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0051611

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 655011

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Mel R. Adams, Technical Basis and Planning, R2-12, 373-6167	[] Yes [X] No	08/04/99
	6. Project Title/No./Work Order No. FY 2000 Tank Characterization Technical Sampling Basis and Waste Information Requirements Document	7. Bldg./Sys./Fac. No. N/A	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-4048, Rev. A	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

This ECN was generated in order to complete a Tri-Party Agreement milestone.

AUG 1999 RECEIVED EDMC

14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

Revision required to complete Tri-Party Agreement milestone.

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

RELEASE STAMP

DATE: AUG 11 1999 HANFORD RELEASE STA: 4 ID: 2

A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-655011

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng.	M.R. Adams	8/11/99	PE		
Cog. Mgr.	J.W. Hunt	8/11/99	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Fiscal Year 2000 Tank Characterization Technical Sampling Basis and Waste Information Requirements Document

M. R. Adams
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: ECN-655011 UC: 2070
Org Code: 74B10 CACN/COA: 102215/EI00
B&R Code: EW 3120074 Total Pages: 75

Key Words: Fiscal Year 2000, FY 2000, Year 2000, Tank Characterization, Characterization, Technical Sampling Basis, Waste Information Requirements

Abstract: N/A

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RECORD OF REVISION	(1) Document Number HNF-4048	Page 1

(2) Title
Fiscal Year 2000 Tank Characterization Technical Sampling Basis and Waste Information Requirements Document

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
A	(7) Initially released 05/24/99 on EDT-611466.	M.R. Adams	J.W. Hunt
0 RS	Incorporate per ECN-655011.	M.R. Adams	J.W. Hunt
		MR Adams	JWHunt 8/11/99

A-7320-005 (08/91) WEF168

HNF-4048
Revision 0

FISCAL YEAR 2000 TANK CHARACTERIZATION TECHNICAL SAMPLING BASIS AND WASTE INFORMATION REQUIREMENTS DOCUMENT

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Lockheed Martin Hanford Corporation

Date Published
August 1999

Prepared for the U. S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Approved for public release; distribution is unlimited

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LIST OF TERMS

AB	Authorization Basis
BIO	Basis for Interim Operation
Btu/hr	British thermal units per hour
CCRN	correspondence control reference number
cm	centimeter
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOE-ORP	U.S. Department of Energy, Office of River Protection
DQO	data quality objective
DST	double-shell tank
Ecology	Washington State Department of Ecology
ECN	Engineering Change Notice
EPA	U.S. Environmental Protection Agency
FY	fiscal year
HLW	high-level waste
HTI	Hanford Tanks Initiative
ICD	Interface Control Document
IH	Industrial Hygiene
IHLW	Phase 1 high-level waste
ILAW	Phase 1 low-activity waste
IMUST	inactive miscellaneous underground storage tank
in.	inches
kg	kilogram
LDUA	light-duty utility arm
LERF	Liquid Effluent Retention Facility
LMHC	Lockheed Martin Hanford Corporation
LOI	Letter of Instruction
LAW	low-activity waste
m^3	cubic meter
NOC	Notice of Construction
PHMC	Project Hanford Management Contract
PNNL	Pacific Northwest National Laboratory
SAP	Sampling and Analysis Plan
SHMS	standard hydrogen monitoring system
SST	single-shell tank
TCR	Tank Characterization Report
TIR	Tank Interpretative Report
TPA	Tri-Party Agreement (Hanford Facility Agreement and Consent Order)
TSB	Technical Sampling Basis Document
TSB-WIRD	Technical Sampling Basis and Waste Information Requirements Document
TWINS	Tank Waste Information Network

LIST OF TERMS (Continued)

TWRS	Tank Waste Remediation System
USQ	unreviewed safety question
WHC	Westinghouse Hanford Company
WIRD	Waste Information Requirements Document
WP&D	Waste Processing and Disposal
%	percent

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1.0 PURPOSE

The *Fiscal Year 2000 Tank Characterization Technical Sampling Basis and Waste Information Requirements Document* (TSB-WIRD) has the following purposes:

- To identify and integrate sampling and analysis needs for fiscal year (FY) 2000 and beyond.
- To describe the overall drivers that require characterization information and to document their source.
- To describe the process for identifying, prioritizing, and weighting issues that require characterization information to resolve.
- To define the method for determining sampling priorities and to present the sampling priorities on a tank-by-tank basis.
- To define how the characterization program is going to satisfy the drivers, close issues, and report progress.
- To describe deliverables and acceptance criteria for characterization deliverables.

Characterization information is required to maintain regulatory compliance, perform operations and maintenance, resolve safety issues, and prepare for disposal of waste. Commitments connected with these requirements are derived from the *Hanford Facility Agreement and Consent Order* (Ecology et al. 1996), also known as the Tri-Party Agreement (TPA); the *Recommendation 93-5 Implementation Plan* (DOE-RL 1996) to the Defense Nuclear Facilities Safety Board (DNFSB); and other requirement sources described in Section 4.0 of this document.

2.0 BACKGROUND

Prior to FY 1998, the Tri-Party Agreement Milestone M-44-00 required the sampling of all tanks and annual development of a specific number of new tank characterization reports (TCRs) annually as deliverables. The milestone intended that the TCRs would be used by the Washington State Department of Ecology (Ecology) to measure progress of the Characterization Project in meeting the information requirements of the Project Hanford Management Contract (PHMC) Tank Waste Remediation System (TWRS).

While this approach was appropriate during the formative stages of the characterization program, the process did not effectively tie characterization activities to program needs as the program matured. The milestone was modified (M-44-00A) to establish the *Waste Information Requirement Document* (WIRD)(Ecology et al. 1997). The WIRD replaced the Tank Waste Analysis Plan and the Tank Characterization Plans previously required by the TPA, Milestone M-44-01 and M-44-02 series.

In prior years, an important precursor to the WIRD was the *Tank Characterization Technical Sampling Basis Document (TSB)*. The TSB document described the methodology used and the results of efforts to determine characterization issues, issue priorities, issue weights, and tank sampling priorities. In FY 1999, the decision was made to combine the TSB and WIRD documents. Formerly, the TSB was produced in March of a fiscal year using the planning baseline of January/February. The WIRD was produced in August of the fiscal year, some eight months later. Continued development of the planning baseline, particularly for disposal, resulted in two documents with different planning content. Placing the documents together eliminates this problem and removes the cost of preparing one of the documents. This new integrated document (TSB-WIRD) contains the content formerly found in both the TSB and the WIRD.

The information contained in this TSB-WIRD reflects ongoing planning and current understanding of projected characterization information needs to resolve the issues listed in this TSB-WIRD. Since original baseline requirements are in the process of being revised, the information contained herein may not reflect currently published planning baselines.

3.0 CHARACTERIZATION INFORMATION FLOW DIAGRAM

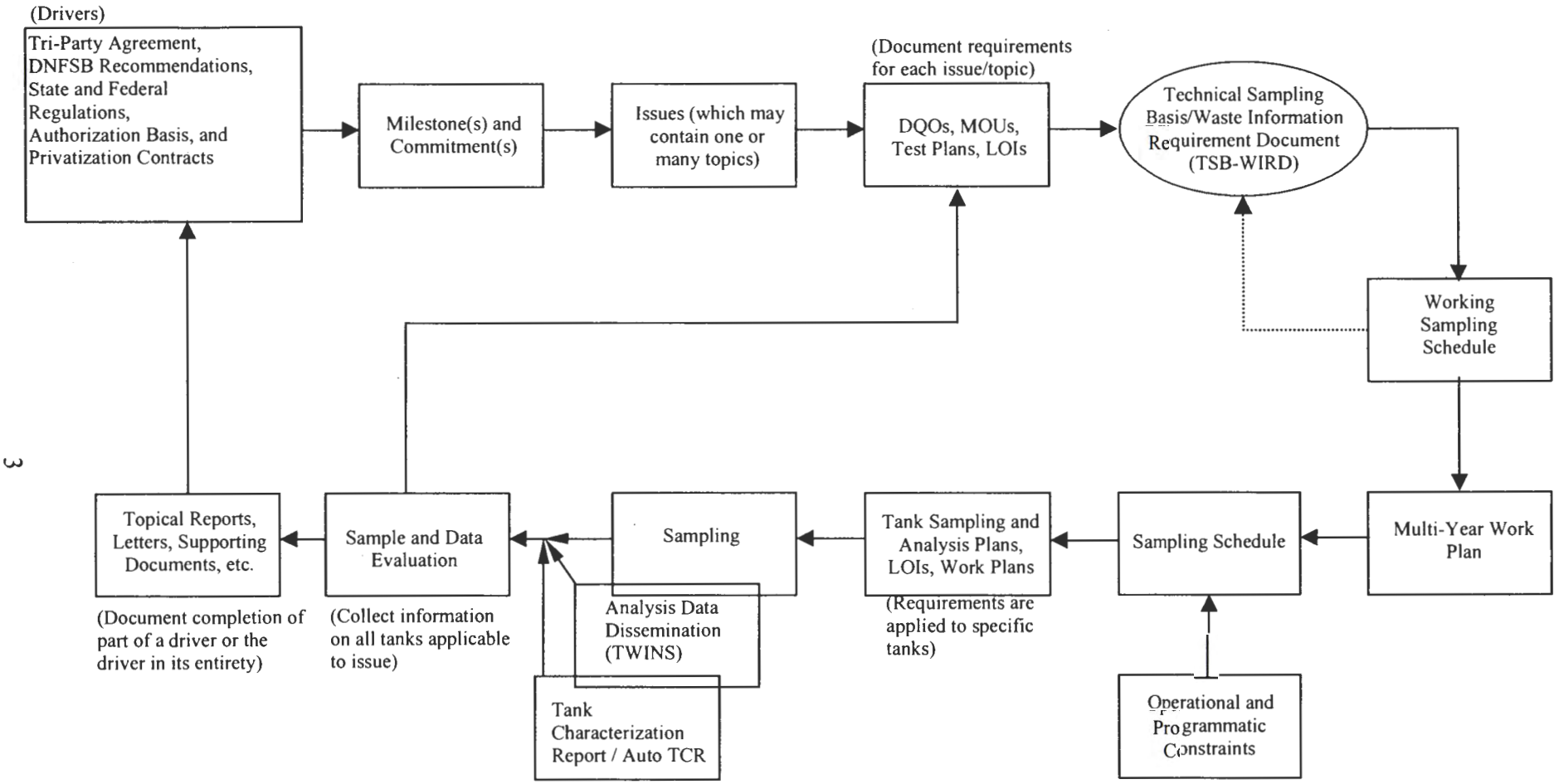
Figure 3-1 illustrates the process by which characterization information is generated and used. This document, the TSB-WIRD, is shown with an oval for quick identification. Each box represents a step in the characterization process. A step may be the creation of a document(s), execution of an event(s), or performance of a work function(s). Each step requires information from a preceding step. Note that the process is iterative; that is, information learned from a step may cause subsequent changes.

The specific information represented by each box or oval may change over time. The information drivers may change or be completed. Milestones may be added or removed. Data Quality Objectives (DQOs), test plans, and letters of instruction (LOIs) are created, removed, or updated periodically to reflect current program needs.

The TSB-WIRD is updated annually to reflect changes in milestones and commitments. The Multi-Year Work Plan (see TWRS 1998 as an example) uses applicable milestones and commitments to build a budget-driven work plan. The work plan, TSB-WIRD, and operational and programmatic constraints are all combined to create a sampling schedule. The sampling schedule is constantly updated and changed to reflect changes in the program needs and conditions in the field.

Tank sampling and analysis plans, LOIs, and work plans are generated prior to tank sampling. The information from data evaluations is reported via electronic databases and web access, reports both hardcopy and electronic, letters, supporting documents, and other means to complete portions of a driver or the driver in its entirety. The cycle ends when there are no more drivers for information and all issues are closed.

Figure 3-1. Characterization Information Flow Diagram



4.0 TWRS CHARACTERIZATION INFORMATION DRIVERS

TWRS information drivers are derived from the following primary sources:

- Tri-Party Agreement (TPA)
- DNFSB *Recommendation 93-5 Implementation Plan*
- Regulatory requirements
- Disposal drivers
- Authorization Basis documents.

Documents describing these drivers, program activities meeting the objectives of the drivers, and associated information needs were used as input to this TSB-WIRD.

Supporting documents report or reflect information driver milestones, commitments, and deliverables. Types of supporting documents include:

- Waste Characterization Multi-Year Work Plan
- TWRS Topical Reports
- TWRS DQO documents.

Each information driver source is discussed in the sections following.

4.1 TRI-PARTY AGREEMENT MILESTONES

The Tri-Party Agreement (TPA)(Ecology et al. 1996) is an agreement between the U.S. Department of Energy, Washington State Department of Ecology, and the U.S. Environmental Protection Agency (EPA). The agreement defines what actions the U.S. Department of Energy must take to complete the cleanup mission at the Hanford Site. The milestones in the TPA constitute a major driver for characterization activities. Ten major TPA milestones are supported by the characterization program. Most milestones include interim milestones. TPA milestone due dates and issues are listed in Table 4-1.

Table 4-1. Tri-Party Agreement Milestones and Issues (2 Sheets)

Program or Issue	Milestone or Driver	Milestone Due Date	Notes
Compatibility (Interim Stabilization)	M-41-00 (former)	9/30/2000	See Section 7.1
C-106 Sluicing	M-40-00	9/30/2001	
	M-45-00	9/30/2024	
Phase 1 Disposal	M-50-00 M-50-04	12/31/2028 6/30/2008	
	M-51-00 M-51-03	12/31/2028 12/31/2009	
	M-60-00 M-60-10 M-60-11 M-60-12	12/31/2024 7/31/1998 8/31/1998 12/31/2002	See Section 4.1.8
	M-61-00 M-61-01 M-61-02	12/31/2028 TBD 12/31/2003	See Section 4.1.9
	M-90-00 M-90-05-T01	TBD 12/31/2001	
SST Retrieval and Tank Closure (HTI)	M-45-00 M-45-03-T01 M-45-03-T02 M-45-04-T02 M-45-06-T01 M-45-06-T02 M-45-06-T03 M-45-06-T04	9/30/2024 9/30/2003 6/30/2002 12/31/2000 11/30/2004 9/30/2006 3/31/2012 3/31/2014	
Process Sampling	M-43-00	6/30/2005	
Phase 2 Disposal	M-45-00 M-45-02D M-45-02E M-45-02F M-45-02G	9/30/2024 9/30/1999 9/30/2000 9/30/2001 9/30/2002	
	M-50-00	12/31/2028	
	M-51-00	12/31/2028	
	M-60-00 M-60-13	12/31/2024 12/31/2003	See Section 4.1.8
	M-61-00 M-61-03	12/31/2028 12/31/2004	See Section 4.1.9
Flammable Gas	M-40-00	9/30/2001	
Organic Fuel	M-40-00	9/30/2001	
Organic Solvents	M-40-00	9/30/2001	
Criticality	M-40-00 M-40-12	9/30/2001 9/30/1999	

Table 4-1. Tri-Party Agreement Milestones and Issues (2 Sheets)

Program or Issue	Milestone or Driver	Milestone Due Date	Notes
Characterization Information Deliverables	M-44-00A	9/30/2002	
	M-44-13D	6/30/2000	
	M-44-13E	6/30/2001	
	M-44-14D	8/31/2000	
	M-44-14E	8/31/2001	
	M-44-15D	9/30/2000	
	M-44-15E	9/30/2001	
	M-44-15F	9/30/2002	
	M-44-16D	9/30/2000	
	M-44-16E	9/30/2001	
	M-44-16F	9/30/2002	

4.1.1 Tri-Party Agreement Major Milestone M-40-00, "Mitigate/Resolve Tank Safety Issues for High Priority Watch List Tanks."

