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Tank Waste Remediation System Privatization Phase 1 Infrastructure Project Systems Engineering Implementation Plan

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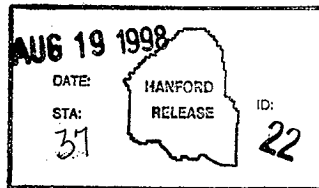
Abstract: This Systems Engineering Implementation Plan (SEIP) describes the processes, products, and organizational responsibilities implemented by Project W-519 to further define how the project's mission, defined initially by the *Tank Waste Remediation System Phase 1 Privatization Infrastructure Project W-503 Mission Analysis Report* (Hoertkorn 1997), will be accomplished using guidance provided by the *Tank Waste Remediation System Systems Engineering Management Plan* (SEMP) (Peck 1998). This document describes the implementation plans for moving from a stated mission to an executable cost, schedule, and technical baseline and to help ensure its successful completion of those baselines.

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**TANK WASTE REMEDIATION
SYSTEM PRIVATIZATION PHASE 1
INFRASTRUCTURE PROJECT
SYSTEMS ENGINEERING
IMPLEMENTATION PLAN**

August 1998

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LIST OF TERMS

CD	Critical Decision
CEIS	Cost estimating input sheet
DOE	U.S. Department of Energy
DRD	Design requirements document
FSAR	Facility Safety Analysis Report
HSTD	Hanford Site Technical Database
ICD	Interface control document/drawing
LMHC	Lockheed Martin Hanford Corporation
MYPP	Multi-year Program Plan
O&M	Operations and Maintenance
PC	Privatization Contractor
PEP	Project Execution Plan
PHMC	Project Hanford Management Contract
ROD	Record of Decision
ROI	Return on Investment
SE	Systems Engineering
SEIP	Systems Engineering Implementation Plan
SEMP	Systems Engineering Management Plan
SSC	Systems, structures, and components
TBR	Technical Basis Review
TWR	Tank Waste Retrieval
TWRS	Tank Waste Remediation System

TANK WASTE REMEDIATION SYSTEM PRIVATIZATION PHASE 1 INFRASTRUCTURE PROJECT SYSTEMS ENGINEERING IMPLEMENTATION PLAN

1.0 INTRODUCTION

The U.S. Department of Energy (DOE), as part of the strategy to privatize the immobilization of the Hanford tank waste, will provide electricity, raw and potable water, a prepared site and roads and will accept liquid effluents from the privatization contractor. Privatization Phase 1 Infrastructure Project W-519 was chartered with the mission to define, design, and build the systems to support the private contractor infrastructure needs for construction and operation of the Privatization Contractor's (PC) facilities. After acceptance, the systems will be turned over to the Site Infrastructure and Waste Management contractors for operations.

1.1 SUMMARY

This Systems Engineering Implementation Plan (SEIP) describes the processes, products, and organizational responsibilities implemented by Project W-519 to further define how the project's mission, defined initially by the *Tank Waste Remediation System Phase 1 Privatization Infrastructure Project W-503 Mission Analysis Report* (Hoertkorn 1997), will be accomplished using guidance provided by the *Tank Waste Remediation System Systems Engineering Management Plan* (SEMP) (Peck 1998). This document describes the implementation plans for moving from a stated mission to an executable cost, schedule, and technical baseline and to help ensure its successful completion of those baselines.

1.2 SCOPE AND APPLICABILITY

This SEIP applies to all Project W-519 technical activities, including subcontracts, throughout the project life cycle from conceptual design through construction of facilities and systems and turnover to the Site Infrastructure and Waste Management contractors. This SEIP communicates the project specific planning for implementing systems engineering as defined in the TWRS SEMP (Peck 1998). Where existing plans and procedures exist, those documents are referenced herein.

1.2.1 Background

Project W-519 will provide site and road development, electrical power, water, and liquid effluents transfer systems in support of the Tank Waste Remediation System (TWRS)

Phase 1 Privatization contract. Additional details of the conceptual design and design requirements are provided in the Conceptual Design Reports and Design Requirements Documents listed in the *Tank Waste Remediation System Privatization Phase I Infrastructure Project W-519 Project Execution Plan* (Parazin 1998a) and as referenced herein.

