APR 15 1998

Sta. 37

ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT 621690

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Immobilized Waste	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: W-465	6. Design Authority/ Design Agent/Cog. Engr.: C. A. Petersen/D. A. Burbank	7. Purchase Order No.: N/A
8. Originator Remarks: Systems Engineering Management and Implementation Plan for Project W-465, Immobilized Low-Activity Waste Storage		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks: 11A. Design Baseline Document? [X] Yes [] No		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	HNF-2578	-	0	SEMP SEMP SEIP for Project W-465, ILAW Storage	N/A	1,2	1	

16. KEY											
Approval Designator (F)		Reason for Transmittal (G)				Disposition (H) & (I)					
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval	4. Review			1. Approved	4. Reviewed no/comment				
		2. Release	5. Post-Review			2. Approved w/comment	5. Reviewed w/comment				
		3. Information	6. Dist. (Receipt Acknow. Required)			3. Disapproved w/comment	6. Receipt acknowledged				
17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
1,2	1	Design Authority	<i>C. A. Petersen</i>	4/14/98	H6-37	1,2	1	K.C. Burgard	<i>K. Burgard</i>	4/14/98	H6-37
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		Env.									

18. D. A. Burbank Signature of EDT Originator	19. K.C. Burgard Authorized Representative Date for Receiving Organization	20. C. A. Petersen Design Authority/ Cognizant Manager	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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SYSTEMS ENGINEERING MANAGEMENT AND IMPLEMENTATION PLAN FOR PROJECT W-465, IMMOBILIZED LOW-ACTIVITY WASTE STORAGE

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Parsons Infrastructure and Technology Group, Inc., Richland, WA
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 621690

UC: 2000

Org Code: 73400

Charge Code: D2D01

B&R Code: EW3130010

Total Pages: 49- 46

Key Words: SEMP, Systems engineering, implementation plan, technical baseline, Immobilized Low-Activity Waste (ILAW), Immobilized High-Level Waste (IHLW), waste storage, TWRS storage and disposal projects

Abstract: The Systems Engineering Management and Implementation Plan (SEMP) for TWRS Project W-465 describes the project implementation of the Tank Waste Remediation System Systems Engineering Management Plan (TWRS SEMP), Rev. 1. The SEMP outlines systems engineering (SE) products and processes to be used by the project for technical baseline development. A formal graded approach is used to determine the products necessary for requirements, design, and operational baseline completion. SE management processes are defined, and roles and responsibilities for management processes and major technical baseline elements are documented.

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J. R. Kasper 4-15-98
Release Approval Date

Approved for Public Release

Prepared for
Lockheed Martin Hanford Corporation
Richland, Washington

Systems Engineering Management and Implementation Plan for
Project W-465, Immobilized Low-Activity Waste Storage
HNF-2578, Rev. 0

Prepared by
Parsons Infrastructure and Technology Group, Inc.
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LIST OF ACRONYMS

AGA	Alternatives Generation and Analysis
CDR	Conceptual Design Report
CMIP	Configuration Management Implementation Plan
DRD	Design Requirements Document
EQS	Environmental, Quality, Safety
F&Rs	Functions and Requirements
FSAR	Final Safety Analysis Report
HSTD	Hanford Site Technical Database
ICD	Interface Control Document
ILAW	Immobilized Low-Activity Waste
IP	Implementation Plan
JMN	Justification of Mission Need
LERF	Liquid Effluent Retention Facility
LMHC	Lockheed Martin Hanford Company
LMSI	Lockheed Martin Services, Inc.
MAR	Mission Analysis Report
MEL	Master Equipment List
MOA	Memorandum of Agreement
NRC	Nuclear Regulatory Commission
O&M	Operations and Maintenance
OUP	Operations and Utilization Plan
P&IDs	Piping and instrumentation diagrams
PA	Performance Assessment
PC	Private Contractor
PHMC	Project Hanford Management Contractor
PSE	Preliminary Safety Evaluation
QA	Quality Assurance
QAPP	Quality Assurance Program Plan
QC	Quality Control
RAM	Reliability, Availability, and Maintainability
RCRA	Resource Conservation and Recovery Act of 1976
RML	Risk Management List
SARP	Safety Analysis Report for Packaging
SE	Systems Engineering
SEL	Safety Equipment List
SEMP	Systems Engineering Management Plan
SEMP	Systems Engineering Management and Implementation Plan
SSC	systems, structures, and components
T&E	Test and Evaluation
TEDF	Treated Effluent Disposal Facility
THI	Transportation Hazard Indicator
TWRS	Tank Waste Remediation Plan

1.0 INTRODUCTION

1.1 DOCUMENT SUMMARY

This Systems Engineering Management and Implementation Plan (SEMIP) describes the Project W-465 (herein called the Project) implementation of the *Tank Waste Remediation System Systems Engineering Management Plan* (TWRS SEMP) (LMHC 1998a). The Project SEMIP defines the systems engineering (SE) products and processes used by the Project to comply with the TWRS SEMP (LMHC 1998a). It provides the basis for tailoring the SE processes by applying a graded approach to identify the minimum (necessary and sufficient) SE requirements for successful project execution without incurring unacceptable risks. The SEMIP is a living document that will be revised as necessary to reflect changes in systems engineering guidance as the Project evolves.

1.2 SCOPE AND APPLICABILITY

This project is a sub-project of the Storage and Disposal Program performed by the Tank Waste Retrieval (TWR) Division of Lockheed Martin Hanford Company's (LMHC) Tank Waste Remediation System (TWRS). A two-phase approach is being implemented at the Hanford Site to immobilize and interim store low-activity and high-level waste currently stored in underground tanks. The first step is a proof-of-concept effort to demonstrate the feasibility of using private contractors (PCs) to treat tank waste. Demonstration phase production of Immobilized Low Activity Waste (ILAW) is planned to begin in June 2002 and to be complete in 2007. The primary objectives of the W-465 Project are to design and construct a facility to provide initial ILAW storage space, provision of shipping containers, transport of ILAW to the facility, ILAW package handling for emplacement in the storage/disposal space, and monitoring of the stored waste. The general facility concept involves modifying existing vault facilities in the 200 East Area of the Hanford Site, as described in the *Alternatives Generation and Analysis Report for Immobilized Low-Level Waste Interim Storage Architecture* (WHC 1996a). Closure of the W-465 facility is beyond the scope of the Project, and will be completed following the operational period. Further details of the TWRS mission and background are given in the *Tank Waste Remediation System Program Plan* (FDH 1998e) and the *Tank Waste Remediation System Mission Analysis Report* (LMHC 1998b).

1.2.1 Present Stage of the Project

The W-465 Project is currently in the final stages of concept development with performance requirements identified and estimates prepared for completing the design and construction phases. The Project Justification of Mission Need (Piper 1996) has been completed, the Project "birthright" has been established in the Design Requirements Document (DRD) (SESC 1997), and Critical Decision 1 (Authorization to initiate conceptual design) has been granted DOE-RL (DOE-RL 1996c). Major technical baseline products which have been completed include ILAW storage functions and requirements definition (WHC 1995a), the *Alternatives Generation and*

Analysis Report for Immobilized Low-Level Waste Interim Storage Architecture (WHC 1996a), the *Design Requirements Document for Project W-465* (Rev. 0, SESC 1997, and Rev. 1, SESC 1998a), and the *Immobilized Low-Activity Waste Interim Storage Facility Project W-465 Conceptual Design Report* (FDNW 1997a). Thus, the requirements baseline, as described in the TWRS SEMP, is nearly complete for the Project.