TPA Milestone M-40-00 deals with closing all safety issues associated with single-shell and double-shell tanks. Characterization supports this milestone through the sampling and analysis of tank waste material. Each safety issue has an associated DQO that specifies what information is required to resolve the safety issue. This milestone has one remaining subpart relevant to this TSB-WIRD:

- M-40-12: Resolve nuclear criticality safety issue.

4.1.2 Tri-Party Agreement Major Milestone M-41-00, "Complete Single-Shell Tank Interim Stabilization."

TPA Milestone M-41-00 deals with the stabilization of single-shell tanks (SSTs). This involves removing the pumpable liquid from the SST tanks and moving it to double-shell tanks (DSTs). This operation requires compatibility analysis on the tank liquid to be moved and the receiving tank waste. Characterization supports this milestone by providing compatibility sampling and analysis.

4.1.3 Tri-Party Agreement Major Milestone M-43-00, "Complete Tank Farm Upgrades."

TPA Milestone M-43-00 deals with tank farm upgrades including ventilation upgrades and the cross-site transfer system. Characterization support is provided to such projects on an as-needed basis. Some process samples have been taken to support such upgrades.

4.1.4 Tri-Party Agreement Major Milestone M-44-00A, "Complete Delivery of Information Requirements as Identified in the Annually Submitted WIRD."

This milestone was created in 1997 by change control form M-44-97-03 (December 18, 1997). It replaced M-44-00 that was titled, "Issue tank characterization reports based on process knowledge, prior characterization data and validated empirical data acquired after May 1989 for 177 Hanford high-level waste tanks." TWRS characterization directly supports this milestone. For instance, the TSB-WIRD itself is a deliverable each year in the M-44-00A series. Milestones in the M-44 series are listed in Table 4-1. This milestone has ten subparts relevant to this TSB-WIRD:

- M-44-13D: Submit draft WIRD to Ecology for FY 2001.
- M-44-13E: Submit draft WIRD to Ecology for FY 2002.
- M-44-14D: Submit final WIRD for FY 2001 to Ecology.
- M-44-14E: Submit final WIRD for FY 2002 to Ecology.
- M-44-15D: Issue characterization deliverables consistent with WIRD developed for FY 2000.
- M-44-15E: Issue characterization deliverables consistent with WIRD developed for FY 2001.
- M-44-15F: Issue characterization deliverables consistent with WIRD developed for FY 2002.
- M-44-16D: Complete input of characterization information for HLW tanks for which sampling and analysis were completed per the FY 2000 WIRD into electronic database.
- M-44-16E: Complete input of characterization information for HLW tanks for which sampling and analysis were completed per the FY 2001 WIRD into electronic database.
- M-44-16F: Complete input of characterization information for HLW tanks for which sampling and analysis were completed per the FY 2002 WIRD into electronic database.

4.1.5 Tri-Party Agreement Major Milestone M-45-00, "Complete Closure of All Single-Shell Tanks."

Milestone M-45-00 directs the closure of all SST farms. Characterization support to this milestone was planned to be provided as the Hanford Tanks Initiative (HTI) to develop and demonstrate SST retrieval technology to bring closure to other SSTs. However, HTI activities were suspended in March 1999 (DOE-RL 1999b). Characterization support will be provided for retrieval and disposal of SST waste during Phase 2 Disposal implementation. This milestone has eleven subparts relevant to this TSB-WIRD:

- M-45-02D, E, F and G: Submit annual update of SST retrieval sequence document for Ecology approval.
- M-45-03-T01: Complete SST waste retrieval demonstration.
- M-45-03-T02: Initiate final retrieval demonstration of C-106.
- M-45-04-T02: Complete design for the initial SST retrieval systems.
- M-45-06-T01: Submit tank closure/post-closure plan for selected closure demonstration operable unit or tank farm for Ecology for approval.
- M-45-06-T02: Ecology will issue final closure/post-closure plan for selected closure demonstration operable unit or tank farm.
- M-45-06-T03: Initiate closure actions on an operable unit or tank farm.
- M-45-06-T04: Complete closure actions on one operable unit or tank farm.

4.1.6 Tri-Party Agreement Major Milestone M-50-00, "Complete Pretreatment Processing of Hanford Tank Waste."

Milestone M-50-00 requires the completion of pretreatment processing of Hanford Site tank waste. Before waste is pretreated, sludge washing and sludge pretreatment methods will be evaluated to determine whether the processes will be capable of satisfying set criteria for pretreatment. Characterization is supporting this evaluation by supplying necessary tank samples. This milestone has one subpart relevant to this TSB-WIRD:

- M-50-04: Start Hot Operations of HLW Pretreatment Facility.

4.1.7 Tri-Party Agreement Major Milestone M-51-00, "Complete Vitrification of Hanford High Level Tank Waste."

Milestone M-51-00 concerns the vitrification of Hanford Site high-level waste (HLW). Characterization will support a private vendor contracted by the U.S. Department of Energy by providing waste samples as necessary. This milestone has one subpart relevant to this TSB-WIRD:

- M-51-03: Initiate Hot Operations of the HLW Vitrification Facility.

4.1.8 Tri-Party Agreement Major Milestone M-60-00, "Submit Conceptual Design and Initiate Definitive Design of LLW Vitrification Facility."

The former M-60-00 milestones pertained to pretreatment and immobilization of Hanford low-activity waste (LAW). These milestones, along with other disposal milestones, are currently being deleted because of the award of a contract for privatized immobilization to BNFL, Inc. in

August 1998. With the cancellation of these milestones, milestone M-61-00 will become operative. However, milestone M-61-00 is the subject of re-negotiation and ongoing discussion between the U.S. Department of Energy, Office of River Protection (DOE-ORP) and Ecology. This milestone has four subparts relevant to this TSB-WIRD:

- M-60-10: Select two contractors and issue authorization to proceed with part B work for LAW pretreatment and immobilization.
- M-60-11: Start of construction for two phase 1 LAW pretreatment and immobilization facilities.
- M-60-12: Start of hot operations of two phase 1 LAW pretreatment and immobilization facilities.
- M-60-13: Initiate negotiations on phase 2 LAW pretreatment and immobilization milestone.

4.1.9 Tri-Party Agreement Major Milestone M-61-00, "Complete Pretreatment and Immobilization of Hanford Low-Activity Waste (LAW)."

Milestone M-61-00 concerns the initiation of hot operations or a pretreatment and immobilization facility for Phase 1 LAW waste and initiates negotiations on Phase 2 LAW pretreatment and immobilization. Characterization information will be necessary for operation of the facilities. Milestone M-61-00 is the subject of re-negotiation and ongoing discussion between DOE-ORP and Ecology. This milestone has three subparts relevant to this TSB-WIRD:

- M-61-01: Start construction of phase 1 LAW pretreatment and immobilization facility.
- M-61-02: Initiate hot operations of phase 1 LAW pretreatment and immobilization facility.
- M-61-03: Initiate negotiations on phase 2 LAW pretreatment and immobilization milestones.

4.1.10 Tri-Party Agreement Major Milestone M-90-00, "Complete Acquisition of New Facilities, Modification of Existing Facilities, and/or Modification of Planned Facilities as Necessary for Storage of Hanford Site IHLW and ILAW, and Disposal of ILAW."

Milestone M-90-00 concerns the planning and construction of facilities to store the final immobilized product. Characterization information may be required as input to the design. This milestone has one subpart relevant to this TSB-WIRD:

- M-90-05-T01: Complete ILAW interim storage facility conceptual design.

4.2 DNFSB RECOMMENDATION 93-5 IMPLEMENTATION PLAN

On July 19,1993, the DNFSB transmitted Recommendation 93-5 (Conway 1993) to the U.S. Department of Energy. Recommendation 93-5 stated:

- "Identification of what specifically is in each tank is essential and urgent. Without timely characterization of the wastes, the nature of the risks associated with the tanks cannot be fully assessed and, where necessary, mitigated."

- "Characterization is essential for ensuring safety in the near term during custodial management and remedial activities and also in the long term for advancing the development of permanent solutions to the high level waste problems at Hanford."

In response to this Board recommendation, the U.S. Department of Energy issued the *Recommendation 93-5 Implementation Plan* (DOE-RL 1996). The listing of remaining DNFSB milestone commitments can be found in Table 4-2 of this TSB-WIRD.

The following safety issues were identified in response to the DNFSB recommendation: ferrocyanide, organic complexants, organic solvents, flammable gas, high heat, and criticality. The ferrocyanide issue was resolved and closed with issuance of an internal memorandum (Cash 1996). Closure of the organic complexant issue occurred on January 5, 1999, with issuance of a letter from the U.S. Department of Energy, Richland Operations Office (DOE-RL) (DOE-RL 1999a) to Fluor Daniel Hanford, Inc. Closure of the organic solvents issue is anticipated in August 1999. The high heat issues closure is pending resolution of the C-106 high heat issue (see Section 7.3). The criticality unreviewed safety question (USQ) is closed, but the general criticality safety issue is open with closure scheduled for FY 1999. In addition, efforts are underway to present evidence and arguments to the DNFSB for closure of the core sampling portion of Recommendation 93-5 which requires core sampling of all tanks (Simpson et al.1999) and subsequently closure of the entire Recommendation 93-5 Implementation Plan.

Section 5.4.3 of the Implementation Plan (DOE-RL 1996) identified several milestones to ensure safe operations in TWRS as well as to resolve safety issues. Safe operations in TWRS were enhanced by upgrading the Authorization Basis documents (see Section 4.5). The *Tank Waste Remediation System Basis for Interim Operation,* HNF-SD-WM-BIO-001, Rev 0G (TWRS 1997) was published in July 1997 and has been upgraded and revised as necessary since that date (TWRS 1999).

4.3 REGULATORY DRIVERS FOR CHARACTERIZATION

Several state and federal regulatory requirements are associated with sampling and analysis of dangerous waste and air emissions applicable within TWRS. Other regulatory drivers for future privatization activities include land disposal restrictions for LAW feed and delisting of HLW. Regulatory drivers are listed in several DQOs including Mulkey (1996a), Mulkey and Markillie (1995), and Mulkey and Markillie (1996). These DQOs are currently in the process of revision.

Regulatory drivers for Privatization are listed in the Privatization regulatory compliance DQO which was issued in December 1998 (PNNL 1998).

4.4 DISPOSAL DRIVERS FOR CHARACTERIZATION

At the end of FY 1998, DOE-RL signed a contract with BNFL, Inc. to convert LAW and HLW waste into an immobilized form. In the contract, the waste specifications and procedures for delivery of waste to private contractors (BNFL 1998) were promulgated. The specific information requirements are developed in several DQOs, including:

- *Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project,* PNNL-12040, December 1998 (Wiemers et al. 1998).
- *Data Quality Objectives for Privatization Phase 1: Confirm Tank T is an Appropriate Feed Source for High Level Waste Feed Batch X; HNF-1558, Revision 1* (Nguyen 1999a.).
- *Data Quality Objectives for TWRS Privatization Phase 1: Confirm Tank T is an Appropriate Feed Source for Low-Activity Waste Feed Batch X; HNF-1796, Revision 2* (Nguyen 1999b).
- *Data Quality Objectives for TWRS Privatization Phase 1: Tank Waste Transfer Control; HNF-1802, Revision 1* (Banning 1999).
- *Characterization Data Needs for Development , Design and Operation of Retrieval Equipment Developed through the Data Quality Objective Process; WHC-SD-WM-DQO-008, Revision 1* (Bloom and Nguyen 1996).
- *Low-Activity Waste and High-Level Waste Feed Processing Data Quality Objectives,* PNNL-12163, Revision 0 (Patello 1999).

Other requirements including sampling requirements are spelled-out in the *Interface Control Document ICD-23* (BNFL 1999). The *Tank Waste Remediation System Operations and Utilization Plan* (Kirkbride et al. 1999) provides an engineering analysis for the retrieval baseline that supports privatization. Both of these documents are described further in Section 7.4 of this TSB-WIRD.

4.5 SAFE OPERATIONS DRIVERS FOR CHARACTERIZATION (AUTHORIZATION BASIS)

The Authorization Basis consists of a suite of documents including the *Tank Waste Remediation System Basis for Interim Operation* (BIO), HNF-SD-WM-BIO-001 (TWRS 1997), various supporting documents, and a DOE-ORP approved letter-book. The documents constitute the technical basis for safe operations and maintenance of the tank farm facilities, equipment, and

processes. This suite of documents is revised frequently. Reference should be made to the controlled "gold" copy suite located in the Tank Characterization and Safety Resource Center in the 2750E Building. Characterization issues driven by the Authorization Basis are included in Table 4-2 of this TSB-WIRD.

Table 4-2 lists non-TPA milestones, including DNFSB milestones.