Project W-519 has completed conceptual design and the project is progressing to Critical Decision 2 (CD 2), approval of the technical baseline for W-519 systems. The Critical Decisions (CD 2 through 4) will be conducted in accordance with DOE Order 430.1 Life Cycle Asset Management, Good Practice Guide, *Critical Decision Criteria*, GPG-FM-002 (DOE 1996). Immediately after CD 2, the Electrical System will be subjected to an incremental Critical Decision (CD 3A) to support the start of construction of the Electrical Power System. The CD 3 milestone (CD 3B) for systems other than the Electrical Power System (i.e., Water System, Liquid Effluent System, and Site Development) is planned for February 1999. The Project is awaiting validation of the technical baseline from DOE based on Privatization contracts.

The technical baseline for Phase 1 is currently documented in Design Requirement Documents (DRDs) for each of four system elements (Privatization Electrical Power Systems, Privatization Site Development, Privatization Liquid Effluent System, and Privatization Raw and Potable Water Supply System) and Interface Control Documents (ICD), defining the functional interfaces as listed below:

Design Requirement Documents

- *Design Requirements Document for Phase I, Privatization Electrical Power Systems* (Singh 1997)
- *Design Requirements Document for Phase I, Privatization Site Development* (Shord 1997)
- *Design Requirements Document for Phase I, Privatization Raw and Potable Water Supply System* (Parazin 1996a)
- *Design Requirements Document for Phase I, Privatization Liquid Effluent Systems* (Parazin 1996b)

Interface Control Documents

- *Interface Control Document for TWRS Privatization Phase I Infrastructure Support Project W-519* (Parazin 1998b)
- *Tank Waste Remediation System Privatization Project Interface Control Document* (BNFL 1998)

The technical baseline noted above will be expanded following CD 2 to include design

drawings, ICDs (drawings), procurement/construction specifications, site characterization report, and safety documentation.

1.2.2 Project Risks

The W-519 Project risks have been identified and were documented in Attachment A of the *Risk Analysis Management Report* (Schaus 1998) in accordance with the *TWRS Risk Management Procedure* (LMHC 1997). It was determined that the W-519 Project does not resolve any TWRS Project risks (i.e., no 'critical' risks have been identified). The W-519 Project risks are primarily programmatic and relate to the timely execution of the Privatization Contract, thereby preventing delays in validation of the W-519 technical baseline, and receipt of W-519's CD 2 approvals. The risk management processes used to derive the W-519 risks are described in Section 2.1 of this document.

1.2.3 Component Grading Summary

Guidance for grading W-519 systems, structures, and components, (SSC) to determine the appropriate level of rigor for systems engineering implementation and associated products was provided by the *Draft TWRS Systems Engineering Grading Guidelines*, HNF-IP-0842. The three systems (i.e., Electrical System, Liquid Effluent System, and Raw and Potable Water Supply System) were evaluated with the recommended component risk areas/complexity factors and the findings summarized in Appendix A. Note that the components needed for site preparation (i.e., grading and removal of an existing soil pile) are not developmental items and therefore were not subjected to the grading process.

The W-519 SSCs were rated "high", "moderate", or "low" for each Risk Areas/Complexity factor using the descriptions in Table 5.1 of the *TWRS Systems Engineering Grading Guidelines* and a simple arithmetic average performed on the individual results to achieve an Overall Complexity rating. The evaluation resulted in a "low" overall ranking for each of the SSCs. Given this ranking, the SSC Systems Engineering (SE) Level will be either SE-2 or SE-3 depending on the project scope. As W-519 SSCs are new construction, the SE-2 category is the applicable category. SE-3 applies to projects that are "changeout-in-kind" or a form, fit, and function replacement.

In summary, the W-519 systems were categorized as follows;

<u>System</u>	<u>Classification</u>
Privatization Electrical Power Systems	SE-2
Privatization Liquid Effluent System	SE-2
Privatization Raw and Potable Water Supply System	SE-2

From this categorization, the recommended processes and products were tailored for each SSC using Table 5.2 of the *TWRS Systems Engineering Grading Guidelines*. The resulting

planned product list for the W-519 SSCs is included in Appendix B.

