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12web3T 4-27-98


ENGINEERING CHANGE NOTICE

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1. ECN 643788

Proj.
ECN

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersede <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. Jim G. Field, Data Assessment and Interpretation, R2-12, 376-3753	4. USQ Required? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. Date 04/27/98
12a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. N/A	12c. Modification Work Complete N/A <hr/> Design Authority/Cog. Engineer Signature & Date	12d. Restored to Original Condition (Temp. or Standby ECN only) N/A <hr/> Design Authority/Cog. Engineer Signature & Date
13a. Description of Change The document has been totally revised to include the results of recent sampling to address technical issues associated with the waste, and to update the best basis standard inventory.			
14a. Justification (mark one) Criteria Change <input checked="" type="checkbox"/> Design Improvement <input type="checkbox"/> Environmental <input type="checkbox"/> Facility Deactivation <input type="checkbox"/> As-Found <input type="checkbox"/> Facilitate Const <input type="checkbox"/> Const. Error/Omission <input type="checkbox"/> Design Error/Omission <input type="checkbox"/>			
14b. Justification Details Changes required to incorporate new sampling data.			
15. Distribution (include name, MSIN, and no. of copies) See attached distribution.			

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DATE:	
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JUN 18 1998	ID: 2

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Page 2 of 2

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

ECN-643788

16. Design Verification Required

☐ Yes
☒ No

17. Cost Impact

ENGINEERING

Additional ☐ \$
Savings ☐ \$

CONSTRUCTION

Additional ☐ \$
Savings ☐ \$

18. Schedule Impact (days)

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

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. J.G. Field <i>J.G. Field</i>	<u>6/17/98</u>	PE	_____
Cog. Mgr. K.M. Hall <i>K.M. Hall</i>	<u>6/17/98</u>	QA	_____
QA	_____	Safety	_____
Safety	_____	Design	_____
Environ.	_____	Environ.	_____
Other J.W. Cammann <i>J.W. Cammann</i>	<u>6/17/98</u>	Other	_____
	_____		_____
R.J. Cash <i>R.J. Cash</i>	<u>6-17-98</u>		_____
	_____		_____
J.G. Kristofzski <i>J.G. Kristofzski</i>	<u>6/18/98</u>		_____
	_____		_____
	_____		_____
	_____		_____

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Tank Characterization Report for Single-Shell Tank 241-T-105

Jim G. Field

Lockheed Martin Hanford Corp., Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-87RL10930

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Abstract: This document summarizes the information on the historical uses, present status, and the sampling and analysis results of waste stored in Tank 241-T-105. This report supports the requirements of the Tri-Party Agreement Milestone M-44-15B.

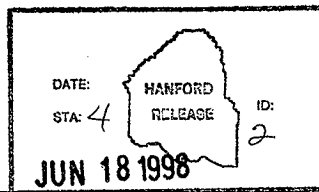
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L. J. J.
Release Approval

JUN 18 1998

Date



Release Stamp

Approved for Public Release

Tank Characterization Report for Single-Shell Tank 241-T-105

J. G. Field
S. R. Wilmarth
Lockheed Martin Hanford Corp.

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

FLUOR DANIEL HANFORD, INC.



P.O. Box 1000
Richland, Washington

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LIST OF TERMS

1C	first cycle decontamination waste
1C2	1C waste produced from 1950 to 1956
2C	second cycle decontamination waste
2C1	2C waste produced from 1944 to 1949
AES	atomic emission spectroscopy
ASTM	American Society for Testing and Materials
BL	B Plant low-level waste
Btu/hr	British thermal units per hour
Ci	curie
Ci/L	curies per liter
CI	confidence interval
cm	centimeter
c/s	counts per second
CW	BiPO ₄ process aluminum cladding waste
DQO	data quality objective
DSC	differential scanning calorimetry
ft	feet
g	gram
g/cm ³	grams per cubic centimeter
g/L	grams per liter
g/mL	grams per milliliter
GEA	gamma energy analysis
HDW	Hanford defined waste
HTCE	historical tank content estimate
IC	ion chromatography
ICP	inductively coupled plasma spectroscopy
in.	inch
IX	ion exchange waste
J/g	joules per gram
kg	kilogram
kg/L	kilograms per liter
kgal	kilogallon
kL	kiloliter
kW	kilowatt
LFL	lower flammability limit
LL	lower limit

LIST OF TERMS (Continued)

m	meter
M	molarity
M/L	moles per liter
mL	milliliter
mm	millimeter
n/a	not applicable
NR	not reported
PHMC	Project Hanford Management Contractor
ppm	parts per million
ppmv	parts per million by volume
QC	quality control
R	REDOX (reduction oxidation)
RPD	relative percent difference
SAP	sampling and analysis plan
SMM	supernatant mixing model
SpG	specific gravity
TCR	tank characterization report
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TLM	tank layer model
TOC	total organic carbon
TWRS	Tank Waste Remediation System
UL	upper limit
vol%	volume percent
W	watt
WSTRS	Waste Status and Transaction Record Summary
wt%	weight percent
°C	degrees Celsius
%	percent
μCi/g	microcuries per gram
μCi/gal	microcuries per gallon
μCi/mL	microcuries per milliliter
μeq/g	microequivalents per gram
μeq/mL	microequivalents per milliliter
μg/g	micrograms per gram
μg/mL	micrograms per milliliter
μm	micrometer

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1.0 INTRODUCTION

A major function of the Tank Waste Remediation System (TWRS) is to characterize waste in support of waste management and disposal activities at the Hanford Site. Analytical data from sampling and analysis and other available information about a tank are compiled and maintained in a tank characterization report (TCR). This report and its appendices serve as the TCR for single-shell tank 241-T-105.

The objectives of this report are 1) to use characterization data in response to technical issues associated with tank 241-T-105 waste and 2) to provide a standard characterization of this waste in terms of a best-basis inventory estimate. Section 2.0 summarizes the response to technical issues, Section 3.0 shows the best-basis inventory estimate, Section 4.0 makes recommendations about the safety status of the tank and additional sampling needs. The appendices contain supporting data and information. This report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1997), Milestone M-44-15b, change request M-44-97-03, to "issue characterization deliverables consistent with the waste information requirements documents developed for 1998."

1.1 SCOPE

The characterization information in this report originated from sample analyses and known historical sources. The results of recent sample events will be used to fulfill the requirements of the data quality objectives (DQOs) and memoranda of understanding specified in Brown et al. (1997) for this tank. Other information can be used to support conclusions derived from these results.

Appendix A contains historical information for tank 241-T-105 including surveillance information, records pertaining to waste transfers and tank operations, and expected tank contents derived from a process knowledge model. Appendix B summarizes recent sampling events (see Table 1-1), sample data obtained before 1989, and sampling results. Appendix C reports the statistical analysis and numerical manipulation of data used in issue resolution. Appendix D contains the evaluation to establish the best basis for the inventory estimate and the statistical analysis performed for this evaluation. Appendix E is a bibliography that resulted from an in-depth literature search of all known information sources applicable to tank 241-T-105 and its respective waste types. The reports listed in Appendix E are available in the Tank Characterization and Safety Resource Center.

Table 1-1. Summary of Recent Sampling.

Sample/Date ¹	Phase	Location	Segmentation	Recovery
Core 205 (6/24/97 and 6/26/97)	Liquid	Riser 3	Segment 1	100%
	Solid/liquid		Segment 2	31%
Core 207 (6/27/97 and 6/30/97)	Solid/liquid	Riser 7	Segment 1	100%
	Solid		Segment 2	82%
Core 53 (3/19/93)	Solid	Riser 8	Segment 1	18%
	Solid/liquid		Segment 2	45%
Core 54 (3/24/93)	Solid/liquid	Riser 2	Segment 1	36%
	Liquid		Segment 2	91% ²
Core 57 (5/28/93)	Solid	Riser 5	Segment 1	8%
	Solid		Segment 2	8%

Notes:

¹Dates are in the mm/dd/yy format.²Most likely water used as hydrostatic head fluid.

1.2 TANK BACKGROUND

Tank 241-T-105 is located in the 200 West Area T Farm on the Hanford Site. It is the second tank in a three-tank cascade series connecting to tank 241-T-104 upstream and to tank 241-T-106 downstream. The tank went into service in 1946, receiving second cycle decontamination waste (2C) from the bismuth phosphate process (Brevick et al. 1997). In 1948, tank 241-T-105 began receiving first cycle decontamination waste (1C), also from the bismuth phosphate process. During its operational life, liquids from the tank were discharged to the cribs, to various tanks, and to the 242-T Evaporator. Other waste types were received by the tank, including coating waste, B Plant low-level waste (BL), and ion-exchange (IX) waste. However, only 2C and 1C wastes are predicted to comprise the solids currently in the tank (Agnew et al. 1997). The tank was removed from service in 1976 and interim stabilized in 1987. Intrusion prevention was completed in 1988.

Table 1-2 describes tank 241-T-105. The tank has an operating capacity of 2,010 kL (530 kgal) and contains an estimated 371 kL (98 kgal) of noncomplexed waste (Hanlon 1998). The tank is not on the Watch List (Public Law 101-510).

Table 1-2. Description of Tank 241-T-105.

TANK DESCRIPTION	
Type	Single-shell
Constructed	1943-1944
In service	1946
Diameter	23 m (75 ft)
Operating depth	5.2 m (17 ft)
Capacity	2,010 kL (530 kgal)
Bottom shape	Dish
Ventilation	Passive
TANK STATUS	
Waste classification	Noncomplexed
Total waste volume ¹	371 kL (98 kgal)
Supernatant volume ¹	0 kL (0 kgal)
Saltcake volume ¹	0 kL (0 kgal)
Sludge volume ¹	371 kL (98 kgal)
Drainable interstitial liquid volume ¹	87 kL (23 kgal)
Waste surface level (January 5, 1998) ²	105.6 cm (41.56 in.)
Temperature (February 1977 to February 1981) ³	16 to 34 °C
Integrity	Sound
Watch List	None
Flammable gas facility group	3
SAMPLING DATE	
Core samples	March and May 1993
Core samples	June 1997
SERVICE STATUS	
Removed from service	1976
Interim stabilization	1987
Intrusion prevention	1988

Notes:

¹Hanlon (1998)

²ENRAF is a registered trademark of ENRAF Corporation, Houston, Texas. ENRAF started recording in August 1995. The level was rebaselined to the center of the dish, thus adding 30.5 cm (12 in.) to the prior level measurement readings. January 5, 1998, was the date of the last surface level measurement before February 28, 1998.

³According to Tran (1993), the thermocouple tree was cut off because it could not be removed. There has been no thermocouple tree since May 1982.

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2.0 RESPONSE TO TECHNICAL ISSUES

The following technical issues have been identified for tank 241-T-105:

- **Safety Screening:** Does the waste pose or contribute to any recognized potential safety problems?
- **Organic complexants:** Does the possibility exist for a point source ignition in the waste followed by a propagation of the reaction in the solid/liquid phase of the waste?
- **Organic solvents:** Does an organic solvent pool exist that may cause a fire or ignition of organic solvents in entrained waste solids?

The sampling and analysis plan (SAP) (Field 1997) specifies the types of sampling and analysis used to address the above issues. Data for push core samples was taken in March and May 1993. However, poor recovery was obtained for these sample events, and resampling was recommended. Data from the analysis of push core samples taken in June 1997 provided the means to respond to the technical issues. The response to the technical issues is detailed in the sections below. See Appendix B for sample and analysis data for tank 241-T-105.

2.1 SAFETY SCREENING

The data needed to screen the waste in tank 241-T-105 for potential safety problems are documented in *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995). These potential safety problems are exothermic conditions in the waste, flammable gases in the waste and/or tank headspace, and criticality conditions in the waste. Each condition is addressed separately below.

2.1.1 Exothermic Conditions (Energetics)

The first requirement outlined in the safety screening DQO (Dukelow et al. 1995) is to ensure there are not sufficient exothermic constituents (organic or ferrocyanide) in tank 241-T-105 to pose a safety hazard. Because of this requirement, energetics in tank 241-T-105 waste were evaluated. The safety screening DQO required that the waste sample profile be tested for energetics every 24 cm (9.5 in.) to determine whether the energetics exceeded the safety threshold limit. The threshold limit for energetics is 480 J/g on a dry weight basis. Results obtained using differential scanning calorimetry (DSC) indicated there were no exotherms in any 1997 samples. The maximum exotherm observed in 1993 samples was 334 J/g (dry weight). This is below the safety screening limit of 480 J/g.