An independent assessment of SE processes and existing baseline products was completed in March, 1998. The assessment (Parsons 1998a) evaluated the adequacy of the technical baseline through the Conceptual Design Report (CDR) (FDNW 1997a), and provided recommendations for SE process improvements. The assessment concluded that the existing baseline was consistent with requirements of the TWRS SEMP (LMHC 1998a), and provides an adequate foundation for continuing baseline development. The report recommendations concerning the requirements baseline will be considered in the DRD Rev. 1 and Advanced Conceptual Design products. Recommendations concerning SE management processes will be implemented through this SEMIP.

1.2.2 SEMIP Application

This SEMIP describes the entire technical baseline, concluding with Critical Decision 4 (Authorization to begin operations), at the end of the operational baseline (See TWRS SEMP Fig. 4). Existing baseline products which support the Project validation planned for April 1998 are summarized. However, the focus of the SEMIP is on the near-term products and processes necessary for completion of the design baseline and facility construction. The SEMIP provides a "road map" for systems engineering application for the project duration.

1.2.3 Project Risks

W-465 Project risks have been well defined and documented at both the project and program levels, and will be managed according to the process described in section 2.3.2 (Risk Management). The independent baseline assessment described in Section 1.2.1 (Parsons 1998a) concluded that there were no major risks associated with the Project technical baseline as of March 1998.

1.2.3 SE Graded Approach

The application of systems engineering to Project W-465 employs a graded approach, as outlined in HNF-IP-0842 Vol. IV, Sec. 1.2 (TWRS Systems Engineering Grading Guidelines, draft). Rather than grading the Project as a whole, the grading process has been applied to the major project systems, in accordance with the guidance of the revised TWRS SEMP (LMHC 1998a). The two major systems for the project are (1) Storage/disposal vaults and waste handling equipment, and (2) ILAW transport/packaging systems. A formal grading process was applied for each of the above systems, using a table of risk and complexity factors taken from HNF-IP-0842 Vol. IV, Sec 1.2, and is presented in Appendix A (Tables A.1 and A.2). The results of the

grading process are used to determine the SE products and processes necessary to the subject systems, as outlined in the Grading Guidelines. The TWRS SEMP was also referenced to determine necessary baseline products. Section 2 of this document addresses resulting management processes, and Section 3 addresses technical baseline products.

Vaults and Handling Equipment: The formal grading process presented in Table A.1 results in a Category SE-2 application, as described in the *TWRS Systems Engineering Grading Guidelines*. SE-2 systems require a selective application of systems engineering, with some SE activities performed informally. The risk and level of complexity for the vault systems are low within the context of the overall TWRS program. The vault storage and associated waste handling systems involve simple architecture elements subject to a complex set of environmental requirements. There is some risk in the RCRA permitting process, and Project interfaces with private contractors are complex and entail a degree of uncertainty at present. The greatest risk for the W-465 Project may be the time constraints. The SE processes required for the storage systems will include a disciplined design process with the associated design reviews; test and evaluation planning and documentation; operations infrastructure development (procedures, training, emergency preparedness); and a formal readiness review process. Management Systems for configuration control, formal interface control, and risk and decision management will also be required.

ILAW Transport and Packaging: The formal grading process presented in Table A.2 results in a Category SE-2 application, as described in the *TWRS Systems Engineering Grading Guidelines*. SE-2 systems require a selective application of systems engineering, with some SE activities performed informally. The basic architecture for the transportation system (truck with shielded cab, trailer, shipping container, and access road ways) is simple and similar to other transportation systems used at the Hanford Site. The relatively low source term and the high degree of confinement provided by the immobilized waste matrix and the ILAW packages should dictate a set of transportation requirements less stringent than those commonly employed for other on-site shipments. The risk involved in designing and procuring or constructing a system that will meet the transportation safety program requirements is minimal. The SE processes and products required for the transportation system focus on development of a Packaging Design Criteria document, the Safety Analysis Report for Packaging (SARP), procurement and/or construction specifications, and fabrication, construction, and acceptance under a Quality Assurance (QA) program. Development testing, preliminary design deliverables, and extensive design reviews and post-delivery testing and evaluation may not be necessary.

1.2.4 Interface with Other Planning Documents

TWRS top-level document relationships are shown in Figure 1 and Figure 2 of the TWRS SEMP (LMHC 1998a). This SEMP implements the TWRS Plans and Procedures (DOE Good Practice Guides, TWRS Risk Management Plan, TWRS Configuration Management Plan) referenced in section 2 of the TWRS SEMP. The SEMP also interfaces with the TWRS Program Baseline, which includes the TWRS Program Multi-Year Work Plan (project technical scope and schedule), the TWRS Program Plan (FDH 1998e), and TWRS Level 1 Logic. The Level 1 Logic provides an operational event sequence for the storage and disposal projects, and details

interfaces with private contractor operations and other TWRS projects. At the Project level, the SEMIP interfaces with the upper-tier project plan for TWRS Projects W-465 and W-520, titled *TWRS Retrieval and Disposal Mission Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b). A W-465 Project Management Plan will be developed following conceptual design, which will identify plans, organizational interfaces, management control systems, and reporting requirements for project managers.

2.0 SYSTEMS ENGINEERING MANAGEMENT PROCESSES

This section describes the processes that are used to control the elements of the Integrated Baseline. Emphasis is placed primarily on control processes for the Technical Baseline.

2.1 Risk Management

The primary tool for communicating risk information is the TWRS Retrieval and Disposal Project Risk Management List (RML)(LMHC 1998h). The RML identifies Project risks; describes their likelihood and consequences; and identifies any residual risks, handling actions, and handling action status for Projects W-464, W-465, and W-520. The Storage and Disposal RML is currently being reviewed and updated on a monthly basis. The *Tank Waste Remediation System Risk Management Plan* (FDH 1998a), requires that Risk Management Implementation Plans be developed for each TWRS Project. The Risk Management Implementation Plan for Projects W-464 and W-465 is documented in the *Storage and Disposal Project Risk Management Plan* (WHC 1995b). Detailed guidance for performing risk management activities is provided in HNF-IP-0842, Volume IV, Section 2.6, "Risk Management" (LMHC 1997b), and further information is in the *Tank Waste Remediation System Program Plan*, Section 9.5 (FDH 1998e).

