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		Date 10-7-94
Project Title/Work Order Tank 244A Tank Characterization Plan (WHC-SD-WM-TP-273)		EDT No. 159077
		ECN No.

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7. Abstract This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, WHC 222-S Laboratory, and PNL 325 Analytical Chemistry Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples from tank 244A.		
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Tank 244A Tank Characterization Plan

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

MASTER

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CONTENTS

SAMPLING EVENT A: LIQUID GRAB SAMPLING IN FISCAL YEAR 1994

1.0	SPECIFIC TANK OBJECTIVES	1
1.1	RELEVANT SAFETY ISSUES	1
1.1.1	Tank 244A Characterization Objectives	1
1.1.2	Waste Compatibility Program Data Quality Objective	1
2.0	TANK, WASTE, AND SAMPLING INFORMATION	2
2.1	SAMPLING INFORMATION	2
3.0	LABORATORY SAMPLE RECEIPT AND ANALYSIS INSTRUCTIONS	2
3.1	INSUFFICIENT LIQUID GRAB SAMPLE	3
4.0	SPECIFIC ANALYTE, QUALITY CONTROL, AND DATA CRITERIA	5
4.1	SPECIFIC METHODS AND ANALYSES	5
4.2	QUALITY ASSURANCE/QUALITY CONTROL	5
4.2.1	Laboratory Operations	5
4.2.2	Sample Collection	5
4.2.3	Sample Custody	6
5.0	ORGANIZATION	8
6.0	EXCEPTIONS AND PRIORITIES	8
6.1	EXCEPTIONS FOR TANK 244A	8
6.2	PRIORITIES FOR TANK 244A	8
7.0	DELIVERABLES	9
7.1	FORMAT I REPORTING	9
7.2	FORMAT II REPORTING	9
8.0	CHANGE CONTROL	9
9.0	REFERENCES	10

LIST OF TABLES

Table 1	244A Grab Samples Chemical, Radiological, and Physical Analytical Requirements	7
Table 2	Tank 244A Project Key Personnel List	8

LIST OF FIGURES

Figure 1	Test Plan Flowchart for Tank 244A	4
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LIST OF ABBREVIATIONS

ACL	Analytical Chemistry Laboratory
DCRT	double contained receiver tank
DQO	data quality objective
DSC	differential scanning calorimetry
DST	double shell tank
GEA	gamma energy analysis
IC	ion chromatography
ICP	inductively coupled plasma - (atomic emission spectroscopy)
LIMS	Laboratory Information Management Systems
SST	single-shell tank
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TOC	total organic carbon
USQ	unreviewed safety question

1.0 SPECIFIC TANK OBJECTIVES

1.1 RELEVANT SAFETY ISSUES

The Double-Shell Tank (DST) System currently receives waste from the Single-Shell Tank (SST) System in support of SST stabilization efforts or from other on-site facilities which generate or store waste. Waste is also transferred between individual DSTs. The mixing or commingling of potentially incompatible waste types at the Hanford Site must be addressed prior to any waste transfers into the DSTs. The primary goal of the Waste Compatibility Program is to prevent the formation of an Unreviewed Safety Question (USQ) as a result of improper waste management.

Tank 244A is a Double Contained Receiver Tank (DCRT) which serves as an overflow tank for the East Area Tank Farms. Waste material is able to flow freely between the underground storage tanks and tank 244A. Therefore, it is necessary to test the waste in tank 244A for compatibility purposes. Two issues related to the overall problem of waste compatibility must be evaluated:

- Assurance of continued operability during waste transfer and waste concentration.
- Assurance that safety problems are not created as a result of commingling wastes under interim storage.

The results of the grab sampling activity prescribed by this Tank Characterization Plan shall help determine the potential for four kinds of safety problems: criticality, flammable gas accumulation, energetics, and corrosion and leakage.

1.1.1 Tank 244A Characterization Objectives

The characterization effort applicable to this Tank Characterization Plan is focused on the resolution of the waste compatibility issue of tank 244A. Analyses shall be performed on the grab samples obtained from tank 244A. These analyses are discussed in section 4.0. Only decisions based on sampling and analysis of liquid waste from tank 244A will be addressed within this document; operational issues such as plugged pipelines and equipment problems are not within the scope of this Tank Characterization Plan.