Based on historical process transfer records, there is no evidence that any exothermic agent should exist in this waste. According to Agnew et al. (1997), no fuels are expected in 2C1 (2C waste produced from 1944 to 1949) and 1C2 (1C waste produced from 1950 to 1956), which were predicted to compose the waste in the tank. Although not predicted by Agnew et al. to be present in the tank, other waste types (coating waste) received by the tank did contain small quantities of organics.

2.1.2 Flammable Gas

Headspace measurements were taken before taking the June 1997 push core samples. Flammable gas was not detected in the tank headspace (0 percent of the lower flammability limit [LFL]) before sampling.

2.1.3 Criticality

The safety screening DQO threshold for criticality, based on the total alpha activity, is 1 g/L. Because total alpha activity is measured in $\mu\text{Ci/mL}$ instead of g/L, the 1 g/L limit is converted into units of $\mu\text{Ci/mL}$ by assuming that all alpha decay originates from ^{239}Pu . The safety threshold limit is 1 g ^{239}Pu per liter of waste. Assuming that all alpha is from ^{239}Pu , for a maximum sample density of 1.53 g/mL, 1 g/L of ^{239}Pu is equivalent to 40.2 $\mu\text{Ci/g}$ of alpha activity. The maximum total alpha activity result was 0.587 $\mu\text{Ci/g}$, well below the notification limit. The maximum total alpha result for 1993 samples was 0.823 $\mu\text{Ci/g}$.

2.2 ORGANIC COMPLEXANTS

The data required to support the issue of organic complexants are documented in *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997). Energetics by DSC and sample moisture analyses were conducted to address the organic complexants issue. As stated previously, no exotherms were observed in any 1997 samples. Although exotherms were observed in 1993 samples, no exothermic activity is expected (see Section 2.1.1), and the tank is classified as "safe" for this issue.

2.3 ORGANIC SOLVENTS SAFETY SCREENING

The data required to support the organic solvents safety screening issue are documented in the *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). The DQO requires tank headspace samples be analyzed for total nonmethane organic compounds to determine whether the organic extractant pool in the tank is a hazard. The purpose of this assessment is to ensure an organic solvent pool fire or ignition of organic solvents cannot occur.

No vapor samples have been taken to estimate the organic pool size. However, the organic program has determined that even if an organic solvent pool does exist, the consequence of a fire or ignition of organic solvents is below risk evaluation guidelines for all tanks (Brown et al. 1998). Consequently, vapor samples are not required for this tank. The organic solvents issue is expected to be closed for all tanks in fiscal year 1998.

2.4 OTHER TECHNICAL ISSUES

No vapor samples are planned to address the *Data Quality Objective for Tank Hazardous Vapor Safety Screening* (Osborne and Buckley 1995) because headspace vapor (sniff) tests are required for the safety screening DQO (Dukelow et al. 1995), and the toxicity issue was closed for all tanks (Hewitt 1996).

A factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. Heat load estimates, based on core samples obtained in 1997, were not possible because these samples were not analyzed for radionuclides. An estimate of the tank heat load based on 1993 radionuclide analyses gives a value of 1,310 W (4,470 Btu/hr). Table 2-1 shows the heat load estimate. A second heat load estimate of 19.7 W (67.3 Btu/hr), based on process history, was available from Agnew et al. (1997). A third estimate based on tank headspace temperatures was 1,461 W (4,988 Btu/hr) (Kummerer 1995). All heat load estimates are well below the limit of 11,700 W (40,000 Btu/hr) that separates high- and low-heat load tanks (Smith 1986).

Table 2-1. Tank 241-T-105 Projected Heat Load.

Radionuclide	Curies	Watts
¹³⁷ Cs	13,300	62.8
⁹⁰ Sr	1.15E+05	769
Total	1.18E+05	832

2.5 SUMMARY

The results of all analyses performed to address potential safety issues showed that primary analyte(s) did not exceed safety decision threshold limits (Table 2-2). Poor recovery was obtained from the second segment of core 205. However, excellent recovery was obtained for core 207. Because no exotherms were observed in any samples, the tank is classified as safe for the organics complexants issue. Vapor samples have not been taken for this tank, and no vapor samples are planned. The organic solvents safety issue is expected to be resolved for all tanks in fiscal year 1998.

Table 2-2. Summary of Technical Issues.

Issue	Sub-Issue	Result
Safety screening	Energetics	No exotherms were observed in 1997 samples; 1993 exotherms were below 480 J/g.
	Flammable gas	The headspace vapor test showed 0 percent of the LFL (combustible gas meter).
	Criticality	All analytical results were well below the total alpha activity limits.
Organic complexants	Safety categorization (safe)	No exotherms observed in 1997 samples; 1993 exotherms were below 480 J/g. The issue is expected to be closed in fiscal year 1998.
Organic solvent	Organic solvent pool size	Not vapor sampled. The issue is expected to be closed in fiscal year 1998.

3.0 BEST-BASIS INVENTORY ESTIMATE

Information about chemical, radiological, and/or physical properties is used to perform safety analyses, engineering evaluations, and risk assessments associated with waste management activities, as well as regulatory issues. These activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing them into a form suitable for long-term storage/disposal.

Chemical and radiological inventory information is generally derived using three approaches: 1) component inventories are estimated using the results of sample analyses; 2) component inventories are predicted using the Hanford defined waste (HDW) model based on process knowledge and historical information; or 3) a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material usage, and other operating data.

An effort is underway to provide waste inventory estimates that will serve as the standard characterization for management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available chemical information for tank 241-T-105 was performed including the following information:

- Data from core samples from tank 241-T-105 collected in 1997 and 1993
- Representative sample data for 1C and BiPO₄ process aluminum cladding waste (CW) waste types (Kupfer et al. 1997)
- An inventory estimate generated by the HDW model (Agnew et al. 1997).

The evaluation supports using the sample-based results as the best-basis inventory for this tank. Where sample results were not available, engineering evaluations based on sample results for other tanks containing 1C and CW waste (Kupfer et al. 1997) are used as the best basis. Where isotope-specific sample data were not available, HDW model values or a combination of sample results and HDW model values are used to determine radionuclide inventories.

Best-basis tank inventory values are derived for 46 key radionuclides (Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ⁹⁰Sr, ¹³⁷Cs, ^{239/240}Pu, and total uranium (or total beta and total alpha), while other key radionuclides such as ⁶⁰Co, ⁹⁹Tc, ¹²⁹I, ¹⁵⁴Eu, ¹⁵⁵Eu, and ²⁴¹Am have been infrequently reported. For this reason, it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track radionuclide movement with tank waste transactions. These computer models are described in Kupfer et al. (1997), Section 6.1, and in Watrous and Wootan (1997). Model-generated values for

radionuclides in any of 177 tanks are reported in Agnew et al. (1997). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result, if available.

Tables 3-1 and 3-2 show the best-basis inventory estimate for tank 241-T-105. Simpson (1998) specifies mercury values. Radionuclide curie values are decayed to January 1, 1994.

The inventory values reported in Tables 3-1 and 3-2 are subject to change. Refer to the Tank Characterization Database (LMHC 1998) for the most current inventory values.

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-T-105 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, C or E) ¹	Comment
Al	26,100	S	
Bi	3,350	S	
Ca	410	S	
Cl	208	S	
TIC as CO ₃	9,430	S	
Cr	374	S	
F	250	S	
Fe	9,430	S	
Hg	8.28	E	Per change package 7 (Simpson 1998)
K	259	S	
La	20.20	S	
Mn	4,040	S	
Na	34,500	S	
Ni	40.2	S	
NO ₂	18,220	S	
NO ₃	12,700	S	
OH _{TOTAL}	69,700	C	Charge balance spreadsheet
Pb	237	S	
PO ₄	1,610	S	ICP analysis
Si	1,920	S	
SO ₄	5,260	S	IC analysis

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-T-105 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, C or E) ¹	Comment
Sr	72.5	S	
TOC	1,890	S	
U _{TOTAL}	3,010	S	
Zr	23.4	S	

Notes:

IC = Ion chromatography
 ICP = inductively coupled plasma spectroscopy
 TIC = total inorganic carbon
 TOC = total organic carbon

¹S = sample-based (see Appendix B), M = HDW model-based, E = engineering assessment, and C = calculated by charge balance; includes oxides as hydroxides, not including CO₂, NO₂, NO₂, PO₄, SO₄, and SiO₂.

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-T-105 Decayed to January 1, 1994 (Effective April 1, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E) ¹	Comment
³ H	4.94	S	
¹⁴ C	0.41	S	
⁵⁹ Ni	0.00480	M	
⁶⁰ Co	15.7	S	
⁶³ Ni	0.435	M	
⁷⁹ Se	0.00357	M	
⁹⁰ Sr	115,000	S	
⁹⁰ Y	115,000	S	Based on ⁹⁰ Sr activity
⁹³ Zr	0.0169	M	
^{93m} Nb	0.0142	M	
⁹⁹ Tc	153	S	
¹⁰⁶ Ru	1.88E-09	M	
^{113m} Cd	0.0426	M	

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-T-105
Decayed to January 1, 1994 (Effective April 1, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E) ¹	Comment
¹²⁵ Sb	274	S	
¹²⁶ Sn	0.00538	M	
¹²⁹ I	2.22E-04	M	
¹³⁴ Cs	22.7	S	
¹³⁷ Cs	13,300	S	
^{137m} Ba	12,600	S	Based on 0.946 of ¹³⁷ Cs activity
¹⁵¹ Sm	13.2	M	
¹⁵² Eu	0.00586	M	
¹⁵⁴ Eu	737	S	
¹⁵⁵ Eu	869	S	
²²⁶ Ra	8.76E-07	M	
²²⁷ Ac	4.49E-06	M	
²²⁸ Ra	2.25E-11	M	
²²⁹ Th	4.37E-09	M	
²³¹ Pa	9.88E-06	M	
²³² Th	4.74E-12	M	
²³² U	2.29E-05	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³³ U	1.06E-06	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁴ U	0.989	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁵ U	0.0437	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁶ U	0.00983	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁷ Np	7.28E-04	M	
²³⁸ Pu	0.422	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²³⁸ U	1.01	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-T-105
Decayed to January 1, 1994 (Effective April 1, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E) ¹	Comment
²³⁹ Pu	99.1	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴⁰ Pu	6.68	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴¹ Am	99.7	S	
²⁴¹ Pu	10.6	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴² Cm	0.287	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴² Pu	4.41E-05	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴³ Am	7.07E-04	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴³ Cm	0.00588	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴⁴ Cm	0.0168	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes

Note:

¹S = sample-based (see Appendix B), M = HDW model-based (Agnew et al. 1997a), and E = engineering assessment-based.

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4.0 RECOMMENDATIONS

All 1997 core sample analytical results were well within the notification limits for the safety screening DQO (Dukelow et al. 1995). The LFL was 0 percent for this tank. Although sample recovery was poor for core 205, sample recovery was excellent for core 207. The 1993 core samples that were recovered also showed all analytical results were well within notification limits for the safety screening DQO. Therefore, the sampling and analysis activities performed for tank 241-T-105 have met all requirements for the safety screening DQO. Vapor samples have not been taken to resolve the organic solvent safety DQO (Meacham et al. 1997). However, the organic solvent issue is expected to be closed for all tanks in fiscal year 1998, and no additional vapor sampling is planned for tank 241-T-105. The tank is classified as safe for the organic complexants issue because no exotherms were observed in any 1997 samples, and exotherms were below 480 J/g in 1993 samples.

Table 4-1 summarizes the Project Hanford Management Contractor (PHMC) TWRS Program review status and acceptance of the sampling and analysis results reported in this TCR. All issues required to be addressed by sampling and analysis are listed in column 1 of Table 4-1. Column 2 indicates by "yes" or "no" whether issue requirements were met by the sampling and analysis performed. Column 3 indicates concurrence and acceptance by the program in PHMC/TWRS that is responsible for the applicable issue. A "yes" in column 3 indicates no additional sampling or analyses are needed. Conversely, "no" indicates additional sampling or analysis may be needed to satisfy issue requirements.

Table 4-1. Acceptance of Tank 241-T-105 Sampling and Analysis.

Issue	Sampling and Analysis Performed	Program ¹ Acceptance
Safety screening data quality objective	Yes	Yes
Organic complexant memorandum of understanding (Schreiber 1997) ²	Yes	Yes
Organic solvents data quality objective ²	No	n/a

Notes:

n/a = not applicable

¹PHMC TWRS Program Office

²The organic solvent and organic complexant safety issues are expected to be closed in fiscal year 1998.

