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Tank 241-C-204 Tank Characterization Plan (WHC-SD-WM-TP-307), Revision 0		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, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-C-204.

8. RELEASE STAMP

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WHC-SD-WM-TP-307
Revision 0

Tank 241-C-204
Tank Characterization Plan

DISCLAIMER

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

by

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LIST OF ABBREVIATIONS

C-204	Tank 241-C-204
DOE	U.S. Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
DQO	Data Quality Objective
DST	Double-Shell Tank
HEPA	High-Efficiency Particulates Air Filter
RCRA	*Resource Conservation and Recovery Act of 1976*
SST	Single-Shell Tank
TCP	Tank Characterization Plan
TOC	Total Organic Carbon
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the U.S. Department of Energy (DOE) to concentrate the near term sampling and analysis activities on identification and resolution of safety issues (Conway 1993). The data quality objective (DQO) process was chosen as a tool to be used to identify sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double shell tank (DST) and single shell tank (SST) using the DQO process . . . Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information" (Ecology et al. 1994). This document satisfies that requirement for tank 241-C-204 (C-204) sampling activities.

2.0 DATA QUALITY OBJECTIVES APPLICABLE TO TANK 241-C-203

The sampling and analytical needs associated with the Hanford Site underground storage tanks on one or more of the four Watch Lists (ferrocyanide, organic, flammable gas, and high heat) and the safety screening of all 177 tanks have been identified through the DQO process. A DQO identifies the information needed by a program group concerned with safety issues, regulatory requirements, tank waste processing, or the transport of tank waste. As of January 1995, tank C-204 was classified as a non-Watch List tank, so the only DQO applicable to this tank is the safety screening DQO.

2.1 SAFETY SCREENING DATA QUALITY OBJECTIVES

The *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994) describes the sampling and analytical requirements that are used to screen waste tanks for unidentified safety issues. Both Watch List and non Watch List tanks will be sampled and evaluated to classify the waste tanks into one of three categories (SAFE, CONDITIONALLY SAFE, or UNSAFE) following the guidelines for the four Watch List classifications and other safety issues. A tank can be removed from a Watch List if it is classified as SAFE. The safety issue DQOs identify the guidelines used to determine to which classification a tank belongs based on analyses that indicate if certain measurements are within established parameters. The primary analytical requirements for the safety screening of a tank are energetics, total alpha activity, moisture content, and flammable gas concentration. If a specified parameter is exceeded, further analysis of a secondary set of measurements, resulting in a possible change in tank classification, is required.

This DQO requires that a vertical profile of the tank waste be obtained from at least two widely spaced risers. This vertical profile may be obtained using core, auger, or grab samples. The safety screening analyses shall be applied to all core samples, DST Resource Conservation and Recovery Act (RCRA) samples, and auger samples, except those taken exclusively to assess the flammable gas crust burn issue.

3.0 TANK HISTORICAL INFORMATION

This section summarizes the available historical information on tank C-204. Included are the age of the tank, process history, and the expected contents of the tank based on historical information. The fill history information is available in *A History of the 200 Area Tank Farms* (Anderson 1990) and *Waste Status and Transaction Record Summary for the Southwest Quadrant* (Agnew 1994).

3.1 JANUARY 1995 TANK STATUS

Tank C-204 is classified as a low heat load tank and is passively ventilated. The tank was classified as an assumed leaker in 1988. Interim stabilization and intrusion prevention measures have been completed. Interim stabilization was completed in September 1982 and intrusion prevention measures were completed in December 1982. Approximately 11,400 liters (3,000 gallons) of non-complexed (NCPLX) sludge is contained in the tank. This volume of waste corresponds to a depth of 46 cm (18 in).

3.2 TANK CONFIGURATION

Single shell tank C-204 was constructed between 1943 and 1944 and is located in the 200 East Area. Tank C-204 is one of four 200 series tanks that comprise the C-Tank Farm with a 6 meter (20 foot) diameter and an operating depth of 5.2 meters (17 feet). The tank has a maximum operating capacity of 208,000 liters (55,000 gallons). Tank C-204 is not in a cascade flow series, but is connected to a diversion box. A cascade system consists of tanks connected in series by pipes. When the primary tank in the system became full, the waste would then flow to the secondary tanks in the system.

3.3 AGE AND HISTORY OF TANK 241-C-204

Tank C-204 began receiving metal waste in 1948. In the fourth quarter of 1953 the metal waste was sluiced from the tank for uranium recovery and the supernate was transferred to tank 241-C-106. Tank C-204 started receiving semi-works waste again in the fourth quarter of 1956. The tank was removed from service in the first quarter of 1976 and was not intended for further use. In the first quarter of 1977, the tank was actively restricted and declared inactive in 1977. Interim stabilization was completed in September 1982 and intrusion prevention measures were completed in December 1982. Tank C-204 was considered a leaker in 1988 with a leak volume of approximately 1325 liters (350 gallons). The tank is not in a cascade series, but is connected to a diversion box. Table 3-1 summarizes the influx and effluent history of tank C-204 (Anderson 1990, Agnew 1994).

Table 3-1: Tank C-204 Fill History

Quarter:Year	Waste type and Description	Total Final Volume kL (kgal)
4:1947 - 1:1948	Began receiving metal waste. Filled in January 1948.	208 (55)
2:1953	500 gallons transferred to C-106.	206 (54.5)
4:1953	40 kgals transfer of supernate to C-106, metal waste transfer unknown.	57 (15)
1:1954	Water and initial sludge.	193 (51)
4:1954 - 1:1955	Pumped in November and January.	0 (0)
1:1956 - 4:1956	Received semi-works waste.	132 (35)
4:1967	Unknown transfer in of 21 kgals.	216 (57)
2:1970	14 kgals transferred to C-104.	163 (43)
3:1977	41 kgals transferred unknown. Declared inactive.	11 (3)
4:1982	Interim stablized and intrusion prevention measures completed.	11 (3)

3.4 EXPECTED TANK CONTENTS

The contents of C-204 are expected to consist of sludge approximately 46 cm (18 in) deep with no liquid capable of being pumped remaining in the tank. Table 3-2 summarizes the expected tank contents (Brevick 1994).