1.2.4 Interface with Other Planning Documents

This SEIP is intended to delineate the systems engineering aspects of the project and support the *Tank Waste Remediation System Privatization Phase I Infrastructure Project W-519 Project Execution Plan (PEP)* (Parazin 1998a). This SEIP uses the guidelines for systems engineering described in the TWRS SEMP (Peck 1998).

2.0 SYSTEMS ENGINEERING MANAGEMENT PROCESSES

2.1 RISK MANAGEMENT

Risk Management for Project W-519 is performed per the guidelines of the *TWRS Risk Management Procedure* (LMHC 1997). Appendix C provides the Privatization Infrastructure Risk Implementation Plan that describes the activities for identifying, analyzing, documenting, mitigating and monitoring project risks. The TWRS Privatization Infrastructure risk management list provides a listing of project-specific risk information.

2.2 DECISION MANAGEMENT

Project W-519 has implemented a simplified Decision Management process as referenced in the TWRS SEMP (Peck 1998), Section 2.3.4 consistent with the *Decision Management Procedure* (LMHC 1997). Technical decisions of major program importance are documented and the responsible manager and/or decision maker is assigned. The overall compilation of major TWRS Project decisions including the status of those for Project W-519 are documented in the *TWRS Technical Decision Status Summary* (Zimmerman 1997). Currently, for Project W-519, no outstanding decisions exist, nor are new project level decisions expected. If new decisions are identified, they will be planned, framed, analyzed, closed and documented in accordance with the *Decision Management Procedure*.

2.3 INTERFACE MANAGEMENT

Preparation and maintenance of ICDs are described in the W-519 PEP, Section 5.2.2, which references the Project Hanford Management Contract (PHMC) procedure HNF-PRO-243, and the *Interface Management Procedure* (LMHC 1997). Note that the discussion in the PEP on interfaces deals mostly with functional interfaces as opposed to physical interfaces (i.e., electrical/mechanical). Physical interfaces will be defined using ICDs as part of the definitive design process, following CD 2. ICDs for physical interfaces are reviewed, and approved using the Configuration Management processes of Section 2.4.

Agreements that document functional and organizational interfaces with other TWRS projects are recorded as Memoranda of Agreement. Agreements between LMHC and other PHMC contractors are recorded as contract modifications and incorporated into the Fluor Daniel Hanford contract guidance for future work planning.

2.4 CONFIGURATION MANAGEMENT

Configuration management for Project W-519 is described in the *TWRS Privatization Infrastructure Project Configuration Management Implementation Plan* (Parazin 1998c). The

guidance for this plan was provided by the *TWRS Configuration Management Plan* (Vann 1998). The *TWRS Privatization Infrastructure Project Configuration Management Implementation Plan* (Parazin 1998c) describes the processes to be used to control the technical, cost, and schedule baselines and include related activities by subcontractors or interfacing projects that support the identified processes.

2.5 TECHNICAL REVIEWS

Technical reviews are conducted per the TWRS SEMP (Peck 1998), Section 2.3.6. These involve reviews to support the Critical Decision (CD) milestones as defined in DOE Order 430.1 Good Practice Guide, *Critical Decision Criteria* (DOE 1996). As stated in Section 1.2 of this document, the next review for Project W-519 is CD 2, where the authorization to proceed with definitive design is expected. The following documents are currently in work to support the CD 2 milestone:

- a) SEIP (this document)
- b) Configuration Management Implementation Plan
- c) Risk Management Implementation Plan (Appendix C of this document)
- d) Project Execution Plan
- e) Acquisition Plan.

Internal reviews during the definitive design phase (beyond CD 2) will be conducted twice: when the design is 30 percent and 90 percent complete. The next external review following CD 2 will be CD 3, where approvals will be completed for the start of construction. Additionally, an Operational Startup Review will be held as part of CD 4. See the Project W-519 PEP (Parazin 1998a), Section 2.3, for additional details regarding planned reviews.

2.6 SYSTEMS ENGINEERING MANAGEMENT PROCESS ROLES AND RESPONSIBILITIES

Roles and responsibilities for the systems engineering management processes are defined in the *Tank Waste Remediation System Privatization Phase I Infrastructure Project W-519 Project Execution Plan* (Parazin 1998a) Table 3-1.

