRD, and IICD identify the requirements of DOE-RW for acceptance of IHLW for disposal at a federal geologic repository. A Memorandum of Agreement for Acceptance of Department of Energy Spent Nuclear Fuel and High-Level Nuclear Waste, (MOA) sets forth, specifies, and lists the programmatic protocols, technical data, specifications and requirements for producing an acceptable IHLW waste form for disposal at a federal geologic repository. The Quality Assurance Requirements and Description for the Civilian Radioactive Waste Management Program (QARD) established the minimum QA requirements for compliance with the US Department of Energy, Office of Civilian Radioactive Waste Management (DOE-RW, or OCRWM). These requirements must be met before the IHLW waste glass canisters will be accepted by the DOE Office of River Protection (ORP) for onsite interim storage and later formal acceptance by DOE-RW for final disposal. **(M047) (M114)**

1.2.2.1.2 Canister System: The reference canister system used to contain the IHLW product shall be a 4.5-meter long by 0.61-meter diameter canister system with a neck and flange design similar to that used at the West Valley Demonstration Project.

1.2.2.1.3

1. "Fill Height: Fill height shall be equivalent to at least 87% of the volume of the empty canister. The average fill height over all the canisters shall be at least 95% of the volume of the empty canister."
2. "Maximum Heat Generation Rate: The maximum heat generation rate for any single canister shall not exceed 1500 watts per canister when delivered to DOE."
3. "Surface Contamination Limitations: Removable contamination on the external surfaces of the package shall not exceed 3,670 Bq/m² for alpha and 36,700 Bq/m² for beta-gamma. **(M047)**

1.2.2.1.4 Condition at Delivery: At time of delivery to DOE, the HLW form shall stand upright without support on a flat horizontal surface and properly fit into a right-circular, cylindrical cavity (64-cm diameter and 4.51-m length).

1.2.2.1.5 Dangerous and Hazardous Waste Requirements: The WTP shall be designed, constructed, and operated so that the IHLW product does not designate as characteristic or criteria for dangerous waste or extremely hazardous waste pursuant to WAC 173-303-070, and is not restricted from land disposal pursuant to WAC 173-303-140 and 40CFR268, *Land Disposal Restrictions*.

- 1.2.2.1.6 Product Loading: Loading of non-volatile components in Envelope D, and, if directed by DOE, entrained solids after washing in accordance with Specification 12, *Number of High-Level Waste Canisters and Estimated Volume of ILAW Glass per Batch of Waste Envelope D*, shall be achieved, such that, the concentration of at least one of the waste components or waste component combinations in Table TS-1.1, *Minimum Component Limits in High-Level Waste Glass* exceeds its minimum weight percent in HLW glass as identified in Table TS-1.1 (e.g., for a high-iron waste, the waste product shall incorporate at least 12.5 weight percent iron oxide from the waste into the glass). The product loading shall not cause the limits in any other requirement of this specification to be violated. Product waste loading shall be calculated on an average basis for each batch transfer of Waste Envelope D. The waste loading may be adjusted downward if necessary to comply with Universal Treatment Standards leaching requirements.
- 1.2.3 Handling Requirements:
- 1.2.3.1 Product Handling: The canister shall have a point of connection that allows vertical upward, vertical downward, and horizontal motion while attached to a hoist and grapple.
- 1.3 Quality Assurance: A QA Program (Table C.5-1.1, Deliverable 6.11) for the IHLW form development, qualification, characterization, and certification is required and shall be consistent with DOE/RW-0333P.
- 1.4 Inspection and Acceptance: The DOE-approved IHLW Product Compliance Plan (Table C.5-1.1, Deliverable 6.2), described in Standard 6, *Product Qualification, Characterization, and Certification*, defines the content and delivery of documentation required to demonstrate compliance with the requirements of this specification. Product inspection and acceptance shall be performed in accordance with Specification 13, *Waste Product Inspection and Acceptance*, and the required IHLW QA Program. In addition to Specification 13 requirements for IHLW, the Contractor shall conform to the Contractor Certification Program as described in DOE Manual 435.1-1, Chapter II, Section M.(1).

Table TS-1.1 Minimum Component Limits in High-Level Waste Glass

Component	Weight Percent in HLW Glass
Fe ₂ O ₃	12.5
Al ₂ O ₃	11.0
Na ₂ O + K ₂ O	15.0
ZrO ₂	10.0
UO ₂	8.0
ThO ₂	4.0
CaO	7.0
MgO	5.0
BaO	4.0
CdO	3.0
NiO	3.0
PbO	1.0
TiO ₂	1.0
Bi ₂ O ₃	2.0
P ₂ O ₅	3.0
F	1.7
Al ₂ O ₃ + ZrO ₂	14.0
Al ₂ O ₃ + ZrO ₂ + Fe ₂ O ₃	21.0
MgO + CaO	8.0
Cr ₂ O ₃	0.5
SO ₃	0.5
Ag ₂ O	0.25
Rh ₂ O ₃ + Ru ₂ O ₃ + PdO	0.25
Any single waste oxide (exclusive of Si) not specifically identified in Specification 8, TS-8.1 and 8.4	0.2
Total of all other waste oxides (exclusive of Si) not specifically identified in this table.	8.0