Table 3-2: Composite Inventory Estimate for Tank C-204

Physical Property	Value	
Total Solid Waste	19200 kg (3000 gallons)	
Heat Load	25.0 W (85.2 BTU/hour)	
Bulk Density	1.70 g/ml	
Void Fraction	0.20	
Water	47.24 Weight Percent	
Total Organic Carbon	0 Wet Weight Percent	
Analytes	**µg/g**	**µg/ml**
Na^{+}	162000	275400
OH^{-}	30700	52190
NO_3^{-}	746	1268
CO_3^{-2}	83300	141610
PO_4^{-3}	161000	273700
SO_4^{-2}	2430	4130
U	106000	180200
Radionuclides	**µCi/g**	**µCi/ml**
Pu	0.12	0.204
Cs	1.85	3.145
Sr	191	324.7

4.0 TANK C-204 SCHEDULED SAMPLING EVENTS

Only one sampling event for tank C-204 is currently scheduled: an auger sample in June 1995. No other sampling is scheduled through Fiscal Year 1997 (Stanton 1995). The auger sampling shall be conducted in accordance with the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994). Sampling and analytical requirements from this DQO are identified in Table 4-1. A more complete list of analytical requirements is given, as an appended revision, in the appropriate Sampling and Analysis Plan.

Table 4-1: Integrated DQO Requirements

Sampling Event	Applicable DQO	Sampling Requirements	Analytical Requirements
Auger	Tank Safety Screening	Samples from a minimum of 2 risers separated radially to the maximum extent possible	▪Energetics ▪Moisture Content ▪Total Alpha ▪Gas Composition

5.0 REFERENCES

Agnew, S. F., 1994, *Waste Status and Transaction Record Summary for the Southwest Quadrant*, WHC-SD-TI-615,Rev.0, Westinghouse Hanford Company, Richland, WA.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, WA.

Babad, H. and K. S. Redus, 1994, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Westinghouse Hanford Company, Richland, WA.

Brevick, H. H., L. A. Gaddis, and W. W. Pickett, 1994, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 West Areas*, WHC-SD-WM-ER-349, Rev. 0, ICF Kaiser Hanford Company, Richland, WA.

Conway, J. T., 1993, Letter to H. R. O'Leary, DOE, "DNFSB Recommendation 93-5 to the Secretary of Energy." 9400070, dated July 19, 1993.

Ecology, EPA, and DOE, 1994, *Hanford Federal Facility Agreement and Consent Order, Fourth Amendment*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, WA.

Hanlon, B. M., 1994, *Waste Tank Summary for Month Ending November 30, 1994*, WHC-EP-0182-80, Westinghouse Hanford Company, Richland, WA.

Stanton, G. A., 1995, Letter to Distribution, "Baseline Sampling Schedule, Change 95-01", 74320-95-01, dated February 2, 1995.

APPENDIX A

SAMPLING AND ANALYSIS PLAN FOR AUGER SAMPLING IN FISCAL YEAR 1995

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LIST OF ABBREVIATIONS FOR APPENDIX A

ACL	Analytical Chemistry Laboratory
C-204	Tank 241-C-204
DOE	Department of Energy
DQO	data quality objective
DSC	differential scanning calorimetry
DST	double-shell tank
GEA	gamma energy analysis
HPGE/MCA	high purity germanium - multi channel analysis
IC	ion chromatography
ICP	inductively coupled plasma - atomic emission spectroscopy
LIMS	Laboratory Information Management Systems
NCPLX	non complex waste
PNL	Battelle Pacific Northwest Laboratory
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	Sampling and Analysis Plan
SARP	Safety and Analysis Report for Packaging
TCP	Tank Characterization Plan
TGA	thermogravimetric analysis
TOC	total organic carbon
TWRS	Tank Waste Remediation System
USQ	unreviewed safety question
WHC	Westinghouse Hanford Company

A1.0 SPECIFIC TANK CHARACTERIZATION OBJECTIVES

This Sampling and Analysis Plan will identify characterization objectives for sample collection, hot cell sample breakdown, and laboratory analytical requirements following the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994).

The sampling criteria for safety screening requires that "a vertical profile of the waste be obtained from at least two widely spaced risers . . . assuming the quality of the data obtained supports appropriate safety classifications of the tank. Such sampling can be done by core drilling, by auger sampling (for shallow tanks) or by obtaining liquid grab samples at several levels" (Babad and Redus 1994). Tank C-204 shall be sampled for safety screening purposes using the auger sampling method (Section A2.0).

The requirements for the safety screening of a tank specify the analyses to be performed on half segments and include the identification of the content of a common set of primary analytes and waste characteristics. These analyses are energetics, total alpha activity, percent moisture, and flammable gas concentrations. If acceptance limits are exceeded for these analyses, a secondary set of analyses and a possible Watch List classification would be warranted. This Sampling and Analysis Plan identifies procedures and requirements, following the safety screening DQO and the Characterization Program, for collecting and characterizing samples from tank C-204 by the auger sampling method.

A2.0 TANK STATUS AND SAMPLING INFORMATION

A2.1 TANK STATUS

Tank C-204 is classified as a low heat load tank and is passively ventilated. The tank was classified as an assumed leaker in 1988. Interim stabilization and intrusion prevention measures have been completed. Interim stabilization was completed in September 1982 and intrusion prevention measures were completed in December 1982. Approximately 11,400 liters (3,000 gallons) of non-complexed (NCPLX) sludge is contained in the tank. This volume of waste corresponds to a depth of 46 cm (18 in) of waste. Tank C-204 is 6 meters (20 feet) in diameter and has a maximum operating capacity of 208,000 liters (55,000 gallons). Tank C-204 is not in a cascade flow series, but is connected to a diversion box. A cascade system consists of tanks connected in series by pipes. When the primary tank in the system became full, the waste would then flow to the secondary tanks in the system. Tank C-204 is not on any Watch List and there are no unreviewed safety questions (USQs) associated with the tank at this time.