1.1.2 Waste Compatibility Program Data Quality Objective

The document, *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994) will be used in the generation of this Tank Characterization Plan. This document describes the process used to develop a data quality objective (DQO) for the waste compatibility issue, as well as the analytical requirements for determining waste compatibility.

2.0 TANK, WASTE, AND SAMPLING INFORMATION

DCRT 244A is located in the A-farm complex and receives waste from several of the farms in the 200 East area. There are currently 7,260 gallons of liquid in tank 244A, which is suspected to be rainwater. However, since there is very limited access to the tank, it has never been sampled. Therefore, no historical information could be obtained. Further, as this is not one of the Hanford Site underground storage tanks, no fill history information is available.

2.1 SAMPLING INFORMATION

Tank 244A is scheduled to be grab sampled. Two 100 mL samples shall be taken using the typical weighted-bottle sampler. The samples shall be taken from two different depths, preferably one sample from the surface of the liquid and one from the bottom of the tank. For detailed information regarding the tank 244A grab sampling activities, refer to work package ES-94-00255. This work package will contain all the applicable operating procedures and the chain of custody records for this sampling event.

With respect to sampling quality control, no field/trip blank shall be taken during this sampling event due to the order of magnitude of the analyte results expected. Cross contamination should not have a significant effect on the analyte results (Sutey 1994).

3.0 LABORATORY SAMPLE RECEIPT AND ANALYSIS INSTRUCTIONS

A flowchart showing the general analysis scheme for tank 244A is presented in Figure 1. These steps are given as guidance to the performing laboratory, and may be altered as necessary. Any alterations shall be documented, with justification, in the data report. Grab sample analyses may not need to be performed in the hot cell (based on radioactivity). If the samples must be analyzed in the hot cell, a hot cell blank should be performed by the laboratory, although it is not required; otherwise, no hot cell blank is necessary. The reporting levels for analyses are contained in Table 1 and are detailed in Section 7.0 of this document.

Any decisions or observations made during sample breakdown shall be documented in writing. These decisions and observations shall also be reported in the data report.

- Step 1 — Receive two liquid grab samples at the laboratory. The discussion of sample receipt is in Section 4.2.3, "Sample Custody" of this document.
- Step 2 — Record visual observations such as color and clarity of the liquid, and the presence of any solid particles.
- Step 3 — Closely inspect the liquid sample for the presence and approximate volume of any solids. If no solids exist, proceed to Step 5. However, if solids are recovered from the liquid, go to Step 4A.
- Step 4A — Remove a portion of the liquid sample and determine the volume percent solids by centrifugation.

- Step 4B — If greater than 1 gram of solid sample is recovered, archive these solids for possible future analyses (Bratzel 1994).
- Step 5 — Closely inspect the liquid sample for the presence and approximate volume of any potential organic layers. If no potential organic layers exist, proceed to Step 7. However, if potential organic layers exist, go to Step 6.
- Step 6 — Report any visual potential organic layer as soon as possible by Format I reporting. Separate and retain the potential organic layer in a jar. Perform the following steps on the remaining (possibly aqueous) layer.
- Step 7 — Remove sufficient aliquots and then perform those analyses shown in Table 1.
- Step 8 — Archive up to 40 mL of the remaining liquid sample (Bratzel 1994).

3.1 INSUFFICIENT LIQUID GRAB SAMPLE

In the event that the sample volume from tank 244A is found to be insufficient to perform the requested analyses in Table 1, Characterization Support and Analytical Services shall be notified (for points of contact, see Section 5.0, Table 2). A prioritization of the analyses required in this Tank Characterization Plan is given in Section 6.2. Any analyses prescribed by this document, but not performed, shall be identified and justified in the appropriate data report.

Figure 1: Test Plan Flowchart for Tank 244A

4.0 SPECIFIC ANALYTE, QUALITY CONTROL, AND DATA CRITERIA

4.1 SPECIFIC METHODS AND ANALYSES

Table 1 summarizes the analyses to be performed on the tank 244A grab samples. The laboratory procedure numbers which shall be used in the analyses are included in the table. These analyses are based on the Waste Compatibility Program's DQO (Carothers 1994).