2.2 Decision Management

The Project will develop a Decision Document following conceptual design, which will be cross-referenced to the TWRS Level 1 logic and will outline decisions throughout the baseline development. The Decision Document will incorporate CDR uncertainties, DRD hold points, and define design agent risk management responsibilities. A formal decision process will be employed by the Project for decisions of major importance. A simplified process will be employed for decisions of lesser magnitude. The decision maker or responsible manager will determine to what extent the full decision process is required for each particular decision. Decision management for the project will be accomplished according to HNF-IP-0842, Volume IV, Section 2.7, "Decision Management" (LMHC 1997b). The Project emphasis will be on early identification of decision points and issues; effective communication to involved parties; elevation, if required, to the appropriate decision maker with any requested information and recommendations; timely decision making; and prompt communication of results.

2.3 Interface Management

Interface management will be essential for interfaces with DOE, permitting authorities (Washington State Department of Ecology, Environmental Protection Agency), and PCs. ICDs and contract modifications are in development at the time of this writing. Interface management will be conducted in accordance with *Identification and Control of TWRS Interfaces* (LMHC 1998d); the TWRS SEMP, Section 2.3.2; and HNF-IP-0842 Vol. IV, Sec. 2.8, *Interface Control*. Further information on interface management is given in the *Tank Waste Remediation System*

Program Plan (FDH 1998e) Section 9.7, and the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b) Section 4.3, contains information on interfacing organizations and approval authorities. Interface Analysis and ICDs are addressed in Section 3 of this document.

2.4 Configuration Management

The configuration management requirements for TWRS are provided in the *Tank Waste Remediation System Configuration Management Plan* (FDH 1998d). The *Tank Waste Remediation System Configuration Management Implementation Plan* (CMIP)(LHMC, 1997f) will be revised to implement the requirements of this plan. Configuration Management provides a structure for identifying and controlling critical physical systems and configuration information (documents, drawings, data, logic diagrams, etc.). The products of the W-465 Project will be evaluated based on configuration management scope criteria to identify those products that will be controlled as configuration items. The minimum requirements for the configuration management scope criteria are defined in *Configuration Management Plan* (FDH 1997a). Hanford Site Technical Database (HSTD) configuration management will be maintained according to the *TWRS Technical Database Manager Definition Document* (LMHC 1998j).

Document control for the project is accomplished in accordance with HNF-PRO-232, "Project and Task Document Management." The Lockheed Martin Services, Inc. (LMSI) implementation of these requirements is found in the *Documentation and Records Management Manual* (LMSI 1995). Documents for W-465 are maintained by a dedicated document control representative in the Document Service Center, Room 1310 of the 2440 Stevens Building, Richland, Washington.

2.5 Technical Reviews

Reviews are conducted to assess the development of the Project Baseline and to verify conformance to the TWRS baseline, the project mission, and requirements sources [e.g., (Final Safety Analysis Report (FSAR), Performance Assessment (PA), Test and Evaluation (T&E) Plan, Fire Hazards Analysis, etc.]. Project reviews will be conducted according to the TWRS SEMP, Section 2.3.6.2, and will be completed prior to Project Critical Decisions (See Fig. 3.1). The three remaining reviews include (1) System Functional Review, (2) Detailed Design Review, and (3) Operational Startup Review. Other reviews may be added at the discretion of TWRS or the Project Manager. Management responsibilities for the reviews are presented in Table 2.1. Review products will be developed according to the guidance of DOE Order 430.1. Following is a definition of planned baseline products associated with the three Critical Decision Reviews:

System Functional Review (CD-2): The review product consists of a Review Comment Record (RCR) and a Project Validation Package submitted to DOE with a request for validation. This review is in progress for Projects W-464 and W-465 as of April, 1998.

Detailed Design Review (CD-3): The review product consists of an approved design released for construction.

Operational Startup Review (CD-4): The review product consists of a summary letter from the Project to DOE, declaring readiness for operations.

2.6 SE Management Process Responsibilities

Table 2.1 provides a responsibility matrix between organizations/positions defined in the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b) and the management processes identified in sections 2.1 through 2.5 above. The responsible organizations/positions listed are those internal to PHMC.

Table 2.1. Management Processes Responsibilities Matrix

Organization/ Position	Management Process				Technical Reviews		
	Risk Mngmt.	Decision Mngmt.	Config. Mngmt.	Interface Mngmt.	System Functional Review (CD-2)	Detailed Design Review (CD-3)	Operational Startup Review (CD-4)
Prog. Manager	A/L	A/L	A	A	A	A	A
Proj. Manager	A	A	A/S	A	A	A/L	A
EQS	S	S	A/S	S	A/S	S	A/S
Systems Eng.	S	S	A/L	L	S	S	S
Operations Rep.	S/R/C	A	A	A/S	A/S	A/S	A/L
TE&NS and Project Engr.	S/R/C	S	A/S	A/S	A/S	A/S	A/S
Design Agent	S	S	C/S	S	S	A/S	S
Bus. Manager	S/R	S/C		S	S	S	S
HNF-IP-0842 Vol. IV Sec. #	2.6	2.7	HNF-1900	2.8	GPG-FM- 015	GPG-FM- 015	3.12

Legend:

- A: Approve - Responsibility for process management and authority to issue documents.
- C: Concurrence - Approval is requested but not mandatory.
- L: Lead - Responsible for process performance or product preparation.
- R: Review - Comments requested within position's or organization's area of expertise.
- S: Support - Provide support for process performance or product preparation.
- EQS: Environmental, Quality, and Safety
- TE&NS: TWRs Engineering and Nuclear Safety

3.0 SYSTEMS ENGINEERING PROCESS

This section provides details of how systems engineering will be applied to the TWRS Project W-465 Technical Baseline development. A description of existing baseline products is given, as well as an outline of the SE processes and products to be used to further define the baseline during the design and construction phases of the project. Roles and responsibilities for major baseline product development are outlined in section 3.4.

3.1 SYSTEMS ENGINEERING APPLICATION TO PROJECT W-465

This subsection provides a narrative of SE products and processes applied to the project. The text explains the products, processes, and decision points which are shown graphically in Fig. 3.1 (W-465 Project Baseline Development Flow Diagram). Reference to the TWRS SEMP (LMHC 1998a) is made where applicable to avoid redundancy.

3.1.1 Requirements Traceability

The upper level functions that the TWRS Storage and Disposal program is required to provide are currently dictated by the TWRS Mission Analysis Report (MAR) (LMHC 1998b) and HSTD. A planned revision to the TWRS Operations and Utilization Plan (OUP) (LMHC 1997d) will incorporate private contractor data when it is released. Lower level functions and performance requirements for the project are defined in a DRD, Rev. 0 (SESC 1997), and Rev. 1 (SESC 1998a), and will be updated as necessary throughout design baseline development. Requirements traceability will be maintained by documenting requirements in the HSTD through periodic change requests. Design criteria for the ILAW transport and packaging systems will be similarly input to the HSTD. This process is described in the TWRS SEMP (LMHC 1998a), section 2.3.5.

3.1.2 Mission Analysis

The TWRS SEMP (LMHC 1998a) does not require a MAR for projects which are defined by a top-down process, utilizing the missions defined in the TWRS MAR (LMHC 1998b). The mission and upper level functions for the Storage and Disposal program are well defined in the TWRS MAR (LMHC 1998b).