Table 4-2 summarizes the status of PHMC TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. Column 1 lists the different evaluations performed in this report. Column 2 shows whether issue evaluations have been completed or are in progress. Column 3 indicates concurrence and acceptance with the evaluation by the program in PHMC/TWRS that is responsible for the applicable issue. A "yes" indicates that the evaluation is completed and meets all issue requirements.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-T-105.

Issue	Evaluation Performed	TWRS ¹ Program Acceptance
Safety screening data quality objective	Yes	Yes
Organic complexant memorandum of understanding (Safety classification: Safe)	Yes	Yes
Organic solvents data quality objective ²	n/a	n/a

Notes:

¹PHMC TWRS Program Office

²The organic solvents issue is expected to be closed in fiscal year 1998. Additional sampling is not required to close this issue for this tank (Brown et al. 1998).

5.0 REFERENCES

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APPENDIX A

HISTORICAL TANK INFORMATION

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APPENDIX A

HISTORICAL TANK INFORMATION

Appendix A describes tank 241-T-105 based on historical information. For this report, historical information includes information about the fill history, waste types, surveillance, or modeling data about the tank. This information is necessary for providing a balanced assessment of sampling and analytical results.

This appendix contains the following information:

- **Section A1.0:** Current tank status including the current waste levels and the tank stabilization and isolation status
- **Section A2.0:** Information about the tank design
- **Section A3.0:** Process knowledge about the tank, the waste transfer history, and the estimated contents of the tank based on modeling data
- **Section A4.0:** Surveillance data for tank 241-T-105, including surface-level readings, temperatures, and a description of the waste surface based on photographs
- **Section A5.0:** Appendix A references.

A1.0 CURRENT TANK STATUS

As of November 30, 1997, tank 241-T-105 contained an estimated 371 kL (98 kgal) of noncomplexed waste. This waste is composed entirely of sludge, with an estimated 87 kL (23 kgal) of drainable liquid (Hanlon 1998). The solid volume was determined by surface-level measurements, and the liquid volume was determined by photographic evaluation (Hanlon 1998). Table A1-1 shows the volumes of the waste phases found in the tank. Temperature data are not available after February 1981 because no thermocouple tree is currently in this tank. Section A4.0 further discusses waste levels and tank temperatures. Tank 241-T-105 is listed as a low-heat load tank (Hanlon 1998) and is passively ventilated to the atmosphere through a breather filter (Bergmann 1991). Except for temperature readings, monitoring systems are currently in compliance with established standards (Hanlon 1998).

Tank 241-T-105 is not a Watch List tank (Public Law 101-510). The integrity of the tank is sound. Tank 241-T-105 was removed from service in 1976 and interim stabilized in 1987. Intrusion prevention was completed in 1988.

Table A1-1. Tank 241-T-105 Contents Status Summary.¹

Waste Type	Volume
Total waste	371 kL (98 kgal)
Supernatant	0 kL (0 kgal)
Sludge	371 kL (98 kgal)
Saltcake	0 kL (0 kgal)
Drainable interstitial liquid	87 kL (23 kgal)
Drainable liquid remaining	87 kL (23 kgal)
Pumpable liquid remaining	64 kL (17 kgal)

Note:

¹Hanlon (1998)

A2.0 TANK DESIGN AND BACKGROUND

The T Tank Farm, built between 1943 and 1944, was one of the first four tank farms constructed at the Hanford Site. It is the northernmost tank farm in the 200 West Area. The T Farm was designed for nonboiling waste with a maximum fluid temperature of 104 °C. A typical T Farm tank contains 9 to 11 risers, ranging in size from 10 cm (4 in.) to 1.1 m (42 in.) in diameter, that provide surface-level access to the underground tank. Generally, there is one riser through the center of the tank dome and four or five each on opposite sides of the dome. These single-shell tanks are constructed of 30 cm- (1 ft-) thick reinforced concrete with a 6.4 mm (0.25 in.) mild carbon steel liner (ASTM A283 Grade C) on the bottom and sides and a 38 cm- (1.25 ft-) thick domed concrete top. The tanks have a dished bottom with a 1.2 m (4 ft) radius knuckle and a 5.2 m (17 ft) operating depth. The tanks are set on a reinforced concrete foundation. Tank 241-T-105 has a diameter of 23 m (75 ft) and a capacity of 2,010 kL (530 kgal) (Brevick et al. 1997).

The tank and foundation were waterproofed by a coating of tar covered by a three-ply, asphalt-impregnated, waterproofing fabric. The waterproofing was protected by welded wire reinforced gunite. Two coats of primer were sprayed on all exposed interior surfaces. The tank ceiling dome was covered with three applications of magnesium zincfluorosilicate wash. Lead flashing was used to protect the joint where the steel liner meets the concrete dome.

Asbestos gaskets were used to seal the risers in the tank dome. The tank was covered with approximately 2.1 m (7 ft) of overburden (Rogers and Daniels 1944).

Tank 241-T-105 is the second tank in a "cascade" that connects tanks 241-T-104 and 241-T-106. The tanks are connected by a 7.6 cm (3 in.) cascade line. A cascade was a system whereby several tanks were connected in series by pipes. The pipes were located at the top of the tanks' working depths. Waste was added to the first tank in a cascade and flowed to the next tank without overfilling the first tank. By using a cascade, fewer connections needed to be made during waste handling operations. This method reduced waste handling requirements, personnel exposure, and the chance of a loss of tank integrity from waste overflow. Another advantage of using the cascades was to clarify the waste. Heavier solids and insoluble constituents would precipitate primarily in the first tank (241-T-104), and the clarified liquids would flow through the cascade to the other tanks (241-T-105 and 241-T-106). This practice led to rapid filling of the first tank with solids and enabled the clarified liquid from the tanks in the cascade to be discharged to cribs.

Figure A2-1 is a plan view of the riser configuration. The figure shows that tank 241-T-105 has four process inlet nozzles, one cascade inlet, and one cascade outlet. Table A2-1 lists tank 241-T-105 risers and shows their sizes and general use.

Figure A2-2 shows a tank cross section and the approximate waste level and a schematic of the tank equipment. Tank 241-T-105 has nine risers. Risers 2, 3, 5, 6, 7, and 8 are tentatively available for sampling (Lipnicki 1997). Risers 2, 3, 6, and 7 are all 30 cm (12 in.) in diameter. Risers 5 and 8 are 10 cm (4 in.) in diameter. Risers 2 and 3 are approximately 40 degrees counterclockwise from the inlet, and risers 5, 6, 7, and 8 are approximately 70 degrees clockwise from the inlet.

Figure A2-1. Riser Configuration for Tank 241-T-105.

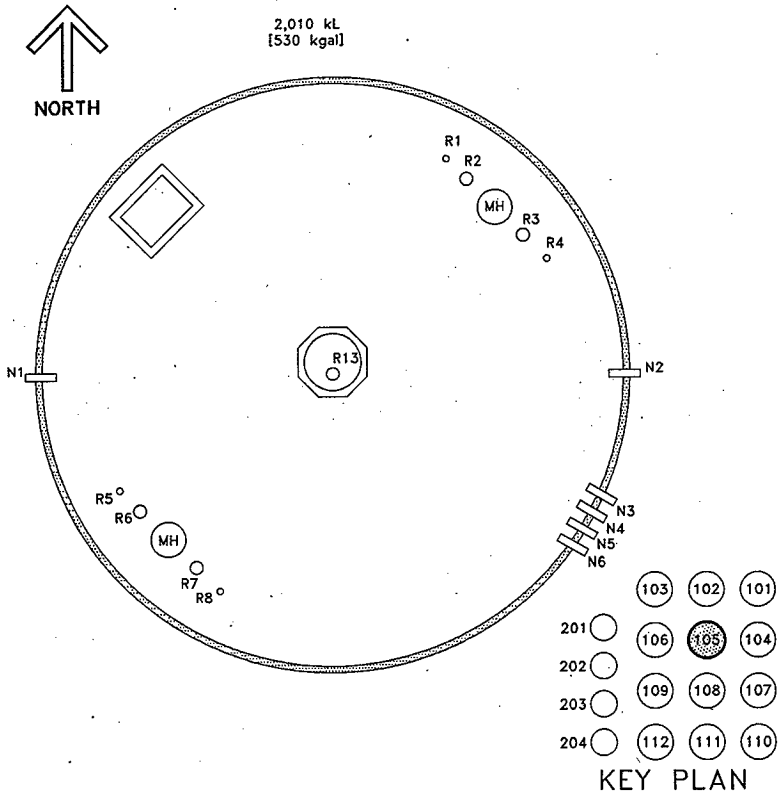


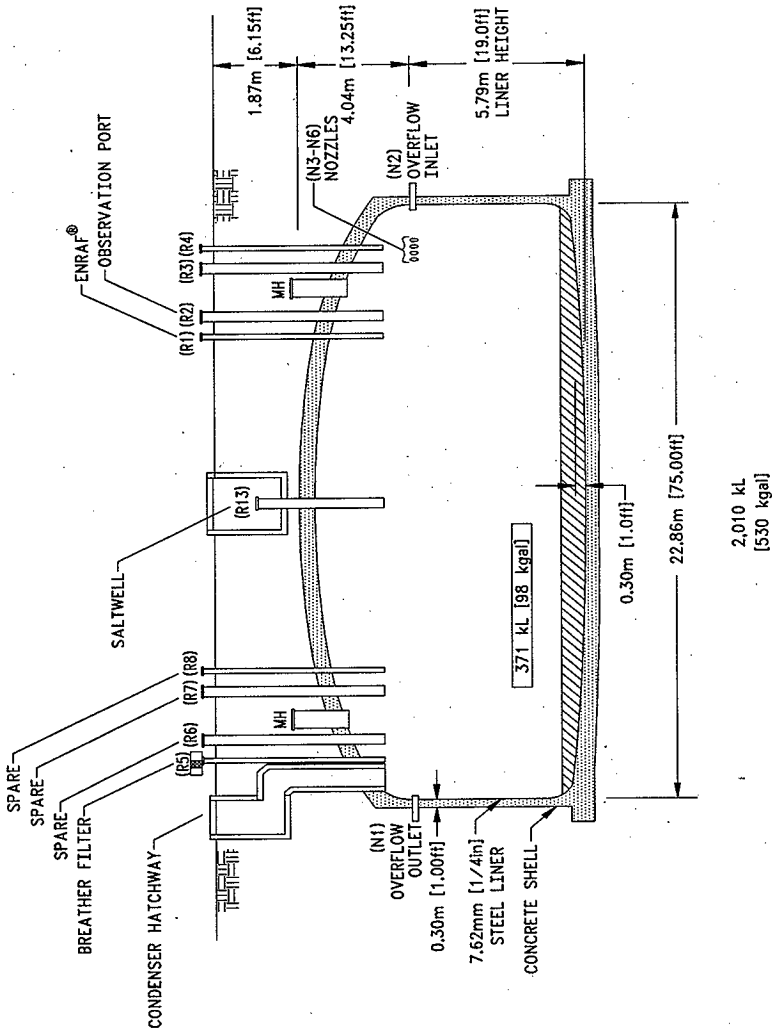
Table A2-1. Tank 241-T-105 Risers.^{1, 2, 3, 4, 5}

Number	Diameter		Description and Comments
	cm	in.	
1	10	4	ENRAF ⁸ surface level gauge
2 ⁶	30	12	B-222 Observation Port (Benchmark December 11, 1986)
3 ⁶	30	12	Blank
4	10	4	Cut and capped (prior location of thermocouple)
5 ⁶	10	4	Breather filter
6	30	12	Flange, spare
7 ⁶	30	12	Flange, spare
8 ⁶	10	4	Flange, spare
13	30	12	Salt well (Benchmark December 11, 1986)
N1	7.6	3	Cascade outlet
N2	7.6	3	Cascade inlet
N3	7.6	3	Inlet nozzle, capped
N4	7.6	3	Inlet nozzle, capped
N5	7.6	3	Inlet nozzle, capped
N6	7.6	3	Inlet nozzle, Line V-699 to Diversion Box 241-T-153

Notes:

¹Alstad (1993)²Tran (1993)³Vitro Engineering Corporation (1988)⁴The parentheses include engineering change notices before 1995.⁵If there was a discrepancy between the documents and the drawing, the drawing took precedence.⁶Risers tentatively available for sampling (Lipnicki 1997)

Figure A2-2. Tank 241-T-105 Cross Section and Schematic.