4.2 QUALITY ASSURANCE/QUALITY CONTROL

4.2.1 Laboratory Operations

The 222-S Laboratory has a quality assurance program plan (Meznarich 1994) and a quality assurance project plan (Taylor 1993) that shall provide the primary direction for the quality assurance/quality control involved in analyzing the 244A tank waste samples. If the analyses are performed at the 325 ACL, the analysis shall be guided by the 325 Quality Assurance Plan (Kuhl-Klinger 1994). Additionally, the *Hanford Analytical Services Quality Assurance Plan* (DOE 1994), when implemented, shall be used as quality assurance/quality control guidance.

Method specific quality control such as calibrations and blanks are also found in the analytical procedures. Sample quality control (duplicates, spikes, standards) are identified in Table 1. If no criteria are provided in Table 1, the performing laboratory shall perform to its quality assurance plan(s).

4.2.2 Sample Collection

Two grab samples from tank 244A are to be taken and shipped to the laboratory by Sampling Operations in accordance with work package ES-94-00255. That work package shall initiate the chain-of-custody for the samples. The following documents will be used as guidance in the handling and shipment of the tank 244A liquid grab samples:

- TO-100-052, "Segregate, Package, and Inventory Radioactive Waste."
- WHC-CM-2-14, "Responsibilities and Procedures for all Hazardous Material Shipments."
- WHC-SD-TP-SARP-001, "Sample Pig Transport System Safety Analysis Report for Packaging (onsite)."
- WHC-SD-WM-HSP-002, "Tank Farm Health and Safety Plan."

Samples shall be identified by a unique number before being shipped to the laboratory. The sampling team is responsible for documenting any problems and procedural changes affecting the validity of the sample in a field notebook. Sampling Operations shall enter this information in the comment section of the chain-of-custody form for addition to the data reports.

Sampling Operations should transport each sample collected to the performing laboratory within 1 working day of removing the sample from tank 244A, but must

transport each sample within 3 working days. Sampling Operations is responsible for verbally notifying the laboratory (373-2435 for 222-S Laboratory; 373-6704 for 325 ACL) at least 24 hours (72 hours for 325 ACL) in advance of an expected shipment. If samples are going to be delivered after 3:00 pm, the laboratory shall be notified at least four hours in advance of actual sample shipment so that proper shift operations can be planned.

4.2.3 Sample Custody

The chain-of-custody form is initiated by the sampling team as described in the work package. Grab samples are shipped in a bottle and sealed with a Waste Tank Sample Seal. All sample shipments are to be labeled with the following information:

WASTE TANK SAMPLE SEAL

Supervisor

Sample No.

Date of Sampling

Time of Sampling

Shipment No.

Serial No.

The sealed and labeled samples are shipped to the laboratory along with the chain-of-custody form. The receipt and control of samples in the Westinghouse Hanford 222-S Laboratory is described in procedure LO-090-101. Receipt and control of samples in the 325 ACL is described in procedure PNL-ALO-051.

Table 1. 244A Grab Samples Chemical, Ra

Project Name	244A Grab	TANK	244A	# GRABS	2	GRAB #	1 and 2		
Plan Number	WHC-SD-WM-TP-273, REV 0								Homo Field I Hot C
Charge Code	WHC-TBD; PNL-TBD								
Program Contact	J. M. Jones								
TWRS Contact	R. D. Schreiber								
Lab. Project Coordinator	R. E. Vogel								
ANALYSES					PREPARATIONS				
METHOD	ANALYTE	WHC PROCEDURE	PNL PROCEDURE	UNITS	ACID	FUS	H ₂ O	OTHER ⁵	DUP
Titration	OH ⁻ ⁴	LA-211-102	PNL-ALO-228	μg/mL				direct	ea sn
TIC	CO ₃ ²⁻	LA-622-102	PNL-ALO-380	μg/mL				direct	ea sn
Ion Chromatography	SO ₄ ²⁻ , NO ₃ ⁻ , NO ₂ ⁻ , Cl ⁻ , F ⁻ , PO ₄ ³⁻	LA-533-105	PNL-ALO-212	μg/mL				direct	ea sn
DSC/TGA	net exo. energy	LA-560-112 LA-514-113	PNL-ALO-508	cal/g				direct	ea sn
ICP	Na, Al, Fe	LA-505-151	PNL-ALO-211	μg/mL				direct	ea sn
Furnace Oxidation	TOC	LA-344-105	PNL-ALO-381	μg/mL				direct	ea sn
GEA	Cs-137	LA-548-121	PNL-ALO-450	μCi/mL				direct	ea sn
Sep. & β count	Sr-90	LA-220-101	PNL-ALO-431 PNL-ALO-433	μCi/mL				direct	ea sn
Sep. & α count	Pu-239/240	LA-503-156	PNL-ALO-422 PNL-ALO-423	μCi/mL				direct	ea sn
Sep. & α count	Am-241	LA-503-156	PNL-ALO-417	μCi/mL				direct	ea sn
Centrifugation	vol % solids	LA-519-132	PNL-ALO-504	%				direct	ea sn
pH	[H ⁺]	LA-212-103	PNL-ALO-225	none				direct	ea sn
Specific Gravity	liquid density	LA-510-112	PNL-ALO-501	none				direct	ea sn
Visual	Organic Layer	LA-519-151	PNL-ALO-501	none				direct	N/A