3.1.3 Functions and Requirements/Specification Development

The major functions that the TWRS program must perform to accomplish the storage and disposal missions are identified in the HSTD. Upper level performance requirements for throughput, storage capacity, storage durations, etc. for ILAW Storage are described in the TWRS MAR (LMHC 1998b) and the TWRS OUP (LMHC 1997d). The ILAW storage

functions and requirements decomposition is provided in the DRD (SESC 1998a). The DRD will provide the basis for Level 1 specifications, which will be generated from the HSTD following conceptual design. Functions and requirements for the ILAW transport and packaging systems will be captured in a design criteria document or equivalent, and input to the HSTD.

3.1.4 Alternative Analysis and Selection

Alternative storage facility architectures to be evaluated for Project W-465 were defined in the letter from R. E. Murkowski, WHC, to P. E. Lamont, WHC, *Immobilized Low-Level Waste Interim Storage Alternatives*, (WHC 1996c). The letter defines four ILAW storage facility options, compares access options to the existing grout vaults (roof and wall entry), and defines three waste transport options. This alternative description letter was followed by a decision plan which defines the ILW interim storage architecture decision responsibilities, strategy, criteria, required information, and schedule, in a letter from D. L. Washenfelter to R. J. Murkowski, *Immobilized Low-Level Waste Interim Storage Architecture Selection Decision Plan* (WHC 1996d). The formal architecture evaluation for the ILAW Storage function is documented in the AGA (WHC 1996a). The privatization contracts (DOE-RL 1996a,b) limit ILAW transportation options to over-road transport by truck, thereby eliminating the need for a formal alternative evaluation. The DOE documented concurrence with the AGA recommendations for ILAW storage in a letter from W. J. Taylor, DOE-RL, to President, WHC, *Milestone Completion - Issue Low-Level Waste Interim Storage Engineering Evaluation* (DOE 1996a).

The W-465 Advanced Conceptual Design process will analyze alternatives for high-risk elements identified in the Conceptual Design Report (FDNW 1997a) and the TWRS Storage and Disposal Risk Management List. Alternative analysis will continue throughout design development until all lower-level architecture is defined.

3.1.5 Interface Analysis

An initial project interface analysis is provided in *Identification and Control of TWRS Interfaces* (LMHC 1998d). Section 3.1.6 of this document augments that analysis. Guidance on interface analysis is given in the TWRS SEMP (LMHC 1998a) and WHC-IP-0842 Vol. IV, Sec. 2.8 (Interface Control). Further interface analysis will be addressed in updated TWRS Level 1 logics and supporting documentation, which will be reflected in annual updates to the TWRS Multi-Year Work Plan (MYWP).

3.1.6 Interface Control Documentation

The W-465 Project has a number of interfaces with other LMHC organizations, other PHMC contractors, and the private contractors responsible for delivering the ILAW product. There are also several external interfaces with the Department of Energy and regulatory agencies. Physical interfaces will be documented in ICDs, and administrative interfaces will be managed through contract modifications or memorandums of agreement. A description of each of the currently

identified internal and external interfaces is provided in following sections.

3.1.6.1 Privatization Contractor Interfaces. These interfaces are currently documented in the ICD-15 (FDH 1997b), between DOE and the PCs. A counterpart interface document will be prepared by the W-465 Project for the privatization interface.

3.1.6.2 Infrastructure Interfaces. Infrastructure interfaces between LHMC and other Hanford contractors include utilities, roadways, secondary waste disposal, and analytical laboratory services. A summary of Hanford contractor services is given in the *Tank Waste Remediation System Retrieval and Disposal Mission Technical Baseline Summary Description*, HNF-1901 (FDH 1998b). Contracts between Flour-Daniel Hanford and supporting contractors[DE&S Hanford, Inc. (DESH), DynCorp Tri-Cities Services, Inc. (DYN), and Waste Management Federal Services of Hanford, Inc. (WMFSH)) will be modified as required, based on requirements provided by the TWRS Project and documented in the HSTD. Interface documentation will also be developed for infrastructure elements internal to TWRS including telecommunications and remote monitoring systems, as required. Staffing for facility operations and management responsibilities for project turnover and readiness preparations will be negotiated by the Operations Manager.

3.1.6.3 Environmental Interface. ILAW Storage Facility monitoring plans will be developed to address pre-operational, operational, and post-closure monitoring of the storage facility and surrounding environment. Project interface may be required with Hanford Site monitoring programs, DOE-RL, and PCs to perform these functions.

3.1.6.4 Secondary Waste Interfaces. Interfaces for handling of secondary wastes including solid wastes and vault leachate will be developed as necessary. Interfaces with site facilities such as the Liquid Effluent Retention Facility (LERF) or the Treated Effluent Disposal Facility (TEDF), regulators, DOE-RL, and other Hanford Site contractors may be required.

3.1.6.5 Interfaces with Other TWRS Projects. An interface will be developed with TWRS Project W-520 which will provide the required closure barrier design for the W-465 Facility. A future project will address facility closure.

3.1.7 System Assessments/Evaluations

The TWRS SEMP (LMHC 1998a) includes a requirement to determine the extent to which the existing vault systems are able to perform the Project mission. This requirement has been satisfied by the architecture assessments in the AGA Report (WHC 1996a) and the W-465 CDR (FDNW 1997a). Further assessment will be conducted during construction.

3.1.8 Specialty Engineering Analysis and Integration

In addition to design engineering and project and construction management, specialty engineering disciplines as listed in the TWRS SEMP (LMHC 1998a) will be used in Project baseline development. Specialty engineering analyses will be documented and traceable. Results will be used during functional and performance analysis and as input into the appropriate systems, structures, and components (SSC) specifications. The following are specialty engineering applications which have been or will be required for Project W-465:

3.1.8.1 Human Systems Integration: Human systems integration is used to reduce the potential for human error in system operation and ensure system safety, operational efficiency, ease of maintainability, and reliability. The CDR (FDNW 1997a) outlines requirements for the work environment at the vault facility (e.g. ventilation and continuous air monitors). Further input to the baseline will be derived from the Operations and Maintenance (O&M) Concept, Reliability Availability, and Maintenance (RAM) analysis, and O&M input during preliminary and detailed design.

3.1.8.2 Reliability, Availability, and Maintainability: The O&M Concept will provide a basis for RAM analysis, which will be completed when design detail is sufficiently developed (typically during detailed design). The RAM analysis will be evaluated against design requirements when completed.

3.1.8.3 Safety: A *Preliminary Safety Evaluation for Project W-465, Immobilized Low-Activity Waste Interim Storage* (PSE) (NHC 1997a) has been completed for the project. Other safety analyses are planned, including a SARP for the ILAW packaging systems. These documents are used as sources for design requirements. Further safety analysis will be conducted according to the *Master Safety Plan for Immobilized Low-Activity and High-Level Waste* (Mouette 1998), which outlines the authorization basis development.

3.1.8.4 Quality: A Quality Assurance Program Plan (QAPP), based on the requirements of the *Quality Assurance Program Description* (FDH 1997d), will be written for the project during the conceptual phase, and will provide guidance for project activities through construction. The Project Test and Evaluation Plan will identify other test and evaluation quality elements. Project quality procedures will be developed and implemented to address the requirements of the *Quality Assurance Program Description* (FDH 1997d).