Table 4-2. Non-Tri-Party Agreement Milestones and Issues

Program or Issue	Milestone or Driver	Milestone Due Date
Compatibility (Interim Stabilization)	Authorization Basis	N/A
Tank SY-101 Level Rise	Authorization Basis	N/A
Phase 1 Disposal	Privatization Contract	N/A
	Regulatory Drivers	N/A
Evaporator Operations	Authorization Basis	N/A
Dangerous Wastes	Regulatory Drivers	N/A
Air Emissions	Regulatory Drivers	N/A
Industrial Hygiene Support	Occupational Safety Drivers	N/A
Process Sampling	Authorization Basis	N/A
	State and Federal Regulations	N/A
Organic Fuel	Authorization Basis	N/A
Organic Solvents	DNFSB 5.4.3.4D	12/31/1999
	DNFSB 5.4.3.4E	2/28/2000
	DNFSB 5.4.3.4.F	11/30/2000
Vapor Screening to support rotary mode sampling	Regulatory Drivers	N/A
General Characterization	DNFSB 5.6.3.1.J	12/31/2002
Caustic Mitigation	Authorization Basis	N/A
Criticality	Authorization Basis	N/A

N/A = not applicable

5.0 INFORMATION DRIVERS: SUPPORTING DOCUMENTS

Supporting documents report, schedule, evaluate, or reflect the milestones, commitments, or deliverables connected with information drivers. Supporting documents generally do not contain information drivers themselves, but, in the case of DQOs, they provide specific requirements associated with an information driver.

5.1 WASTE CHARACTERIZATION PROGRAM MULTI-YEAR WORK PLAN

The TWRS *Waste Characterization Multi-Year Work Plan WBS 1.1,* HNF-SP-1230, Rev. 1, (TWRS 1998) contains the technical baseline, work breakdown structure, schedule, and cost baseline for the Characterization Program. The document is issued each fiscal year. The most recent version contains FY 1999 work plans and was issued in November 1998.

5.2 TWRS TOPICAL REPORTS

Topical reports are technical documents that are used to present the current knowledge on a particular issue. Additional data or analysis needs may be discovered during preparation of a topical report that can lead to waste phenomena and/or waste behavior studies.

Topical reports include:

- *Flammable Gas Project Topical Report,* HNF-SD-1193,•Rev. 2 (Johnson et al. 1997)
- *Organic Complexant Topical Report,* HNF-SD-WM-CN-058, Rev. 1 (Meacham et al. 1997)
- *Organic Solvent Topical Report,* HNF-SD-WM-SARR-036, Rev. 1A (Cowley et al. 1997).

5.3 DATA QUALITY OBJECTIVE DOCUMENTS

The DQOs define the work scope required to address a specific issue and contain guidance on the type and extent of characterization necessary to resolve the issue. Each TWRS program issue has an associated DQO that defines the questions, decisions to be made, required information, and the quality of data required to resolve the questions. Table 5-1 lists the TWRS DQOs and their status. An active DQO is one wherein the data are still being collected to satisfy it or it is a DQO in preparation that has not yet been released. An inactive DQO is one against which data are no longer being collected.

Although a DQO may be closed or closing for SST/DST issues, it may remain active for inactive miscellaneous underground storage tanks (IMUST) or other activities. A DQO currently inactive could again become active if new issues or questions arise.

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
242-A Evaporator/LERF WHC-SD-WM-DQO-014	242-A Evaporator/LERF Data Quality Objectives	Covers information needs for Evaporator operations.	Rev. 2 issued 4/3/98 Rev. 1A issued 5/16/95 Rev. 1 issued 4/25/95 Rev. 0 issued 9/29/94
Air Emission Regulatory DQO WHC-SD-WM-DQO-021	Data Quality Objectives for Regulatory Requirements for Hazardous and Radioactive Air Emissions Sampling and Analysis	Covers information needs for tank farms air regulatory compliance and permitting.	Revision in process. Rev. 0 issued 11/30/95
C-103 Dip Sample PNL-8871 UC-510	Organic Layer Sampling for SST 241-C-103 Background, and Data Quality Objectives, and Analytical Plan	Covers information needs to resolve the specific issue of the organic layer in tank 241-C-103. **INACTIVE**	Issued 8/93
C-103 Vapor WHC-EP-0774	Tank 241-C-103 Vapor and Gas Sampling Data Quality Objectives	Covers information needs to resolve the vapor problem in tank 241-C-103. **INACTIVE**	Rev. 0 issued 2/28/94 CCRN 9451694
C-106 High Heat WHC-SD-WM-DQO-015 Originally WHC-EP-0723	Tank 241-C-106 Sampling Data Requirements Developed Through the DQO Process	Covers information needs to help resolve high heat issue in C-106. **INACTIVE**	Rev. 0 issued 1/20/94 as WHC-EP-0723 CCRN 9450464

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
Crust Burn Flammable Gas WHC-SD-WM-DQO-003	Data Requirements Required Through the Data Quality Objectives Process for the Crust Burn Issue Associated with Flammable Gas Tanks	Covers information needs to ensure coring could be performed safely (without igniting the crust) in tanks 241-SY-103 and 241-AW-101. **INACTIVE**	Rev. 1 issued 4/27/94 CCRN 9453471
Dangerous Waste Regulatory WHC-SD-WM-DQO-025	Data Quality Objectives for Regulatory Requirements for Dangerous Waste Sampling and Analysis	Covers information needs for TWRS dangerous waste regulatory compliance and permitting.	Revision in process. Rev. 0 issued 7/2/96
Ferrocyanide WHC-SD-WM-DQO-007 Originally WHC-EP-0728	Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objectives Process	Covers information needs for the resolution of the Ferrocyanide safety issue. **INACTIVE**	Rev. 2 issued 7/13/95 Rev. 1 issued 4/28/95 Rev. O issued 8/24/94 CCRN 9455679 Originally issued 12/31/93 CCRN 9361056
Flammable Gas WHC-SD-WM-DQO-004	Flammable Gas Tank Safety Program: Data Requirements for Core Sample Analysis Developed through the Data Quality Objectives (DQO) Process	Covers information needs to support resolution of the flammable gas issue.	Rev. 3 issued 12/18/97 Rev. 2 issued 7/20/95 Rev. 1 issued 5/1/95 Rev. 0 issued 5/13/94 CCRN 9453471
Hanford Tank Initiative (Characterization of the C-106 hard heel)	Title not yet determined.	Covers information needs to support HTI in hard heel removal and tank closure. Tank 241-C-106 only. **INACTIVE**	The HTI project is no longer active. Not currently scheduled for issuance.

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
Hazardous Vapor Safety Screening WHC-SD-WM-DQO-002	Data Quality Objectives for Hazardous Vapor Safety Screening	Covers information needs to support the Vapor Programs safety screening. **INACTIVE**	Rev. 2 issued 11/15/99
Historical Data Acquisition Model Verification WHC-SD-WM-DQO-018	Historical Model Evaluation Data Requirements	Covers information needs supporting the historical model for tank grouping.	Rev. 2 issued 2/18/97 Rev. 1 issued 6/20/96 Rev. 0 issued 5/8/95
HLW Feed DQO (Privatization) WIT-98-024	High-Level Waste Feed Data Quality Objectives	Covers information needs required by BNFL, Inc. and DOE WP&D for Phase 1 HLW waste feed. **INACTIVE**	Replaced by PNNL-12163 Rev. 0 issued 5/98
HTI AX-104 Vadose Zone HNF-2326	Hanford Tank Initiative Tank 241-AX-104 Upper Vadose Zone Demonstration Data Quality Objectives	Covers demonstration of the cone penetrometer technology and upper vadose zone sample collection within the AX tank farm. Data used to support risk assessment and tank closure. **INACTIVE**	The HTI project is no longer active. Rev. 0 issued 3/24/98
HTI Tank AX-104 waste Characterization HNF-SD-WM-DQO-027	Tank 241-AX-104 Waste Characterization Data Quality Objective	Covers information needs to support Hanford Tank Initiative (HTI) in tank closure and risk assessment. Tank 241-AX-104 only. **INACTIVE**	The HTI project is no longer active. ECN (Rev. 0-B) issued 1/13/98 ECN (Rev. 0-A) issued 10/10/97 Rev. 0 issued 9/3/97

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
In-Tank Generic Vapor WHC-SD-WM-DQO-002	Data Quality Objective for Tank Hazardous Vapor Safety Screening (Formerly - Data Quality Objectives for Generic In-Tank Health and Safety Vapor Issue Resolution	Covers information needs required by the Vapor Program.	Rev. 2 issued 11/15/95 Rev. 1 issued 4/28/95 Rev. 0 issued 3/7/94 CCRN 9451694
LAW and HLW Feed Processing DQO PNNL 12163	Low-Activity Waste and High-Level Waste Feed Processing DQOs.	Waste feed processing information needs required by DOE WP&D. Supercedes PNNL-12064 and WIT-98-024.	Rev. 0 issued 4/99
LAW Feed DQO (Privatization) Revision number PNNL-12064 Original number is WHC-SD-WM-DQO-023	Revision title is: Low-Activity Waste Feed Data Quality Objective Old title is: Data Requirements For TWRS Privatization Waste Characterization	Covers Phase 1 LAW waste feed information needs required by privatization contractor (BNFL, Inc.) and DOE Waste Processing and Disposal (WP&D). **INACTIVE**	Replaced by PNNL-12163. Rev. 0 issued 12/98 (PNNL-12064) Rev. 0 issued 11/97 (WIT-98-010) Rev. 0 issued 11/13/96 (WHC-SD-WM-DQO-023)
Organic Complexant WHC-SD-WM-DQO-006	Data Quality Objective to Support Resolution of the Organic Fuel Rich Tank Safety Issue	Covers information needs to resolve the organic complexant issue. **INACTIVE**	Rev. 2 issued 9/8/95 Rev. 1 issued 4/28/95 Rev. 0 issued 4/29/94 CCRN 9453093
Organic Solvent HNF-SD-WM-DQO-026	Data Quality Objective to Support Resolution of the Solvent Safety Issue	Covers information needs to resolve the safety issue of organic solvent pools in the tanks.	Rev. 0 issued 8/13/97

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
Pretreatment WHC-SD-WM-DQO-022 Originally DQO-011 Sampling Strategy WHC-SD-WM-TA-154	Data Needs and Attendant Data Quality Objectives for Tank Waste Pretreatment and Disposal	Covers information needs to support enhanced sludge washing, solids/liquid separation, cesium removal, strontium removal, TRU removal, and technetium removal.	Rev. 0 issued 6/29/95 OLD DQO WAS DQO-011 Rev. 1 issued 9/15/94 CCRN 9456763 Rev. 0 issued 8/3/94 CCRN 9455386
Privatization Regulatory PNNL-12040	Regulatory Data Quality Objectives Supporting Tank Waste Remediation System Privatization Project.	Covers information needs under RCRA and corresponding state requirements, and to facilitate permitting and compliance activities for treatment and disposal of waste.	Rev. 0 issued 12/98
Retrieval (equipment) WHC-SD-WM-DQO-008	Characterization Data Needs for Development, Design and Selection of Retrieval Equipment and Process for SSTs and DSTs, Developed through the DQO Process	Covers information needs for retrieval equipment requirements.	Rev. 1 issued 7/31/96 Rev. 0 issued 6/29/95
Safety Screening WHC-SD-WM-SP-004	Tank Safety Screening Data Quality Objectives	Covers information needs to determine safe storage of tank waste. (Includes criticality analysis requirements.)	Rev. 2 issued 8/31/95 Rev. 1 issued 4/27/95 Rev. 0 issued 2/23/94 CCRN 9451671
Tank 241-Z-361 Characterization DQO for Sludge HNF-4225	241-Z-361 Sludge Characterization DQO	Covers information needs for disposal of the waste in tank 241-Z-361.	Rev. 0 issued 4/99

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
Tank 241-Z-361 Characterization DQO for Vapor HNF-2176	Tank 241-Z-361 Waste Characterization Data Quality Objective: Headspace Vapor and Tank Structure	Covers information needs to open, vapor sample, and photograph tank 241-Z-361.	Rev. 0 issued 6/10/98
Vapor Rotary Mode WHC-SD-WM-SP-003	Rotary Core Vapor Sampling Data Quality Objective	Covers information needs to support the NOC for rotary coring. **INACTIVE**	Rev. 0 issued 2/25/94 CCRN 9451694
Waste Compatibility WHC-SD-WM-DQO-001	Data Quality Objective for Tank Farms Waste Compatibility Program	Covers information needed for waste transfers within the tank farms and for waste coming into the tank farms.	Rev. 3 issued 6/99. Rev. 2 issued 6/23/97 Rev. 1 issued 4/24/95 Rev. 0 issued 3/4/94 CCRN 9451694
Waste Feed Delivery - Confirm Tank T is Appropriate for Batch X (LAW) HNF-1796	Data Quality Objectives for TWRS Privatization Phase 1: Confirm Tank T Is an Appropriate Feed Source for Low-Activity Waste Feed Batch X	Covers information needs for waste feed delivery for LAW to the staging tanks for Phase 1.	Rev. 2 issued 3/3/99 Rev. 1 issued 7/2/98 Rev. 0 issued 3/11/98
Waste Feed Delivery - Confirm Tank T is Appropriate for Batch X (HLW) HNF-1558	Data Quality Objectives for TWRS Privatization Phase 1: Confirm Tank T Is an Appropriate Feed Source for High Level Waste Feed Batch X	Covers information needs for waste feed delivery for HLW to the staging tanks for Phase 1.	Rev. 1 issued 3/3/99 Rev. 0 issued 8/20/98

Table 5-1. TWRS DQO Documents (7 Sheets)
Inactive Documents are Shaded
Listed in alpha/numerical order by subject.

SUBJECT DOCUMENT NUMBER	DOCUMENT TITLE	DOCUMENT SCOPE	ISSUE DATE/TRANSMITTAL NUMBER
Waste Feed Delivery - Waste Qualification (HLW)	High-Level Waste Feed Qualification Data Quality Objective	Covers information needs to transfer HLW from the staging tank to the private contractor.	Scheduled FY 2000
Waste Feed Delivery - Waste Qualification (LAW) HNF-2734	Low-Activity Waste Feed Qualification Data Quality Objective	Covers information needs to transfer LAW from the staging tank to the private contractor.	Scheduled FY 2000
Waste Feed Delivery - Waste Transfer Control HNF-1802	Data Quality Objectives for TWRS Privatization Phase 1: Tank Waste Transfer Control	Covers information needs to transfer waste into or out of a Phase 1 feed tank prior to retrieval.	Rev. 1 issued 4/28/99 Rev. 0 issued 8/4/98
Wastewater Regulatory WHC-SD-WM-DQO-024	Data Quality Objectives for Regulatory Requirements for Wastewater Effluents Sampling and Analysis	Covers regulatory information needs for TWRS wastewater effluents.	Rev. 0 issued 3/28/96

Notes:
CCRN = correspondence control reference number
ECN = engineering change notice
LERF = Liquid Effluent Retention Facility

6.0 PROCESS FOR DETERMINING CHARACTERIZATION ISSUES AND PRIORITIES

The process for determining characterization issues and priorities was completed in an annual facilitated session including representatives from the programs and projects that require characterization information, DOE-ORP, Ecology, and an observer from the DNFSB. Meeting minutes from the session form the basis for this section of the TSB-WIRD (DeFigh-Price 1999).