¹ ea - each, DUP - duplicate, spk/msd - spike or matrix spike duplicate, AB - analytical batch, N/A - not applicable
² Serial dilutions rather than matrix spikes may be performed to assess accuracy.
³ Tracer or carrier may be used in place of a spike and results corrected for recovery.
⁴ OH⁻ will not be run if pH < 12.5.
⁵ Direct liquid samples will be diluted in acid or water to adjust to proper sample size.
⁶ Action limit is applicable up to 500 °C. If the energetics action limit is exceeded, laboratory personnel and Wes
⁷ See Section 6.1.

Biological and Physical Analytical Requirements

COMMENTS				REPORTING LEVELS				
Initialization Test - Not Required Blank - Not Required Blank - Not Required				FORMAT I			Early Notify	
				FORMAT II			Process Control	
				FORMAT III			Safety Screen	
				FORMAT IV			Waste Management	
				FORMAT V			RCRA Compliance	
				FORMAT VI			Special	
QUALITY CONTROL ¹				CRITERIA				REPORT FORMAT
	SPK/MSD	BLANK	CALIB STD	PRECISION	ACCURCY ⁷	NOTIFICATION LIMIT	EXPECTED RANGE	
	N/A	ea AB	ea AB	± 20%	80 - 120%	[OH ⁻] ≤ 0.01M or ≥ 8M	not available	I, II
	N/A	ea AB	ea AB	± 20%	80 - 120%	none	not available	II
	1/mtrx	ea AB	ea AB	± 20%	80 - 120%	[NO ₂ ⁻] ≤ 506 or ≥ 253,000; [NO ₃ ⁻] ≥ 62000 (µg/mL)	not available	I, II
	N/A	N/A	ea AB	± 20%	80 - 120%	net exo. energy > 0 ⁸	not available	I, II
	N/A ²	ea AB	ea AB	± 20%	80 - 120%	none	not available	II
	1/mtrx	ea AB	ea AB	± 20%	80 - 120%	> 10,000 µg/mL	not available	I, II
	N/A	ea AB	ea AB	± 20%	80 - 120%	none	not available	II
	1/mtrx ³	ea AB	ea AB	± 20%	80 - 120%	none	not available	II
	1/mtrx ³	ea AB	ea AB	± 20%	80 - 120%	> 0.8 µCi/mL	not available	I, II
	1/mtrx ³	ea AB	ea AB	± 20%	80 - 120%	> 0.1 µCi/g	not available	I, II
	N/A	N/A	N/A	± 20%	80 - 120%	none	not available	II
	N/A	N/A	ea AB	± 20%	80 - 120%	none	not available	II
	N/A	N/A	ea AB	± 20%	80 - 120%	> 1.3	not available	I, II
	N/A	N/A	N/A	N/A	N/A	none	not available	I, II

mtrx - matrix.

Systems Engineering will decide if adiabatic calorimetry shall be performed.

5.0 ORGANIZATION

The organization and responsibility of key personnel involved in this tank 244A characterization project are listed in Table 2.

Table 2: Tank 244A Project Key Personnel List.