Specification 2: Immobilized Low-Activity Waste Product

- 2.1 Scope: This Specification defines the requirements for the ILAW product, a final waste product. The ILAW product is a glass waste form for disposal on the Hanford Site.
- 2.2 Requirements:
- 2.2.1 References:
- 2.2.1.1 10CFR61. *Licensing Requirements for Land Disposal of Radioactive Waste*, Code of Federal Regulations. U.S. Nuclear Regulatory Commission, Washington, D.C.
 - 2.2.1.2 40CFR268. *Land Disposal Restrictions*. Code of Federal Regulations. U.S. Environmental Protection Agency, Washington, D.C.
 - 2.2.1.3 49CFR172.101. *Table 2 - Radionuclides*. Code of Federal Regulations. U.S. Department of Transportation, Washington, D.C.
 - 2.2.1.4 49CFR173. *Shippers-General Requirements for Shipments and Packaging*. Subpart I - *Radioactive Materials*, Code of Federal Regulations. U.S. Department of Transportation, Washington, D.C.
 - 2.2.1.5 ANSI Standard N14.5. February 5, 1998. *Radioactive Materials - Leakage Tests on Packages for Shipment*. American National Standards Institute, New York.
 - 2.2.1.6 ANSI/ANS-16.1. April 14, 1986. *Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short Term Test Procedure*. American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.
 - 2.2.1.7 ANSI/ANS-55.1. July 28, 1992. *Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants; Appendix B - Testing for Free Liquids in Solidified Matrices*. American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.
 - 2.2.1.8 ASTM B553-79. May 25, 1979. *Standard Test Method for Thermocycling of Electroplated Plastics*. American Society for Testing and Materials, Easton, Maryland.
 - 2.2.1.9 ASTM C39/C39M-01. July 2001. *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*. American Society for Testing and Materials, Easton, Maryland.
 - 2.2.1.10 ASTM C1285-02. October 2002. *Standard Test Methods for Determining Chemical Durability of Nuclear Waste Glasses: The Product Consistency Test (PCT)*. American Society for Testing and Materials, Easton, Maryland.
 - 2.2.1.11 ASTM G21-96. July 10, 1999. *Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi*. American Society for Testing and Materials, Easton, Maryland.
 - 2.2.1.12 ASTM G22-76 (R1996). November 26, 1976. *Standard Practice for Determining Resistance of Plastics to Bacteria*. American Society for Testing and Materials, Easton, Maryland.

- 2.2.1.13 DOE Manual 435.1-1. July 9, 1999. *Radioactive Waste Management Manual*. U.S. Department of Energy, Washington, D.C.
 - 2.2.1.14 NRC. January 1995. *Branch Technical Position on Concentration Averaging and Encapsulation*. Division of Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C.
 - 2.2.1.15 NRC. January 1991. *Technical Position on Waste Form*, Rev. 1, Low-Level Waste. Division Management Branch, Office of Nuclear Material Safety and Safeguards, U. S. Nuclear Regulatory Commission, Washington, D.C.
 - 2.2.1.16 NUREG/BR-0204. July 1998. *Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest*. U.S. Nuclear Regulatory Commission, Washington, D.C.
 - 2.2.1.17 SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.
 - 2.2.1.18 WA 7890008967. Rev. 2. August 1995 (as modified). *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage and Disposal of Dangerous Waste at the Hanford Facility*. Washington State Department of Ecology, Olympia, Washington.
 - 2.2.1.19 WAC. WAC 173-303. May 2000. *Dangerous Waste Regulations*, Washington Administrative Code, as amended.
 - 2.2.1.20 Vitreous State Laboratory, 1998. *Glass Formulation and Testing with TWRS LAW Simulants*, The Catholic University of America, Washington, D.C.
- 2.2.2 Product Requirements:
- 2.2.2.1 Package Description: The ILAW product shall be in the form of a package. The constituent parts of each package are a sealed stainless-steel container enclosing a poured glass waste form and an optional filler material of sand or glass. If an optional filler is used, DOE concurrence on the filler composition is required.
 - 2.2.2.2 Waste Loading: The loading of waste sodium from Envelope A in the ILAW glass shall be greater than 14 weight percent based on Na₂O. The loading of waste sodium from Envelope B in the ILAW glass shall be greater than 3.0 weight percent based on Na₂O. The loading of waste sodium from Envelope C in the ILAW glass shall be greater than 10 weight percent based on Na₂O.
 - 2.2.2.3 Size and Configuration: The package shall be a 304L stainless-steel right circular cylinder. The height of the package shall be 2.286m (90"), and the diameter shall be 1.22 m (48"). At the time of acceptance, the ILAW package shall stand without support on a flat, horizontal surface.
 - 2.2.2.4 Mass: The mass of each package shall not exceed 10,000 kilograms.
 - 2.2.2.5 Void Space: The void space in the container shall not exceed 10 percent of the total internal volume at the time of filling, excluding void space internal to the glass waste form (e.g., small bubbles in the glass). After cooling, if necessary,

the container shall be filled with suitable inert dry filler such that the void space meets the requirements of Dangerous Waste Regulation WAC 173-303-665 (12); i.e., the container shall be at least ninety (90) percent full when placed in the landfill.

2.2.2.6 Chemical Composition Documentation: The chemical composition of the waste form, filler, and package shall be identified.

2.2.2.6.1 DELETED

2.2.2.6.2 Chemical Composition During Production: The production documentation (Table C.5-1.1, Deliverable 6.7) shall provide the chemical composition of each waste form, optional filler, and package. The reported composition shall include elements (excluding oxygen) present in concentrations greater than 0.5 percent by weight and elements and compounds required to meet regulatory or Contract requirements.

2.2.2.6.3 DELETED

2.2.2.7 Radiological Composition Documentation: The radionuclide composition of the waste form shall be documented. Radionuclides shall be identified that are significant as defined in NUREG/BR-0204 and 49CFR172.101 (Table 2). Technetium-99 (⁹⁹Tc) shall be considered to be significant at concentrations greater than 0.003 Ci/m³ in the ILAW form. The inventories shall be indexed to December 31, 2002. The documentation shall be consistent with the radiological description format described in NUREG/BR-0204.

2.2.2.7.1 Radionuclide Composition Qualification: The ILAW Product Qualification Report (Table C.5-1.1, Deliverable 6.6) shall identify the estimated radionuclide concentration in the waste form.

2.2.2.7.2 Radionuclide Composition During Production: The ILAW production documentation (Table C.5-1.1, Deliverable 6.7) shall identify the radionuclide inventory in each ILAW package produced. The actual inventory indexed at the month of product transfer and the inventory indexed to December 31, 2002, shall be reported.