The objective of the facilitated session held on January 20, 1999 was threefold: (1) determine issues currently requiring and projected for characterization support; (2) determine the relative priority (priority rank) of issues; and (3) establish the relative ranking and weight of the issues.

The team in the facilitated session determined that one of the issues in the previous (1998) facilitated issue meeting, flammable gas, does not require characterization sampling in the upcoming year. (The flammable gas USQ, the criticality USQ, the Ferrocyanide USQ, and the Separable Organic Phase USQ were closed in September 1998 (DOE-RL 1998) as part of the closure of TPA milestone M-40-09, "Close All Unreviewed Safety Question for Double Shell and Single Shell Tanks.") It is not anticipated that flammable gas will be a driver for further characterization activities for SSTs or DSTs. However, vapor samples to verify Standard Hydrogen Monitoring System (SHMS) cabinet instrument readings will continue to be collected from SHMS cabinets. Flammable gas may be a driver for IMUSTs, but the characterization required will be addressed under a new IMUST issue discussed in Section 7.8 of this TSB-WIRD. (It should also be noted that a number of the issue names and descriptions have changed from the previous year.)

Following identification of the issues, the maximum benefit gained by sampling for each issue was determined. Following consideration of maximum benefit, the facilitated team voted on the rank priority of issues using a decision analysis method known as the Nominal Grouping Technique (NGT). Table 6-1 provides the identified issues in rank order of priority along with the maximum benefit derived from sampling for each issue. Further elaboration of these issues can be found in Section 7.0 of this TSB-WIRD.

Table 6-1. Maximum Benefit Gained by Sampling for Each Issue (2 Sheets)

ISSUE	MAXIMUM BENEFIT GAINED BY SAMPLING
Compatibility	Allows transfer and co-mingling of wastes without adverse reactions or consequences to meet operational commitments.
SY-101 Level Rise	Remediates level rise to close USQ . Supports and maintains operations in safe envelope.
C-106 Sluicing	Resolves high heat safety issue and resolves environmental concerns.
Phase 1 Disposal	Supports equipment and facility design including 241-AZ-101 mixer pump test, meets requirements for feed delivery to avoid idle facilities, supports DOE and BNFL, Inc. design deliverables, supports construction and satisfies regulatory requirements for waste feed delivery and permitting.
Evaporator Operations	Maintains (conserves) tank space, enables waste minimization and avoids construction of new tanks.
Regulatory Compliance	Avoids enforcement actions, initiates/maintains operations and reduces risk of Phase 1 delays.
Industrial Hygiene (IH) Support	Minimizes personnel exposure and equipment costs. Limits legal liabilities and health consequences. Prevents disruptions to operations.

Table 6-1. Maximum Benefit Gained by Sampling for Each Issue (2 Sheets)

ISSUE	MAXIMUM BENEFIT GAINED BY SAMPLING
IMUSTs	Allows future activities in these tanks without Authorization Basis (AB) upgrades. Resolves or validates safety issues for these tanks. Closes flammable gas, organic complexant USQs and IMUST identified USQ.
SST Retrieval & Tank Closure (HTI)	Validates assumptions used to interpret historical records, demonstrates/selects technologies, validates and updates inventory for the Retrieval Performance Evaluation.
Process Sampling	Verifies compliance with operating requirements and maintains operations.
Safety Screening	Ensures validation of the safety envelope.
Miscellaneous Facilities	Develops compliant AB for miscellaneous facilities and addresses key safety issues.
Phase 2 Disposal	Efforts on an opportunistic basis to close Phase 2 needs.
Historical Model Evaluation	Confirms or refutes assumptions used to interpret data. Reduces risk.

Following determination of the relative priority of the issues, the issue weights were determined by the facilitated team using the Multi-Attribute Decision Analysis technique. Determination of issue weights was performed by establishing the most important issue (Compatibility) with a relative weight of 100. Team members voted on the relative weight of every other issue with respect to Compatibility. After individual voting for the relative importance of each issue, the results of the voting were combined and individual weights were averaged. Table 6-2 provides the ranks and weighting of issues.

Table 6-2. Results of Ranking and Weighting of Issues

ISSUE	RANK	ISSUE WEIGHT
Compatibility	1.0	100
SY-101 Level Rise	2	96
C-106 Sluicing	3	92
Phase 1 Disposal	4	85
Evaporator Operations	5	77
Regulatory Compliance	6	68
Industrial Hygiene (IH) Support	7	61
IMUSTs	8	50
SST Retrieval & Tank Closure (HTI)	9	38
Process Sampling	10	31
Safety Screening	11	23
Miscellaneous Facilities	12	18
Phase 2 Disposal	13	9
Historical Model Evaluation	14	7

7.0 ISSUES REQUIRING CHARACTERIZATION INFORMATION

The issues listed and ranked in Tables 6-1 and 6-2 are further described in the following sections. Information required by each issue is documented through the DQO process (EPA 1994 and LMHC 1997b). The DQO process leads to the documentation of information needs, data quality requirements, boundary conditions, and special handling requirements relating to sampling and analysis. The DQO process is an iterative one requiring that a DQO be revised when program needs or conditions change. Table 5-1 lists TWRS DQOs.

7.1 COMPATIBILITY

Information requirements to support waste compatibility issues and waste transfers are described in the *Data Quality Objectives for Tank Farms Waste Compatibility Program* (Mulkey and Miller 1998), the *DST Waste Analysis Plan* (Mulkey 1996b) and from the BIO (TWRS 1999). Waste transfers that require compatibility information include transfers from DST to DST, SST to DST, waste generators to DSTs, and 242-A Evaporator to DSTs. All DSTs are within the scope of the compatibility DQO. The SSTs are within the scope of the compatibility DQO only if waste is scheduled to be transferred out of a SST for interim stabilization of a tank.

There are two functions associated with sampling and analysis for compatibility. The first is to ensure that the transfer of waste will not result in an unsafe condition or a condition that would adversely impact future disposal/retrieval actions. The second function is to ensure continued operability during waste transfers, waste concentration/minimization operations, and waste storage. The compatibility DQO must be executed whenever waste is sent to a DST.

Other operations supported by the compatibility DQO include saltwell pumping (interim stabilization) and waste evaporation. Saltwell pumping, or interim stabilization, is the primary method used to prevent tanks from leaking until the waste is retrieved and processed. In the pumping process, liquid (both supernatant and drainable interstitial liquid) is pumped out of the saltwell of a SST and into a DST.

Before waste supernatant can be evaporated in the evaporator, the waste must be staged to the evaporator candidate feed tanks. The compatibility DQO must be executed between DSTs and candidate feed tanks prior to waste staging. After evaporation, evaporator product/ slurry and bottoms must be sent to DSTs. This transfer also requires a compatibility analysis.

Interim stabilization of SSTs is a major activity requiring compatibility sampling. The primary document defining interim stabilization needs is the *Single-Shell Tank Interim Stabilization Project Plan* (Vladimiroff 1999). The plan contains several milestones including:

- start pumping 4 tanks (SX- and S- farms) September 1999
- start pumping 7 tanks (U-, SX-, A- and AX- farms) September 2000
- start pumping 8 tanks (U-, BY-, S- and C- farms) September 2001

- start pumping 7 tanks (U-, SX-, S- and C- farms) September 2002
- complete interim stabilization by January 2004.

Specific tanks to be interim stabilized are listed in the compatibility section of Appendix B, Table B-1.

In addition, the State of Washington, U.S. Department of Energy, and the U.S. Department of Justice have developed a Consent Decree announced in March 1999 that establishes a pumping schedule for SSTs. The court ordered consent decree replaced language in the TPA pertaining to tank stabilization. The decree requires 98 % of the remaining 6 million gallons of liquid waste to be pumped by September 2003 and the final 2 % to be removed by September 2004.

7.2 SY-101 LEVEL RISE

Tank 241-SY-101 exhibited level growths alleviated by periodic gas releases from 1980 to 1993. The gas releases were apparently caused by large, buoyant masses of solids with trapped gas breaking loose from the settled solids causing vigorous mixing and release of gas into the headspace. A mixer pump was installed in 1993 to mix settled solids and release generated gas in a more controlled manner. The mixer pump has been effective in mitigating the buoyant displacement behavior. However, in 1997, a perceptible trend of a non-alleviated, increasing waste level was noticed. A USQ was declared in February 1998 because the tank waste level was approaching action limits.

Because of the USQ, the highest sampling priority for the Characterization Project in FY 1999 has been the retrieval of three (3) full depth cores from SY-101 including approximately seventeen (17) retained gas sampler (RGS) segments.

Characterization activities driven by this issue respond to the Level Rise USQ, environmental concerns and SY-102 compatibility with SY-101. Both SY-101 and SY-102 are within the scope of this issue since SY-102 will be the receiver tank for wastes expected to be removed from SY-101 during FY 2000.

7.3 C-106 SLUICING

Tank 241-C-106 has been used for radioactive waste storage since mid-1947. Based on its capacity to store waste, this tank received an excess of sludge containing high levels of strontium-90. The heat load of C-106 exceeds the heat load limit of 40,000 Btu/hr and classifies the tank as a high-heat load tank (Ogden et al. 1997). Tank C-106 is the only SST that requires water addition to maintain active cooling. To alleviate high-heat problems, tank C-106 is in the process of sluicing, retrieval, and waste transfer to tank AY-102.

Current plans are to transfer six (6) feet of tank waste from C-106 tank to tank AY-102. The characterization program supports C-106 sluicing operations with collection of grab samples from AY-102.

Tank 241-C-106 sluicing does not have a DQO, but a Process Control Plan (PCP) lists what samples need to be taken and the analysis to be performed (Carothers et al. 1998).

7.4 PHASE 1 DISPOSAL

At the end of FY 1998, DOE-RL signed a privatization contract with BNFL, Inc. to convert LAW and HLW waste feed into an immobilized form. The scope of this issue includes support to Phase 1 of the treatment and disposal effort including: (1) characterization of candidate Phase 1 feed source tank waste (chemical and physical); (2) treatment facility design support; (3) authorization to proceed with Part B-2 compliance; (4) regulatory compliance work, (5) waste feed delivery design support; and (6) support to BNFL, Inc. contract Interface Control Document (ICD) 23.

The following DQOs deal with privatization contractor waste feed processing:

- *Regulatory Data Quality Objectives Supporting Waste Remediation System Privatization Project;* PNNL-12040, Revision 0 (Wiemers et al. 1998).

- *Low-Activity Waste and High-Level Waste Feed Processing Data Quality Objectives*; PNNL-12163, Revision 0 (Patello 1999).

The following is a list of DQOs required for the PHMC to deliver wastes and to verify that the wastes are within the LAW and HLW feed envelopes prior to staging of waste for delivery to BNFL, Inc.:

- *Data Quality Objectives for Privatization Phase 1: Confirm Tank T is an Appropriate Feed Source for High Level Waste Feed Batch X;* HNF-1558, Revision 1 (Nguyen 1999a).

- *Data Quality Objectives for TWRS Privatization Phase 1: Confirm Tank T is an Appropriate Feed Source for Low-Activity Waste Feed Batch X;* HNF-1796, Revision 2 (Nguyen 1999b).

- *Data Quality Objectives for TWRS Privatization Phase 1: Tank Waste Transfer Control;* HNF-1802, Revision 1 (Banning 1999).

- *Characterization Data Needs for Development, Design and Operation of Retrieval Equipment Developed through the Data Quality Objective Process;* WHC-SD-WM-DQO-008, Revision 1 (Bloom and Nguyen 1996).

BNFL, Inc. is conducting waste treatability studies as part of their contract (BNFL 1998). The waste treatability studies are used to develop information in support of waste treatment facility design, safety basis, permitting, and waste form compliance. The studies are conducted using samples of candidate LAW feed and HLW feed collected from source tanks. The sampling requirements for the studies are spelled-out in the *Interface Control Document ICD-23* (BNFL 1999). In addition to tanks identified in Table B-2 of this TSB-WIRD, ICD-23 also requires Single-Shell Tank (SST) full depth cores from 6 to 8 tanks per year from FY 2002 to FY 2006 to address high organic content. The specific tanks have not yet been determined.

The *Tank Waste Remediation System Operations and Utilization Plan* (Kirkbride et al. 1999) provides an engineering analysis for the retrieval baseline that supports Privatization. In general, the document provides an analysis of LAW and HLW feed staging, the SST retrieval sequence and the process summary basis. Waste feed delivery characterization data needs are found in Section 2.1.2 of the document. One requirement is completion and maintenance of Best-Basis Inventory numbers.

The disposal program is dynamic and priorities, order of sampling and/or specific tanks may change as program needs are further refined. WP&D will continue to develop these details.

Specific tanks supporting Phase 1 Disposal as identified at this time are listed in Appendix B, Table B-2.

7.5 EVAPORATOR OPERATIONS

Successful operation of the 242-A Evaporator requires sampling and analysis of evaporator feed waste. The sampling and analysis requirements are described in *242-A Evaporator/Liquid Effluent Retention Facility Data Quality Objectives* (Von Bargen 1998).

The evaporator DQO has requirements for three functions:

- Process control evaluation to ensure the evaporator operates efficiently with minimal equipment degradation. Process control evaluation also compares the waste compatibility in the candidate feed tanks with the wastes in the feed and slurry tanks.

- Safety evaluation to ensure that hazardous wastes do not endanger workers or the environment.

- Environmental compliance evaluation to ensure the waste released to the slurry tank, the gases released to the air and the water released to the Liquid Effluent Retention Facility (LERF) are in compliance with environmental limits.

Several tanks are associated with evaporator operations. Tank 241-AW-102 is the feed tank to the evaporator while tank 241-AW-106, the slurry tank, receives the evaporator bottoms after waste evaporation. These two tanks are not ordinarily sampled for the Evaporator/LERF DQO (WHC-SD-WM-DQO-014) because the wastes in these tanks are evaluated before the wastes are sent to them. Evaporator condensate is sent to the Liquid Effluent Retention Facility. Tanks that transfer waste to the feed tank are referred to as candidate feed tanks and include tanks 241-AP-104, 241-AP-107, and 241-AW-104. Tanks supporting the evaporator operations issue are listed in Appendix B, Table B-3.