3.0 SYSTEMS ENGINEERING PROCESS AND PRODUCTS

3.1 SYSTEMS ENGINEERING PROCESS

The project systems engineering process, as illustrated in Figure 3-1, is described below. This process is consistent with the TWRS SEMP (Peck 1998) and the DOE's *Tank Waste Remediation System (TWRS) Systems Engineering Management Policy* (Kinzer 1997).

Project W-519 developed its initial technical baseline using functional and requirements analysis and documented the results in Design Requirements Documents (DRDs). Currently traceability data for the DRD requirements is being maintained informally by the document authors. The project performed alternative evaluations and documented the results in Engineering Studies, which are equivalent to Alternative Generation and Analysis documents.

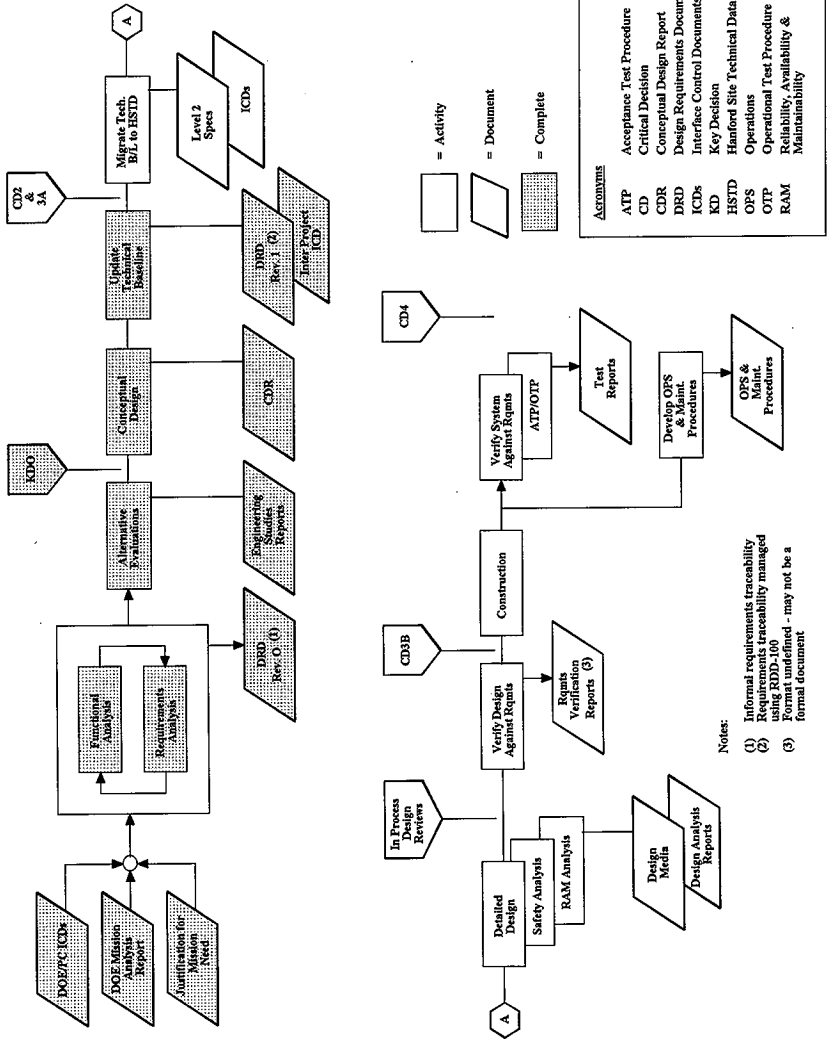
The project has completed its conceptual design activities, and has approved Conceptual Design Reports. Based on the results of the conceptual design, W-519 updated the DRDs and developed an inter-project ICD to coordinate the interfaces between the W-519 systems and systems being installed by other TWRS projects.

The project will migrate the functions, requirements, and interface data into the Hanford Site Technical Database (HSTD), along with requirements traceability information. The HSTD will generate Level 2 specifications similar in form, fit and function to the DRD to replace the existing documents, but will have full requirements traceability and integration with the rest of the Hanford and TWRS major facilities.