A2.2 SAMPLING INFORMATION

Tank C-204 is currently scheduled to be sampled by the auger sampling method. Samples are expected to be taken from riser 7. The 200 series tanks are 20 feet in diameter and have very few risers to choose from. Two samples are wanted from these tanks and only one 12 inch riser is available. Therefore, two samples are to be taken from the same riser (see Section A6.2). If a different riser is necessary to meet sampling and analysis requirements, this change must be recorded and approved by the cognizant engineer before sampling. The risers used may be recorded on a

permanent data sheet or recorded directly in the work package. Sampling shall be conducted following procedures and documentation included in tank C-204 work package ES-95-00012. If the sampling depth is within ±5 inches of the current depth information, one 20 inch auger bit will be used for the sampling of the riser. In the event that the current depth information is incorrect, a different sized auger bit may be used. The objective of the sampling event is to reach the inner bottom of the tank (bottom of the waste); therefore the number of samples might change depending on the actual depth of the waste in the tank.

A3.0 LABORATORY SAMPLE RECEIPT AND ANALYSIS INSTRUCTIONS

A3.1 TANK SPECIFIC ANALYTICAL PROCEDURES

A flow chart depicting the general safety screening sample breakdown and analysis scheme is presented in Figures A-1, A-2, and A-3. These steps are described in detail to provide the hot cell and laboratory chemists with guidance for the breakdown of the samples and may be altered as appropriate by the performing laboratory. As noted, several analyses listed in Table A-1 require a 45 day reporting time. The 45-day reporting format, Format III, is explained in Section A7.3.

Any decision, observation, or deviation justification made to this work plan or during the sample breakdown shall be documented in writing. These decisions and observations shall also be reported in the data report. The reporting formats for the analyses are contained in Table A-1.

As a precautionary measure, the Safety and Analysis Report for Packaging (SARP) has been reviewed for any safety issues involved with transportation of tank C-204 auger samples. **For tank C-204 auger samples, the transport sample casks must be vented every 15 days from the time of the cask sealing to allow any accumulated gas to escape.**

Step 1 Receive auger sample(s) at the laboratory in accordance with approved procedures.

Step 2 Conduct the following on the sample material from each isolated auger sample:

- Perform a visual examination of the sample(s)
- Record observations. This may include a sketch of the sample in addition to written documentation of pertinent descriptive information such as color, texture, homogeneity, and consistency.
- Take color photographs or a color videotape to visually document the sample.

Step 3 Does the sample contain drainable liquids?

Yes: Proceed to Step 4A
No: Proceed to Step 5A

Step 4A Separate any drainable liquids from the solids. Measure and record the volume. Retain drainable liquids for further processing.

Step 4B Is the sample 100% liquid?

No: Proceed to Step 5A
Yes: Proceed to Step 11

SOLIDS PATH

Step 5A Is there a hard, dry layer on the top portion of the auger sample?

Yes: Proceed to Step 5B
No: Proceed to Step 5C

Step 5B Separate the hard, dry layer and retain for analysis.

Step 5C Divide each auger sample into two equal subsamples (i.e., half segments).

Step 6 Homogenize each subsample using the appropriate, approved procedure.

Step 7 Will a homogenization test be performed?

Yes: Proceed to Step 8
No: Proceed to Step 9

NOTE: One subsample, at a minimum, should be used if a homogenization test is to be performed. Additional tests may be performed at the laboratory's discretion.

Step 8 Conduct the homogenization test by taking 1 to 2 g aliquots from widely separated locations of the homogenized subsample. Conduct the homogenization test in accordance with Bell (1993).

Step 9 Collect sufficient aliquots from each homogenized subsample to perform the appropriate preparations and analyses listed in Table A-1 in duplicate.

NOTE: If there is an insufficient amount of sample available in any subsample to perform all required analyses, notify the Characterization Program within one business day and follow the prioritization of analyses given in Section A3.3.

Step 10 Remove at least 20 ml and up to 40 ml of each homogenized subsample for the archive sample (Bratzel 1994).

LIQUIDS PATH

Step 11 Closely inspect the liquid sample for the presence and approximate volume of any potential organic layers. Does the sample contain any immiscible (potential organic) layers?

Yes: Proceed to Step 12A
No: Proceed to Step 13

Step 12A Report any visually observed immiscible (potential organic) layer immediately by the early notification system (Section A7.2).

Step 12B Separate and retain the potential organic layer for possible future analysis.

NOTE: Steps 13 through 17 shall be performed on the remaining (probable aqueous) liquid layer only.

Step 13 Filter the remaining liquid sample through a 0.45 micron filter.

Step 14 Is there greater than 1 gram of solid on the filter?

Yes: Proceed to Step 15
No: Proceed to Step 16

Step 15 Archive the solids for possible future analysis (Bratzel 1994).

Step 16 Remove sufficient aliquots from the liquid sample to perform the appropriate analyses listed in Table A-1 in duplicate.

Step 17 Archive at least 20 ml and up to 40 ml of the sample drainable liquids as the sample liquid archive (Bratzel 1994).

PRIMARY ANALYSIS PATH

Step 18 Perform primary analyses as listed in Table A-1.

Step 19 Compare the primary analysis data with notification limits.

Step 20A Do the results exceed the notification limits (Table A-1)?

Yes: Proceed to Step 20B.
No: Proceed to Step 23.

Step 20B Report results exceeding the notification limits using Format I reporting deliverable requirements as listed in Section A7.2.

SECONDARY ANALYSIS PATH

Step 21 Perform secondary analyses according to Table A-1.

Step 22A Do the secondary analyses exceed the notification limits?

Yes: Proceed to Step 22B
No: Proceed to Step 23

Step 22B Report results exceeding the notification limits using Format I reporting deliverable requirements as listed in Section A7.2.

Step 23 Report results as listed in Section A7.0.