7.6 REGULATORY ISSUES

TWRS must meet environmental regulations applicable to waste tanks. Information requirements associated with regulatory compliance include air emissions, dangerous waste, and wastewater.

Characterization sampling and analysis of tank headspace is to be conducted according to *Data Quality Objectives for Regulatory Requirements for Hazardous and Radioactive Air Emissions Sampling and Analysis* (Mulkey and Markillie 1995) currently under revision. Although this DQO applies to all DSTs and SSTs whether actively or passively ventilated, the current sampling needs for air emissions are directed to tanks that have an immediate need for an air permit because of planned activities related to disposal or for other reasons. Generally, these are tanks in which waste will be disturbed as a result of equipment installation, disposal activities or interim stabilization measures.

Regulatory information on solid and liquid components of tank waste material is required by the *Data Quality Objectives for Regulatory Requirements for Dangerous Waste Sampling and Analysis* (Mulkey 1996a). The dangerous waste sampling requirements are directed at DSTs that will be staged for transfer of waste feed to the Privatization contractor in order to properly designate the wastes prior to the transfer.

Regulatory information required for TWRS facilities and operations that discharge or potentially discharge wastewater is defined in *Data Quality Objectives for Regulatory Requirements for Wastewater Effluents Sampling and Analysis* (Mulkey and Markillie 1996). The wastewater regulations apply to effluents from facilities and do not require in-tank waste data.

Tanks supporting the regulatory issues described above are listed in Appendix B, Table B-4.

7.7 INDUSTRIAL HYGIENE (IH) SUPPORT

Following a series of exposures to unknown vapors by tank farm operators in 1992, an intense program was enacted to develop sampling and analysis capabilities to monitor Industrial Hygiene (IH) parameters in situations where potential personnel exposure to tank vapors exists. Such data are also used to support submittal of TWRS exhauster Notices of Construction (NOC) and to obtain air permits for various retrieval projects and the rotary core sampler exhauster. By

early 1998 enough data had been collected to satisfy and resolve the identified safety issues, and vapor sampling, other than IH sniffs, was suspended. However, the following program requirements now appear to make some form of IH vapor sampling an ongoing requirement:

- IMUST/Miscellaneous Facility tank sampling
- IH concerns related to waste disturbing retrieval activities such as C-106 sluicing

Characterization support to the industrial hygiene (IH) issue is necessary for all activities wherein tank waste will be significantly disturbed and the potential for hazardous vapor release is significant. When such disturbing activities occur, data is needed to determine personnel protective measures and exposure limits and to determine control equipment. These data are used to minimize personnel exposure and equipment costs, limit legal liabilities and health consequences and to prevent disruptions to operations. Tanks within the scope of this issue and their priority are listed in Appendix B, Table B-5.

7.8 INACTIVE MISCELLANEOUS UNDERGROUND STORAGE TANKS (IMUST)

TWRS Owned IMUSTs

An IMUST is a tank other than an SST or a DST that is (a) inactive, (b) radioactive, (c) underground or partially underground, and (d) not located within a major miscellaneous facility. (See Section 7.12 for miscellaneous facilities.) There are currently about 70 IMUSTs identified on the Hanford site. Of these, 43 are currently owned by TWRS with 4 additional that may become owned by TWRS and several that may be transferred out of TWRS ownership because the negotiation of IMUST ownership is ongoing. These tanks are identified in *Authorization Basis Status Report (Miscellaneous TWRS Facilities, Tanks and Components)* (Lipke and Stickney 1998). Generally, the document concludes that although IMUSTs pose no immediate threat to Hanford workers or the public, some characterization is needed to support IMUST flammable gas and organic USQs. Characterization will also support Authorization Basis (AB) upgrades and help reduce remaining small residual risks. Results will support continued tank surveillance and assurance of proper tank controls.

In January 1999, DOE-RL directed Fluor Daniel Hanford, Inc. to incorporate sampling and analysis of IMUSTs into FY 2000 planning documents (DOE-RL 1999c). This letter serves as a driver for sampling and analysis in support of resolution of IMUST USQs. There are no TWRS IMUST specific DQOs at this time. However, it is likely that existing safety issue DQOs will be expanded to include the IMUSTs within their scope, including the Flammable Gas, Organic Complexant, and Safety Screening DQOs.

As a result of DOE-RL 1999c, in January 1999, a prioritized list of IMUSTs was developed for future sampling (Lipke 1999). The list represents the issues pertaining to IMUSTs: flammable gas, organic, criticality, and AB compliance and is derived from Lipke and Stickney (1998). Ten (10) tanks were selected that taken together (1) represent the identified issues of concern and (2) return the greatest amount of useful information while sampling a relatively small number of

tanks. The list is found in Table B-6 of Appendix B. Analytical results from these 10 IMUSTs are expected to provide sufficient information to adequately address the other IMUSTs, or if not adequate, to guide additional sampling requirements. Although ranked from 1 to 10, the order of sampling may vary depending on operational constraints. If sampling resources are limited, sampling of the tanks having easier access will provide valuable information on each of the four issues of concern at the earliest time.

Coordination of flammable gas sampling with sludge sampling limits the need for opening a tank twice. The flammable gas sampling is planned before sludge sampling since sludge sampling is likely to vent gases of interest. The AB and criticality issues require full depth sludge sampling while the organic issue can utilize any type of sludge sample including a grab sample.

Non-TWRS Owned IMUSTs

Tank 241-Z-361 is an IMUST tank located at the Plutonium Finishing Plant. Although not "owned" by TWRS, the TWRS characterization program will support the sampling of this tank. The tank was in service from 1949 to 1976. All supernate was pumped from the tank and the tank was isolated in 1975. The tank was sealed in 1985 to prevent communication with the biosphere. The tank's carbon steel liner appears to have been dissolved through corrosion. This was evident from 1975 photographs. From the 1975 photographs, it is also apparent that some degradation of the concrete tank had occurred, but most of the concrete remains intact. Approximately 239 cm (94 in.) of sludge remains in the tank (about 75 m^3). Samples of sludge taken in 1975 through 1977 indicate the sludge is in a moderately heterogeneous distribution. Although this tank is not managed by TWRS, the Characterization Project will perform the required sampling and analyses. The U. S. Environmental Protection Agency has the oversight for this project.

The primary objective of the 241-Z-361 Project is to remove the contents of tank 241-Z-361 in order to resolve safety, safeguards, and environmental issues. Characterization of the waste in tank 241-Z-361 is required to resolve a USQ (Wagoner 1997) concerning uncertain hazards and risks associated with the tank. The primary safety risk identified is due to an estimated 26 to 75 kg of plutonium expected to be in the tank waste. The most probable plutonium inventory is about 29 kg (Lipke et al. 1997). Other USQ requirements include: evaluating the tank structure to assess the risk of a seismic event or other natural hazards, and assessing the potential for flammable gas build-up and deflagration from natural or work-induced ignition sources.

Two DQOs and two sampling and analysis plans (SAPs) provide the sampling and analysis direction for the characterization of tank 241-Z-361. The first DQO and SAP cover the vapor sampling and video photography of the tank. This sampling was conducted in May of 1999. The second DQO and SAP cover core sampling of the sludge. The vapor and photography DQO was issued June 10, 1998, and the SAP was issued September 22, 1998. The sludge DQO was issued in April 1999, the SAP in May 1999. All of the planned sampling in this tank is required to close the USQ and is schedule driven to meet project milestones and performance agreements.

7.9 SST RETRIEVAL AND TANK CLOSURE (HANFORD TANK INITIATIVE- HTI)

The HTI is a technical and financial partnership between the U.S. Department of Energy Office of Waste Management and the Office of Science and Technology. The purpose of HTI was to accelerate activities to gain technical, cost and regulatory perspectives on two high-level SSTs (AX-104 and C-106).

The first tank to be sampled for HTI was AX-104 because it represents the configuration of an assumed leaker SST after sluicing. A sluiced tank is the baseline of the retrieval process. The current tank closure criterion is to leave no more than 360 cubic feet of waste in a tank or the limit of the best waste retrieval technology whichever is less.

The second tank to be sampled for HTI was C-106. Once the soft-sludge sluicing retrieval of tank C-106 is complete, the remaining waste in the tank will be mainly a layer of hard-heel sludge. The hard-heel sludge has very different properties than the soft sludge. The HTI was to demonstrate technologies to remove the hard-heel sludge.

A DQO to direct the characterization activities in tank AX-104 for HTI was prepared in 1997 (Miller 1997). The document has undergone two subsequent revisions (Banning 1997 and Banning 1998). Four auger samples were obtained and analyzed from two risers in November 1997. Light-duty utility arm (LDUA) sampling was planned for March 1999. LDUA samples were to be taken from the floor, walls, and dome of the tank. Characterization sampling of this tank was to be used for risk assessment and closure of a SST. However, in March 1999 support to the LDUA was cancelled at the Hanford Site (DOE-RL 1999b).

Hard heel characterization needs for tank C-106 were to be determined in a DQO scheduled to be completed in June 1999. However, in March 1999 the HTI program was suspended at Hanford.

7.10 PROCESS SAMPLING

The scope of process sampling includes caustic mitigation and verification of safety, operational, and environmental parameters. Occasionally, a safety or tank farm operations issue arises that requires sampling that may not be covered by any other of the issues described in this report. When a process sampling need is identified, a test plan or letter of instruction is prepared to specify the sampling and analytical requirements.

Operations often require information on the caustic levels in tanks in order to stay within caustic limits to inhibit corrosion and stress corrosion cracking. Operating specifications for DSTs and saltwell receiver tanks describe limits for nitrite, nitrate, and hydroxide concentrations (LMHC 1997a, LMHC 1998, and LMHC 1996). The saltwell receivers include double-contained receiver tanks (DCRTs) 244-BX, 244-S, and 244-TX, and TK-003 of the CR vault. When information on caustic levels is required, operations provides a process memorandum, and Process Engineering prepares a letter of instruction or sampling and analysis plan to control the characterization work.

Only DSTs are required to remain within the caustic level operating specifications outlined in LMHC (1997a and 1998). Waste information is needed to verify that a tank is within its corrosion specifications to the extent to which it is caustic deficient, to predict the corrosion rate and determine if caustic additions will restore the tank to the proper caustic level.

The sampling and analysis of caustic deficient tanks is need-driven. When a tank is outside the caustic operating limits, operations will determine whether sampling is required and when it is required. Sampling and analysis to meet other safety, operational, or environmental monitoring concerns are also need-driven.

An ongoing flammable gas program to collect vapor grab samples to verify the accuracy of SHMS measurements was also formerly within the scope of the Process Sampling issue. The sampling will be discontinued in fiscal year 2000 due to a lack of a technical need to continue (McCain and Bauer 1999).

7.11 SAFETY SCREENING

The *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995) was developed to ensure that tanks that were not originally included on a Watch List would be screened to determine if they should be categorized under one or more of the existing safety issues. The safety screening DQO also tested tanks that were on a Watch List to confirm that the correct safety issues were applied to the tanks. The safety screening DQO was not designed to remove a tank from a Watch List, but merely to refer the tank to the appropriate safety issue(s) for further evaluation.

Significant improvements in scientific knowledge, technical data, and resolution of safety issues has occurred since the *Recommendation 93-5 Implementation Plan* (DOE-RL 1996) was issued. The ferrocyanide and organic complexant issues have been closed, and closure of the organic solvents issue is pending. The criticality USQ has been closed. A number of topical reports concerning these issues have been completed (see Section 5.2). The BIO has also been issued and implemented and establishes proper controls on all tanks whether safety screened or not.

The sampling and analysis requirements of the safety screening DQO will continue to be applied opportunistically to tanks being sampled for some other purpose. In summary, the characterization efforts have resulted in enough knowledge about specific safety issues to render the safety screening issue moot as a sole driver for sampling of SSTs and DSTs.

Documentation has been prepared (Simpson et al. 1999) to recommend to the DNFSB that 45 tanks which have not yet been sampled or sufficiently sampled for safety screening do not need to be sampled at this time solely for safety screening purposes. Until the recommendation is acted on by the DNFSB, tanks that have not yet been sampled or sufficiently sampled for safety screening will have the safety screening analysis performed on an opportunistic basis only. Tanks that have not been sampled or sufficiently sampled for safety screening are listed in Appendix B, Table B-7.

7.12 MISCELLANEOUS FACILITIES

Tanks within major facilities designed to house multiple processes and components are not considered as IMUSTs and will be dispositioned with the facility, i.e., the tanks within the facility will be managed as a common unit of property. Therefore, tanks within these facilities are treated here as a separate issue from the IMUST issue described in Section 7.8. Facilities considered are those that are TWRS owned, and all are within the Hanford 200 Areas.

Miscellaneous facilities are considered for characterization sampling and analysis in support of the TWRS Authorization Basis (AB) upgrades or AB follow-on actions. There are no miscellaneous facilities-specific DQOs, and none are in preparation at this time. All facilities considered are typically inactive and do not pose an immediate safety concern in their current configuration. Lipke and Stickney (1998) provide a detailed qualitative evaluation of the facilities and conclude that there are no cases identified where there is immediate need to invoke new or different controls for the purposes of preventing facility worker fatality or serious injury, or unacceptable risks to onsite workers or the public.

Lipke and Stickney (1998) do, however, identify 11 miscellaneous facilities of interest, 6 of which are recommended for characterization sampling to be conducted in support of future TWRS AB upgrade actions. The facilities, in general order for sampling are:

- 242-T Evaporator
- 244- CR Vault
- 242-S Evaporator
- ITS-1 In-tank Solidification System
- 241-AX-IX Ion Exchange Column
- 244-AR Vault.

Sampling priority rankings for miscellaneous facilities are shown in Table B-8 of Appendix B.

In each of these facilities, characterization sampling and analysis of tanks or other components will serve to improve the facility technical baseline through better, more quantifiable identification of tank contents in support of the AB. The 242-T Evaporator is of highest priority primarily because the surrounding facility is of questionable structural integrity. Early characterization of tank contents will serve to provide a basis for activities in support of structural remediation or decommissioning. The other facilities are of generally equal priority with the 244-AR Vault being lower since sampling is only potentially needed in the event of sump level conditions which may drive a need to remove the waste in tank 244-AR-TK-002.

To date there are no definitive schedules or timeframe within which characterization of the miscellaneous facilities must be completed. As the AB upgrade process progresses and schedules are produced, the TSB-WIRD document will be updated as appropriate.