- 2.2.2.8 Radionuclide Concentration Limitations: The radionuclide concentration of the ILAW form shall be less than Class C limits as defined in 10CFR61.55. In addition, the average glass concentrations of ¹³⁷Cesium (¹³⁷Cs) and ⁹⁰Strontium (⁹⁰Sr) shall be limited as follows: ¹³⁷Cs < 3 Ci/m³ and ⁹⁰Sr < 20 Ci/m³. The method used to perform concentration averaging should be identified in the ILAW Product Compliance Plan.
- 2.2.2.9 Surface Dose Rate Limitations: The dose rate at any point on the external surface of the package shall not exceed 500 mRem/hr.
- 2.2.2.10 Surface Contamination Limitations: Removable contamination on the external surfaces of the package shall not exceed 367 Bq/m² for alpha and 3670 Bq/m² for beta-gamma contamination when measured using the method described in 49CFR173.443(a).
- 2.2.2.11 Labeling: Each package shall have an identification number on the shoulder and side of the package as described in the ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3). The lettering on the label shall be at least 5.0 cm high, and characters shall have a width of at least 3.5 cm. The label shall contain a unique identification (e.g., serial number), which shall be assigned to each package and the corresponding documentation. Labels and markings shall have a predicted service life of 50 years assuming that the packages are stored in a ventilated enclosure at ambient temperatures.
- 2.2.2.12 Closure and Sealing: The fully loaded package shall be closed and sealed. The closure system shall be sealed to prevent the dispersal of radioactive material during the most severe conditions encountered during normal use and handling. The closure system shall be designed to ensure that the seal remains intact for a storage period of 50 years in an ambient-temperature, ventilated enclosure.
- 2.2.2.13 External Temperature: The temperature of the accessible external surfaces of the package shall not exceed 465°F (alternating pour) or 550°F (single pour) when returned to DOE. This temperature constraint shall assume a shaded, still air environment at an ambient temperature of 38°C.
- 2.2.2.14 Free Liquids: The package shall contain no detectable free liquids as defined in ANSI/ANS-55.1 or SW-846 Method 9095.
- 2.2.2.15 Pyrophoricity or Explosivity: The package contents shall not be pyrophoric, readily capable of detonation, or readily capable of explosive decomposition or reaction (including reaction with water) at normal pressure and temperature. The waste form and any optional filler materials shall not be ignitable or reactive as defined in WAC 173-303-090(5) and WAC 173-303-090(7).
- 2.2.2.16 Explosive or Toxic Gases: The package shall not contain or be capable of generating quantities of explosive (e.g., hydrogen) or toxic gases, vapors, or fumes harmful to persons handling the waste.

2.2.2.17 Waste Form Testing:

2.2.2.17.1 DELETED

2.2.2.17.2 Product Consistency Test: The normalized mass loss of sodium, silicon, and boron shall be measured using a seven day product consistency test run at 90°C as defined in ASTM C1285-98. The test shall be conducted with a glass to water ratio of 1 gram of glass (-100 +200 mesh) per 10 milliliters of water. The normalized mass loss shall be less than 2.0 grams/m². Qualification testing shall include glass samples subjected to representative waste form cooling curves. The product consistency test shall be conducted on waste form samples that are statistically representative of the production glass.

2.2.2.17.3 Vapor Hydration Test: The glass corrosion rate shall be measured using at least a seven day vapor hydration test run at 200°C as defined in the DOE concurred upon ILAW Product Compliance Plan. The measured glass alteration rate shall be less than 50 grams/(m² day). Qualification testing shall include glass samples subjected to representative waste form cooling curves. The vapor hydration test shall be conducted on waste form samples that are representative of the production glass.

2.2.2.18 Compressive Strength: The mean compressive strength of the waste form shall be determined by testing representative non-radioactive samples. The compressive strength shall be at least 3.45E6 Pa when tested in accordance with ASTM C39/C39M-99 or an equivalent testing method.

2.2.2.19 DELETED

2.2.2.19.1 DELETED

2.2.2.19.2 DELETED

2.2.2.19.3 DELETED

2.2.2.19.4 DELETED

2.2.2.20 Dangerous Waste Limitations: The ILAW product shall be acceptable for land disposal under the State of Washington Dangerous Waste Regulations, WAC 173-303, and RCRA LDR in 40CFR268.

2.2.2.21 Compression Testing: Each fully loaded package shall be able to withstand a compression load of five times the weight of the container. Compliance with this specification shall be established by using the compression (stacking) test described in 49CFR173.465(d) or evaluated against this test by any of the methods authorized by 49CFR173.461(a). The integrity of the package shall be demonstrated by showing that the seal remains intact in accordance with Specification 2.2.2.12, *Closure and Sealing*.

2.2.2.22 Container Material Degradation: The container and handling appurtenances shall be designed to allow safe lifting and movement (in accordance with Specification 2.2.3.1) after a storage period of 50 years.

2.2.2.23 Manifesting: A shipping manifest shall be prepared for delivery with each shipment of ILAW product. Information on the manifest shall satisfy the requirements in DOE Manual 435.1-1, Chapter N, Section I.(2), and NUREG/BR-0204. Any package containing dangerous waste must be labeled and manifested in accordance with WAC 173-303-370 and the *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Wastes* (Permit No. WA 7890008967).

2.2.3 Handling Requirements:

2.2.3.1 Package Handling: The package shall be compatible with crane lifting and movement. The package shall be equipped with lifting and other handling appurtenances designed to allow safe lifting, and movement, when fully loaded. The package shall maintain its integrity during handling, and transportation.

2.3 Quality Assurance: A QA Program (Table C.5-1.1, Deliverable 7.2) for ILAW Product development, qualification, characterization, and certification is required and shall be based upon NQA-1, unless exceptions are agreed upon by the contracting parties. The QA Plan shall address the QA/quality control requirements addressed in SW-846 and WAC 173-303-806. **(M066)**

2.4 Inspection and Acceptance: The DOE-approved ILAW Product Compliance Plan (Table C.5-1.1, Deliverable 6.3), described in Standard 6, *Product Qualification, Characterization, and Certification*, defines the content and delivery of documentation required to demonstrate compliance with the requirements of this specification. Product inspection and acceptance shall be performed in accordance with Specification 13, *Waste Product Inspection and Acceptance*, and the required ILAW QA Program. In addition to Specification 13 requirements for ILAW, the Contractor shall conform to the Contractor Certification Program as described in DOE Manual 435.1-1, Chapter IV, Section J.(1).

Specification 3: Reserved

Reserved

Specification 4: Reserved

Specification 5: Reserved

Specification 6: Reserved

Specification 7: Low-Activity Waste Envelopes Definition

7.1 Scope: This Specification establishes three LAW feed envelopes, Waste Envelopes A, B, and C; and defines how a unit of LAW is determined for each LAW envelope. Each waste envelope provides the compositional limits for chemical and radioactive constituents in the waste feed to be provided to the WTP. The WTP shall be designed to treat the waste envelopes.