After CD 2 the project will perform detailed design activities including specialty engineering analysis for the raw and potable water system, the liquid effluent system, and for site preparation activities. The electrical system will be procured from a commercial vendor using a single contract for design and construction services. Design reviews will be conducted at the 30 and 90 percent complete milestones including the electrical system.

Design will be verified against the requirements using the methods documented in Section 4.0 of the specifications before authorizing start of construction (CD 3). After construction is complete, system performance will be verified by acceptance and operational tests. The project will provide for the development of operations and maintenance procedures for the operations organizations prior to equipment turnover (CD 4).

Figure 3-1. Project Systems Engineering Process.



3.2 MAJOR PRODUCTS

Project W-519 will develop systems engineering products to document the results of the project definition and design activities and to describe the future activities to verify the design satisfies requirements. The following provides a listing of the systems engineering documents contained in the TWRS SEMP with an explanation of the applicability to W-519, and where applicable, a description of the equivalent W-519 document. The project systems engineering documents have been selected based on the project grading described in Section 1.2.3.

Mission Analysis Report: Top level Project W-519 mission information is included in the *TWRS Phase 1 Privatization Infrastructure Project Mission Analysis Report* (Hoertkorn 1997). This document was prepared in keeping with the guidance of the TWRS SEMP Revision 0 (Peck 1996) that called for a mission analysis for projects that were not defined using a top down systems engineering process. The *Project Justification for Mission Need* defines the overall purpose of the project.

Operations and maintenance concept: The infrastructure SSCs are extensions of existing Hanford systems and will be operated and maintained in accordance with existing philosophies and procedures. Operations and maintenance procedures will be developed for the new SSCs as required to ensure the operations and maintenance data is current and complete.

Functions and Requirements/Specifications/Project Design Criteria: Project W-519 has a set of approved Design Requirements Documents defining the project requirements. The contents of the DRDs will be entered into the HSTD and Level 2 specifications equivalent to the DRDs with full requirements traceability will be generated. The current DRDs are as follows:

- *TWRS Privatization Phase 1, Site Development Design Requirements Document* (Shord 1997)
- *Design Requirements Document for the Phase 1 Privatization Electrical Power System* (Singh 1997)
- *TWRS Privatization Phase 1 Raw and Potable Water Supply Systems* (Parazin 1996a)
- *TWRS Privatization Phase 1 Liquid Effluent Transfer Systems* (Parazin 1996b)

Alternative Analysis and Selection/Trade Studies: The project architecture was selected based on the engineering studies conducted for the conceptual design. These studies were based on the Design Requirements Documents. The studies performed include the following:

- *TWRS Privatization Phase 1, Site Development Engineering Study* (Shord 1996a)

- *Engineering Study for the Phase 1 Privatization Facilities Electrical Power* (Singh 1996)
- *TWRS Privatization Phase 1 Raw and Potable Water Service Engineering Study* (Shord 1996b)
- *TWRS Privatization Phase 1 Liquid Effluent Transfer Systems Engineering Study* (Parazin 1996c)

Decision Documents: Project level decisions have been documented in the Conceptual Design Reports. No further project level decisions have been identified at this time. Design decisions will be documented through the design analysis reports.

Interface Control Documents/Diagrams: The project has physical interfaces with three different groups: the other TWRS projects, other PHMC major facilities, and the private contractors. For interfaces with the other TWRS projects, W-519 has developed the *Interface Control Document for TWRS Privatization Phase 1 Infrastructure Support Project W-519* (Parazin 1998b) documenting where the project interfaces with other tank farm projects. The interfaces with the other PHMC major facilities are documented in the Conceptual Design Reports and detailed design media. The Design Authorities for this project are the interfacing major facility owners, which fulfills the integration requirement for design coordination between two systems. The interfaces with the Private Contractor (PC) are documented through a Privatization ICD. Functional and organizational interface control is described in Section 2.3 of this document.

System Assessment/Evaluations: N/A

Specialty Engineering Analysis Reports: The project will perform the necessary specialty engineering analysis to ensure the design satisfies the DRD specialty engineering requirements.