7.13 PHASE 2 DISPOSAL

The scope of Phase 2 disposal includes gathering data to support DOE preparation of a Request for Proposal (RFP) for final disposition of tank waste. The Phase 2 activities will be directed by two new DQOs: one for LAW and one for HLW. Phase 2 retrieval data needs are in the infancy of planning and will be defined after experience is gained from sluicing tank C-106 and the completion of the AZ-101 mixer pump test and further considerations yet to be determined.

In addition to tanks identified in Table B-2 of this TSB-WIRD, ICD-23 also requires Single-Shell Tank (SST) full depth cores from 6 to 8 tanks per year from FY 2002 to FY 2006 to address high organic content. The specific tanks have not yet been determined.

7.14 HISTORICAL MODEL EVALUATION

Throughout the life of the operating facilities at Hanford, process information has been generated including waste transfer logs, chemical purchase records, and process flow sheets. Efforts have been made to use this historical information to characterize tank contents including creating models for specific waste types within a tank along with the spatial variability (Agnew et al. 1997).

Information requirements for evaluating the model are described in *Historical Model Evaluation Data Requirements* (Simpson and McCain 1997). The purpose of this DQO is to evaluate the ability of the model (Hanford Defined Waste Model) to accurately predict tank waste composition by quantifying the uncertainties intrinsic to model estimates and sample data. Tanks remain that have not been sampled or the samples are not adequate to satisfy the DQO. These tanks are listed in Appendix B, Table B-9.

8.0 TANK SAMPLING PRIORITIES

One of the purposes of the TSB-WIRD is to optimize use of characterization resources by establishing tank sampling priorities. To this end, a tank sampling priority list has been created. Priority numbers have been assigned for each of the 177 SSTs and DSTs. The priority numbers become the basis for identifying tanks that, if sampled, will support resolution of important safety issues, develop the waste retrieval and disposal process and support ongoing operations activities. This section describes how the priority numbers were developed. (IMUST tanks and miscellaneous facilities are prioritized separately in Tables B-6 and B-8, respectively of this TSB-WIRD.

8.1 DEVELOPMENT OF SAMPLING PRIORITY NUMBERS

The following steps were used to develop sampling priority numbers for each tank:

- For each tank, a determination was made as to which issues apply in each of the following waste phases: solid, liquid and vapor. (See Section 7.0 for a description of the issues.) For some tanks, more than one issue applies. (See Appendix B for tanks in the scope of each issue.)

- Because some tanks within an issue are more important (higher priority) than other tanks with regard to closure of that issue, a determination was made as to whether each tank was high, medium, or low priority with regard to that issue compared to other tanks within that issue.

- A priority number was then developed for each tank for each of the three waste phases by summing the issue weights from Table 6-2 for the issues that apply to the waste phases in that tank. Before summing, each issue weight was multiplied by 5 if the tank is high priority for that issue, by a 3 if the tank is medium priority for that issue, or by a 1 if the tank is low priority for that issue. As an example, if the Phase 1 Disposal issue and the Evaporator Operations issue apply to the solid phases in a tank and the tank is high priority for the Disposal issue but low priority for the Evaporator Operations issue, the calculation of the raw priority number for solid phase 1s as follows for that tank: (85 x5) + (77 x 1) = 502. This process is completed for each waste phase: solid, liquid and vapor.

- Following calculation of the above raw priority numbers for each tank, the priority numbers were normalized with 100 being assigned to the highest priority tank for each waste phase.

The methodology above gives higher priority to tanks wherein sampling will address more than one issue. The priority also considers the relative weight of the issues that apply to a tank. In addition, the priority considers how important a tank is with regard to each issue that applies to it. The high, medium, or low ranking for a tank for an issue was made by the TWRS programs and/or tank coordinator experts on each tank in consideration of but not necessarily limited to the following: (a) when sampling is needed with higher priority to those needed sooner or (b) the waste forms and types in the tank with higher priority given to those tanks that best represent an issue. (See Appendix B for elaboration of the criteria for assigning high, medium, and low ranking for tanks within each issue.)

In general, a tank will have the higher priority when:

- The tank has numerous issues that apply to it.

- The issues that apply to the tank are of high relative weight compared to other issues.

- The sampling needs are sooner rather than later.
- The tank better represents an issue than another tank to which that issue applies.

Tank sampling priorities for solid, liquid and vapor phase sampling are shown in Appendix A, Tables A-1, A-2 and A-3.

8.2 DESCRIPTION OF SAMPLING REPORTING TABLES

Table 8-1 *Summary of Sampling/Reporting by Issue* provides information on the number of tanks needed for sampling by issue and by fiscal year and the number of tanks scheduled for sampling in FY 2000. The table also provides a means to report and track the actual numbers of tanks sampled per issue on an ongoing basis. The table is updated and included in each quarterly report to show sampling actual progress in comparison to samples scheduled. Key features of Table 8-1 include:

- **Tanks Needed FY 20xx:** The table shows the minimum number of tanks (by issue) projected to be needed in each fiscal year to meet milestones and commitments.
- **Total Tanks Scheduled FY 2000:** The table shows the number of tanks scheduled (by issue) in FY 2000 to meet milestones and commitments. The scheduled number may differ from the FY 2000 needed number because the scheduled number is dependent on available resources.
- **Total Tanks Sampled FY 2000:** The table shows the number of tanks actually sampled (by issue). The table is updated for use in quarterly reports.

Specific tanks are not identified in the table because of ongoing changes in program needs and operational considerations. However, specific tanks currently expected to support each issue are shown in Appendix B.

Table 8-1. Summary of Sampling/Reporting by Issue

	Compat. (Int. Stab.)	SY-101 Level Rise [1]	C-106 Sluicing [5]		Phase 1 Disposal	Evap. Operation	Regulatory Compliance			Indus. Hygiene Support	IMUSTs		SST Retrieval & Tank Closure (HTI) [2]	Process Sampling	Safety Screening	Misc. Facilities		Phase 2 Disposal [3]	Historical Model Eval.
							DW	AE											
Sampling Needed:	Cond.	Cond.	Cond.	Vapor	Cond.	Cond.	Cond.	Cond.	Vapor	Vapor	Cond.	Vapor	Cond.	Cond.	Cond.	Cond.	Vapor	Cond.	Cond.
Total Tank Samplings Needed for Issue	14	OC	0	0	26	7	15	1	16	5	10	10	0	OC	OP	6	6	149	OP
Milestone Due Date (FY)	2004	NA	NA	NA	2004	NA	NA	NA	NA	NA	NA	NA	2002	NA	NA	NA	NA	TBD	NA
Tanks FY2000 Needed	5	OC	0	0	7	3	0	0	6	1	0	3	0	OC	OP	0	0	0	OP
Total Tanks Scheduled FY2000	5	0	0	0	7	2	0	0	6	1	0	10 [6]	0	0	0	0	0	0	0
Total Tanks Sampled FY2000																			
Tanks FY2001 Needed	7	0	0	0	8	2	0	1	5	0	4	5	0	OC	OP	2	2	0	OP
Tanks FY2002 Needed	2	0	0	0	6	1	0	0	2	0	2	2	0	OC	OP	2	2	0	OP
Tanks FY2003 Needed	0	0	0	0	5	1	0	0	2	2	2	0	0	OC	OP	2	2	0	OP
Tanks FY2004 Needed	0	0	0	0	0	0	4	0	1	2	2	0	0	OC	OP	0	0	0	OP
Tanks FY2005 Needed	0	0	0	0	0	0	3 [4]	0	0	0	0	0	0	OC	OP	0	0	0	OP

Notes: Cond. = Condensed
OC = Operationally Contingent
OP = Opportunistic
DW = Dangerous Waste
AE = Air Emissions
IMUSTs = Inactive Miscellaneous Underground Storage Tanks
HTI = Hanford Tank Initiative
TBD = To be determined

(1) Was an issue at the time of issue definition. Sampling completed since then. Future sampling dependent on remediation design.
(2) Work is suspended indefinitely.
(3) See Section 7.13
(4) The remaining 8 tanks are needed beyond FY 2005.
(5) See discussion Appendix B, C-106 Sluicing Issue.
(6) Subject to inclusion in FY2000 Multi-Year Work Plan

Table 8-2 shows the number of TCRs planned for FY 2000. The table also indicates the issues that will be addressed by each TCR planned in FY 2000.

Table 8-2. Tank Characterization Reports Planned for FY 2000

TCR Number	Tank	TCR Completed	Issues Addressed
1	AN-101 (1)		COMP (INT.STAB.)
2	AN-107 (1)		P1D
3	AW-101 (1)		P1D
4	AY-102 (1)		C-106, P1D, IH
5	AZ-101 (2)		P1D, IH
6	AZ-102 (2)		P1D, IH
7	C-104 (1)		P1D
8	SY-101 (1)		P1D, P2D
9	TX-113 (2)		SS, HM
10	TX-118 (2)		SS, P2D, HM
11	U-102 (2)		COMP (INT. STAB.)
12	U-103 (2)		COMP (INT. STAB.)
13	U-105 (2)		COMP (INT. STAB.)

KEY:
COMP(INT. STAB.)- compatibility (interim stabilization)
HM- Historical Model
IH- Industrial Hygiene
P1D- Phase 1 Disposal
P2D- Phase 2 Disposal
REG- Regulatory
SS- Safety Screening
NOTES:
(1) These tanks have been sampled and data are available.
(2) These TCRs contingent on receipt of analytical data.

8.3 USE OF PRIORITY TABLES IN CHARACTERIZATION SCHEDULING

Once characterization sampling requirements are prioritized, the sampling requirements are reflected into an operational sampling schedule that is continually updated and revised for configuration control as conditions in the field or program needs change. It is not always possible (or desirable) to sample in the exact order of the sampling priority listed in the tables of Appendix A. When creating the sampling schedule, consideration is given to: (a) the priority number of the tank(s) and (b) operational constraints.

The first consideration when creating the sampling schedule is to schedule tanks with as high of priority numbers as possible in order to support the maximum number of high weight issues. The second consideration is operational constraints. Some of the most common operational considerations are:

- **Tank Farm Operations**: If a tank is scheduled for other operations such as saltwell pumping or caustic additions, it may be necessary to delay characterization sampling for other issues regardless of the sampling priority of the tank.

- **Location Considerations**: Moving the sampling equipment from farm to farm is time consuming and costly because of considerations of worker exposure and radiological control. It may be beneficial to sample tanks of lower priority while the equipment is positioned in a farm rather than to return at a later date.

Operational considerations are not necessarily restricted to those described above.

9.0 REPORTING CHARACTERIZATION PROGRESS

Three tools are provided in the TSB-WIRD to measure characterization progress during FY 2000. The tools are:

- Table A-2 in Appendix A provides columns to indicate by quarter which tanks have been sampled for solids, liquid and/or vapor. Therefore, tanks that have issues associated with sampling of one or more of these waste phases will be checked-off each quarter if they are sampled for the phase(s) during the quarter. This table is updated and included in the TSB-WIRD quarterly report.

- Table 8-1 provides a summary of the total number of tanks that need to be sampled in

- FY 2000 and out-years to satisfy the issues indicated and to meet milestone commitments. (See "Total Tank Samplings Needed for Issue" row in Table 8-1.) The "Tanks FY 2000 Needed" row shows the minimum number needed in FY 2000 to meet ultimate milestones. The table also shows the number of tanks scheduled (projected) to be sampled for each issue during FY 2000 based on current projections of sampling capabilities. (See "Total Tanks Scheduled FY 2000" row.) Note that the tanks needed for an issue may be more or less than the tanks scheduled for an issue because the tanks scheduled are based on operational and fiscal considerations. The table also contains a row to indicate the number of tanks actually sampled for an issue during FY 2000. This row is updated during each quarter and the table is included in the TSB-WIRD quarterly report.

- Table 8-2 provides information on the number of TCRs planned and the issues addressed by each TCR. This table will also be updated as TCRs are issued and the status included in the TSB-WIRD quarterly.

10.0 DESCRIPTION OF DELIVERABLES AND ACCEPTANCE CRITERIA

The primary focus in acquiring characterization information is to sample tanks, analyze samples, and interpret the data in order to meet the requirements of safe storage, waste retrieval, waste disposal, and operations functions. In this process, a number of deliverables are due to Ecology. The deliverables include TCRs, the TSB-WIRD, and a characterization deliverables year-end report.

10.1 CHARACTERIZATION PROJECT SAMPLING ACTIVITIES

This section outlines the types of sampling performed by the Characterization Project and is divided into condensed phase and vapor phase sampling sections.

Condensed Phase Sampling

Core Sampling: Core sampling provides a sample that represents the waste depth in the tank regardless of whether the waste is in the liquid or solid phase. Core sampling may be performed in push mode, rotary mode, by auger, or by other appropriate sampling devices that may be devised.

Grab Sampling: Grab sampling is normally used to obtain a liquid sample or a sample of salt or sludge solids that are suspended in a slurry. Grab sampling can obtain liquid samples from the surface of the tank or below the surface as long as there is no solid layer to obstruct the sampler. Grab samples are normally used to satisfy requirements connected with operations issues, particularly waste compatibility, evaporator operations, and caustic mitigation. Grab samples may also be used to provide Privatization LAW samples to private vendors. When no solid waste layers are encountered, grab samples can be used effectively.

Auger Sampling: Auger sampling involves manually drilling an auger into the waste surface to obtain samples from the top of the waste down to 25 to 30 inches. Auger sampling is not effective in dry, crumbly waste because the sample will not adhere to the auger or in liquids.

Vapor Phase Sampling

Vapor sampling is used to obtain a gas sample from inside the tank dome/head space above the surface of the solid or liquid phase or from stacks as appropriate. Vapor samples are taken to meet requirements in the air emissions regulatory DQO, to routinely monitor/verify readings from selected SHMS cabinets for the flammable gas program, to collect industrial hygiene data, and to sample for the IMUST flammable gas USQ.

10.2 TANK CHARACTERIZATION REPORTS

Tank Characterization Reports (TCRs) are used to report and interpret data collected from tanks and to evaluate the extent to which the data satisfy DQO requirements. The TCRs also report the "Best-Basis" estimate of the total inventory of various chemicals and radionuclides within a tank.