A3.2 INSUFFICIENT SAMPLE RECOVERY

If the amount of material recovered from the auger samples taken from tank C-204 is insufficient to perform the analyses requested and permit a minimum 10 mL archive per sample, the laboratory shall notify the Tank Cognizant Engineer and the manager of Analytical Services, Program Management and Integration within one working day (Table A-2). The priorities for the analyses requested in this document are given in Section A3.3. Any analyses prescribed by this document and not completed shall be identified in the appropriate data report along with justification for non performance.

A3.3 PRIORITIES OF REQUESTED ANALYSES

Confirmation of the priority levels or revision of sample breakdown procedures may be provided to the laboratory based upon the sample recovery, readily observable physical properties within the sample, and the requested sample breakdown procedures provided in Section A3.1. The priority of an analysis is specified by its designation as a primary or secondary analysis. Further prioritization will be determined by the program on a DQO basis.

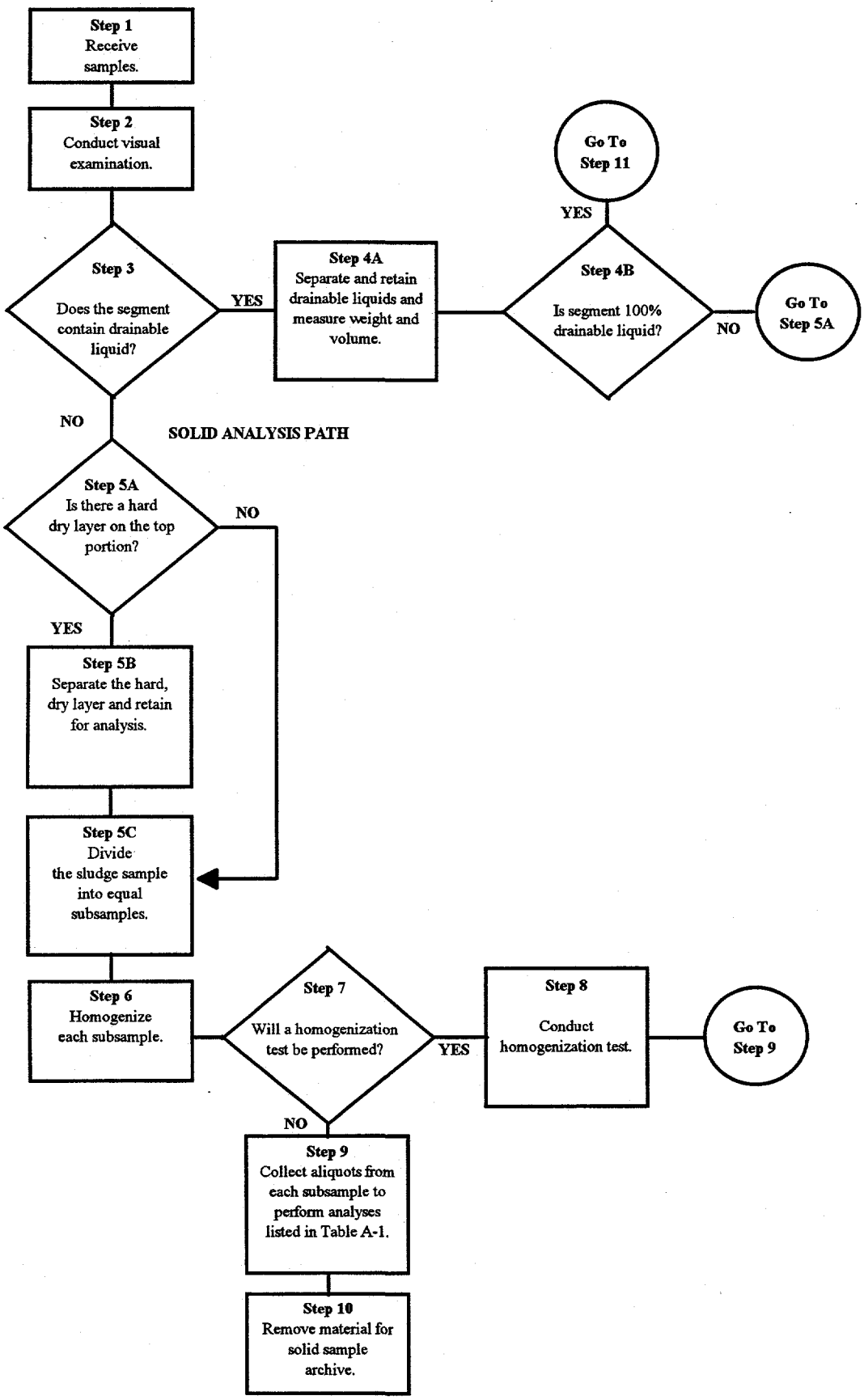

Figure A-1: Solid Analysis Flow Chart

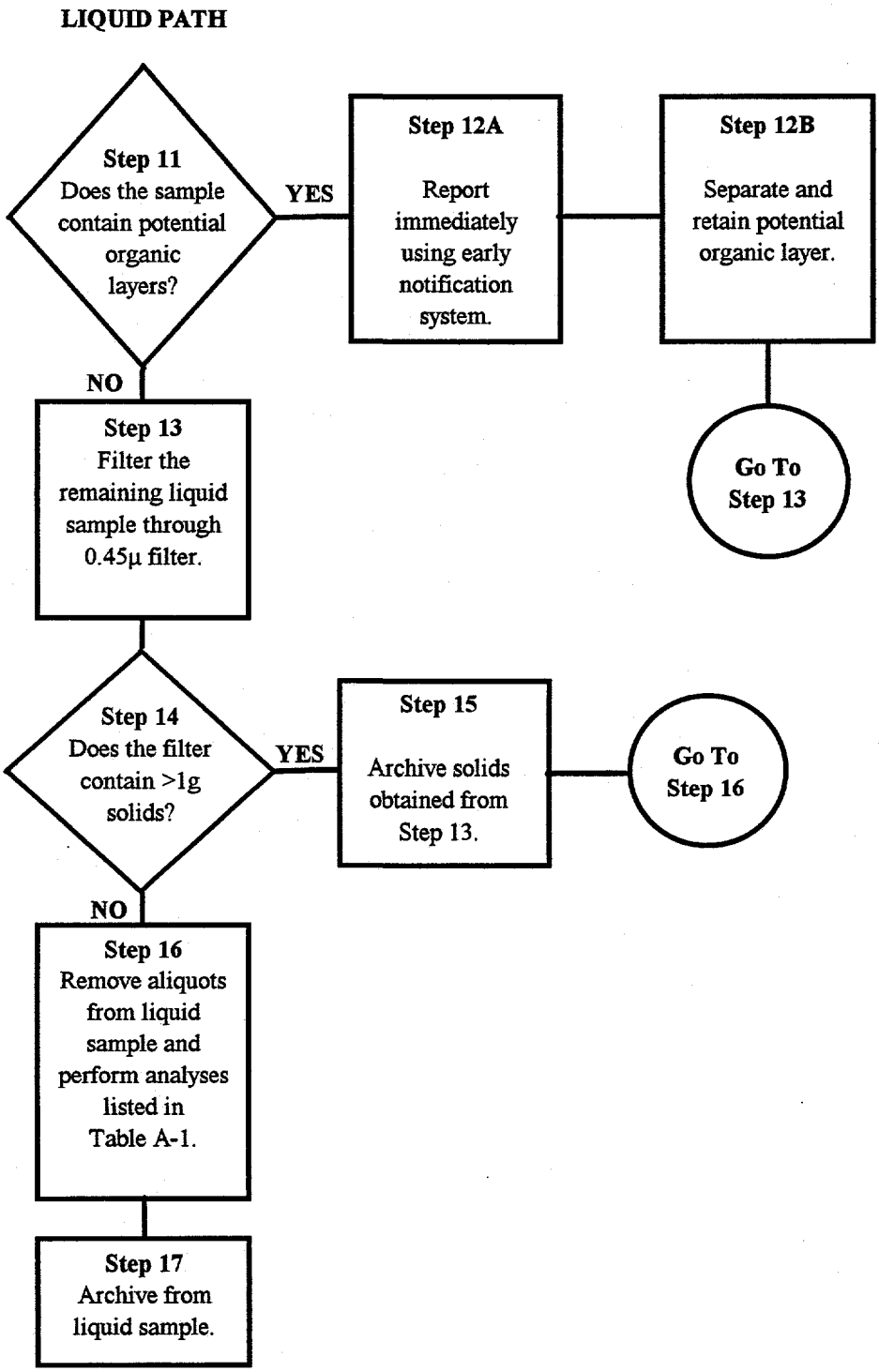

Figure A-2: Liquid Analysis Flow Chart

ANALYSIS AND REPORTING PATH

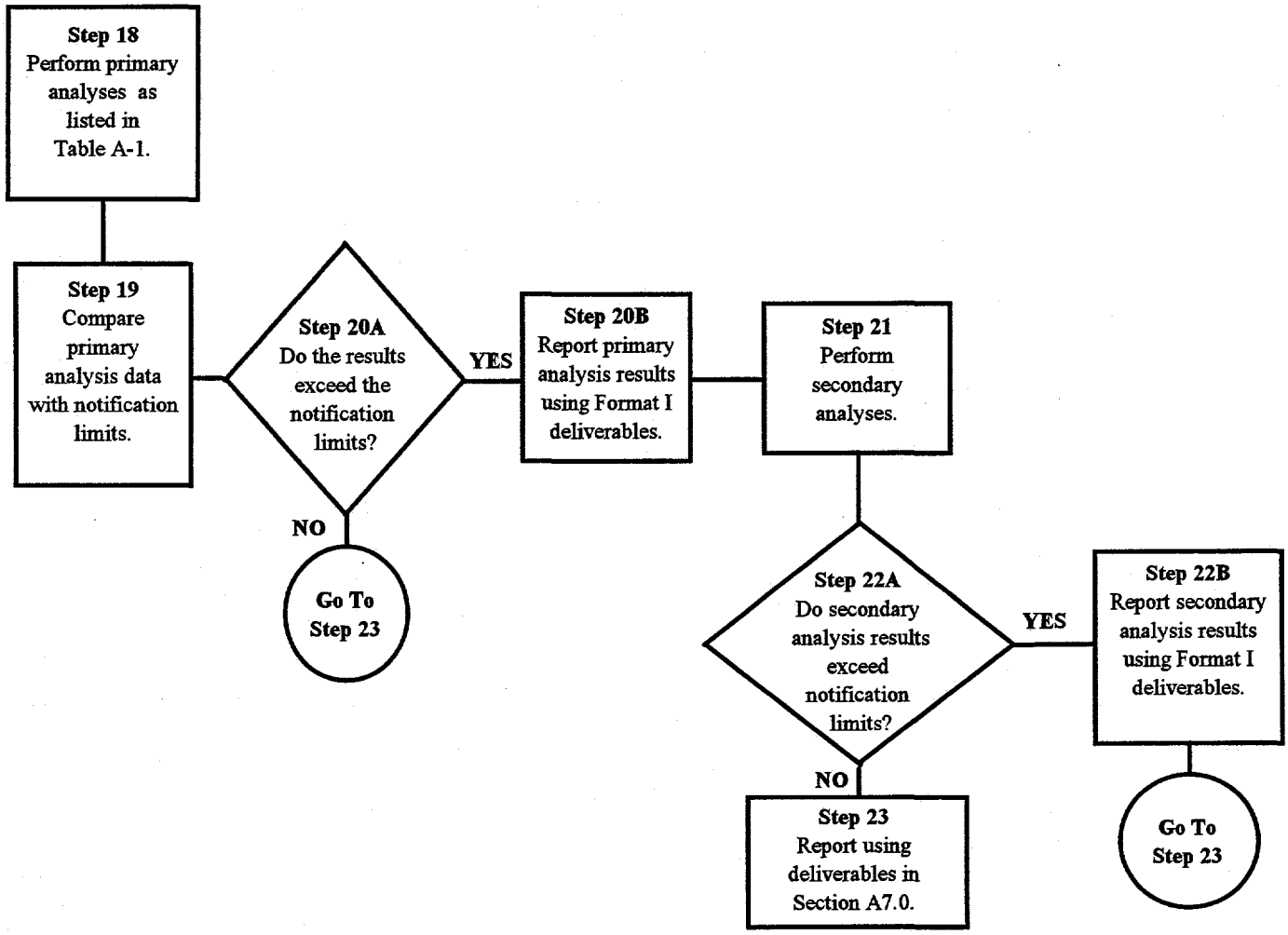

Figure A-3: Sample Analysis and Reporting Flow Chart

A4.0 SPECIFIC ANALYTE, QUALITY ASSURANCE, AND DATA CRITERIA

A4.1 SPECIFIC METHODS AND ANALYSES

The analyses in Table A-1 to be performed on the tank C-204 auger samples are based on the safety screening DQO referenced in Section A1.0. The laboratory procedure numbers, which shall be used for the analyses, are included in the table.

A4.2 QUALITY ASSURANCE

A4.2.1 Laboratory Operations

The WHC 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 quality assurance when analyzing the waste tank auger samples at the 222-S Laboratory. Additionally, the *Hanford Analytical Services Quality Assurance Plan* (DOE 1994), when implemented (August 31, 1995), shall be used for quality assurance 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 A-1. If criteria are not provided in Table A-1, the performing laboratory shall perform to its quality assurance plan(s).