The planned analyses and related documentation include the following:

- Reliability, Availability and Maintainability
- Safety

Preliminary Safety Evaluation

Safety assessment

Unresolved Safety Question Screening

Fire Hazard Analysis

- Quality Assurance (NHC-QAPP-018)

Design Optimization: The project has performed design optimization and documented the results in the engineering studies and conceptual design reports.

Test and Evaluation: Evaluation of the design will be performed as part of the design verification process described in the PEP Section 5.7 (Parazin 1998). The project test activities will be documented in Acceptance Test Procedures developed by the design agent and Operational Test Procedures developed by the respective PHMC operating contractor.

Integrated Logistics: In order to support installation, the project will purchase construction spares for the new systems. The project will provide for the development of operations and maintenance procedures. The facility owners are responsible for the remainder of the logistics support activities including sparing, any required operations training, etc. This agreement will be documented in a memorandum of agreement.

3.3 ROLES AND RESPONSIBILITIES

Roles and responsibilities for the systems engineering products are defined in the *Tank Waste Remediation System Privatization Phase I Infrastructure Project W-519 Project Execution Plan* (Parazin 1998) Table 3-1.

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APPENDIX A

**W-519 SYSTEMS ENGINEERING GRADED RISK
AREAS/COMPLEXITY FACTORS**

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APPENDIX A

**W-519 SYSTEMS ENGINEERING GRADED RISK
AREAS/COMPLEXITY FACTORS**

Table A-1. W-519 Electrical System Systems Engineering Graded Risk Areas/Complexity Factors.

Risk/complexity factors	Risk	Rationale*
Technology	Low	Commercial off-the-shelf equipment
Time	Low	Ample time to perform work
Interfaces	High	Potential major impact to operations and other contractors.
Number of Key Participants	High	Bonneville Power Administration, DynCorp, PC, Project
Contractor Capabilities	Low	Proven track record
Magnitude and type of environmental contamination	Low	N/A
Regulatory Involvement	Low	None
NEPA, Permits or Licensing	Low	TWRS ROD and no additional permitting
Number of locations/Site Ownership/Site Improvements Access	Low	1 site, No infrastructure or improvements required
Labor Skills, Availability, Staff build up and Productivity	Moderate	High voltage work requires special labor skills and qualifications
Quality Requirements	Low	
Funding	Moderate	2-3 years for design/construction/startup
Political visibility	Low	
Cost Sharing	Low	
Public Involvement	Low	Tribal nations
Overall Complexity	Low	

NEPA = *National Environmental Policy Act of 1969*

PC = Privatization Contractor

ROD = Record of Decision

TWRS = Tank Waste Remediation System

*Risk/Complexity factor evaluation criteria used to develop rationale contained in *Draft TWRS Systems Engineering Grading Guidelines*, Table 5.1

Table A-2. W-519 Liquid Effluent Transfer System Systems Engineering Graded Risk Areas/Complexity Factors.

Risk/complexity factors	Risk	Rationale*
Technology	Low	Common/off-the-shelf technology Civil/conventional construction
Time	Low	Ample time to perform work
Interfaces	High	Potential major impacts on site operations, and other contractors
Number of Key Participants	High	WMH, Project, Ecology, PC
Contractor Capabilities	Low	Proven track record
Magnitude and type of environmental contamination	Low	Hazardous or low-level waste, fully characterized
Regulatory Involvement	Moderate	WAC
NEPA, Permits or Licensing	Low	TWRS ROD and no additional permitting
Number of locations/Site Ownership/Site Improvements Access	Low	1
Labor Skills, Availability, Staff build up and Productivity	Low	No special skill requirements, staff readily available,
Quality Requirements	Low	
Funding	Moderate	2-3 year duration, other line item project size
Political visibility	Low	none
Cost Sharing	Low	none
Public Involvement	Low	Tribal nations
Overall Complexity	Low	

NEPA = National Environmental Policy Act of 1969

PC = Privatization Contractor

ROD = Record of Decision

TWRS = Tank Waste Remediation System

WAC = Washington Administrative Code

WMH = Waste Management Federal Services of Hanford, Inc.

*Risk/Complexity factor evaluation criteria used to develop rationale contained in

Draft TWRS Systems Engineering Grading Guidelines, Table 5.1.