In FY 1999 a change was made from production of "hard copy", released TCRs to an electronic version of the TCR called the automated TCR. The automated TCR, available on the local area network, allows a user to assemble a custom made TCR at any time for any purpose by selecting from a menu of standard data tables, including analytical data, vapor data, best-basis inventory data, tank level and temperature data, etc. The automated TCR also provides the user with a question and answer format Tank Interpretive Report (TIR). The TIR interprets data by way of answers to seven (7) questions including questions regarding: tank information drivers, tank history, tank comparisons, disposal implications, scientist's assessment of data quality and quantity, unique aspects of the tank, and best-basis inventory derivations for the tank. The automated TCR also provides the user with a tank-specific reference list with electronic links to references related to a tank. The automated TCR draws data from a configuration-controlled database containing analytical data for tanks called the Tank Waste Information Network System (TWINS). TWINS is accessible via the internet at http://twins.pnl.gov:8001/TCD/main.html.

10.3 ACCEPTANCE CRITERIA FOR ECOLOGY DELIVERABLES

Technical Sampling Basis and Waste Information Requirements Document (TSB-WIRD):

TWRS information needs are defined in the TSB-WIRD that is prepared and submitted to Ecology annually. The document identifies characterization deliverables to support safe storage, waste retrieval, waste disposal, and operations. The TSB-WIRD describes characterization deliverables to be issued based on existing TPA and other milestones. The document also describes information drivers, identifies and prioritizes characterization issues, and prioritizes tanks for sampling.

The TSB-WIRD and the other deliverables discussed in this section (10.3) shall conform in quality to the standards in the *TWRS Process Engineering Instruction Manual* (Adams 1999a), Section 11.6, "Publication Standards for Preparation of Documents."

The portion of the TSB-WIRD that identifies tank waste characterization activities outside the scope of the TPA, such as DNFSB milestones, shall not be subject to Ecology approval or concurrence, but shall be considered for information only.

Quarterly Reports:

Quarterly reports, although not required by a TPA milestone, are provided to DOE-ORP and Ecology to give status on characterization progress. The quarterly reports include use of the measures of progress described in Section 9.0. In general, the quarterly reports include the following elements:

- Use of Table A-2 to show status of sampling by waste phase during the four quarters of the fiscal year.
- Use of Table 8-1 to show actual tanks sampled by issue for comparison with tanks scheduled for sampling by issue. Table 8-2 shows TCRs completed.
- A list of and discussion of milestones met or in progress with reference to appropriate tables in the TSB-WIRD.
- Other information and discussion as deemed appropriate to report characterization status and progress.

Characterization Deliverable Report:

Each fiscal year, a year-end summary report reflecting characterization deliverables identified in the most recent TSB-WIRD is prepared to report the extent to which deliverable were completed. The report identifies specific issues and/or tanks to which the deliverables were applied. The annual report builds upon information provided in the quarterly reports.

Data Management Deliverables:

Currently the TPA requires that tank characterization data be provided to Ecology and EPA offsite via electronic means. This requirement is met by use of TWINS. TWINS is accessible via the internet at http://twins.pnl.gov:8001/TCD/main.html. Analytical data concerning tank contents is posted to TWINS within seven working days after release of the final analytical data package from the laboratory. Data entry into the TWINS is regulated by Standard Electronic Formats (Adams 1998 and Adams 1999b.)

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APPENDIX A

TANK SAMPLING PRIORITY TABLES

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APPENDIX A

TANK SAMPLING PRIORITY TABLES

Table A-1, *Tank Sampling Priority Rankings by Waste Phase,* lists the priority values for tanks for three (3) waste phases: solid, liquid and vapor. The priority values are the normalized priorities with a ranking of 100 applied to the highest priority tank for each waste phase. Not listed on the table are DST/SST that have a priority value of 0 for a given waste phase.

Table A-2, *Tank Sampling Priority Rankings with Sampling Progress by Quarter,* provides a means of showing status of sampling by various methodologies during the four quarters of FY 2000. This table will be updated each quarter to show sampling conducted and will be included in the quarterly report.

Table A-3, *Tank Sampling Priority Rankings by Issue,* provides sampling priorities by issue for each tank. A tank rank of 5 for an issue means that the tank is high priority for that issue. A tank rank of 3 for an issue means that the tank is medium priority for that issue. A tank rank of 1 for an issue means that the tank is low priority for that issue. The bases for tank rankings are described in the issue tables in Appendix B.

Table A-1. Tank Sampling Priority Rankings by Waste Phase

Solid		Liquid		Vapor	
Tank	Priority	Tank	Priority	Tank	Priority
AW-103	100	BY-105	100	AY-102	100
AY-101	100	BY-106	100	AZ-101	81
AY-102	100	SY-102	100	AN-105	65
AN-102	78	U-106	100	AN-107	65
AN-103	78	U-108	100	AP-102	65
SY-102	78	AY-102	92	AP-104	65
AN-104	73	AZ-101	85	AN-106	43
AN-107	73	AP-104	77	AZ-102	43
AZ-102	73	AP-107	77	C-102	43
AN-105	51	AW-104	77	C-104	43
AW-104	41	S-101	60	SY-101	43
AW-105	41	S-109	60	AN-103	26
C-107	41	S-111	60	AN-104	26
AZ-101	32	S-112	60	AW-101	26
AX-104	30	SX-102	60	SY-102	26
AW-101	24	U-107	60	AW-102	9
C-102	24	U-111	60		
C-104	24	C-103	20		
SY-101	24	S-107	20		
AP-101	14				
AP-104	14				
S-102	14				
S-103	14				
S-105	14				
SY-103	14				
SX-103	3				
SX-104	3				
TX-105	3				
TX-110	3				
TX-111	3				
TX-115	3				
TX-116	3				

Table A-2. Tank Sampling Priority Rankings with Sampling Progress by Quarter (4 Sheets)

Tank	Solids Priority	Liquid Priority	Vapor Priority	FY00 First Quarter			FY00 Second Quarter			FY00 Third Quarter			FY00 Fourth Quarter		
				Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap
AY-102	100	92	100												
AW-103	100	0	0												
AY-101	100	0	0												
SY-102	78	100	26												
AN-103	78	0	26												
AN-102	78	0	0												
AN-107	73	0	65												
AZ-102	73	0	43												
AN-104	73	0	26												
AN-105	51	0	65												
AW-104	41	77	0												
AW-105	41	0	0												
C-107	41	0	0												
AZ-101	32	85	81												
AX-104	30	0	0												
C-102	24	0	43												
C-104	24	0	43												
SY-101	24	0	43												
AW-101	24	0	26												
AP-104	14	77	65												
AP-101	14	0	0												
S-102	14	0	0												
S-103	14	0	0												
S-105	14	0	0												
SY-103	14	0	0												
SX-103	3	0	0												
SX-104	3	0	0												
TX-105	3	0	0												
TX-110	3	0	0												
TX-111	3	0	0												
TX-115	3	0	0												
TX-116	3	0	0												
BY-105	0	100	0												
BY-106	0	100	0												
U-106	0	100	0												
U-108	0	100	0												
AP-107	0	77	0												
S-101	0	60	0												
S-109	0	60	0												
S-111	0	60	0												
S-112	0	60	0												
SX-102	0	60	0												
U-107	0	60	0												
U-111	0	60	0												
C-103	0	20	0												
S-107	0	20	0												
AP-102	0	0	65												

Table A-2. Tank Sampling Priority Rankings with Sampling Progress by Quarter (4 Sheets)

Tank	Solids Priority	Liquid Priority	Vapor Priority	FY00 First Quarter			FY00 Second Quarter			FY00 Third Quarter			FY00 Fourth Quarter		
				Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap
AN-106	0	0	43												
AW-102	0	0	9												
A-101	0	0	0												
A-102	0	0	0												
A-103	0	0	0												
A-104	0	0	0												
A-105	0	0	0												
A-106	0	0	0												
AN-101	0	0	0												
AP-103	0	0	0												
AP-105	0	0	0												
AP-106	0	0	0												
AP-108	0	0	0												
AW-106	0	0	0												
AX-101	0	0	0												
AX-102	0	0	0												
AX-103	0	0	0												
B-101	0	0	0												
B-102	0	0	0												
B-103	0	0	0												
B-104	0	0	0												
B-105	0	0	0												
B-106	0	0	0												
B-107	0	0	0												
B-108	0	0	0												
B-109	0	0	0												
B-110	0	0	0												
B-111	0	0	0												
B-112	0	0	0												
B-201	0	0	0												
B-202	0	0	0												
B-203	0	0	0												
B-204	0	0	0												
BX-101	0	0	0												
BX-102	0	0	0												
BX-103	0	0	0												
BX-104	0	0	0												
BX-105	0	0	0												
BX-106	0	0	0												
BX-107	0	0	0												
BX-108	0	0	0												
BX-109	0	0	0												
BX-110	0	0	0												
BX-111	0	0	0												
BX-112	0	0	0												
BY-101	0	0	0												
BY-102	0	0	0												
BY-103	0	0	0												
BY-104	0	0	0												

Table A-2. Tank Sampling Priority Rankings with Sampling Progress by Quarter (4 Sheets)

Tank	Solids Priority	Liquid Priority	Vapor Priority	FY00 First Quarter			FY00 Second Quarter			FY00 Third Quarter			FY00 Fourth Quarter		
				Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap
BY-107	0	0	0												
BY-108	0	0	0												
BY-109	0	0	0												
BY-110	0	0	0												
BY-111	0	0	0												
BY-112	0	0	0												
C-101	0	0	0												
C-105	0	0	0												
C-106	0	0	0												
C-108	0	0	0												
C-109	0	0	0												
C-110	0	0	0												
C-111	0	0	0												
C-112	0	0	0												
C-201	0	0	0												
C-202	0	0	0												
C-203	0	0	0												
C-204	0	0	0												
S-104	0	0	0												
S-106	0	0	0												
S-108	0	0	0												
S-110	0	0	0												
SX-101	0	0	0												
SX-105	0	0	0												
SX-106	0	0	0												
SX-107	0	0	0												
SX-108	0	0	0												
SX-109	0	0	0												
SX-110	0	0	0												
SX-111	0	0	0												
SX-112	0	0	0												
SX-113	0	0	0												
SX-114	0	0	0												
SX-115	0	0	0												
T-101	0	0	0												
T-102	0	0	0												
T-103	0	0	0												
T-104	0	0	0												
T-105	0	0	0												
T-106	0	0	0												
T-107	0	0	0												
T-108	0	0	0												
T-109	0	0	0												
T-110	0	0	0												
T-111	0	0	0												
T-112	0	0	0												
T-201	0	0	0												
T-202	0	0	0												

Table A-2. Tank Sampling Priority Rankings with Sampling Progress by Quarter (4 Sheets)

Tank	Solids Priority	Liquid Priority	Vapor Priority	FY00 First Quarter			FY00 Second Quarter			FY00 Third Quarter			FY00 Fourth Quarter		
				Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap	Sol	Liq	Vap
T-203	0	0	0												
T-204	0	0	0												
TX-101	0	0	0												
TX-102	0	0	0												
TX-103	0	0	0												
TX-104	0	0	0												
TX-106	0	0	0												
TX-107	0	0	0												
TX-108	0	0	0												
TX-109	0	0	0												
TX-112	0	0	0												
TX-113	0	0	0												
TX-114	0	0	0												
TX-117	0	0	0												
TX-118	0	0	0												
TY-101	0	0	0												
TY-102	0	0	0												
TY-103	0	0	0												
TY-104	0	0	0												
TY-105	0	0	0												
TY-106	0	0	0												
U-101	0	0	0												
U-102	0	0	0												
U-103	0	0	0												
U-104	0	0	0												
U-105	0	0	0												
U-109	0	0	0												
U-110	0	0	0												
U-112	0	0	0												
U-201	0	0	0												
U-202	0	0	0												
U-203	0	0	0												
U-204	0	0	0												

Table A-3. Tank Sampling Priority Rankings by Issue

Tank ↓	Solids Priority	Liquid Priority	Vapor Priority	Compat. (Interim Stab.)	Tank Rank	Tank SY-101 Level Rise	Tank Rank	C-106 Sluicing	Tank Rank	Phase 1 Disposal	Tank Rank	Evap. Oper.	Tank Rank	Danger. Wastes	Tank Rank	Air Emiss.	Tank Rank	Indus. Hygiene Support	Tank Rank	SST Retrieval & Tank Closure	Tank Rank	Proc. Sampling (1)	Tank Rank	Safety Screening (2)	Tank Rank	Phase 2 Disposal (3)	Tank Rank	Hist. Model Eval.	Tank Rank
Issue Weight →				100		96		92		85		77		68		68		61		38		31		23		9		7	
AY-102	100	92	100					LV	5	S	5			S	3	V	5												
AW-103	100	0	0							S	5			S	3														
AY-101	100	0	0							S	5			S	3														
SY-102	78	100	26	L	5					S	5			S	1	V	3												
AN-103	78	0	26							S	5			S	1	V	3												
AN-102	78	0	0							S	5			S	1														
AN-107	73	0	65							S	3			S	3	V	5	V	3										
AZ-102	73	0	43							S	3			S	3	V	5												
AN-104	73	0	26							S	3			S	3	V	3												
AN-105	51	0	65							S	3			S	1	V	5	V	3										
AW-104	41	77	0							S	3	L	5																
AW-105	41	0	0							S	3																		
C-107	41	0	0							S	3																		
AZ-101	32	85	81							L	5			S	3	V	5	V	5										
AX-104	30	0	0																	S	5								
C-102	24	0	43							S	1			S	1	V	5												
C-104	24	0	43							S	1			S	1	V	5												
SY-101	24	0	43							S	1			S	1	V	5												
AW-101	24	0	26							S	1			S	1	V	3												
AP-104	14	77	65							S	1	L	5			V	5	V	3										
AP-101	14	0	0							S	1																		
S-102	14	0	0							S	1																		
S-103	14	0	0							S	1																		
S-105	14	0	0							S	1																		
SY-103	14	0	0							S	1																		
SX-103	3	0	0																									S	3
SX-104	3	0	0																									S	3
TX-105	3	0	0																									S	3
TX-110	3	0	0																									S	3
TX-111	3	0	0																									S	3
TX-115	3	0	0																									S	3
TX-116	3	0	0																									S	3
BY-105	0	100	0	L	5																								
BY-106	0	100	0	L	5																								
U-106	0	100	0	L	5																								
U-108	0	100	0	L	5																								
AP-107	0	77	0									L	5																
S-101	0	60	0	L	3																								
S-109	0	60	0	L	3																								
S-111	0	60	0	L	3																								
S-112	0	60	0	L	3																								
SX-102	0	60	0	L	3																								
U-107	0	60	0	L	3																								
U-111	0	60	0	L	3																								
C-103	0	20	0	L	1																								
S-107	0	20	0	L	1																								
AP-102	0	0	65													V	5	V	3										
AN-106	0	0	43													V	5												
AW-102	0	0	9													V	1												

Key: S = Solid; L = Liquid; V = Vapor; 5 = High Value; 3 = Medium Value; 1 = Low Value

(1) See Section 7.10 (2) See Section 7.11 (3) See Section 7.13

APPENDIX B

PRIORITIZATION OF TANKS WITHIN AN ISSUE

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APPENDIX B

PRIORITIZATION OF TANKS WITHIN AN ISSUE

This appendix contains high (H), medium (M), or low (L) rankings for each tank within each issue. The criteria for establishing the ranking of each tank are also given. The phases of waste to which the rankings apply can be found in Tables A-1, A-2 and A-3 along with the normalized priority numbers for each waste phase by tank.