A4.2.2 Sample Collection

Two auger samples are to be taken from tank C-204 and shipped to the performing laboratory by Sampling Operations in accordance with work package ES-95-00012. This work package shall also initiate the chain-of-custody for the samples. Approved work procedure TO-080-090 ("Load/Transport Sample Cask(s)") is to be used during the sampling event. Samples shall be identified by a unique number before being shipped to the performing 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 one working day of removal from the tank, but must transport each sample within three calendar days. Sampling Operations is responsible for verbally notifying the 222-S Laboratory (373-2435) at least 24 hours in advance of an expected shipment.

A4.2.3 Sample Custody

The chain-of-custody form will be initiated by the sampling team as described in work package ES-95-00012. Samples are to be shipped in a cask and sealed with a Waste Tank Sample Seal containing the information noted below.

WASTE TANK SAMPLE SEAL	
Supervisor:	Sample No.:
Date of Sampling:	Time of Sampling:
Shipment No.:	Serial No.:

The sealed and labeled samples shall be shipped to the laboratory along with the chain-of-custody form. The receipt and control of samples in the WHC 222-S Laboratory are described in laboratory procedure LO-090-101.

Table A-1: C-204 Chemical, Radiological and Physical Analytical Requirements

SOLID ANALYSES

Project Name	C-204 Auger Sample	COMMENTS		REPORTING LEVELS	
Plan Number	WHC-SD-WM-TP-307, REV. 0	Homogenization Test - Per Laboratory Discretion		FORMAT I	Early Notify
		Field Blank - Not Required		FORMAT II	Process Control
PROGRAM	PROGRAM CONTACTS	Hot Cell Blank - Per Laboratory Discretion		FORMAT III	Safety Screen
A. Safety Screening	Safety Screening H. Babad			FORMAT IV	Waste Management
	TWRS R. D. Schreiber	TANK	#AUGERS	FORMAT V	RCRA Compliance