7.2 Requirements:

7.2.1 References:

- 7.2.1.1 HNF-SD-WM-SAR-067, Rev. 1-I. March 2000. *Tank Waste Remediation System Final Safety Analysis Report*. CH2M HILL Hanford Group, Inc., Richland, Washington.
- 7.2.1.2 HNF-SD-WM-TSR-006, Rev. 1-HE. March 2000. *Tank Waste Remediation System Technical Safety Requirements*, CH2M HILL Hanford Group, Inc., Richland, Washington.
- 7.2.1.3 OSD-T-151-00007, Rev. H-22. June 14, 2000. *Operating Specification for 241-AN, AP, AW, AY, AZ, and SY Tank Farms*. CH2M HILL Hanford Group, Inc., Richland, Washington.
- 7.2.1.4 DOE/RL-88-21, Rev. 10. December 21, 1999. *Double Shell Tank Unit Permits Application*. U.S. Department of Energy, Richland Operations Office, Richland, Washington.

7.2.2 Envelope Requirements:

7.2.2.1 Composition: This specification lists the concentration limits for the LAW Envelopes A, B, and C feed to be transferred by DOE to the Contractor for LAW services in Tables TS-7.1, *Low-Activity Waste Chemical Composition, Soluble Fraction Only*, and TS-7.2, *Low-Activity Waste Radionuclide Content, Soluble Fraction Only*. The concentration limits apply to the soluble fraction only. The Na concentration limits for the LAW feeds are identified below.

Waste Feed	Na (mole per liter)
Envelope A, B, C	4 – 10
AZ-101 and AZ-102 Supernatant	2 – 5
HLW Slurry and other HLW Liquids (Defined in Specification 8, <i>High-Level Waste Envelope Definition</i>)	0.1 – 10

The LAW feeds may contain up to 3.8 weight percent solids. Solids are defined as the product of centrifuging the LAW feed, separating and drying the solids, and removing the dissolved solids contribution. The insoluble fraction characterization will include measurements of Al, Cr, Fe, Mn, Na, P, S, Si, U, TIC, TOC, ⁶⁰Co, ⁹⁰Sr, ⁹⁹Tc, ¹³⁷Cs, ¹⁵⁴Eu, ^{239/240}Pu, ²⁴¹Am, and total alpha concentrations. Trace quantities of unspecified radionuclides, chemicals, and other impurities may be present in the waste feed.

All LAW feed (soluble and insoluble components) will meet the Tank Farm Operations specifications given in OSD-T-151-00007 (except for free hydroxide), the *Tank Waste Remediation System Final Safety Analysis Report*, and *Technical Safety Requirements*, as applicable.

The radiochemical inventory of the LAW feed at the time of delivery shall be compared to the specification limits to assess compliance. The specifications for ^{60}Co , and ^{154}Eu shall apply at the time of delivery for ILAW immobilization.

The LAW feed provided shall not contain a visible separate organic phase.

The LAW feed provided will generate gases, including hydrogen and ammonia, at a nearly constant rate and a nearly uniform composition. The Contractor is responsible for the management of changes in gas release rate and distribution resulting from their waste processing activities.

Dangerous waste codes are identified in the Double-Shell Tank System Unit Permit Application (DOE/RL-88-21, December 21, 1999). Multi-source leachate (F039) is included as a waste derived from non-specific source wastes F001 through F005.

- 7.2.2.2 **Radioactive Material Concentration:** The maximum ^{137}Cs concentration equivalent in the transferred Envelope A, Envelope B, and Envelope C wastes feeds shall not exceed 1.2 Ci/l. The maximum ^{137}Cs concentration equivalent in the liquid fraction of Tank AZ-101 and AZ-102 feeds shall not exceed 3.0 Ci/l.

7.2.3 **Units of Low-Activity Waste:** Units of LAW shall be defined as follows:

- (a) Envelope A: The quantity of Waste Envelope A containing one metric ton of waste sodium shall equal one unit.
- (b) Envelope B: The quantity of Waste Envelope B containing one metric ton of waste sodium for all tanks except AZ-102 shall be the lesser of the following number of units:
- (1) 2.8 units; or
 - (2) $\frac{X}{Y}$ units
- where X is equal to 18-weight percent sodium oxide loading in the ILAW glass and Y is equal to the achievable waste sodium oxide loading, for the particular waste feed. The waste loading limitations shall be based solely upon effects of chlorine, chromium, phosphate, and sulfate.
- (3) For AZ-102, the only criteria used will be 4.7 units. Further details regarding AZ-102 are found in Specification 2, Paragraph 2.2.2.2.
- (c) Envelope C: The quantity of Waste Envelope C containing one metric ton of waste sodium shall be the lesser of the following number of units:
- (1) 1.4 units; or
 - (2) $\frac{X}{Y}$ units

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

Table TS-7.1 Low-Activity Waste Chemical Composition, Soluble Fraction Only

Chemical Analyte	Maximum Ratio, analyte (mole) to sodium (mole)		
	Envelope A	Envelope B	Envelope C
Al	2.5E-01	2.5E-01	2.5E-01
Ba	1.0E-04	1.0E-04	1.0E-04
Ca	4.0E-02	4.0E-02	4.0E-02
Cd	4.0E-03	4.0E-03	4.0E-03
Cl	3.7E-02	8.9E-02	3.7E-02
Cr	6.9E-03	2.0E-02	6.9E-03
F	9.1E-02	2.0E-01	9.1E-02
Fe	1.0E-02	1.0E-02	1.0E-02
Hg	1.4E-05	1.4E-05	1.4E-05
K	1.8E-01	1.8E-01	1.8E-01
La	8.3E-05	8.3E-05	8.3E-05
Ni	3.0E-03	3.0E-03	3.0E-03
NO ₂	3.8E-01	3.8E-01	3.8E-01
NO ₃	8.0E-01	8.0E-01	8.0E-01
Pb	6.8E-04	6.8E-04	6.8E-04
PO ₄	3.8E-02	1.3E-01	3.8E-02
SO ₄	1.0E-02	7.0E-02	2.0E-02
TIC ¹	3.0E-01	3.0E-01	3.0E-01
TOC ²	5.0E-01	5.0E-01	5.0E-01
U	1.2E-03	1.2E-03	1.2E-03

Notes:

1. Mole of inorganic carbon atoms/mole sodium
2. Mole of organic carbon atoms/mole sodium

**Table TS-7.2 Low-Activity Waste Radionuclide Content, Soluble Fraction Only
 Maximum Ratio, radionuclide to sodium (mole)**

Radionuclide	Envelope A		Envelope B		Envelope C	
	Bq	uCi	Bq	uCi	Bq	uCi
TRU	4.80E+05	1.30E+01	4.80E+05	1.30E+01	3.00E+06	8.11E+01
¹³⁷ Cs	4.30E+09	1.16E+05	2.00E+10	5.41E+05	4.30E+09	1.16E+05
⁹⁰ Sr	4.40E+07	1.19E+03	4.40E+07	1.19E+03	8.00E+08	2.16E+04
⁹⁹ Tc	7.10E+06	1.92E+02	7.10E+06	1.92E+02	7.10E+06	1.92E+02
⁶⁰ Co	6.10E+04	1.65E+00	6.10E+04	1.65E+00	3.70E+05	1.00E+01
¹⁵⁴ Eu	6.00E+05	1.62E+01	6.00E+05	1.62E+01	4.30E+06	1.16E+02

Notes:

1. The activity limit shall apply to the feed certification date.
2. TRU is defined as: Alpha-emitting radionuclides with an atomic number greater than 92 with half-life greater than 20 years.