Table A-3. W-519 Raw and Potable Water Supply System Systems Engineering Graded Risk Areas/Complexity Factors.

Risk/complexity Factors	Risk	Rationale*
Technology	Low	Common/off-the-shelf technology Civil/conventional construction
Time	Low	Ample time to perform work
Interfaces	High	Potential major impacts on site operations, and other contractors
Number of Key Participants	Moderate	PC, DynCorp, Project
Contractor Capabilities	Low	Proven track record
Magnitude and type of environmental contamination	Low	Hazardous or low-level waste, fully characterized
Regulatory Involvement	Moderate	WAC
NEPA, Permits or Licensing	Low	TWRS ROD and no additional permitting
Number of locations/Site Ownership/Site Improvements Access	Low	1
Labor Skills, Availability, Staff build up and Productivity	Low	No special skill requirements, staff readily available,
Quality Requirements	Low	
Funding	Low	1 year duration
Political visibility	Low	none
Cost Sharing	Low	none
Public Involvement	Low	Tribal nations
Overall Complexity	Low	

NEPA = *National Environmental Policy Act of 1969*

PC = Privatization Contractor

ROD = Record of Decision

WAC = Washington Administrative Code

*Risk/Complexity factor evaluation criteria used to develop rationale contained in
Draft TWRS Systems Engineering Grading Guidelines, Table 5.1

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APPENDIX B

**GRADING OF MAJOR PRODUCTS BASED
ON RISK/COMPLEXITY FACTORS**

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APPENDIX B

GRADING OF MAJOR PRODUCTS BASED ON RISK/COMPLEXITY FACTORS

As described in Section 1.2.3 of this document the following table defines the planned W-519 System Engineering product list using the grading results from Appendix A, and *Draft TWRS Systems Engineering Grading Guidelines*, Table 5.2 Systems Engineering Products/Process list. A "yes" or "no" signifies the projects plan on whether or not the product is required.

Table B-1. Major Products Based on Risk/Complexity Factors. (2 Sheets)

Systems engineering process/product	Electrical	Liquid effluent	Raw and potable water
Mission Analysis Report	Yes ¹	Yes ¹	Yes ¹
Project Design Criteria	No	No	No
O&M Concept	No	No	No
Systems Engineering Plans	Yes	Yes	Yes
Risk Management Process	Yes	Yes	Yes
Decision Management Process	Yes	Yes	Yes
Decision Documents	As Required	As Required	As Required
Interface Control Documents	Yes	Yes	Yes
Interface Control Drawings	Yes	Yes	Yes
Configuration Management Process	Yes	Yes	Yes
Project Technical Reviews	Yes	Yes	Yes
Traceability of Technical Requirements	Yes	Yes	Yes
Functional Flow Block Diagrams	No	No	No
Requirements Analysis Reports	No	No	No
Alternative Generation & Analysis Reports	Yes	Yes	Yes
Level 2 Specifications	Yes	Yes	Yes

Table B-1. Major Products Based on Risk/Complexity Factors. (2 Sheets)

Systems engineering process/product	Electrical	Liquid effluent	Raw and potable water
Requirements Verification Reports	Yes	Yes	Yes
Test Procedures	Yes	Yes	Yes
Test Reports	Yes	Yes	Yes
Technical Performance Measurement	No	No	No
System Analysis Reports	No	No	No
Construction Specifications	No	Yes	Yes
Trade Study Reports	Yes ²	Yes ²	Yes ²
Master Equipment Lists	Yes	Yes	Yes
Design Analysis Reports	Yes	Yes	Yes
Procurement Specifications	Yes	Yes	Yes
As-Built Drawings	Yes	Yes	Yes
Operations Manuals/Procedures	Yes	Yes	Yes
Specialty Engineering Analysis Report	Yes	Yes	Yes
Safety Equipment List	Yes	Yes	Yes
Maintenance Manuals/Procedures	Yes	Yes	Yes
Training Certification	No	No	No
Licenses and Permits	No	No	No
FSAR	No	No	No

DOE = U.S. Department of Energy

FSAR = Facility Safety Analysis Report

O&M = Operations and Maintenance

SEMP = Systems Engineering Management Plan

TWRs = Tank Waste Remediation System

¹Developed by DOE before release of TWRs SEMP Rev. 1²Included in Conceptual Design Reports.