	222-S Laboratory J. G. Kristofzski	C-204	2	FORMAT VI	Special

	PRIMARY ANALYSES			SAMPLE[1]		PREP[2]	QUALITY CONTROL[3]						CRITERIA			FOR-MAT
PROGRAM	METHOD	ANAL.	WHC PROCEDURE	½ SEG SLDG	½ SEG SC		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT[4]	EXPECTED RANGE[4]	
A	DSC	Energy	LA-514-113	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	J/g[5]	> 481	unknown	I, III
A	TGA	% H_2O	LA-560-112	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	wt%	< 17	47	I, III
A	Alpha	Total Alpha	LA-508-101	X		f or a	ea smpl	1/mtrx	ea PB	ea AB	±10	90-110	µCi/g	> 41	unknown	I, III
	SECONDARY ANALYSES			SAMPLE[1]		PREP[2]	QUALITY CONTROL[3]						CRITERIA			FOR-MAT
PROGRAM	METHOD	ANAL.	WHC PROCEDURE	½ SEG SLDG	½ SEG SC		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT[4]	EXPECTED RANGE[4]	
A	RSST[10]	Energy	see 10 below	X	X	d	N/A	N/A	N/A	ea AB	±10	90-110	J/g	> 481	unknown	I, III
A	Distillation[10]	CN	LA-695-102	X	X	d	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/g	> 39,000	unknown	I, III
A	Hot Persulfate[10]	TOC	LA-342-100	X	X	d	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg C/g	> 30,000	unknown	I, III
A	Sep. & α counting[11]	Pu-239/240	LA-503-156	X		f	ea smpl	1/mtrx[8]	ea PB	ea AB	±10	90-110	µCi/g	> 41	0.12	I, III
A	ICP[11]	Fe	LA-505-151	X		f or a	ea smpl	see[9]	ea PB	ea AB	±10	90-110	µg/g	none	unknown	III
		Mn												none	unknown	III
		U												none	106,000	III

[1]½ SEG SLDG-½ segment, sludge; ½ SEG SC-½ segment, saltcake

[2]d-direct, f-fusion dissolution, a-acid dissolution, w-water dissolution

[3]PR-precision, AC-accuracy, ea-each, smpl-sample, DUP-duplicate, SPK/MSD-spike and matrix spike duplicate, AB-analytical batch, PB-preparation blank, N/A-not applicable, mtrx-matrix

[4]Units for notification limits and expected range are those listed in the "units" column.

[5]Dry weight basis.

[6]Direct liquid samples may be diluted in acid or water to adjust to proper sample size and/or pH.

[8]Tracer or carrier may be used in place of a spike and results corrected for recovery.

[9]Either serial dilutions or matrix spikes will be performed.