A3.0 PROCESS KNOWLEDGE

The sections below 1) provide information about the transfer history of tank 241-T-105, 2) describe the process wastes that made up the transfers, and 3) give an estimate of the current tank contents based on transfer history.

A3.1 WASTE TRANSFER HISTORY

Table A3-1 summarizes the waste transfer history of tank 241-T-105. The first waste type introduced into tank 241-T-105 was 2C waste in 1946 (Agnew et al. 1997b). This waste consisted of effluent remaining after precipitation of plutonium product in the second decontamination cycle of the BiPO_4 process at T Plant. The 2C waste filled the tank and cascaded to tank 241-T-106 from 1947 to the first quarter of 1948. Because tank 241-T-105 received waste directly from T-plant, 2C solids are expected to have been deposited in the lower portion of the tank. In the second quarter of 1948, much of the 2C supernatant in tank 241-T-105 was sent to the T-107 crib.

From the second quarter of 1948 to the first quarter of 1949, 1C waste cascaded into tank 241-T-105 from tank 241-T-104. Waste cascaded from tank 241-T-105 to tank 241-T-106 during this same period. Produced in the BiPO_4 process at T plant, 1C waste consisted of by products co-precipitated from a plutonium-containing solution. Coating waste from the removal of aluminum fuel element cladding was also added; it comprised about 24 percent of the waste stream. The 1C waste is characterized by a relatively high concentration of bismuth and aluminum. During the second quarter of 1951, the waste was transferred from tank 241-T-105 to tanks 241-TX-117 and 241-TX-118. The 1C waste cascaded from tank 241-T-104 to tank 241-T-105 from the fourth quarter of 1951 to the third quarter of 1954. In 1954, the supernatant in tank 241-T-105 was pumped out and sent to a crib. Supernatant waste was also sent to tank 241-TX-118 in the fourth quarter of 1954. The cascade system was not used after 1954.

The tank began receiving CW at the beginning of 1955, and it was full by the end of 1956. Agnew et al. (1997a) says that CW originated from the reduction oxidation (REDOX) process, but Anderson (1990) says the CW originated from the BiPO_4 process. Waste transaction records in Agnew et al. (1997b) indicate BiPO_4 was added rather than REDOX process aluminum cladding waste. Flush water was also added to the waste during 1956.

Tank 241-T-105 received supernatant from tank 241-S-107 in 1965. From 1967 to 1968, supernatant was transferred to tank 241-TX-118 as feed to the 242-T Evaporator. In 1967, Hanford laboratory operations waste was transferred to tank 241-T-105. This dilute waste was generated by laboratories in the 300 Area. In 1968 and 1969, tank 241-T-105 received decontamination waste, a wash solution from equipment decontamination efforts at T Plant. It is composed of a dilute sodium nitrite solution, averaging 0.02M sodium nitrite.

Tank 241-T-105 received transfers from other single-shell tanks of liquid waste mixtures containing BL and IX wastes in 1973. Supernatant, consisting of most of the tank's volume, was transferred to tank 241-T-106 in the same year. B Plant low-level waste originated from the fractionization plant. Ion exchange waste was a product of the cesium recovery process at B Plant.

In 1974, supernatant waste was transferred to tank 241-S-110. Small supernatant transfers from salt well pumping were made from tanks 241-T-101 and 241-AY-102 in 1976 and 1984, respectively. Table A3-1 shows the estimated cumulative volume of each waste type received and transferred by tank 241-T-105.

Table A3-1. Tank 241-T-105 Major Transfers^{1,2}. (2 sheets)

Transfer Source	Transfer Destination	Waste Type	Time Period	Estimated Waste Volume	
				KL	kgal
Direct from T-plant	---	2C1	1946-1948	+4,012	+1,060
---	241-T-106	---	1946-1949 1951-1954	-8,346	-2,205
---	Crib T-107	Supernatant	1948	-1,321	-349
241-T-104	---	1C	1948-1949 1951-1954	+10,955	+2,894
---	241-TX-117	Supernatant	1951	-863	-228
---	241-TX-118	Supernatant	1951, 1954, 1967, 1968	-6,568	-1,735
---	Crib	Supernatant	1954	-1,313	-347
REDOX	---	CW ³	1955-1956	+980	+259
Flush water	---	Flush water	1955-1956	+314	+83
241-S-107	---	Supernatant	1965	+83	+22
300 Area Laboratories	---	Laboratory waste	1967	+1,499	+396
T Plant	---	Decontamination waste	1968-1969	+1,230	+325
BX-104	---	BL, IX	1972-1973	+1,435	+379

Table A3-1. Tank 241-T-105 Major Transfers^{1, 2}. (2 sheets)

Transfer Source	Transfer Destination	Waste Type	Time Period	Estimated Waste Volume	
				kL	kgal
241-T-107	---	BL, IX	1973	+1,711	+452
---	241-T-106, S-110, T-101	Supernatant	1973-1975	-3,335	-881
---	AY-102	Salt well liquid	1984	-64	-17

Notes:

¹Agnew et al. (1997b)²Because only major transfers are listed, the sum of transfers will not equal the current tank waste volume.³Anderson (1990)

A3.2 HISTORICAL ESTIMATION OF TANK CONTENTS

The historical transfer data used for this estimate are from the following sources:

- The *Waste Status and Transaction Record Summary: WSTRS, Rev. A*, (Agnew et al. 1997b) is a tank-by-tank quarterly summary spreadsheet of waste transactions.
- The *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4* (Agnew et al. 1997a) contains the Hanford defined waste (HDW) list, the supernatant mixing model (SMM), the tank layer model (TLM), and the historical tank content estimate (HTCE).
- The HDW list is comprised of approximately 50 waste types defined by concentration for major analytes/compounds for sludge and supernatant layers.
- The TLM defines the sludge and saltcake layers in each tank using waste composition and waste transfer information.
- The SMM is a subroutine within the HDW model that calculates the volume and composition of certain supernatant blends and concentrates.

Using these records, the TLM defines the sludge and saltcake layers in each tank. The SMM uses information from the WSTRS, the TLM, and the HDW list to describe the supernatants and concentrates in each tank. Together the WSTRS, TLM, SMM, and HDW list determine the inventory estimate for each tank. These model predictions are considered estimates that require further evaluation using analytical data.

Based on Agnew et al. (1997a), tank 241-T-105 contains a bottom layer of 270 kL (72 kgal) of 2C1 waste and a top layer of 98 kL (26 kgal) of 1C2 waste. The 2C1 waste type is 2C waste produced from 1944 to 1949. The 1C2 waste type is 1C waste generated from 1950 to 1956. Figure A3-1 is a graphical representation of the estimated waste type and volume for the tank layers. Both the 2C1 and 1C2 waste types are predicted to contain greater than 1 weight percent of sodium, hydroxide, nitrate, and phosphate, and between 1 and 0.1 weight percent of sulfate, calcium, carbonate, silicate and fluoride. Bismuth and iron are predicted above 1 weight percent for 2C1 waste, and aluminum is predicted at greater than 1 weight percent for 1C2 waste. Table A3-2 shows the historical estimate of the expected tank waste constituents and their concentrations.

Figure A3-1. Tank Layer Model.

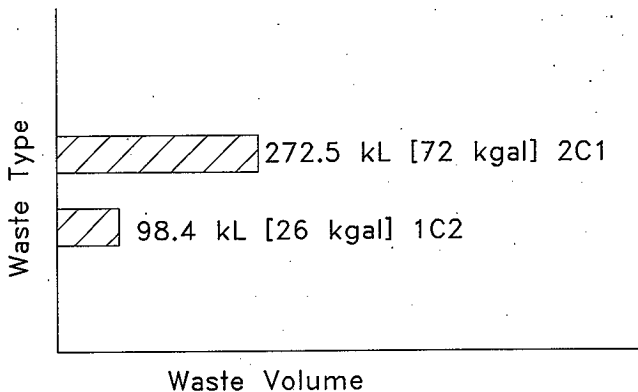


Table A3-2. Historical Tank Inventory Estimate.^{1,2} (4 sheets)

Total Inventory Estimate					
Physical Properties				-95 CI	+95 CI
Total waste	4.75E+05 (kg)	(98.0 kgal)	----	----	----
Heat load	1.97E-02 (kW)	(67.3 Btu/hr)	----	1.36E-02	2.57E-02
Bulk density ³	1.28 (g/cm ³)	----	----	1.18	1.36
Water wt% ³	69.7	----	----	64.3	77.2
TOC wt% C (wet) ³	0	----	----	0	0
Chemical Constituents	M/L	ppm	kg	-95 CI (M/L)	+95 CI (M/L)
Na ⁺	4.40	7.90E+04	3.75E+04	2.46	6.16
Al ³⁺	0.115	2.43E+03	1.15E+03	0.115	0.115
Fe ³⁺ (total Fe)	0.502	2.19E+04	1.04E+04	0.492	0.511
Cr ³⁺	3.73E-03	152	72.0	3.24E-03	4.22E-03
Bi ³⁺	8.37E-02	1.37E+04	6.49E+03	6.50E-02	9.37E-02
La ³⁺	0	0	0	0	0
Hg ²⁺	2.48E-05	3.89	1.85	5.54E-06	3.11E-05
Zr (as ZrO(OH) ₂)	6.50E-05	4.63	2.20	4.07E-05	8.90E-05
Pb ²⁺	0	0	0	0	0
Ni ²⁺	1.24E-03	57.1	27.1	1.12E-03	3.99E-03
Sr ²⁺	0	0	0	0	0
Mn ⁴⁺	0	0	0	0	0
Ca ²⁺	0.125	3.91E+03	1.86E+03	8.30E-02	0.160
K ⁺	5.59E-03	171	81.1	4.90E-03	6.27E-03
OH ⁻	2.19	2.90E+04	1.38E+04	2.13	2.27
NO ₃ ⁻	0.958	4.64E+04	2.20E+04	0.870	1.03
NO ₂ ⁻	9.56E-02	3.44E+03	1.63E+03	4.69E-02	0.164
CO ₃ ²⁻	0.125	5.86E+03	2.78E+03	8.30E-02	0.160
PO ₄ ³⁻	1.04	7.72E+04	3.67E+04	0.443	1.41
SO ₄ ²⁻	4.26E-02	3.20E+03	1.52E+03	3.74E-02	4.79E-02

Table A3-2. Historical Tank Inventory Estimate.^{1,2} (4 sheets)

Total Inventory Estimate					
Chemical Constituents (Cont'd)	M/L	ppm	kg	-95 CI (M/L)	+95 CI (M/L)
Si (as SiO ₃ ²⁻)	0.102	2.23E+03	1.06E+03	6.27E-02	0.271
F ⁻	0.164	2.44E+03	1.16E+03	0.148	0.760
Cl ⁻	2.57E-02	712	338	2.26E-02	2.88E-02
C ₆ H ₅ O ₇ ³⁻	0	0	0	0	0
EDTA ⁴⁻	0	0	0	0	0
HEDTA ³⁻	0	0	0	0	0
Glycolate ⁻	0	0	0	0	0
Acetate ⁻	0	0	0	0	0
Oxalate ²⁻	0	0	0	0	0
DBP	0	0	0	0	0
Butanol	0	0	0	0	0
NH ₃	1.58E-02	210	99.9	1.02E-02	2.09E-02
Fe(CN) ₆ ⁴⁻	0	0	0	0	0
Radiological Constituents	CI/L	μCi/g	CI	-95 CI (CI/L)	+95 CI (CI/L)
³ H	2.19E-07	1.71E-04	8.11E-02	9.45E-08	4.04E-07
¹⁴ C	4.56E-08	3.56E-05	1.69E-02	3.18E-08	5.91E-08
⁵⁹ Ni	1.30E-08	1.01E-05	4.80E-03	9.03E-09	4.22E-08
⁶³ Ni	1.17E-06	9.17E-04	0.435	8.16E-07	3.84E-06
⁶⁰ Co	1.11E-08	8.70E-06	4.13E-03	7.42E-09	1.48E-08
⁷⁹ Se	9.61E-09	7.51E-06	3.57E-03	6.70E-09	1.25E-08
⁹⁰ Sr	4.40E-03	3.44	1.63E+03	3.05E-03	5.74E-03
⁹⁰ Y	4.40E-03	3.44	1.63E+03	3.05E-03	5.74E-03
⁹³ Zr	4.56E-08	3.57E-05	1.69E-02	3.18E-08	5.92E-08
^{93m} Nb	3.84E-08	3.00E-05	1.42E-02	2.68E-08	4.97E-08
⁹⁹ Tc	3.16E-07	2.47E-04	0.117	2.21E-07	4.11E-07
¹⁰⁶ Ru	5.07E-15	3.96E-12	1.88E-09	3.18E-15	6.94E-15
^{113m} Cd	1.15E-07	8.97E-05	4.26E-02	7.85E-08	1.51E-07