Some radionuclides, such as ⁹⁰Sr and ¹³⁷Cs, have daughters with relatively short half-lives. These daughters have not been listed in this table. However, they are present in concentrations associated with the normal decay chains of the radionuclides.

1Bq = 2.703 e-5 uCi

Specification 8: High-Level Waste Envelope Definition

8.1 Scope: This Specification establishes the HLW slurry composition and the unwashed solids composition (Envelope D). This waste envelope provides the compositional limits for chemical and radioactive constituents and physical properties in the waste feed to be provided to the WTP. The WTP shall be designed to treat the feed envelope.

8.2 Requirements:

8.2.1 References:

- 8.2.1.1 HNF-SD-WM-SAR-067, Rev. 1-I. March 2000. *Tank Waste Remediation System Final Safety Analysis Report*. CH2M HILL Hanford Group, Inc., Richland, Washington.
- 8.2.1.2 HNF-SD-WM-TSR-006, Rev. 1-HE. March 2000. *Tank Waste Remediation System Technical Safety Requirements*, CH2M HILL Hanford Group, Inc., Richland, Washington.
- 8.2.1.3 OSD-T-151-00007, Rev. H-22. June 14, 2000. *Operating Specification for 241-AN, AP, AW, AY, AZ, and SY Tank Farms*. CH2M HILL Hanford Group, Inc., Richland, Washington.
- 8.2.1.4 DOE/RL-88-21, Rev. 10. December 21, 1999. *Double Shell Tank Unit Permits Application*. U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- 8.2.1.5 RPP-7475, Rev. 0. December 7, 2000. *Criticality Safety Evaluation of Hanford Tank Farms Facility*, CH2M HILL Hanford Group, Inc., Richland, Washington.
- 8.2.1.6 CPS-T-149-00012, Rev A-3. March 14, 2002. *Criticality Prevention Specification - Tank Farms Operations*.

8.2.2 High-Level Waste Slurry Description and Envelope Requirements:

8.2.2.1 Composition: The HLW slurry will contain a mixture of liquids (Envelopes A, B, or C) and solids (Envelope D). The compositional range of the liquid fraction is defined in Specification 7, *Low-Activity Waste Envelopes Definition*. For liquid fractions with a sodium molarity of less than three, the liquid shall be treated as if 3 molar sodium were present for feed certification purposes. The *Radioactive Material Concentration* specification contained in Specification 7.2.2.2 does not apply to Envelope A, B, or C liquids. The composition range of the Envelope D unwashed solids is given in Tables TS-8.1, TS-8.2, TS-8.3, and TS-8.4. The feed concentration will be between 10 and 200 grams of unwashed solids/liter, except for feeds from waste Tanks AZ-101 and AZ-102, where minimum solids content does not apply.

Compositions for Envelope D unwashed solids (Tables TS-8.1, TS-8.2, TS-8.3, and TS-8.4) are defined in terms of elemental or anion concentrations and radionuclide activities per 100 grams equivalent non-volatile waste oxides. The non-volatile waste oxides include sodium oxide and silicon oxide.

The HLW feed components identified in Tables TS-8.1, TS-8.2 and TS-8.3 are waste components important to establishing the waste oxide loading in the HLW

glass. Only these components have concentration limits, which will be used to provide the basis for certification that the HLW feed is within specification limits.

The HLW feed components identified in Table TS-8.4 are also important to HLW glass production. The concentrations of these components in the waste are not expected to exceed the maximum values listed in Table TS-8.4. Information on these components will be provided to support product and process qualification but will not be used as a basis for determining if the feed meets specification requirements.

All HLW feed (soluble and insoluble components) will meet the Tank Farm Operations specifications given in OSD-T-151-00007 (except for free hydroxide), the *Tank Waste Remediation System Final Safety Analysis Report* (HNF-SD-WM-SAR-067), and *Technical Safety Requirements* (HNF-SD-WM-TSR-006, Revision 1-D) as applicable. The radiochemical inventory of the waste feed at the time of delivery shall be compared to the specification limits to assess compliance.

Trace quantities of unspecified radionuclides, chemicals, and other impurities may be present in the waste feed. Feed will be delivered by pipeline in batches. Limits apply to the total retrievable contents of waste from a feed tank. Some elements, components, and isotopes are determined by calculation and not analytic measurement.

The HLW feed provided will not contain a visible separate organic layer.

The HLW waste provided will generate gases due to radiolysis including hydrogen and ammonia at a nearly constant rate and nearly uniform composition. The Contractor is responsible for the management of changes in gas release rate and distribution resulting from their waste processing activities.

Applicable dangerous waste codes are identified in the Double-Shell Tank System Unit Permit Application (DOE/RL-88-21, December 21, 1999). Multi-source leachate (F039) is included as a waste derived from non-specific source wastes F001 through F005.