Individual	Organization	Responsibility
J. G. Kristofzski	222-S Analytical Operations	Program Support Manager of Analytical Operations
K. L. Silvers	325 Analytical Chemistry Laboratory	Project Manager for Single Shell Tank (Grab Sampling) Projects
R. D. Schreiber	TWRS Characterization Support	Tank 244A Tank Characterization Plan Cognizant Engineer
J. M. Jones	East Systems Engineering	Sampling and Compatibility Cognizant Engineer
J. L. Deichman	Analytical Services	Manager of Analytical Services Program Management and Integration
East Tank Farm Operations Shift Manager	Tank Farm Operations	200 East Tank Farm Point of Contact if Action Limit is Exceeded (372-2689)

6.0 EXCEPTIONS AND PRIORITIES

6.1 EXCEPTIONS FOR TANK 244A

In the Waste Compatibility DQO, several necessary specifications concerning sampling and analysis were omitted. These clarifications are addressed in (Sutey 1994).

In (Sutey 1994), accuracy requirements are specified in terms of spike recovery. However, the laboratory can also assess accuracy via standards. Therefore, it was presumed that the Program would like to have information on accuracy for those analyses for which spikes are not performed, and would specify accuracy requirements as 80-120% regardless of the method of accuracy determination (Table 1).

Since historical information exists to adequately address the potential for line plugging and precipitation of solids during the transfer of waste, no viscosity and cooling curve analyses shall be required during this analysis activity (Jones 1994).

6.2 PRIORITIES FOR TANK 244A

In order to complete the compatibility assessment for tank 244A, results from all of the analyses in Table 1 must be received. Therefore, if insufficient sample is

retrieved, the tank shall need to be resampled at a later date. However, analyses are still requested on any sample obtained, and should be performed in the following order:

- (1) Corrosion Species: OH^- , IC, and pH
- (2) Energetics: DSC/TGA and separable organic layer
- (3) Flammable Gas Accumulation: SpG
- (4) Criticality Analyses: Pu-239/240, Am-241, ICP, and volume percent solids
- (5) TOC
- (6) Heat Generation: Sr-90 and Cs-137
- (7) Other analyses listed in Table 1

7.0 DELIVERABLES

All analyses of tank 244A waste material will be reported as Formats I and II as shown in Table 1. The Waste Compatibility Program may request progress reports from the laboratory regarding the analyses via this Tank Characterization Plan. However, due to the rapid turn around time required for the 244A analyses (see Section 7.2), no special progress reports shall be required from the laboratory. All reports generated as part of normal operations (e.g., monthly reports) shall still be done. The data shall be reported in the units given by Table 1, and all procedure and revision numbers used in the analyses shall be included in the report. Additional information regarding reporting formats is given in (Schreiber 1994a).

7.1 FORMAT I REPORTING

Table 1 contains the notification limits for each analyte. Any results that exceed the notification limits defined in the DQO processes shall be reported immediately by calling the East Tank Farm Operations Shift Manager at 372-2689 and the Characterization Program office (Schreiber 1994b). This verbal notification must be followed within 1 working day by written communication to J. M. Jones, J. L. Deichman, R. D. Schreiber, D. R. Bratzel, T. J. Kelley, S. J. Eberlein, and N. W. Kirch, documenting the observations. Additional analyses for verification purposes may be contracted between the performing laboratory and the contacts above either by a revision to this document or by letter of instruction.

7.2 FORMAT II REPORTING

Due to the immediate necessity of the data, the 222-S Laboratory has agreed to have the analysis completed and results reported within 60 days of receipt of the sample at the laboratory loading dock. If the samples must be sent to 325 ACL, the results shall be reported within 90 days of receipt of the last sample from tank 244A by the laboratory. The results will be reported using either a Laboratory Information Management Systems (LIMS) report or electronically to J. M. Jones. In addition to the LIMS/electronic report, a letter report shall be sent to R. D. Schreiber, L. M. Sasaki, J. M. Jones, P. Sathyanarayana, S. J. Eberlein, and D. R. Bratzel summarizing the results. Any observations taken during the receipt and analysis of the grab samples should be included in this letter report.

8.0 CHANGE CONTROL

Under certain circumstances, it may become necessary for the performing laboratory to make decisions concerning a sample without review of the data by the customer or the

Characterization Program. These changes shall be documented. Changes may be documented through the use of internal characterization changes notices or analytical deviation reports for minor low-impact changes and documented in applicable laboratory notebooks. All significant changes (such as changes in scope) shall be documented by Characterization Support via an Engineering Change Notice to this Tank Characterization Plan. All changes shall also be clearly documented in the final data report.

Additional analysis of grab sample material from this characterization project at the request of the Characterization Program shall be performed according to a revision of this Tank Characterization Plan.

9.0 REFERENCES

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