Table A3-2. Historical Tank Inventory Estimate.^{1,2} (4 sheets)

Total Inventory Estimate					
Radiological Constituents (Cont'd)	Ci/L	$\mu\text{Ci/g}$	Ci	-95 CI (Ci/L)	+95 CI (Ci/L)
¹²⁵ Sb	1.07E-08	8.40E-06	3.99E-03	6.97E-09	1.45E-08
¹²⁶ Sn	1.45E-08	1.13E-05	5.38E-03	1.01E-08	1.88E-08
¹²⁹ I	5.97E-10	4.67E-07	2.22E-04	4.16E-10	7.76E-10
¹³⁴ Cs	4.62E-10	3.61E-07	1.71E-04	2.93E-10	6.28E-10
¹³⁷ Cs	5.00E-03	3.91	1.86E+03	3.46E-03	6.52E-03
^{137m} Ba	4.73E-03	3.70	1.76E+03	3.28E-03	6.17E-03
¹⁵¹ Sm	3.57E-05	2.79E-02	13.2	2.49E-05	4.63E-05
¹⁵² Eu	1.58E-08	1.23E-05	5.86E-03	1.53E-08	1.63E-08
¹⁵⁴ Eu	2.06E-07	1.61E-04	7.63E-02	1.35E-07	2.76E-07
¹⁵⁵ Eu	1.19E-06	9.32E-04	0.443	1.16E-06	1.23E-06
²²⁶ Ra	2.36E-12	1.85E-09	8.76E-07	1.77E-12	2.94E-12
²²⁸ Ra	6.07E-17	4.74E-14	2.25E-11	5.92E-17	6.21E-17
²²⁷ Ac	1.21E-11	9.47E-09	4.49E-06	9.06E-12	1.51E-11
²³¹ Pa	2.66E-11	2.08E-08	9.88E-06	1.98E-11	3.34E-11
²²⁹ Th	1.18E-14	9.20E-12	4.37E-09	1.15E-14	1.21E-14
²³² Th	1.28E-17	9.99E-15	4.74E-12	9.01E-18	1.65E-17
²³² U	9.70E-11	7.58E-08	3.60E-05	8.25E-11	1.06E-10
²³³ U	4.49E-12	3.51E-09	1.67E-06	3.83E-12	5.05E-12
²³⁴ U	4.20E-06	3.28E-03	1.56	3.59E-06	4.98E-06
²³⁵ U	1.86E-07	1.45E-04	6.88E-02	1.59E-07	2.21E-07
²³⁶ U	4.17E-08	3.26E-05	1.55E-02	3.56E-08	4.68E-08
²³⁸ U	4.26E-06	3.33E-03	1.58	3.65E-06	5.06E-06
²³⁷ Np	1.96E-09	1.53E-06	7.28E-04	1.36E-09	2.55E-09
²³⁸ Pu	2.86E-07	2.23E-04	0.106	1.43E-07	4.92E-07
²³⁹ Pu	6.70E-05	5.24E-02	24.9	2.24E-05	1.32E-04
²⁴⁰ Pu	4.52E-06	3.53E-03	1.68	1.89E-06	8.33E-06
²⁴¹ Pu	7.18E-06	5.61E-03	2.66	2.67E-06	1.08E-05
²⁴² Pu	2.98E-11	2.33E-08	1.11E-05	9.24E-12	4.62E-11
²⁴¹ Am	1.00E-07	7.83E-05	3.72E-02	6.38E-08	1.36E-07

Table A3-2. Historical Tank Inventory Estimate.^{1,2} (4 sheets)

Total Inventory Estimate					
Radiological Constituents (Cont'd)	CI/L	$\mu\text{Ci/g}$	CI	-95 CI (CI/L)	+95 CI (CI/L)
²⁴³ Am	7.11E-13	5.56E-10	2.64E-07	4.48E-13	9.71E-13
²⁴² Cm	2.89E-10	2.26E-07	1.07E-04	2.79E-10	2.99E-10
²⁴³ Cm	5.92E-12	4.62E-09	2.19E-06	5.70E-12	6.13E-12
²⁴⁴ Cm	1.69E-11	1.32E-08	6.26E-06	1.06E-11	2.31E-11
Totals	M	$\mu\text{g/g}$	kg	-95 CI (M or g/L)	+95 CI (M or g/L)
Pu	1.10E-03 (g/L)	----	0.407	3.68E-04	2.16E-03
U	5.37E-02	9.98E+03	4.74E+03	4.60E-02	6.37E-02

Notes:

CI = confidence interval

¹Unknowns in tank solids inventory are assigned by the TLM.²Historical tank inventory estimates have not been validated and should be used with caution.³Volume average for density, mass average water weight percent, and TOC weight percent C.

A4.0 SURVEILLANCE DATA

Tank 241-T-105 surveillance consists of surface-level measurements, temperature monitoring, and dry well monitoring for radioactivity outside the tank. Surveillance data provide the basis for determining tank integrity. Liquid-level measurements can indicate whether the tank has a major leak. Solid surface-level measurements indicate physical changes in consistency of the solid layers of a tank. Dry wells located around the tank perimeter may show increased radioactivity caused by leaks in the vicinity of the dry wells.

A4.1 SURFACE-LEVEL READINGS

An ENRAF[®] surface-level gauge was installed in July 1995. Before this, surface-level readings were taken by Food Instrument Corporation in intrusion mode. Surface-level measurements are manually entered into the Computer Automated Surveillance System. Surface-level data from 1991 to 1996 show a steady waste level. In January 1996, the location

for surface-level measurements was changed from the tank side wall to near the tank center. Figure A4-1 shows the level history data. The waste surface level on January 5, 1998, was 105.6 cm (41.6 in.).

A4.2 INTERNAL TANK TEMPERATURES

Historical temperature data from 1977 to 1981 ranged from 16 °C to 34 °C (see Figure A4-2). The last available temperature reading for tank 241-T-105 was 23 °C taken February 1981. The thermocouple tree was cut off in 1981 (Brevick et al. 1997).

Tank 241-T-105 has not received waste since it was removed from service in 1976, but 64 kL (17 kgal) of supernatant waste has been removed. This may have affected the tank temperature. Also, historical temperatures may be higher than current temperatures because radiation-generated heat decreases as radioactive constituents decay over time.

A4.3 DRY WELL RADIOACTIVITY

Two dry wells were drilled around tank 241-T-105 in 1973, and another dry well was drilled in 1975. These dry wells have registered high radioactivity. The dry well closest to tank 241-T-106 had greater than 200 c/s. The remaining two had greater than 50 c/s before 1990. The radioactivity has been attributed to an estimated 435 kL (115 kgal) leak from tank 241-T-106 (Welty 1988).

A4.4 TANK 241-T-105 PHOTOGRAPHS

The 1976 photographic montage of the inside of tank 241-T-105 shows a black, uneven surface that appears to have a medium-brown colored material underneath. In part of the montage, a small amount of liquid appears to be on the waste surface. Some liquids have evaporated since 1987, but the photograph probably represents current tank contents (Brevick et al. 1997).

Figure A4-1. Tank 241-T-105 Level History.

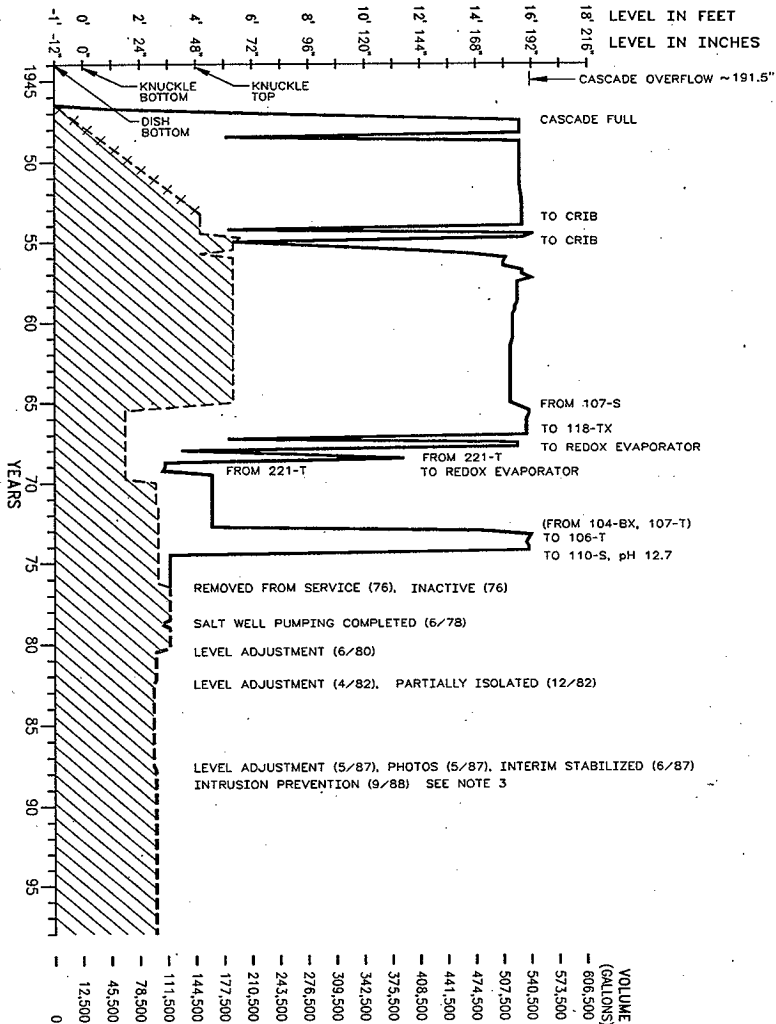
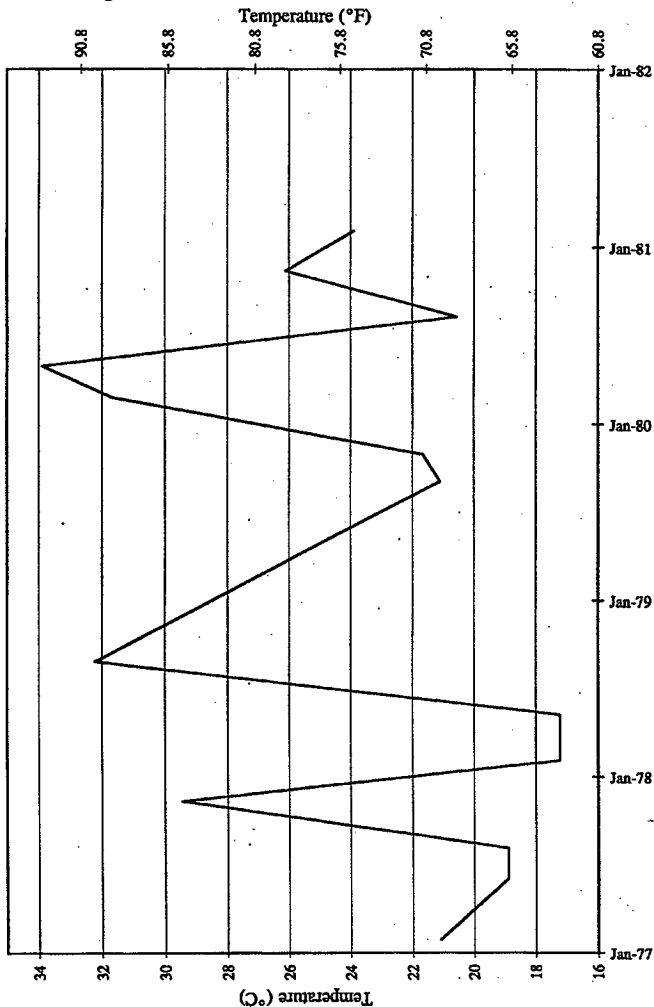


Figure A4-2. Tank 241-T-105 High Temperature Plot.



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APPENDIX B

SAMPLING OF TANK 241-T-105

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APPENDIX B

SAMPLING OF TANK 241-T-105

Appendix B provides sampling and analysis information for each known sampling event for tank 241-T-105 and assesses push core sample results. It includes the following:

- **Section B1.0:** Tank Sampling Overview
- **Section B2.0:** Sampling Events
- **Section B3.0:** Assessment of Characterization Results
- **Section B4.0:** Appendix B References.