3.1.8.5 Regulatory Compliance: The *Permitting Plan for the Immobilized Low-Activity Waste Project* (LMHC 1997c) provides the current project strategy and identifies analyses and document submittals required by regulation. Revisions of the Permitting Plan will be written as required. Approved permits and other regulatory decisions become project constraints and will be used as requirements source documents during design baseline development.

3.1.8.6 Facility Startup: Following completion of W-465 Facility construction and testing, and prior to ILAW storage operations, the project will complete operations readiness preparations to include operation and maintenance procedure validation and training, emergency preparedness,

issuing as-built piping and instrument diagrams (P&IDs) and essential drawings, spare parts procurement for initial operations, and operational staffing plans.

3.1.8.7 ILAW Performance Assessment: If ILAW disposal (vs. storage) is determined to be the mission for Project W-465, the Project will integrate design requirements from the *Hanford Low-Activity Tank Waste Performance Assessment* (Mann et al. 1998) and subsequent revisions. (See Fig. 3.1) The Performance Assessment (PA) evaluates the long-term potential for contaminant migration from disposal systems to estimate its potential effect on human health and the environment. The function of the PA is to provide "reasonable assurance" that the disposal activity will perform as expected in the design and meet long-term performance objectives. Further details are given in the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b). Major products supporting a revised Performance Assessment (scheduled for 2001) include waste form data packages and geotechnical data packages. An ILAW disposal authorization will require approval of both the PA and the Site Composite Analysis. The Site Composite Analysis evaluates impacts of previous and current disposal actions from other sources, with an emphasis on groundwater contamination.

3.1.9 Operations and Maintenance Concept Development

An O&M Concept for the W-465 project will be developed from architecture and design concepts that address package acceptance, emplacement, monitoring operations, and preventive or corrective maintenance. Throughput and other processing requirements affecting operational capabilities and operating constraints are also part of the O&M Concept. The time/motion study provided in the CDR Appendix K (FDNW 1997a) will be used as a basis for O&M Concept development, to be completed following Preliminary Design. The O&M Concept will be written to the level of information available at the time, and will be updated as the project design matures. The TWRS SEMP Section 3.2.2 provides further information.

3.1.10 Design Optimization

A trade study has been completed to evaluate the fraction of ILAW waste which will be contact handled, versus remote handled, titled *Phase 1 Immobilized Low-Activity Waste Operational Source Term Report* (SESC 1998b). These studies will be identified in the MYWP and will support the design baseline. Other studies will be completed as necessary to resolve conceptual design uncertainties or other design issues. Design optimization guidance is given in the TWRS SEMP (LMHC 1998a).

3.1.11 Physical System Test and Evaluation

The Project will develop a T&E Plan following preliminary design to verify that end products perform their design functions and meet all established requirements prior to project turnover. A graded approach will be used to determine the degree to which elements of T&E are applied to W-465 systems. Required test procedures will be developed in the design baseline, and

subsequent test reports will be documented in the operational baseline. The ILAW packaging and transportation systems will be verified in accordance with the vendor testing and QA/Quality Control (QC) requirements identified in the fabrication/procurement specifications. Additional post-receipt inspections and testing, if any, will be identified in the procurement specifications.

The T&E Plan for the grout vault systems and the procurement specifications, and all test and QA/QC procedures used for the project will be maintained current and revised by a formal process if performance requirements or the associated test method or acceptance criteria are to be changed. The complete set of T&E results will be reviewed as part of the turnover process, and identified issues will be formally resolved prior to the declaration of operational readiness. Development and execution of T&E will be in accordance with HNF-2029, *Tank Waste Remediation System Test and Evaluation Plan* (LMHC 1998i) and the appropriate sections of the *TWRS Administrative Manual*, HNF-IP-0842.

3.1.12 Integrated Logistics Support

The TWRS SEMP requirements for logistics support planning will be met by baseline documents including the O&M Concept, O&M Procedures, Packaging and Transport Design Criteria, Design Reports, RAM Analysis, and Training Needs Analysis. The Project architecture is relatively simple and does not warrant development of stand-alone logistics support plans.

3.1.13 Project Validation

The basis for project validation is the technical information, cost estimates, and schedule developed during conceptual design. Project W-465 validation is described in the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b). A Project validation review is scheduled for April 1998, with yearly updates planned.

3.1.14 Decision Points

Critical Decision 1, authorization to initiate conceptual design, has been completed for the project. Remaining critical decisions are shown in Fig. 3.1, and are described in the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b). Completed decisions include issuance of the TWRS Environmental Impact Statement Record of Decision (Federal Register 1997), which confirmed interim storage of ILAW at the Hanford Site and final disposal of ILAW in near-surface disposal facilities on Site. Additionally, the Nuclear Regulatory Commission (NRC) granted an incidental waste determination for the low-activity waste, subject to certain conditions, in June 1997 (NRC 1997).

3.2 TECHNICAL BASELINE DEVELOPMENT

Technical baseline development is described in detail in GPG-FM-10 (Project Execution and Engineering Management Planning). Baseline development is an iterative process in which several cycles of functions and requirements definition, alternatives analysis, and system design are necessary. This iterative process ensures that the project end products satisfy the mission needs. This iterative process is currently reflected in the W-465 baseline by revisions to the DRD (SESC 1997, SESC 1998a) and plans for advanced conceptual design, which will build on the existing CDR (FDNW 1997a).

Figures 3.1a, 3.1b, and 3.1c illustrate the chronological development of the Project baseline. Supporting processes and documents including safety analysis, project reviews, and test and evaluation functions are shown as they relate to baseline development. The timing of some elements (e.g., Review of PC deliverables) may vary depending upon actual delivery dates.

Figure 3.1a PROJECT W-465 BASELINE
DEVELOPMENT FLOW DIAGRAM

ACRONYM LIST

AGA	Alternative Generation and Analysis
CDR	Conceptual Design Report
DRD	Design Requirements Document
F&R	Functions and Requirements
iLAW	Immobilized Low-Activity Waste
JMN	Justification of Mission Need
MAR	Mission Analysis Report
O&M	Operations and Maintenance
PSE	Preliminary Safety Evaluation
RAM	Reliability, Availability, and Maintainability
SE	Systems Engineering
TWRS	Tank Waste Remediation System

= Product Completed as of April 1998

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Figure 3.1c PROJECT W-465 BASELINE
DEVELOPMENT FLOW DIAGRAM

3.3 MAJOR TECHNICAL BASELINE PRODUCTS

Table 3.1 identifies and describes major products that comprise the W-465 Technical Baseline. Required products were determined according to the graded approach described in Section 1, and were derived from the TWRS SEMP (LMHC 1998a) and the TWRS Systems Engineering Grading Guidelines (HNF-IP-0842, Vol. IV, Sec 1.2, Draft). Descriptions of project deliverables were derived in part from *Subcontract Number 80232764-9-K001, Defense Nuclear Facilities Safety Board Recommendation 92-4 Implementation Plan, Revision 2N, Commitment 5.2.2(d)* (LMHC, 1997e) and the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b).