[10]This analysis required if DSC exceeds notification limits. The RSST method, yet to be proceduralized, may be found in WHC-SD-WM-TP-104.

[11]Performed only if total alpha exceeds notification limit.

Table A-1: C-204 Chemical, Radiological and Physical Analytical Requirements

LIQUID ANALYSES			
Project Name	C-204 Auger Sample	COMMENTS	REPORTING LEVELS
Plan Number	WHC-SD-WM-TP-307, REV. 0	Homogenization Test - Per Laboratory Discretion	FORMAT I — Early Notify
		Field Blank - Not Required	FORMAT II — Process Control
PROGRAM	PROGRAM CONTACTS	Hot Cell Blank - Per Laboratory Discretion	FORMAT III — Safety Screen
A. Safety Screening	Safety Screening — H. Babad		FORMAT IV — Waste Management
	TWRS — R. D. Schreiber	TANK: C-204 / #AUGERS: 2	FORMAT V — RCRA Compliance
	222-S Laboratory — J. G. Kristofzski		FORMAT VI — Special

PROGRAM	PRIMARY ANALYSES			SAMPLE[1]	PREP[2]	QUALITY CONTROL[3]						CRITERIA			FORMAT
	METHOD	ANAL.	WHC PROCEDURE	LIQUID		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT[4]	EXPECTED RANGE[4]	
A	DSC	Energy	LA-514-113	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	J/g[5]	> 481	unknown	I, III
A	TGA	% H_2O	LA-560-112	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	wt%	< 17	unknown	I, III
A	Visual	Organic Layer	LA-519-151	X	d	N/A	N/A	N/A	N/A	N/A	N/A	none	presence	unknown	I, III
PROGRAM	SECONDARY ANALYSES			SAMPLE[1]	PREP[2]	QUALITY CONTROL[3]						CRITERIA			FORMAT
	METHOD	ANAL.	WHC PROCEDURE	LIQUID		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT[4]	EXPECTED RANGE[4]	
A	RSST[10]	Energy	see 10 below	X	d	N/A	N/A	N/A	ea AB	±10	90-110	J/g[5]	> 481	unknown	I, III
A	Distillation[10]	CN	LA-695-102	X	d[6]	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/mL	> 39,000[7]	unknown	I, III
A	Hot Persulfate[10]	TOC	LA-342-100	X	d[6]	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg C/mL	> 30,000[7]	unknown	I, III

[2]d-direct, f-fusion dissolution, a-acid dissolution, w-water dissolution

[3]PR-precision, AC-accuracy, ea-each, smpl-sample, DUP-duplicate, SPK/MSD-spike and matrix spike duplicate, AB-analytical batch, PB-preparation blank, N/A-not applicable, mtrx-matrix

[4]Units for notification limits and expected range are those listed in the "units" column.

[5]Dry weight basis.

[6]Direct liquid samples may be diluted in acid or water to adjust to proper sample size and/or pH.

[7]Converted from weight basis to a volumetric basis assuming a liquid density of 1.0 g/mL.

[8]Tracer or carrier may be used in place of a spike and results corrected for recovery.

[9]Either serial dilutions or matrix spikes will be performed.

[10]This analysis required if DSC exceeds notification limits. The RSST method, yet to be proceduralized, may be found in WHC-SD-WM-TP-104.

A5.0 ORGANIZATION

The organization and responsibility of key personnel involved with the tank C-204 characterization project are listed in Table A-2.

Table A-2: Tank C-204 Project Key Personnel List

Individual	Organization	Responsibility
J. G. Kristofzski	222-S Analytical Operations	Program Support Manager of Analytical Operations
R. D. Schreiber	TWRS Characterization Support	Tank C-204 Tank Characterization Plan Cognizant Engineer
H. Babad	Characterization Program	Safety Screening Point of Contact
J. L. Deichman	Analytical Services	Manager of Analytical Services Program Management and Integration
East Tank Farm Operations Shift Manager	Tank Farm Operations	East Tank Farm Point of Contact if Notification Limit is Exceeded (373-2689)

A6.0 EXCEPTIONS, CLARIFICATIONS, AND ASSUMPTIONS

A6.1 EXCEPTIONS TO DQO REQUIREMENTS

It is specified in the safety screening DQO (Babad and Redus 1994) that cyanide analyses are to be run on a quarter-segment level and that the notification limit for the DSC analysis is 125 cal/g. The revised ferrocyanide DQO (Meacham et al. 1994) has changed the requirements such that the cyanide analysis is now to be completed on a half segment level and the DSC notification limit is 115 cal/g (dry weight basis). This change will be incorporated in the next revision to the safety screening DQO. Therefore, although this Sampling and Analysis Plan uses the current safety screening DQO, it specifies that cyanide is to be run on a half-segment level and that notification shall be made if the DSC value exceeds 481 J/g dry weight basis (115 cal/g).

A6.2 CLARIFICATIONS AND ASSUMPTIONS

A number of clarifications and assumptions relating to the notification limits or decision thresholds identified in the applicable DQO efforts need to be made with respect to the analyses in Table A-1. Each of these issues are discussed below.

- Any exotherm (in cal/g or J/g) determined by DSC must be reported on a dry weight basis as shown in equation (1) using the weight percent water determined from thermogravimetric analysis.

$$Exotherm\ (dry\ wt) = \frac{[exotherm\ (wet\ wt) \times 100]}{(100 - \%\ water)} \quad (1)$$

NOTE: If there is greater than 90 percent water in a sample, converting to a dry weight basis may lead to a large error in the DSC value. However, the conversion is still required.

▶ The safety screening DQO (Babad and Redus 1994) requires that additional analyses be performed if total alpha activity measures greater than 1 g/L. Total alpha is measured in μCi/g rather than g/L. To convert the notification limit for total alpha into a number more readily usable by the laboratory, it was assumed that all alpha decay originates from Pu-239. The notification limit may then be calculated as shown in equation (2):

$$\left(\frac{1\ g}{L}\right)\left(\frac{1\ L}{10^3\ mL}\right)\left(\frac{1}{density}\ \frac{mL}{g}\right)\left(\frac{0.0615\ Ci}{1\ g}\right)\left(\frac{10^6\ \mu Ci}{1\ Ci}\right) = \frac{61.5}{density}\ \frac{\mu Ci}{g} \quad (2)$$

NOTE: If a density of 1.5 is assumed for solid material, the notification limit becomes 41 μCi/g.