**Table TS-8.1 High-Level Waste Feed Unwashed Solids Maximum Non-Volatile Component Composition
 (grams per 100 grams non-volatile waste oxides)**

Non-Volatile Element	Maximum (grams / 100 grams waste oxides)	Non-Volatile Element	Maximum (grams / 100 grams waste oxides)
As	0.16	Pu	0.054
B	1.3	Rb	0.19
Be	0.065	Sb	0.84
Ce	0.81	Se	0.52
Co	0.45	Sr	0.52
Cs	0.58	Ta	0.03
Cu	0.48	Tc	0.26
Hg	0.1	Te	0.13
La	2.6	Tl	0.45
Li	0.14	V	0.032
Mn	6.5	W	0.24
Mo	0.65	Y	0.16
Nd	1.7	Zn	0.42
Pr	0.35		

**Table TS-8.2 High-Level Waste Feed Unwashed Solids Maximum Volatile Component Composition
 (grams per 100 grams non-volatile waste oxides)**

Volatile Components	Maximum (grams / 100 grams waste oxides)
Cl	0.33
CO ₃ ⁻²	30
NO ₂	36 (total NO ₂ /NO ₃) as NO ₃
NO ₃	
TOC	11
CN	1.6
NH ₃	1.6

Table TS-8.3 High-Level Waste Feed Unwashed Solids Maximum Radionuclide Composition (Curies per 100 grams non-volatile waste oxides)

Isotope	Maximum (Ci / 100 grams waste oxides)	Isotope	Maximum (Ci / 100 grams waste oxides)	Isotope	Maximum (Ci / 100 grams waste oxides)
³ H	6.5E-05	¹²⁹ I	2.9E-07	²³⁷ Np	7.4E-05
¹⁴ C	6.5E-06	¹³⁷ Cs	1.5E00	²³⁸ Pu	3.5E-04
⁶⁰ Co	1E-02	¹⁵² Eu	4.8E-04	²³⁹ Pu	3.1E-03
⁹⁰ Sr	1E+01	¹⁵⁴ Eu	5.2E-02	²⁴¹ Pu	2.2E-02
⁹⁹ Tc	1.5E-02			²⁴¹ Am	9.0E-02
¹²⁵ Sb	3.2E-02	²³³ U	4.5E-06 (all tanks except AY-101/C-104)(2.0E-04 for AY-101/C-104 only)	²⁴³⁺²⁴⁴ Cm	3.0E-03
¹²⁶ Sn	1.5E-04	²³⁵ U	2.5E-07		

Table TS-8.4 Additional High-Level Waste Feed Unwashed Composition for Non-Volatile Components (grams per 100 grams non-volatile waste oxides)

Non-Volatile Element	Maximum (grams / 100 grams waste oxides)	Non-Volatile Element	Maximum (grams / 100 grams waste oxides)
Ag	0.55	Ni	2.4
Al	14	P	1.7
Ba	4.5	Pb	1.1
Bi	2.8	Pd	0.13
Ca	7.1	Rh	0.13
Cd	4.5	Ru	0.35
Cr	0.68	S	0.65
F	3.5	Si	19
Fe	29	Ti	1.3
K	1.3	U	14
Mg	2.1	Zr	15
Na	19		
Th	5.0		

Specification 9: Liquids or Slurries Transferred to DOE Tanks by Pipeline

9.1 Scope: This Specification defines the requirements for the return of any feed material to the Hanford tanks.

9.2 Requirements:

9.2.1 References:

9.2.1.1 Greenburg, A.E., L.S. Clesceri, and A.D. Eaton, eds. *Standard Methods for the Examination of Water and Wastewater*. 19th edition 1995, American Public Health Association, Washington, D.C.

9.2.2 Product Requirements:

9.2.2.1 Product Composition: The elemental composition of the product shall be provided: (1) for all elements (excluding oxygen) constituting more than 0.5 weight percent of the product on a dry basis; (2) for all radionuclides present in concentrations greater than five percent of the total activity; and (3) for all elements and compounds required to meet regulatory or Contract requirements.

9.2.2.2 Composition Limits and Transport Properties: The composition and transport properties shall comply with all applicable Hanford Site tank farms waste acceptance criteria.

9.2.2.3 Criticality: The plutonium concentration in the returned material shall meet all applicable Hanford Site tank farm criteria. The isotopic concentration of the fissile materials in the returned product shall be provided to DOE prior to transfer.

9.2.2.4 Storage: A visible separate organic phase shall not develop during prolonged storage of the product materials in the Double-Shell Tank system.

9.2.2.5 Heat Generation: The Contractor shall determine and report the heat generation rate for product in the Secondary Wastes Compliance Plan (Table C.5-1.1, Deliverable 6.1).

9.2.2.6 Physical Parameters: The Contractor shall determine and report the specific gravity, viscosity, solids content, particle size distribution and particle density, pH, and temperature of the product at the time of transfer to DOE. Procedure 2540F, *Settled Solids*, from *Standard Methods for the Examination of Water and Wastewater*, or an equivalent methodology shall be used to determine the volume of solids in the liquid or slurry.

9.2.2.7 Radioactive Material Concentration: The returned intermediate product shall not contain more than 6 curies per liter equivalent of ¹³⁷Cs. The Contractor shall dilute the returned product, if necessary, to achieve this concentration limit.

9.2.2.8 Prevention of Exothermic Reaction: The returned intermediate product shall not have the potential for an exothermic reaction.

9.2.3 Handling Requirements: None

- 9.3 Inspection and Acceptance: The DOE-approved Secondary Wastes Compliance Plan, described in Standard 6, *Product Qualification, Characterization, and Certification*, defines the content and delivery documentation required to demonstrate compliance with the requirements of this specification. Product inspection and acceptance shall be performed in accordance with Specification 13, *Waste Product Inspection and Acceptance*.

Specification 10: Reserved

Specification 11: Reserved

Specification 12: Number of High-Level Waste Canisters and Estimated Volume of ILAW Glass Per Batch of Waste Envelope D

12.1 Scope: This Specification defines the procedure for determining the number of HLW canisters that will be accepted for each batch of HLW feed delivered per Specification 8, *High-Level Waste Envelope Definition*, analysis and reporting requirements for the separated HLW supernatant and, the separated entrained solids contained within the LAW feed delivered. This procedure shall be implemented by the Contractor once per HLW feed source tank.

12.2 Requirements:

12.2.1 References: None.

12.2.2 Determination of Aqueous Insoluble Fraction: For a HLW feed batch, the mass, and composition of aqueous insoluble solids present shall be determined.

12.2.2.1 Representative Sample: A representative sample of the HLW feed slurry containing at least 100 grams of solids shall be obtained. Interstitial liquids shall be displaced through a series of three washes using 0.01 M NaOH at a temperature of 25°C to 30°C followed by filtration or centrifugation. Each wash shall use a wash volume at least three times the slurry volume.