B1.0 TANK SAMPLING OVERVIEW

This section identifies applicable requirements for the June 1997 and March and May 1993 push mode core sampling and analysis events for tank 241-T-105.

The 1997 push mode core samples were taken to satisfy the requirements of the *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995) and the *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997). Sampling and analyses were performed in accordance with the *Tank 241-T-105 Push Mode Sampling and Analysis Plan* (Field 1997). For further discussion of the sampling and analysis procedures, refer to the *Tank Characterization Reference Guide* (DeLorenzo et al. 1994).

The 1993 push mode core sample event predated current DQOs. Recovery for this sample event was poor, and resampling was recommended. Further discussion of this sample event are included in Section B2.2.

A 1974 liquid grab sample is discussed in Section B2.4.

B2.0 SAMPLING EVENTS

This section describes the 1997 and 1993 push mode core sampling events. Table B2-1 summarizes the sampling and analytical requirements for the applicable DQOs and issues.

Table B2-1. Integrated Data Quality Objective Requirements for Tank 241-T-105.¹

Sampling Event	Applicable DQOs	Sampling Requirements	Analytical Requirements
Push mode core sampling	Safety screening - Energetics - Moisture content - Total alpha - Flammable gas Dukelow et al. (1995) Organic complexants Schreiber (1997) Organic solvents Meacham et al. (1997)	Core samples from a minimum of two risers separated radially to the maximum extent possible. Combustible gas measurement	Flammability, energetics, moisture, total alpha activity, density, anions, cations, radionuclides, TOC, separable organics, physical properties, TIC, pH, Cr(VI)
Vapor sampling	Organic Solvents Meacham et al. (1997)	Steel canisters, triple sorbent traps, sorbent trap systems	Flammable gas, organic vapors, permanent gases

Note:

TIC = total inorganic carbon

¹Field (1997)

B2.1 1997 PUSH CORE SAMPLING EVENT

Two push mode core samples were collected from tank 241-T-105 in 1997. Core 205 was collected from riser 3 on June 24 and 26, 1997. Core 207 was collected from riser 7 on June 27 and June 30, 1997. Two segments were retrieved for each core.

Sampling satisfied the safety screening DQO and organic complexants memorandum of understanding. Analyses included total alpha to determine criticality, DSC to ascertain the fuel energy value, thermogravimetric analysis (TGA) to obtain the total moisture content, and bulk density. In addition, combustible gas meter readings in the tank headspace were performed to measure flammability. Inductively coupled plasma spectroscopy (ICP) and ion

chromatography (IC) analyses were conducted to assess the potential contamination by hydrostatic head fluid used during sampling. Opportunistic ICP and IC analytes were also reported.

The core samples were obtained by a core sampling truck with sampling equipment mounted on a rotating platform. A drill string containing a stainless steel sampler was used to collect the waste. The sampler obtained a 48 cm (19 in.) long and 2.5 cm (1 in.) diameter segment of the waste. After the sampler was filled, it was extracted from the drill string and sealed within a stainless steel liner to trap any liquid which might leak from the sampler. The liner was inserted into a lead-shielded shipping cask before being transferred to the 222-S Laboratory for analysis. Chain-of-custody forms were completed for each segment. A lithium bromide tracer fluid was used as a hydrostatic head fluid during sampling.

B2.1.1 Sample Handling

Core 205 and 207 samples were received by the 222-S Laboratory on June 26 and July 1, 1997, respectively. The samples were transported to the laboratory within four calendar days from the time each segment was removed from the tank.

The valve was half open on the sampler for core 205, segment 2. This may have caused the poor recovery for this segment. Segment 2 of core 205 and segment 1 of core 207 contained 0.5 cm (0.25 in.) chunks of gravel-like material. Table B2-2 provides a description and the characteristics of the two segment core samples.

Table B2-2. Tank 241-T-105 Subsampling Scheme and Sample Description.¹

Core Segment	Sample ID	Weight (grams)	Sample Portion	Sample Characteristics
205:1	205-01	292	Drainable liquid	290 mL of black opaque liquid. A trace amount of crystalline solid material. No organic layer was observed. LiBr head fluid was added to drill string.
205:2	205-02	81.0 liner liquid 41.0 drainable	Drainable liquid	Valve was half open. 80 mL black opaque liner liquid. 35 mL drainable liquid. Solids were 1/4 to 1/2 in. hard crystalline material coated by black sludge slurry. Some crystals were clear others were dark gray, like cement. Pieces could not be broken with a spatula. No organic layer was observed.
		81.6	Lower half	
207:1	207-01	184	Drainable liquid	160 mL black opaque liquid, <5 mL liner liquid. Solids black, granular slurry. No organic layer was observed. 1,500 mL LiBr added to drill string.
		72.3	Lower half	
207:2	207-02	177	Upper half	20 mL light brown, opaque liner liquid, no drainable liquid. Solids light to dark brown, smooth textured sludge slurry. Lower half solids held shape. 1,500 mL LiBr added to drill string.
		198	Lower half	

Note:

¹Esch (1997)

B2.1.2 Sample Analysis

The analyses performed on the push core samples were limited to those required by the safety screening DQO and organic complexants memorandum of understanding. Analyses included DSC for thermal properties, TGA for percent water, total alpha, and bulk density. The safety screening DQO also required ICP and IC analyses for lithium and bromide tracer elements, to assess the potential for hydrostatic head fluid contamination. Other ICP and IC analytes were also reported as "opportunistic" analytes (Field 1997). Total organic carbon analyses were not conducted because no exothermic activity was found in any sample.

Drainable liquid was filtered before analysis. Filtered sludge from core 205, segment 2 drainable liquid was analyzed separately. The amount of sludge recovered was insufficient for sludge analyses on other samples.

The clear and dark crystals observed in the samples (see Table B2-2) were analyzed separately as much as possible. However, the two types of crystalline material could not be completely separated from each other or from sludge coatings. Consequently, reanalyses were not performed for high relative percent differences (RPDs). Because this material was very hard and could not be homogenized, only IC and ICP analyses were performed on this material for characterization purposes (Field 1997). Small pieces, 0.2 g to 0.6 g each, were subsampled to perform a water digest for IC analysis and an acid digest for ICP analysis.

All reported analyses were performed according to approved laboratory procedures (see Table B2-3). Table B2-4 is a summary of the sample portions, sample numbers, and analyses performed on each sample.

Table B2-3. Analytical Procedures¹.

Analysis	Method	Procedure Number
Energetics	Differential scanning calorimetry	LA-514-114
Percent water	Thermogravimetric analysis	LA-514-114
Total alpha activity	Alpha proportional counter	LA-508-101
Flammable gas	Combustible gas analyzer	WHC-IP-0030 IH 1.4 and IH-2.1 ²
Metals by ICP/AES	Inductively coupled plasma spectrometry	LA-505-151 LA-505-161
Anions by IC	Ion chromatography	LA-533-105
Bulk density	Gravimetry	LO-160-103
Specific gravity	Gravimetry	LA-510-112

Notes:

AES = atomic emission spectroscopy

¹Field (1997)

²Safety Department Administrative Manuals, Westinghouse Hanford Company, Richland, Washington:
IH 1.4, Industrial Hygiene Direct Reading Instrument Survey
IH 2.1, Standard Operating Procedure, MSA Model 260 Combustible Gas and Oxygen Analyzer

Table B2-4. Sample Analyses Summary.¹ (2 sheets)

Segment	Segment Portion	Sample Number	Analyses
Core 205, Riser 3			
1	Drainable liquid (filtered)	S97T001675	DSC, TGA, alpha, SpG
		S97T001676	ICP, IC
2	Drainable liquid (filtered)	S97T001679	DSC, TGA, alpha, SpG, ICP, IC
	Lower half (sludge filtered from drainable liquid)	S97T001685	DSC, TGA, bulk density
		S97T001686	Alpha
		S97T001687	ICP
		S97T001688	IC
	Liner liquid	S97T001681	DSC, TGA, SpG, alpha
		S97T001682	ICP, IC
	Lower half (clear crystals)	S97T002007	ICP
		S97T002008	IC
	Lower half (dark crystals)	S97T002016	ICP
		S97T002017	IC

Table B2-4. Sample Analyses Summary.¹ (2 sheets)

Segment	Segment Portion	Sample Number	Analyses
Core 207, Riser 7			
1	Drainable liquid	S97T001691	DSC, TGA, SpG, alpha
		S97T001692	ICP, IC
	Lower half	S97T001695	Bulk density
		S97T001697	DSC, TGA
		S97T001698	Alpha
		S97T001699	ICP
		S97T001700	IC
2	Lower half	S97T001703	DSC, TGA
		S97T001702	Bulk density
		S97T001704	Alpha
		S97T001705	ICP
		S97T001706	IC
	Upper half	S97T001709	DSC, TGA
		S97T001708	Bulk density
		S97T001711	Alpha
		S97T001712	ICP
		S97T001713	IC
	Liner liquid	S97T001696	ICP, IC

Notes:

SpG = specific gravity

¹Esch (1997)

B2.1.3 Analytical Results

This section summarizes the sampling and analytical results associated with the June 1997 sampling and analysis of tank 241-T-105. Table B2-5 shows the location of analytical results included in this report. These results are documented in Esch (1997).

Table B2-5. Analytical Tables.

Analysis	Table Number
Total alpha activity	B2-60
Percent water	B2-58
Summary data for metals by ICP	B2-12 to B2-48
Anions by IC	B2-49 to B2-56
Bulk density	B2-57
Specific gravity	B2-59

The quality control (QC) parameters assessed in conjunction with tank 241-T-105 samples were standard recoveries, spike recoveries, duplicate analyses (RPDs), and blanks. The QC criteria are specified in the SAP (Field 1997). The limits for blanks are set forth in guidelines followed by the laboratory, and all data results in this report have met those guidelines. Sample and duplicate pairs, in which any QC parameter was outside these limits, are footnoted in the sample mean column of the following data summary tables with an a, b, c, d, e, f, g, and h:

- “a” indicates the standard recovery was below the QC limit
- “b” indicates the standard recovery was above the QC limit
- “c” indicates the spike recovery was below the QC limit
- “d” indicates the spike recovery was above the QC limit
- “e” indicates the RPD was above the QC limit
- “f” indicates blank contamination
- “g” indicates this is a tentatively identified compound
- “h” indicates the serial dilution exceeds the acceptance limit.

In the analytical tables in this section, the “mean” is the average of result and duplicate values. All values, including those below the detection level (denoted by “<”), were averaged. If both sample and duplicate values were nondetected, or if one value was detected and the other was not, the mean is expressed as a nondetected value. If both values were detected, the mean is expressed as a detected value.

B2.1.3.1 Total Alpha Activity. Analyses for total alpha activity were performed on the samples recovered from tank 241-T-105. Solids samples were prepared by fusion digestion. Two fusions were prepared for each sample (for duplicate results). Each fused dilution was analyzed twice, and the results were averaged and reported as one value. Direct analyses were performed on drainable liquid samples. The highest result returned was 0.587 $\mu\text{Ci/g}$.

B2.1.3.2 Thermogravimetric Analysis. Thermogravimetric analysis measures the mass of a sample as its temperature is increased at a constant rate. Nitrogen is passed over the sample during heating to remove any released gases. A decrease in the weight of a sample during TGA represents a loss of gaseous matter from the sample, through evaporation or through a reaction that forms gas phase products. The moisture content is estimated by assuming that all TGA sample weight loss up to a certain temperature (typically 150 to 200 °C) is caused by water evaporation. The temperature limit for moisture loss is chosen by the operator at an inflection point on the TGA plot. Other volatile matter fractions can also be differentiated by inflection points.

The percent water for tank 241-T-105 solids samples ranged from 49.2 to 71.7 percent by weight.

B2.1.3.3 Differential Scanning Calorimetry. In a DSC analysis, heat absorbed or emitted by a substance is measured while the sample is heated at a constant rate. Nitrogen is passed over the sample material to remove any gases being released. The onset temperature for an endothermic or exothermic event is determined graphically.

No exothermic reactions were observed; therefore, an upper limit of a 95 percent confidence interval on the mean for each sample was not calculated.

B2.1.3.4 Inductively Coupled Plasma. Samples were prepared by fusion or acid digest. Although a full suite of analytes were reported, only lithium was specifically requested for the safety screening DQO. The primary ICP analyte detected was sodium. Other analytes at concentrations above 1,000 $\mu\text{g/g}$ included aluminum, bismuth, iron, manganese, phosphorous, silicon, sulfur and uranium.