The safety screening DQO, upon which the analyses in Table A-1 are based, does not sufficiently address the analyses of any drainable liquids present. In order to characterize the tank waste adequately, all analyses performed on the solids for the safety screening DQO, except total alpha activity, shall also be completed on any drainable liquid.

The safety screening DQO specifies that one sample each is to be obtained from two risers separated radially to the maximum extent possible. However, in the case of the 200 series C farm tanks, while a second riser could be used through considerable effort, only one 12-inch riser is readily available. Discussions with personnel in the Tank Waste Remediation System indicated that since taking samples out of both risers offered a separation of only two feet, in this case it was acceptable to take two samples out of the same riser, offering a separation of approximately 10 inches.

A7.0 DELIVERABLES

All analyses of tank C-204 waste material shall be reported as Formats I or III as indicated in Table A-1. Additional information regarding reporting formats is given in Schreiber (1994a).

A7.1 PROGRESS REPORTS

Each laboratory performing analyses on tank C-204 waste material from this sampling project shall provide monthly status reports to the Characterization Program. This report shall contain 1) a summary of the activities on the analysis of the tank, 2) preliminary results to the program, and 3) schedule and cost information on a DQO basis.

Monthly and accumulative costs will be compared to the base as part of the

progress report. Monthly variances greater than 10% or $10,000, and accumulative variances greater than $50,000 from the estimated costs or schedule must be explained in the report. Cost reporting shall consist of the following:

1. budgeted cost of work scheduled
2. monthly cost (actual cost of work performed)
3. year-to-date costs (actual cost of work performed)

Schedule reporting shall consist of the following:

1. monthly schedule
2. year-to-date schedule

A7.2 FORMAT I REPORTING

Table A-1 contains the notification limits for each analyte. Any results that exceed their notification limits defined in the DQO processes shall be reported by calling the East Tank Farm Operations Shift Manager at 373-2689 and the Characterization Program Office (Schreiber 1994b). This verbal notification must be followed within one working day by written communication to Analytical Services, Characterization Support, the Characterization Program Office, the Safety Screening Representative, and Waste Tanks Process Engineering. Points of contact within each program or project are defined by Schreiber (1994c). 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 a letter of instruction.

A7.3 FORMAT III REPORTING

A Format III report, reporting the results of the primary safety screen analyses shall be issued to the Safety Screening Representative, Characterization Support, the Characterization Program Office, Los Alamos Technical Associates, the Tank Characterization Resource Center, Waste Tanks Process Engineering, and the Tank Characterization Database representative within 45 days of receipt of the last sample at the laboratory loading dock. The DSC and TGA scans have been requested due to the interpretive nature of the analysis. If analyses for the safety screening secondary analytes are required, these results shall be provided within 90 days of receipt of the last sample at the laboratory loading dock. No calibration data are requested for these reports. Detailed information regarding the contents of this reporting format are given in (Schreiber 1994a).

A8.0 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 through the use of internal characterization change 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.

At the request of the Characterization Program, additional analysis of sample material from this characterization project shall be performed following a revision

of this Tank Characterization Plan.

A9.0 REFERENCES

Babad, H., 1992, *An Overview of Progress Made Toward Resolving Priority One Safety Issues: Fiscal Year 1992*, WHC-EP-0606, Westinghouse Hanford Company, Richland, Washington

Babad, H. and K. S. Redus, 1994, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Westinghouse Hanford Company, Richland, Washington.

Bell, K. E., 1993, *Tank Waste Remediation System Tank Waste Characterization Plan*, WHC-SD-WM-PLN-047, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Bratzel, D. R., 1994, Letter to S. M. Joyce, "Archiving Requirements", 7E720-94-125, dated June 23, 1994.

DOE, 1994, *Hanford Analytical Services Quality Assurance Plan*, DOE/RL-94-55, Rev. 0, U.S. Department of Energy, Richland Field Office, Richland, Washington.

Haller, C. S., 1994, *Fiscal Year 1995 Tank Waste Remediation System Tank Waste Analysis Plan*, WHC-SD-WM-PLN-091, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. M., 1994, *Waste Tank Summary for Month Ending November 30, 1994*, WHC-EP-0182-80, Westinghouse Hanford Company, Richland, Washington.

Meacham, J. E., R. J. Cash, G. T. Dukelow, H. Babad, J. W. Buck, C. M. Anderson, B. A. Pulsipher, J. J. Toth, P. J. Turner, 1994, *Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objectives Process*, WHC-SD-WM-DQO-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Meznarich, H. K., 1994, *Quality Assurance Program Plan for Laboratory Analysis and Process Testing*, WHC-SD-CP-QAPP-003, Rev. 1, Westinghouse Hanford Company, Richland, Washington

Schreiber, R. D., 1994a, Letter to C. S. Haller, "Revised Interim Tank Characterization Plan Guidance", 7E720-94-121, dated May 13, 1994.

Schreiber, R. D., 1994b, Letter to J. G. Kristofzski, "Format I Reporting Requirement", 7E720-94-128, dated August 15, 1994.

Schreiber, R. D., 1994c, Letter to J. G. Kristofzski, "Point of Contact/Distribution List", 7E720-94-141, dated October 11, 1994.

Taylor, L. H., 1993, *Quality Assurance Project Plan for Chemical Analysis of Highly Radioactive Mixed Waste Samples in Support of Environmental Activities on the Hanford Site*, WHC-SD-CP-QAPP-002 Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Whelan, T. E., et al., 1994, *TWRS Characterization Program Quality Assurance Program Plan*, WHC-SD-WM-QAPP-025, Rev. 0, Westinghouse Hanford Company, Richland, Washington.