Table 3.1. SE Processes/Products Required for Baseline Development

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Functions and Requirements	1. Functional Requirements - ILLW Interim Storage Alternatives (WHC 1995a) 2. DRD Rev. 0 (SESC 1997). 3. DRD Rev. 1. (SESC 1998a). 4. HSTD Revision: W-465 F&Rs to be incorporated into HSTD, based on DRD.	Defines level 5 and 6 functions and requirements for W-465. See TWRS SEMP, Table 2 (Level 1 and 2 Specifications). Will incorporate updated project functions and performance requirements. HSTD will be updated periodically throughout project evolution, and will provide requirements traceability.
Alternative Analysis	1. AGA for ILAW Interim Storage (Rev. 0)(WHC 1996a).	See TWRS SEMP, Table 2.
O&M Concept and RAM Analysis	1. Time/Motion Study (CDR App. K) (FDNW 1997a). 1. O&M Concept (See Note 1.) 2. RAM Analysis (See Note 1.)	Basis for O&M concept. See TWRS SEMP, Table 2. Reliability, Availability, Maintainability Analysis of W-465 SSCs, based on O&M Concept.

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Decision Documents	<ol style="list-style-type: none"> 1. Record of Decision for the TWRS System (Federal Register, 1997). 2. NRC Incidental Waste Determination (NRC 1997). 3. DOE Decision Report and Concurrence (DOE 1996a). 4. Critical Decision 1: letter, A. L. Alm to DOE-RL (DOE-RL, 1996c). 5. Tank Waste Retrieval RTP Independent Review (Lerch, 1997). 6. Project Validation Package and Decision (See Note 1.) 7. Project Decision Document (See Note 1.) 8. Critical Decision 2. (See Note 1.) 9. Critical Decision 3. (See Note 1.) 10. Critical Decision 4. (See Note 1.) 	<p>Confirms ILAW storage at Hanford Site and final disposal of ILAW on site.</p> <p>Allows ILAW disposal in shallow land disposal facilities, such as grout vaults.</p> <p>DOE concurrence with AGA recommendations. Also documents milestone completion for "Issue Low-Level Waste Interim Storage Engineering Evaluation."</p> <p>Provides DOE-HQ authorization to initiate conceptual design.</p> <p>Documents status of TWRS program plans and capabilities to support Privatization Phase 1B. and Readiness To Proceed.</p> <p>Basis for budget request.</p> <p>See Section 2.2 of this document.</p> <p>Authorization to begin definitive design.</p> <p>Authorization to begin construction.</p> <p>Authorization to begin operations.</p>
ICDs and Memorandums of Agreement	<ol style="list-style-type: none"> 1. ICDs are summarized in <i>Identification and Control of TWRS Interfaces</i> (LMHC 1998d). (See Note 1.) 2. Contract Modifications. (See Note 1.) 	<p>See TWRS SEMP, Table 2.</p> <p>Document administrative interfaces between site contractors.</p>

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Specialty Engineering Analysis: Safety and QA/QC	1. QAPP. (See Note 1.)	Identifies QA/QC requirements for project.
	2. Preliminary Safety Evaluation (NHC, 1997a).	Initial safety analysis of transport and storage system.
	3. SARP for ILAW packaging system. (See Note 1.)	Safety analysis of ILAW packaging and shipping container.
	4. PSAR. (See Note 1.)	Provides analysis assumptions and required preventive and mitigative design features for input to Preliminary Design.
	5. Hanford Low-Level Immobilized Waste Interim Performance Assessment (Mann, et al. 1997).	Establishes basis for performance requirements for ILAW disposal.
	6. 1998 ILAW Performance Assessment. (Mann et al. 1998)	Updated PA.
	7. PA Waste Form Data Packages. (See Note 1.)	Data to support Final Performance Assessment.
	8. PA Geotechnical Data Packages. (See Note 1.)	Data to support Final Performance Assessment.
	9. 2001 ILAW Performance Assessment. (See Note 1.)	Final PA approval required for ILAW disposal authorization.
	10. Site Composite Analysis. (See Note 1.)	Provides analysis of composite environmental effects of Hanford facilities. Approval required for ILAW disposal authorization.
	11. Storage Facility FSAR or TWRS Authorization Basis Amendment. (See Note 1.)	Final safety basis including accident analysis and Technical Safety Requirements. Analysis assumptions, required preventive and mitigating features, and TSR surveillance and action statement requirements must be incorporated into final design deliverables.

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Specialty Engineering Analysis Reports: Regulatory	1. Permitting Plan for ILAW Project (LHMC 1997b). 2. Revised Permitting Plan for ILAW Disposal at Grout Vaults (See Note 1.) 3. RCRA Part A Permit Application. (Existing for former grout facility) 4. RCRA Part B Permit Application. (See Note 1.)	Environmental permitting requirements for transport and interim storage during Privatization Phase 1. Anticipated revision to incorporate permitting for ILAW disposal at grout vaults, based on DOE disposal decision. Establishes regulatory commitments for RCRA compliance. Establishes final regulatory requirements for RCRA compliance.
Risk Management	1. Storage and Disposal Project Risk Management Plan (WHC 1995b). 2. Project Risk Management List (LHMC 1998h).	Establishes basis for project risk management. Project-specific risk tracking list, reviewed monthly.
Specialty Engineering Analysis: Project Management	1. TWRS Retrieval and Disposal Mission, ILAW Disposal Plan (NHC, 1997b). 2. Systems Engineering Management and Implementation Plan 3. Project Management Plan. See Note 1. 4. Project Validation Package. See Note 1.	Project Plan specific to ILAW storage and disposal (Projects W-465 & W-520). Defines SE application to W-465, according to TWRS SEMP guidance. Identifies plans, interfaces, management control systems, and reporting requirements for W-465. Provides basis for project budget request.
Trade Studies	1. Phase 1 Immobilized Low-Activity Waste Operational Source Term Report (SESC 1998b). 2. Engineering Studies (See Note 1.)	Provides estimate of number of contact vs. remote handled ILAW packages. Will address high-risk elements identified in CDR and Risk Management List.