Lithium results were low or below detection levels for most samples. Lithium was found at $>1,000 \mu\text{g/mL}$ in core 207, segment 2 liner liquid samples, indicating the liner liquid was at least partly hydrostatic head fluid. However, no drainable liquid was observed in core 207, segment 2, and lithium values for solids were $<100 \mu\text{g/g}$.

B2.1.3.5 Ion Chromatography. Samples were prepared by water digest. Although a full suite of analytes was reported, only bromide was requested for the safety screening DQO. The primary ICP analytes were nitrate and nitrite. Oxalate, fluoride, phosphate, and sulfate were observed at $>1,000 \mu\text{g/g}$.

High concentrations of bromide ($> 20,000 \mu\text{g/mL}$) were found in core 207, segment 2 liner liquid, indicating the liner liquid was mostly hydrostatic head fluid. However, bromide values were $< 1,030 \mu\text{g/g}$ for solids; therefore, the impact of hydrostatic head fluid intrusion into the samples was negligible.

B2.1.3.6 Specific Gravity and Bulk Density. Bulk density was performed on core 205 filtered sludge samples and on core 207 samples. The results for core 207 samples ranged from 1.32 to 1.53 g/mL. The bulk density of the filtered sludge was 1.34 g/mL. An average solids density of 1.45 was used to calculate the solids total alpha activity action limit and analyte inventories for the tank. The average specific gravity for the drainable liquids was 1.185 with values ranging from 1.17 to 1.2.

B2.1.3.7 Crystal Composition. The clear crystalline material dissolved readily in HNO_3 and HCl acid. Approximately 80 to 90 percent of the crystalline material dissolved in water alone. Analytes found in this material indicated that the crystals may be sodium fluoride diphosphate. The darker, cement-like crystals did not dissolve as well. Approximately 75 percent dissolved in the acid, leaving white powdery undissolved solids. Very little of the material dissolved in the deionized water (Esch 1997).

B2.2 1993 PUSH CORE SAMPLING EVENT

Two push mode core samples were collected from tank 241-T-105 in 1993. Cores 53 and 54 were collected on March 19 and 24 from risers 8 and 2, respectively. The field blank was collected on March 22, 1993. These cores were transported to the Westinghouse Hanford Company 222-S Laboratory for chemical analyses. Portions of core 54 were sent to the Pacific Northwest National Laboratory 325 Laboratory. Core 57 samples were collected on May 28, 1993 from riser 5 to support the core sampling restart effort. Both segments were sent to the 325 Laboratory for physical tests.

The core samples were obtained by a core sampling truck with sampling equipment mounted on a rotating platform. A drill string containing a stainless steel sampler was used to collect the waste. The sampler obtained a 48 cm (19 in.) long and 2.5 cm (1 in.) diameter segment of the waste. After the sampler was filled, it was extracted from the drill string and sealed within a stainless steel liner to trap any liquid which might leak from the sampler. The liner was inserted into a lead-shielded shipping cask before being transferred to the laboratories. Chain-of-custody forms were completed for each segment.

Water was used as hydrostatic head fluid for core 54.

B2.2.1 Sample Handling

Core samples 53 and 54 were received by the 222-S Laboratory from March 22, 1993, to March 29, 1993, without preservation (no acidification or refrigeration). The 325 Laboratory received core 57 and aliquots from core 54 on June 14, 1993, without preservation. Each core consisted of two segments. The segments were a mixture of liquids and solids. Sample recovery ranged from 8 to 91 percent.

Table B2-6 shows the subsampling scheme and descriptions for the sample extrusions (Kocher 1994 and Giamberardini 1993). Sample recovery was generally poor for this sample event. After the event, an investigation of riser 8 (core 53 samples) showed a bend in the riser that probably contributed to poor sample recovery.

Table B2-6. Tank 241-T-105 Subsampling Scheme and Sample Description.¹

Core Segment	Sample ID	Weight (grams)	Sample Portion	Sample Characteristics
53:1	93-005	29.8 solids 11.3 liner liquid	Homogenized sample	33.7 mL of homogeneous, brown, muddy (like soft wet clay) solids. No drainable liquid. Poor recovery, clear liner liquid.
53:2	93-006	11.2 liner liquid 97.6 drainable liquid, trace solids	Homogenized	85 mL drainable liquid, poor recovery.
54:1	93-007	117 solids 13.8 drainable liquid 5 liner liquid	Homogenized	58 mL dark brown to white solids, smooth and wet, nonhomogeneous, 9 mL drainable liquid, poor recovery.
54:2	93-008	165 g drainable liquid	Homogenized	170 mL drainable liquid, no solids.
57:1	93-011	16.4 solids	Homogenized	1.5 in dark brown solids, cohesive, dry, homogeneous. No liquid. No subsampling. Poor recovery.
57:2	93-012	16 g solids	Homogenized	1.5 in cream and dark brown solids, runny and soft liquid. Heterogeneous sample. No drainable liquid. No subsampling. Poor recovery.

B2.2.2 Sample Analysis

An extensive set of analyses were required by Bell (1993), including tests for chemical, physical, rheological, and thermodynamic properties. This section discusses the analyses used to characterize the waste in tank 241-T-105.

Cores 53 and 54 contained more liquid and fewer solids than expected. Because the amount of solids was not sufficient to perform all analyses required in Bell (1993), the analyses were prioritized in Silvers and Sasaki (1993). The imbalance in analytical results between the two cores was caused because the sample ran out. The liquids from core 53 were analyzed as outlined in Bell (1993). Only limited analyses were performed on the liquids from core 54, because the liquid was believed to be water used as a hydrostatic head fluid during sampling (Silvers and Sasaki 1993). No core composites were made for either core because of the lack of sample. Similarly, no composites were made for core 57.

A homogenization test was performed on segment 1 of core 54. The homogenization test involved analyzing samples taken from two different areas of a homogenized sample to see whether significant differences occurred between the two areas. A discrepancy exists between the laboratory case narrative in Kocher (1994) and the labels in the data tables in Kocher (1994) about the analyses that were performed. The laboratory narrative states that the analyses used in the testing were ICP, gamma energy analysis (GEA), and total alpha; and that homogenization test analyses were made on the acid digest for each subsample (sample numbers starting with 40- and 41-). Although laboratory data tables indicate otherwise, the narrative indicates that all other analyses were conducted on whole solids samples or drainable liquid samples (Kocher 1995).

Table B2-7 shows the analyses that were performed on the solids of each segment, including the homogenization test analyses. Analyses were performed at the 222-S Laboratory and 325 Laboratory as specified in Table B2-7. Table B2-8 shows the analyses that were performed on the drainable liquid from each segment. Table B2-9 lists the procedures used for inorganic and radiological analyses. Table B2-10 lists procedures for physical and rheological analyses.

Table B2-7. Analyses Performed on the Solids (by Segment). (2 sheets)

Core Segment	Analysis or Analyte		
	Chemical	Radiochemical	Physical/Rheological
53	1		DSC, TGA, particle size
54	1	TOC ¹ , TIC ¹	wt% solids (gravimetry) ¹ , particle size
57	1 ¹	Mass spectrometry ¹ , total alpha Pu ¹ ---	DSC, TGA, wt% solids (gravimetry), density, centrifuged solids density, centrifuged supernatant density, vol% settled solids, vol% centrifuged solids, consistency factor, yield point, flow behavior index, wt% centrifuged solids.
57	2 ¹	TIC	DSC, TGA, wt% solids (gravimetry), density, vol% settled solids, volume % centrifuged solids.
Homogenization Test Analyses or Analytes ²			
53	1	Hg, Cr ⁺⁶ , CN ⁻ , OH ⁻ , NO ₂ ⁻ , IC, TOC, TIC,	GEA (fusion; water), GEA (residual solids), total alpha (fusion; water), total beta (fusion; water)
	2	ICP (acid, water, fusion) AA for Cs (acid; fusion),	U, ²⁴¹ Am, ⁹⁹ Tc, ⁹⁰ Sr, ^{239/240} Pu, ¹⁴ C, tritium
			pH, total dissolved solids ---

Table B2-7. Analyses Performed on the Solids (by Segment). (2 sheets)

Core Segment	Analysis or Analyte		
	Chemical	Radiochemical	Physical/Rheological
54	ICP (acid, water, fusion), AA for Cs (acid; fusion), Hg, Cr ⁺⁶ , IC, CN ⁻ , OH ⁻ , NO ₂ ⁻ , NH ₄ ⁺ , TOC, TIC	GEA (fusion; water), GEA (residual solids), total alpha (fusion; water), total beta (fusion; water), tritium, ²⁴¹ Am, ¹⁴ C, ^{239/240} Pu, ⁹⁰ Sr, ⁹⁹ Tc, U	pH, total dissolved solids, wt% solids (gravimetry), wt% residual solids

Notes:

vol % = volume percent

¹Analyses were performed at the 325 Laboratory at Pacific Northwest National Laboratory; all others were performed at the 222-S Laboratory.²As discussed in Section B1.3, the analyses listed as homogenization test analyses in this table are those listed as such in the data tables from the laboratory data package (Kocher 1994).

Table B2-8. Analyses Performed on the Drainable Liquid (by Segment).

Core	Segment	Analysis or Analyte		
		Chemical	Radiochemical	Physical/Rheological
53	2	IC, OH ⁻ , NH ₄ ⁺ , NO ₂ ⁻ , TOC, TIC	Total alpha, total beta, ²⁴¹ Am, ²³⁸ Pu, ^{239/240} Pu, ⁹⁰ Sr, ⁹⁹ Tc, U	DSC, TGA, specific gravity, pH
54	2	IC	----	DSC, TGA, specific gravity, pH

Table B2-9. Inorganic and Radiochemical Analytical Methods.¹ (2 sheets)

Analyte	Method	Procedure
Total metals	ICP spectrometry	LA-505-151
Cr (VI)	Spectrophotometry	LA-265-101
Hg	Cold vapor atomic absorption	LA-325-104
F, Cl, NO ₃ ⁻ , NO ₂ ⁻ , PO ₄ ³⁻ , SO ₄ ²⁻	IC	LA-533-105
NO ₂ ⁻	Absorbance spectrometry	LA-645-001
OH ⁻	Potentiometric titration	LA-661-105
Total organic carbon	Coulometry	LA-622-102/ PNL-ALO-381
Total inorganic carbon	Coulometry	LA-344-105/ PNL-ALO-381
CN ⁻	Distillation/spectrometry	LA-695-101/ LA-695-102
NH ₃	Distillation/titration	LA-634-102
Total uranium	Laser fluorimetry	LA-925-106
Total alpha	Alpha proportional counting	LA-508-104
Total beta	Beta proportional counting	LA-508-101 LA-508-052 LA-504-101
¹³⁷ Cs, ⁶⁰ Co, ²⁴¹ Am	GEA	LA-548-121
Isotopic uranium, plutonium	Mass spectrometry	PNL-ALO-455
^{239/240} Pu, ²⁴¹ Am	Alpha spectrometry	LA-503-156 LA-508-051 PNL-ALO-423/421

Table B2-9. Inorganic and Radiochemical Analytical Methods.¹ (2 sheets)

Analyte	Method	Procedure
⁹⁰ Sr	Extraction/beta proportional counting	LA-220-101
⁹⁹ Tc	Liquid scintillation counting	LA-438-101
¹⁴ C	Liquid scintillation counting	LA-348-104
³ H	Liquid scintillation counting	LA-218-113
pH	Direct	LA-212-103 solids LA-212-102 liquids
Cesium	Atomic absorption	LA-505-121 LA-505-122
NH ₃	Distillation/filtration	LA-634-102

Note:

¹Kocher 1994

Table B2-10. Physical and Rheological Analytical Methods.

Analyte	Method	Procedure
Thermal properties	Thermogravimetric analysis/ Differential scanning calorimetry	LA-561-112/ LA-514-113
% water/total dissolved solids	Gravimetric analysis	LA-564-101/ PNL-ALO-504
Specific gravity	Direct	LA-510-112
Density	Direct	PNL-ALO-501
Rheology	Direct	PNL-ALO-501 PNL-ALO-502
Particle size	Direct	599-2-50.3

B2.2.3 Analytical Results

This section summarizes the sampling and analytical results associated with the March 1993 sampling and analysis of tank 241-T-105. Table B2-11 shows the location of analytical results included in this report. These results are documented in Kocher (1993) and Giamberardini (1993).

Table B2-11. Analytical Data Presentation Tables.