APPENDIX C

**INFRASTRUCTURE PROGRAM RISK
MANAGEMENT IMPLEMENTATION PLAN**

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APPENDIX C

**INFRASTRUCTURE PROGRAM RISK
MANAGEMENT IMPLEMENTATION PLAN**

The W-519 Risk Management Process steps are described below and shown graphically in Figure C-1. The Project performs these activities with support from the Tank Waste Retrieval (TWR) Risk Analysis staff to facilitate the process.

Identify Risk Elements. Risk elements (tasks) are analyzed to identify areas of variation and uncertainty in both budget and schedule. This exercise is used to uncover potential risk factors.

Identify Risks. The risk factors identified in the previous step are screened to identify risks to the program.

Develop Risk Impacts. For each of the identified risks, likelihood of occurrence is estimated, and consequence range is determined. Variable cost elements that will occur are separated from variable cost elements that are uncertain to occur. In addition, the uncertain elements are further assessed to filter out those items which are outside the scope of the work or are below the threshold of credibility or cost impact. These items are recorded.

Evaluate Risk. Using the likelihood and consequence distribution data developed above as inputs, a probability of success curve is developed using a Monte Carlo technique. In addition, higher risk impact elements are identified for further analysis.

Identify Mitigation Action. For each risk, a handling option is identified. For the handling options that require mitigation, a mitigation plan is developed. Steps are identified, responsibilities are established, costs are determined and closure criteria are developed.

Develop Residual Risk Impacts. After identification of mitigation plans, the risks are reevaluated to determine the remaining or residual risk. Likelihood of occurrence is re-estimated, and consequence range is re-determined.

Prioritize Actions. The return on investment (ROI) for an individual mitigation action can now be calculated using the pre and post mitigation impacts and the cost of the mitigation action. The actions are then prioritized based upon the ROI.

Implement Actions. The prioritized list is integrated with other factors such as management sensitivities, political impacts, and regulatory requirements to determine which actions are to be implemented and which are to be denied or deferred. The selected actions are integrated into the multi-year work plan and are handled as part of the planned work.

Monitor Risk Actions. Status of risk mitigation actions will be reported during periodic budget reviews. In addition to existing reporting process requirements, each action will be color coded to indicate how well it is being implemented.

Close Risk Actions. A risk action can be closed in one of two ways, either upon completion of closure criteria or upon elimination of the risk. In either case, closure recommendation will be documented and reported at the budget review for management concurrence.

Figure C-1. Risk Management Implementation Diagram.

Classify Tasks

- Fixed cost (Money & Time); Variable cost (Money & Time);
Uncertain cost (Money & Time); Showstoppers (Money & Time)

Collect Risks From:

- TBR, CEIS; Studies; Team Meetings; Engineering documents; MYPP

Determine responsibilities**Determine Range (Min., Most Likely, Max) of consequences for:**

- Variable elements; Uncertain elements

Determine Range of Probabilities for:

- Uncertain elements

Input data**Perform analyses****Generate report****Develop Critical Risk List****Develop risk mitigation actions:**

- Identify Steps; Assign responsibility; Determine cost; Establish closure

For Residual Risk**Determine Range (Min., Most Likely, Max) of consequences for:**

- Variable elements; Uncertain elements

Determine Range of Probabilities for:

- Uncertain elements

Determine ROI for each action**Rank action****Update report****Implement Action Plans**

- Select actions to fund
- Add to MYPP

Assess Risk Status**Report Status****Adjust action plan (as required)****When closure criteria is met:**

- Close action
- Record Closure
- Prepare & distribute closure report

Identify Risk Elements**Identify Risks****Develop Risk Impacts****Evaluate Risk****Identify Mitigation Action****Develop Residual Risk Impacts****Prioritize Actions****Implement Actions****Monitor Risk Actions****Close Risk Actions**

CEIS = Cost estimating input sheet

MYPP = Multi-year program plan

ROI = Return on investment

TBR = Technical Basis Review.

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