12.2.2.2 Mass and Composition of Aqueous Insoluble Solids: The mass and composition of aqueous insoluble solids present in the representative sample shall be determined in the following sequence:

- (a) The solids shall be separated from the HLW feed slurry by centrifugation at ambient temperature.
- (b) The solids shall be contacted with 0.01M NaOH solution for a minimum of eight hours at 80°C to 90°C and ambient pressure. The volume of 0.01M NaOH solution shall be at least four times the volume of the centrifuged filtered solids. The solids and water shall be gently stirred to promote dissolution of soluble components.
- (c) The solids shall be separated from the contact solution by centrifugation at a temperature of 80-90°C.
- (d) Steps (b) and (c) shall be repeated two more times for a total of three contacts.
- (e) The solids remaining after the three batch contacts with 0.01M NaOH solution shall be analyzed to determine the mass of aqueous insoluble solids and the concentration of elements and radionuclides identified in Specification 8, *High-Level Waste Envelope Definition*.
- (f) The above tests shall not be conducted under saturated conditions for sodium, phosphate, and sulfate.
- (g) For aqueous washing, not more than four grams of sodium per kilogram of insoluble solids received in the HLW slurry shall be added without approval from DOE.
- (h) Prior to the use of alternate methods or reagents, the Contractor shall obtain DOE concurrence.

12.2.3 Determination of Caustic Insoluble Fraction: The mass and composition of caustic insoluble solids present shall be determined for each HLW feed batch.

12.2.3.1 Representative Sample: A representative sample of the HLW feed slurry containing at least 100 grams of solids shall be obtained. Interstitial liquids shall be displaced through a series of three washes using 0.01 M NaOH at a temperature of 25°C to 30°C followed by filtration or centrifugation. Each wash shall use a wash volume at least three times the slurry volume.

12.2.3.2 Mass and Composition of Caustic Insoluble Solids: The mass and composition of caustic insoluble solids present in the representative sample shall be determined in the following sequence:

- (a) The solids shall be separated from the HLW feed slurry by centrifugation at ambient temperature.
- (b) The solids shall be contacted with 3M NaOH solution for a minimum of eight hours at 80°C to 90°C and ambient pressure. The volume of caustic solution shall be at least three times the volume of the centrifuged solids. The solids and caustic solution shall be gently stirred to promote dissolution of caustic soluble components.
- (c) The solids shall be separated from the contact solution by centrifugation at a temperature of 80°C to 90°C.
- (d) The caustic-contacted solids shall be contacted with 0.01M NaOH solution for a minimum of eight hours at 80°C to 90°C and ambient pressure. The volume of 0.01M NaOH solution shall be at least four times the volume of the centrifuged solids. The solids and water shall be gently stirred to promote dissolution of soluble components.
- (e) The solids shall be separated from the contact solution by centrifugation at a temperature of 80°C to 90°C.
- (f) The solids shall be contacted a second time with 0.01M NaOH solution for a minimum of eight hours at 80°C to 90°C and ambient pressure. The volume of 0.01M NaOH solution shall be at least four times the volume of the centrifuged solids. The solids and water shall be gently stirred to promote dissolution of soluble components.
- (g) The solids shall be separated from the contact solution by centrifugation at a temperature of 80°C to 90°C.
- (h) The solids remaining after the single batch contact with caustic solution and two batch contacts with 0.01M NaOH solution shall be analyzed to determine the mass of caustic insoluble solids and the concentration of elements and radionuclides identified in Specification 8, *High-Level Waste Envelope Definition*.
- (i) The above tests shall not be conducted under saturated conditions for sodium, phosphate, and sulfate.
- (j) For caustic washing, not more than 360 grams of sodium per kilogram of insoluble solids received in the HLW slurry shall be added without approval from DOE.

- (k) Prior to the use of alternate methods or reagents, the Contractor shall obtain DOE concurrence.

- 12.2.4 Estimated Number of High-Level Waste Canisters from Aqueous Insoluble Solids: The expected number of HLW canisters from aqueous-washed solids shall be determined using: (1) IHLW glass component limits provided in Specification 1, *Immobilized High-Level Waste*, Table TS-1.1; (2) 95 percent canister fill height in accordance with Specification 1.2.2.1.3; and (3) mass and composition of the aqueous insoluble solids determined in Specification 12.2.2. These estimates shall also include the volume of ILAW glass to be produced in accordance with Specification 2, *Immobilized Low-Activity Waste*, from the immobilization of the solutions resulting from the sludge treatment process.
- 12.2.5 Estimated Number of High-Level Waste Canisters from Caustic Insoluble Solids: The expected number of HLW canisters from caustic-washed solids shall be determined using: (1) IHLW glass component limits provided in Specification 1, *Immobilized High-Level Waste*, Table TS-1.1; (2) 95 percent canister fill height in accordance with Specification 1.2.2.1.3; and (3) mass and composition of the caustic insoluble solids determined in Specification 12.2.3. These estimates shall also include the volume of ILAW glass to be produced in accordance with Specification 2, *Immobilized Low-Activity Waste*, from the immobilization of the solutions resulting from the sludge treatment process.
- 12.2.6 Estimates of Number of High-Level Waste Canisters and Estimated Volume ILAW Glass per Batch of High-Level Waste: Estimates shall be provided with experimental and calculational data to determine the expected number of HLW canisters (and volume of ILAW glass) resulting from aqueous washing of the sludge as determined by the requirements of Specification 12.2.4, and caustic washing as determined by the requirements of Specification 12.2.5. DOE will determine the sludge treatment method (aqueous-washing or caustic-washing).
- 12.2.7 Adjustment to Sodium Content of Low-Activity Fraction: The quantity of LAW feed treated will be adjusted to account for the liquid fraction of the HLW feed per Specification 8, *High Level Waste Envelope Definition*, sodium removed during HLW pretreatment and the sodium hydroxide solution used to treat the HLW feed.
- 12.2.8 Determination of High-Level Waste Supernatant Mass and Composition: The mass and composition of the HLW supernatant generated from HLW pretreatment shall be determined as follows:
- 12.2.8.1 Mass and Composition of High-Level Waste Supernatant: The mass and composition shall be determined by analysis of the HLW Supernatant generated in Pretreatment Plant Operations, which includes the original filtered HLW supernatant and water or caustic leach solutions generated from HLW pretreatment. The chemical and radiochemical composition shall be reported in accordance with the analytes identified in Table TS-7.1 and Table TS-7.2 of Specification 7, *Low-Activity Waste Envelopes Definition*. DOE will determine the LAW Envelope Designation based upon this analysis.
- 12.2.8.2 Sodium Added to High-Level Waste Supernatant: No more than 70 grams of sodium per kilogram shall be added of soluble sodium received in the HLW Feed Envelope. This does not include sodium added for HLW pretreatment described in 12.2.2 or 12.2.3, or sodium leached from the HLW solids.
- 12.3 Quality Assurance: QA Program (Table C.5-1.1, Deliverable 7.2) for the work to be performed to determine the number of HLW canisters per batch of waste Envelope D is required. The QA Program shall be based upon NQA-1. **(M066)**