Compatibility (Interim Stabilization) Issue:

Compatibility samples are taken as the highest priority when necessary to support waste transfers. These samples are "operationally contingent", they are taken when needed to support operations and they can not always be determined in advance. However, the ranking for interim stabilization transfers have been determined at this time and are given in Table B-1 below. The table also includes tank SY-102 that supports cross-site transfers.

Table B-1: Ranking of Tank for Interim Stabilization and Cross Site Transfer

TANK	RANKING	RANKING CRITERIA
BY-105	H	Samples needed in FY 2000.
BY-106	H	Same as above.
SY-102	H	Supports cross- site transfers.
U-106	H	Samples needed in FY 2000.
U-108	H	Same as above.
S-101	M	Samples needed in FY 2001.
S-109	M	Same as above.
S-111	M	Same as above.
S-112	M	Same as above.
SX-102	M	Same as above.
U-107	M	Same as above.
U-111	M	Same as above.
C-103	L	Samples needed in FY 2002.
S-107	L	Same as above.

SY-101 Level Rise Issue:

Currently only two tanks are within the scope of this issue: SY-101 and SY-102. SY-101 is the tank experiencing the level growth for which corrective action is necessary. No additional samples are required for either of these tanks at this time. However, sampling needs may be identified through design for SY-101 remediation operations. Samples are currently considered to be "operationally contingent."

C-106 Sluicing Issue:

Currently only two tanks are within the scope of this issue: C-106 and AY-102. C-106 has been sampled. (C-106 is the only high heat tank wherein corrective action is necessary.) Sampling of the receiver tank AY-102 is high priority and will probably consist of liquid and vapor confirmatory sampling for compatibility after transfers of waste are completed. Sampling of AY-102 is expected to be completed in FY 1999. If it is not completed, sampling of AY-102 will be high priority for FY 2000. Treatment of this issue in Table 8-1 assumes completion in FY 1999. The C-106 issue was identified as an issue during the TSB-WIRD planning workshop, and the issue is discussed here for continuity.

Phase 1 Disposal Issue:

The phase 1 disposal issue consists of four components: waste feed delivery (WFD)(PHMC), privatization (WP& D), ICD-23 (BNFL, Inc.) and support to private contractor's regulatory compliance (P-REG). The sampling needs for these four components are somewhat different particularly with regard to timing as illustrated in the table below. Note that two tanks are listed twice in the table below because they need to be sampled at different times to support one or more of the four components. In general, high priority (H) is given where a sample is needed in FY 2000, a medium (M) priority is given where a sample is needed in FY 2001 and a low (L) priority is given where a sample is needed in FY 2002 or beyond. The tank listing in Table B-2 for AY-102/C-106 means that tank AY-102 will be sampled after sluiced waste from tank C-106 is transferred into tank AY-102.

The disposal program is dynamic and priorities, order of sampling and/or specific tanks may change as program needs are further refined. WP&D will continue to develop these details.

Table B-2: Ranking of Tanks for Phase 1 Disposal Issue (2 Sheets)

TANK	TSB-WIRD RANKING	RANKING CRITERIA			
		WFD(PHMC)	WP &D	ICD-23 (6)	P-REG
AN-102	H		M (1)	H	H (2)
AN-103	H		M (1)	H	
AW-103 (3)	H	H	H		
AY-101 (3)	H	H	H		
AY-102 / C-106 (4)	H	H	H		
AZ- 101 (4)	H	H (5)			
SY-102 (3)	H	H	H		

Table B-2: Ranking of Tanks for Phase 1 Disposal Issue (2 Sheets)

TANK	TSB-WIRD RANKING	RANKING CRITERIA			
		WFD(PHMC)	WP &D	ICD-23 (6)	P-REG
AN-104	M		M (1)	M	
AN-105	M		M (1)	M	
AN-107	M		M (1)	M	(2)
AW-104	M	M	M		
AW-105	M	M	M		
AZ-101 (4)	M			M	
AZ-102	M			M	
C-107	M	M	M		
AP-101	L	L	L		
AP-104	L	L	L		
AW-101	L		M (1)	L	
AY-102 / C-106 (4)	L			L	
C-102	L		L		
C-104	L		L		L
S-102	L	L	L		
S-103	L	L	L		
S-105	L	L	L		
SY-101	L		M (1)	L	
SY-103	L	L	L	L	

Footnotes:
(1) Tank has been sampled. Data are being evaluated.
(2) Tank AN-107 may substitute for tank AN-102. Decision is pending.
(3) Technical baseline tank C-102 or C-104 **or** case 3 tank AY-101 or AW-103 or SY-102 may substitute for this tank. Decisions are pending.
(4) This tank(s) is listed twice on this table because it is to be sampled at different times due to different drivers.
(5) Liquid grab sample to support mixer pump test.
(6) In addition to tanks identified in Table B-2 of this TSB-WIRD, ICD-23 also requires Single-Shell Tank (SST) full depth cores from 6 to 8 tanks per year from FY 2002 to FY 2006 to address high organic content. The specific tanks have not yet been determined.

Evaporator Operations Issue:

Table B-3: Ranking of Tanks for Evaporator Operations Issue

TANK	RANKING	RANKING CRITERIA
AP-104	H	Samples needed in FY 2000, 2001, 2002 and 2003.
AP-107	H	Samples needed in FY 2000 and 2001.
AW-104	H	Samples needed in FY 2000. (1)

(1) Contingent on installation of a transfer pump.

Regulatory Issues: (Tanks listed in alphabetic order. All other tanks to be analyzed for TOC on an opportunistic basis if TOC data does not already exist.) It should be noted that some air emissions sampling is done at tank farm exhausters common to a number of tanks in a farm. When the tank farm exhauster is sampled, credit is taken for all tanks connected to that exhauster for purposes of this TSB-WIRD.

Table B-4: Ranking of Tanks for Regulatory Issues

TANK	RANKING: DANGEROUS WASTE (1)	RANKING: AIR EMISSIONS (1)	RANKING CRITERIA
AN-102	L	N/A	Feed source.
AN-103	L	M	Remove/Install Mixer & Transfer Pumps (W-211)
AN-104	M	M	Install Mixer & Decant/Transfer Pumps (W-211)
AN-105	L	H	Install Mixer & Decant/Transfer Pumps (W-211)
AN-106	N/A	H	No TOC data
AN-107	M	H	Fixed Pump Installation To Decant Supernatant (W-521)
AP-102	N/A	H	Remove/Install Mixer & Transfer Pumps (W-211)
AP-104	N/A	H	Remove/Install Mixer & Transfer Pumps (W-211)
AW-101	L	M	Remove/Install Mixer & Transfer Pumps (W-522)
AW-102	N/A	L	Active Receiver Tank, Evaporator Feed Tank
AW-103	M	N/A	Feed source.
AY-101	M	N/A	Feed source.
AY-102	M	H	Install Mixer & Decant/Transfer Pumps (W-211)
AZ-101	M	H	Slurry Transfer Pump Installation (W-521)
AZ-102	M	H	Install Mixer and Decant/Transfer Pumps (W-211)/ Active Receiver Tank
C-102	L	H	Install Sluicing Equipment and Transfer Pumps (W-523)/No TOC data/ Sluice
C-104	L	H	Install Sluicing Equipment and Transfer Pumps (W-523)/Sluice
SY-101	L	H	Mitigate Crust
SY-102	L	M	Remove Slurry System/Install Mixer & Transfer Pumps (W-211)

(1) H- samples needed within next two fiscal years. M- samples needed within next five fiscal years. L- samples needed beyond next five fiscal years.

Industrial Hygiene Support Issue:

The industrial hygiene sampling issue comes into play any time the waste in a tank is "significantly" disturbed for any operational reason. Since the tanks to be disturbed for operational reasons cannot always be determined in advance, the tanks within this issue are "operationally contingent". However, the tanks listed in the table below are currently known to require sampling support for this issue.

Table B-5: Ranking of Tanks for Industrial Hygiene Sampling Issue

TANK	RANKING	RANKING CRITERIA
AZ-101	H	FY 2000 mixer pump test (W-151)
AP-102	M	FY 2003 install mixer pump (W-211)
AP-104	M	Same as above
AN-105	M	FY 2004 install mixer pump (W-521)
AN-107	M	FY 2004 mixer pump test (W-521)

Inactive Miscellaneous Underground Storage Tanks (IMUST) Issue:

The prioritization of IMUSTs is not intermingled with the prioritization list of DST/SSTs. Therefore, IMUSTs are not assigned a high, medium or low priority for purposes of input to priority values in Tables A-1 through A-3.

Table B-6: Prioritization of IMUSTs for Sampling

RANK	TANK NUMBER	ACCESSIBILITY	PARTICULAR INTEREST
1	241-Z-8	Easy (risers)	AB and Criticality
2	244-UR-002	Difficult	AB, Criticality and Organic
3	242-TA-R1	Limited (cover)	AB and Criticality
4	241-ER-311A	Limited (risers below grade)	AB and Criticality
5	241-AX-151CT	Difficult	AB and Criticality
6	241-C-301	Easy (risers)	AB, Criticality and Flammable Gas
7	241-S-302A	Easy (risers)	AB, Criticality and Flammable Gas
8	241-T-301B	Easy (risers)	AB, Criticality and Flammable Gas
9	241-B-301	Easy (risers)	AB, Criticality and Flammable Gas
10	244-BXR-002	Difficult	AB, Criticality and Organic

SST Retrieval and Tank Closure (Hanford Technical Initiative – HTI) Issue:

If the HTI program is continued in FY 2000, tank AX-104 will be a high priority for sampling to support the planned LDUA activity. (HTI activities were suspended in FY 1999. See Section 7.9 for details.)

Process Sampling Issue:

The process sampling issue includes caustic mitigation and other tank farm operations that require sampling to verify compliance with safety, operational and environmental parameters. This sampling cannot be identified ahead-of-time for placement in the TSB-WIRD. Therefore, this sampling is considered to be "operationally contingent". Vapor grab samples formerly taken on a scheduled basis to verify SHMS measurements have been discontinued in FY 2000. A technical need no longer exists for the SHMS vapor grab samples (McCain 1999).

Safety Screening Issue:

This table shows tanks not yet sampled or not sufficiently sampled for safety screening (Simpson et al. 1999). These tanks are sampled opportunistically. The Safety Screening DQO is addressed only if the tank is being sampled for some other issue.

Table B-7: Tanks for Opportunistic Sampling for Safety Screening DOQ (2 Sheets)

Item No.	Tank ID No	Item No.	Tank ID No.
1.0	A-103	24	TX-102
2	A-104	25	TX-103
3	A-105	26	TX-105
4	A-106	27	TX-106
5	B-105	28	TX-108
6	BX-102	29	TX-109
7	BY-105 (1)	30	TX-110
8	BY-106 (1)	31	TX-111
9	C-102 (1)	32	TX-112
10	S-103	33	TX-113 (2)
11	S-105	34	TX-114
12	S-108	35	TX-115
13	S-112	36	TX-116
14	SX-104	37	TX-117
15	SX-107	38	TX-118 (1,2)
16	SX-109	39	TY-101
17	SX-110	40	TY-102
18	SX-111	41	TY-103
19	SX-112	42	TY-105

Table B-7: Tanks for Opportunistic Sampling for Safety Screening DOQ (2 Sheets)

Item No.	Tank ID No	Item No.	Tank ID No.
20	SX-114	43	U-101 (1)
21	T-101	44	U-104
22	T-103 (1)	45	U-111
23	TX-101		

(1) Tank has been sampled, but not sufficiently for safety screening.
(2) Tank is expected to be sampled in FY 1999.

Miscellaneous Facilities Issue:

Miscellaneous facilities are not prioritized within the same list as DSTs or SSTs. They are not listed in the Appendix A tables. The following table provides separate priority rankings for sampling for miscellaneous facilities.

Table B-8: Ranking of Miscellaneous Facilities

FACILITY	RANKING	RANKING CRITERIA
242-T Evaporator	H	Need quantitative tank content data. Surrounding facilities in poor condition. Moderate safety concern. Prudent to sample for structural integrity remediation support. High radiation with difficult access. Needs vapor and condensed phase samples.
244-CR Vault	M	Need quantitative tank content data. Low safety concern. No critical dates. Needs vapor and condensed phase samples.
244-S Evaporator	M	Same as above with emphasis on tank C- 100.
ITS-1 In-Tank Solidification System	M	Same as above, but need for condensed phase samples depends on vapor sample results.
241-AX-IX Ion Exchange Column	M	Same as above.
244-AR Vault	L	Sump level increase with potential for tank damage. Reevaluation needed. Low safety concern. Tank 002 needs condensed and vapor phase samples. Date needed will be established after evaluation of sump conditions.

Phase 2 Disposal Issue:

All SSTs are within the scope of this issue. However, although planning for Phase 2 disposal has been initiated, the planning has not progressed to the point where prioritization of tanks is possible. To place this issue in perspective, delivery of waste feed for Phase 2 disposal is not currently scheduled until FY 2018. In addition to tanks identified in Table B-2 of this TSB-WIRD, ICD-23 also requires Single-Shell Tank (SST) full depth cores from 6 to 8 tanks per year from FY 2002 to FY 2006 to address high organic content. The specific tanks have not yet been determined.

Historical Model Evaluation Issue:

Eight tanks are within the scope of this issue. No DSTs are within the scope of this issue. All of these tanks are of equal priority. Tanks will be sampled for this issue on an opportunistic basis.

Table B-9: Tanks Within Scope of Historical Model Evaluation Issue

TANK	TANK RANKING
SX-103	M
SX-104	M
TX-105	M
TX-110	M
TX-111	M
TX-115	M
TX-116	M
TX-118 (1)	M

Notes:

(1) Tank is scheduled for sampling in FY 1999.

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