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Design Criteria	1. W-465 DRD Rev. 0. (SESC 1997). 2. W-465 DRD Rev. 1. (SESC 1998a). 3. Level 1 Specifications (See Note 1.) 4. Transportation/Packaging System Specifications (See Note 1.)	See TWRS SEMP, Table 2, (Level 1 & 2 Specifications). Incorporates updated functions and performance requirements. See TWRS SEMP, Table 2. Will provide detailed functions and requirements for transportation and packaging system.
Project Conceptual Design	1. ILAW Interim Storage Facility Project W-465 Conceptual Design Report , HNF-1975 (FDNW 1997). 2. Advanced Conceptual Design Studies (See Note 1.)	Provides conceptual design and estimated cost of grout vault modification. Will complete conceptual design according to revised DRD.
Requirements Baseline Review	System Functional Review. (See Note 1.)	First of three remaining project reviews required by TWRS SEMP (LMHC 1998a). Review is required following completion of conceptual design.
Preliminary and Detailed Design	1. Preliminary Design (Title I) (See Note 1.) 2. Detailed Design (Title II) (See Note 1.) 3. Transportation System Design (See Note 1.) 4. Master Equipment List (See Note 1.) 5. Fabrication and Construction Drawings (See Note 1.) 6. Construction and Procurement Specifications (See Note 1.) 7. Design Analysis Reports (See Note 1.)	Preliminary and detailed designs advance the conceptual design with input from specialty engineering, trade studies, etc. Completion of detailed design will satisfy all project performance requirements. A stand-alone document for vehicle and shipping container design may not be necessary; fabrication and procurement specs may be developed directly from design criteria documents and SARP. See TWRS SEMP, Table 2. See TWRS SEMP, Table 2 (Design Drawings). See TWRS SEMP, Table 2. See TWRS SEMP, Table 2.

TWRS SEMP Process Requirement	W-465 Deliverable	Description
Test and Evaluation	<p>1. Project T&E Plan (See Note 1.)</p> <p>2. Test Procedures. (See Note 1.)</p> <p>3. Test Reports. (See Note 1.)</p>	<p>Document the specific SSC test and evaluation methods, procedures used to verify SSC performance at various stages of baseline development. Also implements elements of QA/QC plan.</p> <p>See TWRS SEMP, Table 2.</p> <p>See TWRS SEMP, Table 2.</p>
Design Baseline Review	Detailed Design Review. (See Note 1.)	Second of three remaining project reviews required by TWRS SEMP.
As-Built Drawings and Equipment Labeling	P&IDs (One-line diagrams), and essential drawings as defined by Cognizant Engineer. (See Note 1)	See TWRS SEMP, Table 2.
O&M Procedures	O&M Procedures (See Note 1.)	See TWRS SEMP, Table 2 (Operations Manuals/ Procedures, Maintenance Manuals/ Procedures)
Safety Equipment List	Safety Equipment List (Part of Detailed Design.) (See Note 1.)	See TWRS SEMP, Table 2.
Operations, Maintenance, Engineering and Support Staff Training	<p>1. Job Task Analysis (JTA), classroom and on-the-job (OJT) for certified operators. (See Note 1.)</p> <p>2. Training Needs Analysis (See Note 1.)</p>	Documents that operators, craftsmen, and technicians have been trained to a required proficiency level for system operation and maintenance. Also includes training and certifications as required for management, engineers, and other staff.
Licenses and Permits	Required RCRA, Construction, and other permits and licenses. (See Note 1.)	See TWRS SEMP, Table 2.
Operational Readiness	Operational Readiness Review and/or Readiness Assessment by Contractor and DOE. (See Note 1.)	Third of three project reviews required by TWRS SEMP.

Note 1: Processes and Products not complete as of April, 1998.

3.4 BASELINE PRODUCT ROLES AND RESPONSIBILITIES

Table 3.2 provides a matrix of organizations/positions (internal to PHMC) defined in the *Immobilized Low-Activity Waste Disposal Plan* (NHC 1997b) and the baseline products identified in section 3.2.2. The matrix indicates several levels of responsibility, including: approval authority, concurrence, review, and preparation lead.

Table 3.2. Roles and Responsibilities Matrix for Major Technical Baseline Products.

Product		Approval	Concurrence	Review	Preparation Lead
Requirements Baseline Products					
AGA for ILAW Interim Storage		See Note 1.	See Note 1.	See Note 1.	See Note 1.
D R D	Level One Specs	M&I Contractor PM	QA SE Operations TE	Project Mgr.	Project Engr.
	Level Two Specs	N/A	N/A	N/A	N/A
ILAW Disposal Plan		See Note 1.	See Note 1.	See Note 1.	See Note 1.
O&M Concept		PM Operations	EQS TE	Project Engr. Construct. Rep. Maintenance	TE Operations
RAM Analysis		PM Operations	TE	Construct. Rep.	TE
Project Validation Package		M&I Contractor PM Project Mgr.	Business Mgr.	TE EQS SE Operations	Project Mgr.
QAPP		EQS, PM, Project Mgr.	TE Operations	SE	EQS
Preliminary Safety Evaluation		See Note 1.	See Note 1.	See Note 1.	See Note 1.

Product	Approval	Concurrence	Review	Preparation Lead
Permitting Plan	EQS PM	Project Mgr. SE	Operations TE	EQS
RCRA Permit Applications	M&I Contractors	PM Project Mgr.	TE SE Operations	EQS
Trade Study Reports	TE PM	Operations SE Project Mgr.	Business Mgr. QA	TE
ICDs between W-465 and Privatization Vendors	M&I Contractors PM	EQS TE Project Mgr.	SE Business Mgr. Operations Rep.	Project Mgr.
Infrastructure ICDs	M&I Contractors Program Mgr.	TE EQS Project Mgr.	SE Operations Business Mgr.	Project Mgr.
Contract Documents for Programmatic Agreements between Contractors	M&I Contractor Program Mgr. Project Mgr.	Business Mgr. TE SE EQS Legal	Business Mgr.	Program Mgr.
Transportation/Packaging Design Criteria	TE Program Mgr.	Project Mgr. Operations EQS	SE	TE
Conceptual Design Report	See Note 1.	See Note 1.	See Note 1.	See Note 1.
Decision Documents	Project Mgr. Program Mgr.	TE, Operations, SE, EQS	Business Mgr.	TE

Product	Approval	Concurrence	Review	Preparation Lead
Design Baseline Products				
Project Management Plan	PM		Business Mgr. Project Engr. M&I Contractor TE, SE, EQS	TE
PSAR	M&I Contractor TE PM	Project Mgr. Operations	Tier 1,2,3 SE EQS	TE
SARP	M&I Contractor TE PM	Project Mgr. Operations	Tier 1,2,3 SE EQS Packaging Engr.	TE WMNW
ILAW Transportation/ Packaging System Specs	DynCorp Project Mgr.	Operations TE, EQS Project Engr. SE	Business Mgr.	Project Mgr. TE
W-465 Preliminary Design (Title I)	Program Mgr. Project Mgr.	TE&NS Project Mgr. Operations	M&I Contractor Business Mgr. SE, EQS	Project Mgr. Design Agent
W-465 Detailed Design (Title II)	Project Mgr.	TE Operations	Business Mgr. M&I Contractor SE, EQS, Construct. Rep.	Project Mgr. Design Agent
Master Equipment List (MEL)	Project Mgr.	Project Engr. TE Operations	SE Operations EQS	TE Design Agent
P&IDs and Essential Drawings	Project Mgr.	Operations TE Project Engr.	Project Engr. Construct. Rep. SE, EQS	Project Mgr. Design Agent