- 12.4 Inspection and Acceptance: A Compliance Plan shall be prepared for DOE review and concurrence regarding these estimated quantities of IHLW and ILAW Products produced from envelope D batches. Standard 6, *Product Qualification, Characterization, and Certification* (Table C.5-1.1, Deliverable 6.8), defines the content and delivery of this compliance plan per this specification. Product inspection and acceptance shall be performed in accordance with Specification 13, *Waste Product Inspection and Acceptance* and an appropriate QA program. The Contractor shall describe in the Compliance Plan referenced above, the compliance strategy for implementing the respective parts of this specification. At a minimum, the strategy shall address the method(s) for obtaining representative samples, determining the HLW solids volume and composition, determining the volume and composition of the HLW supernatant and verification that the conditions in this specification are achieved.

Specification 13: Waste Product Inspection and Acceptance

Waste product will be accepted as follows:

- 13.1 Interim Acceptance: Product will be accepted on an interim basis when the following required documentation has been submitted: (1) objective evidence for the results of analysis, testing, inspection, and demonstration defined in Standard 6, *Product Qualification, Characterization, and Certification* and required by the ILAW Product Compliance Plan, Deliverable 6.3, and (2) certification that the product complies with Contract requirements.

The Contracting Officer will determine interim acceptance upon receipt of all required documentation described above. Timeframe allowed for interim acceptance will be such that turnover to the Tank Farm Contractor for transportation to the disposal or storage facility can be effected without impact to the production of HLW and LAW canisters.

- 13.2 Final Acceptance: Final acceptance of product will be made on a lot basis. The lot size shall be defined subject to the following limitations: (1) for ILAW, the lot size shall not exceed the amount of product that is produced in 15 days; and (2) for IHLW, the lot size shall be a canister-by-canister basis.

Final acceptance will be determined by the Contracting Officer within 90 working days after all required documentation has been submitted as described under Interim Acceptance for all product in the lot.

DOE reserves the right at any time to: (1) verify submitted documentation, and (2) verify product compliance with Contract requirements. Verification methods used by DOE include, but are not limited to, independent inspection, review of operating records, or independent sampling and analysis of product. Upon request by DOE, representative product samples shall be provided.

In the event the product is identified as non-conforming, the product shall be segregated and a corrective action plan shall be prepared for DOE approval for the non-conforming product along with a plan to correct and prevent recurrence of the non-conforming condition. The Contracting Officer shall be notified within 24-hours after the Contractor has determined that a non-conforming product has been produced.

If DOE agrees that the non-conforming condition cannot be reasonably corrected based upon the analysis of the non-conforming product presented in the corrective action plan, DOE will agree to take possession of the non-conforming product.

In the event that the Contractor produces non-conforming waste during the commissioning activity, the non-conforming product will not be credited in determining the plant production capability.

C.9 INTERFACE CONTROL DOCUMENTS

This Section provides the requirements for ICDs that describe the physical and administrative interfaces between DOE, ORP, Tank Farm Contractor, and other Hanford Site Contractors.

The RPP involves two or more Contractors, under Contract to ORP that carry out the functions necessary to achieve the RPP mission. The WTP facilities are located on the Hanford Site and will rely upon other organizations to provide support services. In order to assure that the efforts and facilities are coordinated, a formal system of interface management was developed by RPP. The objective of the interface management system is to assure documentation and management of shared responsibilities for: (1) transfer of energy, data, or materials; and (2) development, operation, and maintenance of a physical compatible facilities and subsystems.

The approach to managing the interfaces is based upon development of ICDs that identify the requirements, roles, and responsibilities for all parties to the interface.

- (a) (1) An initial set of ICDs was prepared as part of the WTP Conceptual Design:

ICD 1:	Raw Water
ICD 2:	Potable Water
ICD 3:	Radioactive Solid Wastes
ICD 4:	Reserved
ICD 5:	Non-Radioactive, Non-Dangerous Liquid Effluents
ICD 6:	Radioactive, Dangerous Liquid Effluents
ICD 7:	Reserved
ICD 8:	Reserved
ICD 9:	Land for Siting
ICD 10:	Reserved
ICD 11:	Electricity
ICD 12:	Roads
ICD 13:	Reserved
ICD 14:	Immobilized High-Level Waste
ICD 15:	Immobilized Low-Activity Waste
ICD 16:	Reserved
ICD 17:	Reserved
ICD 18:	Reserved
ICD 19:	Waste Feed
ICD 20:	Reserved
ICD 21:	Reserved
ICD 22:	Reserved
ICD 23:	Waste Treatability Samples
ICD 24:	Reserved
ICD 25:	Inactive
ICD 26:	Reserved
ICD 27:	Inactive

- (2) Post-award ICDs:

ICD 28:	Pit 30 Aggregate Supply for Construction
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- (b) The Contractor shall update the ICDs as required throughout the period of Contract performance, ICDs shall reflect all interfaces and services needed in the construction and performance testing phases, and projected interface and services needed for the future commissioning and operating phases. The ICDs shall be an element of the design basis.

- (c) The Contractor shall ensure that the ICDs include, at a minimum, details on the following areas consistent with the maturity of the project:
 - (1) Physical Interfaces:
 - (i) Location and description of each hand-off point;
 - (ii) Interface block diagrams and schematics that clearly define organizational responsibilities for each interface (e.g., ownership, construction, and maintenance);
 - (iii) Type, quantity and composition of material;
 - (iv) Packaging requirements;
 - (v) Design drawings (as appropriate); and
 - (vi) Operations and maintenance requirements.
 - (2) Administrative Interfaces:
 - (i) Procedures that define the administrative transfer of interface items (e.g., who, what, when, where, and how).
 - (ii) Linkage to the integrated RPP and individual Contractor project baseline. These schedules and logic must contain detail that demonstrates that the key ICD events or milestones are achievable.
 - (iii) Documentation necessary for official hand-off of interface items.
 - (iv) Authorization basis and permitting integration.
 - (3) Acceptance Criteria shall be developed for every hand-off item.
- (d) Changes to ICDs will be made in accordance with Standard 1.