Product	Approval	Concurrence	Review	Preparation Lead
Construction & Procurement Specifications	Project Mgr.	Operations TE	SE, EQS Project Engr. Construct. Rep. Operations Rep. Business Rep.	Project Mgr. Design Agent
Test Procedures	Project Mgr.	Operations Construct. Rep. TE EQS	SE Construct. Rep.	Project Mgr. Design Agent
Test Reports	Project Mgr.	Operations Construct. Rep. TE EQS	SE	Project Mgr. Design Agent
Design Analysis Report	Project Mgr.	TE	Project Mgr. SE, EQS Operations	Project Mgr. Design Agent
ILAW Performance Assessment (PA)	M&I Contractor Program Mgr.	EQS	Program Mgr. TE Business Mgr. SE	PA Lead
Waste Form Data Packages	N/A	N/A	PA Lead	PNNL
Geotechnical Data Packages	N/A	N/A	PA Lead	PNNL FDNW
Site Composite Analysis			PA Lead	PNNL

Product	Approval	Concurrence	Review	Preparation Lead
Operations Baseline Products				
FSAR or TWRS Authorization Basis Amendment	M&I Contractor Program Mgr.	TE Operations	Tier 1,2,3 SE EQS	TE
Safety Equipment List (SEL)	Project Mgr. TE	TE EQS Operations	Design Agent	TE Design Agent
Job Task Analysis	Program Mgr.	Operations	Project Mgr. EQS	Operations
Training Certification Products	Program Mgr.	TE Operations	Project Mgr. SE, EQS	Operations
O&M Manuals and Procedures	Project Mgr. Operations	TE	EQS	Operations TE
Permit and License Applications	M&I Contractor PM	EQS Project Mgr. Operations	SE TE	EQS
As-Built Drawings	Project Mgr. TE	Operations Construct. Rep. Design Agent	EQS Operations	Project Engr. Design Agent
Cross-Baseline Products				
T&E Plan	Program Mgr.	Project Mgr. SE, EQS Operations TE	Project Engr. Business Mgr.	Project Mgr.
SEMIP	Program Mgr.	Project Mgr. TE SE	Operations EQS	SE
Level 1 Logic Diagrams	Program Mgr.	Project Mgr. TE Operations SE	EQS	Project Engr.

Product	Approval	Concurrence	Review	Preparation Lead
HSTD Change Requests	Project Mgr.	SE TE	Project Engr. EQS	SE
Risk Management List	Program Mgr. Project Mgr.	TE SE EQS Operations	Program Mgr. Project Mgr.	Program Mgr. Project Mgr.

Note 1. Product completed at time of writing.

Legend: TE: TWRS Engineering and Nuclear Safety
 EQS: Environmental, Quality, and Safety
 PM: Program Manager/Engineer
 M&I: Management and Integration
 SE: Systems Engineering
 QA: Quality Assurance
 PNNL: Pacific Northwest National Laboratory
 FDNW: Flour-Daniel Northwest
 PA: Performance Assessment

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Appendix A

**Project W-465 Systems Engineering
Graded Assessment Tables**

Table A.1. Systems Engineering Graded Assessment of ILAW Vaults and Equipment.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
Technology	Common technology and conventional construction.	X			Standard civil construction application required.
Time	Compressed time frame to perform work.			X	May be greatest source of Project risk.
Interfaces	Potential impact on site operations, other contractors, projects, programs, etc.		X		Several high-level interfaces between participants.
Number of Key Participants	3 or more			X	Several Hanford Site contractors plus two private vendors.
Contractor Capabilities	Proven track record	X			Disposal facility construction capability risk is low.
Magnitude and Type of Environmental Contamination	Hazardous or low-level waste, fully characterized	X			Waste will be fully characterized and in a sealed, solid form on receipt by the project.
Regulatory Involvement	EPA, NRC, or States		X		EPA and WA State involvement.
NEPA	Environmental Assessment, EIS, or unique permitting required	X			EIS complete and Record of Decision issued.
Environmental Permits (RCRA, CWA, CAA, etc.) or Licensing			X		RCRA permitting anticipated. Other permit waivers or deviations may be necessary.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
Number of Locations	1	X			Single location for vault facility, on DOE site.
Site Ownership	DOE property	X			Disposal site is DOE owned.
Site Improvement/ Access	Minor infrastructure/ improvements required and accessible.	X			Risk and complexity of site improvements is low.
Labor Skills	Low or moderate skill labor	X			Project management and design teams are in place. Construction contractors are readily available.
Availability	Readily available	X			
Staff Build-Up	Gradual	X			
Productivity	Low or average productivity assumed	X			
Quality Requirements	Large quality tolerances and low productivity risk	X			Project risk assumed for waste quality is low. Quality risk for disposal facility construction is also low.
Funding	2 or more year duration.		X		Although funding must be maintained over a significant period, risk is moderate within Hanford site context.
Political Visibility	Major	X			Political visibility is high, but the associated risk to the Project is low.
Cost Sharing	None	X			None required.
Public Involvement	Minor	X			Public input is expected to have a positive effect on the Project.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
OVERALL COMPLEXITY	Low technology level for construction, several key participants, compressed time frame, moderate permitting and funding risk.	X			Low risk/complexity results in an SE Level 2 application: a selective application of systems engineering.

Table A.2. Systems Engineering Graded Assessment of ILAW Transport/Packaging Systems.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
Technology	Common technology.	X			Little technology risk or complexity.
Time	Ample time to perform work.	X			Not a critical path system.
Interfaces	No major impact on site operations, other contractors, projects, programs, etc.	X			Interfaces involve ILAW storage/disposal facility, PCS, and Waste Management Hanford.
Number of Key Participants	2-3		X		Several key participants for design, project management, fabrication and construction.
Contractor Capabilities	Proven track record	X			Experienced contractors involved.
Magnitude and Type of Environmental Contamination	Hazardous or low-level waste, fully characterized.	X			Waste will be fully characterized and in solid, sealed form on receipt by Project.
Regulatory Involvement	None	X			On site shipment under Hanford site procedures. No DOT or NRC approval required.
NEPA	No permitting	X			Standard construction documentation required: storm water pollution prevention, environmental checklist, etc.
Environmental Permits (RCRA, CWA, CAA, etc.) or Licensing	No permitting	X			SARP satisfies permitting requirements.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
Number of Locations	1	X			Single site
Site Ownership	DOE Property	X			DOE Property
Site Improvement/ Access					N/A
Labor Skills	Low or moderately skilled labor	X			Required for shipping container fabrication. Vendor will produce vehicles and shipping containers for transport system.
Availability	Labor readily available	X			
Staff Build-Up	None required	X			
Productivity	Low or average productivity assumed and moderate schedule risk.	X			
Quality Requirements	Large quality tolerances and low productivity risk.	X			Shipping container quality requirements are minimal.
Funding	2 or more year duration		X		Funding must be maintained over a significant period, but associated risk is moderate.
Political Visibility	Minor	X			Little risk associated with transport system.
Cost Sharing					N/A
Public Involvement	None	X			Little or no public involvement with on site transport and packaging.

RISK/ COMPLEXITY FACTOR	ASSESSMENT	RISK			COMMENTS
		L	M	H	
OVERALL COMPLEXITY	Transport/packaging requirements and architecture are similar to other Hanford systems.	X			Low risk/complexity results in an SE Level 2 application: a selective application of systems engineering.

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