Analysis	Table
Cesium by atomic absorption spectroscopy	B2-61
Mercury by cold vapor atomic absorption spectroscopy	B2-62
Metals by ICP spectroscopy	B2-63 through B2-93
Total uranium by laser fluorimetry	B2-94
Hexavalent chromium by spectrophotometry	B2-95
Ammonia by distillation/titration	B2-96
pH	B2-97
Anions by IC	B2-98 through B2-103
Hydroxide by potentiometric titration	B2-104
Cyanide by distillation/spectrometry	B2-105
Nitrite by spectrophotometry	B2-106
Analyses for total carbon/TOC/TIC	B2-107 through B2-110
Radionuclides by mass spectroscopy	B2-111 through B2-119
Radionuclides by alpha proportional counting	B2-120
Radionuclides by alpha spectroscopy	B2-121 through B2-124
Radionuclides by beta proportional counting	B2-125 and B2-126
Radionuclides by GEA	B2-127 through B2-138
Radionuclides by liquid scintillation counting	B2-139 through B2-141
Analysis for physical properties	B2-142 through B2-154
Analysis for DSC	B2-155
Analysis for thermogravimetric properties	B2-156

The QC parameters assessed in conjunction with the 1993 tank 241-T-105 samples included standard recoveries, spike recoveries, and duplicate analyses (RPDs). The QC criteria specified in the *Tank Waste Remediation System Tank Waste Characterization Plan* (Bell 1993) were 90 to 110 percent recovery for standards, 80 to 120 percent recovery for spikes, and ≤ 20 percent for RPDs. These criteria applied to all analytes. Sample and duplicate pairs, in which any of these three QC parameters were outside of their limits, are footnoted in the sample mean column of the following data summary tables with an a, b, c, d, or e as follows:

- "a" indicates the standard recovery was below the QC limit
- "b" indicates the standard recovery was above the QC limit
- "c" indicates the spike recovery was below the QC limit

- "d" indicates the spike recovery was above the QC limit
- "e" indicates the RPD was greater than the QC limit.

In the analytical tables in this section, the "mean" is the average of the result and duplicate value. All values, including those below the detection level (denoted by "<") were averaged. If both sample and duplicate values were nondetected, or if one value was detected and the other was not, the mean is expressed as a nondetected value. If both values were detected, the mean is expressed as a detected value.

Blanks were prepared and analyzed with the sample analyses. Bell (1993) established a limit for blank concentration of ≤ 20 percent of the sample value. No contamination greater than the established limit was discovered in any sample. Therefore, no footnoting of the data tables in Section B2.0 was needed.

B2.2.3.1 Atomic Absorption Spectroscopy. Cesium analysis was performed on fusion and acid digestions of the solid homogenization samples. The results were below the detection limits.

B2.2.3.2 Cold Vapor Atomic Absorption Spectroscopy. Mercury concentration in the samples was measured using cold vapor atomic absorption spectroscopy on the direct solids on cores 53 and 54. Results ranged from 10.2 to 41 $\mu\text{g/g}$.

B2.2.3.3 Inductively Coupled Plasma. Samples were prepared by acid digestion, water digestion, or KOH fusion digestion. The major waste constituents identified by ICP spectroscopy were Al, Bi, Ca, Fe, Mg, Mn, P, Si, Na, and S; all were present in concentrations exceeding 1,000 $\mu\text{g/g}$. Phosphorus and sulfur were analyzed as a cross check for the phosphate and sulfate results reported from IC analyses.

B2.2.3.4 Laser Fluorimetry. Uranium was analyzed by laser fluorimetry on fusion digestions of the solids and directly on the drainable liquids. Solids results ranged from 8,390 to 10,200 $\mu\text{g/g}$.

B2.2.3.5 Chromium (VI) by Spectrophotometry. Hexavalent chromium was analyzed a water leach on the solids. The results were below analytical detection limits.

B2.2.3.6 Distillation/Titration. Ammonia analysis of tank 241-T-105 samples was performed on drainable liquids, core homogenizations, and hot cell and field blanks (Giamberardini 1993). No ammonia was detected.

B2.2.3.7 pH. Analysis of the pH for tank 241-T-105 samples was performed for liquid and solid samples. The pH was measured on drainable liquids, core homogenizations, and hot cell and field blanks. The pH values of the solids and core 53 drainable liquids ranged from 11.27 to 12.07. The pH values for core 52, segment 2 drainable liquids were much lower (8.26 and 8.29).

B2.2.3.8 Ion Chromatography. Anions were determined on a water digestion of the sample. Ion chromatography was used to determine fluoride, chloride, nitrate, nitrite, phosphate, and sulfate concentrations. The most abundant anion in tank 241-T-105 waste was nitrite. Nitrate exhibited the second highest concentration among anions. Lesser amounts of sulfate, phosphate, chloride, and fluoride were also present.

B2.2.3.9 Potentiometric Titration. The hydroxide concentration was measured by potentiometric titration. Hydroxide values were below detection limits in the solids and averaged 367 $\mu\text{g/mL}$ in drainable liquids.

B2.2.3.10 Distillation/Spectrometry. Cyanide analysis of the tank 241-T-105 samples was performed by distillation/spectrometry. The analysis was performed on segment 1 of cores 53 and 54 by direct analysis. Results ranged from 5.84 to 25.1 $\mu\text{g/g}$.

B2.2.3.11 Nitrite by Spectrophotometry. Nitrite analysis by spectrophotometry was performed on the drainable liquids and on water digestions of the solids. Solids water digest values for nitrite were low. The average concentration in drainable liquids was 17,500 $\mu\text{g/mL}$.

B2.2.3.12 Total Organic Carbon. Total organic carbon analysis was performed by furnace oxidation and persulfate oxidation on the drainable liquid, the two core segments that had solids, and the field and hot cell blanks. Little TOC was observed in drainable liquids. The maximum concentration of TOC in the solids was 5,380 $\mu\text{g/g}$.

B2.2.3.13 Total Inorganic Carbon. Total inorganic carbon analysis was performed on the same samples as the TOC analyses. The TIC values ranged from 3,150 to 7,800 $\mu\text{g/g}$ in the solids and 2,960 to 3,020 $\mu\text{g/mL}$ in drainable liquids.

B2.2.3.14 Mass Spectroscopy. Isotopic uranium and plutonium were determined on fused samples. The primary isotopes were ^{239}Pu and ^{238}U .

B2.2.3.15 Total Alpha and Alpha Emitters. The total alpha concentration was measured on the solids and liquids using alpha proportional counting. Total Pu, ^{241}Am , ^{238}Pu , and $^{239/240}\text{Pu}$ were measured by alpha spectroscopy.

B2.2.3.16 Total Beta Activity. The total beta concentration was measured using beta proportional counting. Measurements were performed directly on the liquids and solids after water and fusion digestions. Strontium-90 also was measured by beta proportional counting. The analyses were performed on the drainable liquid and the solids after a fusion digestion.

B2.2.3.17 Gamma Energy Analysis. The gamma energy analyses were performed on the solids after fusion and water digestions. The primary analyte observed in all samples was ^{137}Cs . All other GEA analytes were near or below detection limits.

B2.2.3.18 Liquid Scintillation Counting. Carbon-14 and ^3H analyses were performed by liquid scintillation counting on the water digested solids. The ^{99}Tc analyses were performed on drainable liquids and fusion digested solids.

B2.2.3.19 Percent Solids, Density, and Specific Gravity. Analysis for weight percent solids was carried out at the 222-S and the 325 Laboratories using gravimetric methods. In addition to weight percent total solids, weight percent analyses were performed on centrifuged solids from core 57, segment 1, exhibiting a result of 98 weight percent. A weight percent solids determination also was performed on the residual solids from a water digestion of the solids from segment 1 of core 54.

Density measurements were determined directly. The density of segment 1 of core 57 was 1.54 g/mL; that of core 57, segment 2, was 1.74 g/mL. Density also was measured on diluted samples (1:3 and 1:1 dilutions) of segment 1 of core 57. The 1:1 dilution gave a density of 1.12 g/mL, and the 1:3 dilution gave a density of 1.03 g/mL. Densities were calculated on all segments by dividing the segment mass by the segment volume. In addition to the densities of the segments, density measurements were made on core 57, segment 1 centrifuged supernatant (1.0 g/mL) and centrifuged solids (1.56 g/mL).

Specific gravity was measured on segment 2 of cores 53 and 54. The results for the drainable liquid samples were 1.05 on core 53 and 0.985 on core 54.

Volume percent analyses were performed on settled solids from segments 1 and 2 of core 57. The volume percent results for both segments were 100 volume percent solids, showing that no drainable liquid existed in the samples. A 1:1 and a 1:3 dilution of samples from both segments of core 57 was also carried out. Centrifuged solids exhibited volume percent results of 96 volume percent and 98 volume percent for segments 1 and 2, respectively.

B2.2.3.20 Total Dissolved Solids. The analysis for total dissolved solids is the same as that for the weight percent solids except that it is performed on a liquid sample. This analysis was performed on water digested solids from cores 53 and 54. The average result for core 54, segment 1, was 0.105 percent; for core 53, segment 1, 0.28 percent.

B2.2.3.21 Particle Size. Particle size distribution analysis was performed on the as-received samples from segments 1 and 2 of core 57. The mean diameter based on probability number density for both segments was 1.0 μm . The mean diameter based on probability volume density was 10 μm for segment 1 and 17 μm for segment 2. Particle size was also measured on samples from segment 1 both of cores 53 and 54. For segment 1 of core 53 the mean diameter based on probability number density was 1.5 μm and the mean diameter based on probability volume density was 1.5 μm . For segment 1 of core 54, the probability number density was 1.5 μm , and the mean diameter based on the probability volume density was 20 μm . Plots of the particle size distribution based on the probability number density and the probability volume density are in the data package (Giamberardini 1993).

B2.2.3.22 Rheology. Viscosity versus shear rate studies were performed on samples obtained from segments 1 and 2 of core 57. Segment 1 exhibited pseudoplastic behavior, that is, the viscosity of the waste decreased with increasing shear rate. The viscosity of a 1:1 dilution of segment 1 at ambient temperature decreased from 200 centipoise to 20 centipoise as shear rate increased from 50 s^{-1} to 450 s^{-1} . These data were fit to a yield power law equation (Giamberardini 1993). The 1:1 dilution of segment 2, however, displayed Newtonian behavior because the viscosity was relatively independent of shear rate; a slight decrease from 5 centipoise to 1 centipoise was observed as shear rate increased from 50 s^{-1} to 450 s^{-1} . Plots of shear stress and viscosity as a function of shear rate for the dilutions are in the data package (Giamberardini 1993).

B2.2.3.23 Differential Scanning Calorimetry. In a DSC analysis, heat absorbed or emitted by a substance is measured while the temperature of the sample is heated at a constant rate. Nitrogen is passed over the sample material to remove any gases being released. The onset temperature for an endothermic or exothermic event is determined graphically.

The DSC analyses yielded exotherms in samples originating from cores 53 and 57; however, exotherms were not observed in the core 54 samples. The DSC plots of the samples also generally yielded two endothermic transition regions. Only exothermic results are shown in the tables.

For segment 1 of core 53, small exotherms were found in transitions two and three. These transitions occurred at peak temperatures of approximately $333 \text{ }^{\circ}\text{C}$ ($320 \text{ }^{\circ}\text{C}$ to $350 \text{ }^{\circ}\text{C}$ range) and $447 \text{ }^{\circ}\text{C}$ ($420 \text{ }^{\circ}\text{C}$ to $460 \text{ }^{\circ}\text{C}$ range). These exotherms released, on a wet weight basis, 13.0 J/g and 17.3 J/g , respectively. Segment 1 of core 57 had a broad exotherm in the 150 to $320 \text{ }^{\circ}\text{C}$ range with an average 175 J/g energy release (wet weight basis).

B2.2.3.24 Thermogravimetric Analyses. Thermogravimetric analysis measures the mass of a sample while the temperature of the sample is increased at a constant rate. Nitrogen is passed over the sample during heating to remove any released gases. Any decrease in the weight of a sample during TGA represents a loss of gaseous matter from the sample through evaporation or a reaction that forms gas phase products. The moisture content is estimated by assuming that all TGA sample weight loss up to a certain temperature (typically $150 \text{ }^{\circ}\text{C}$ to $200 \text{ }^{\circ}\text{C}$) is caused by water evaporation. The temperature limit for moisture loss is chosen by the operator at an inflection point on the TGA plot. Likewise, other volatile matter fractions can often be differentiated by inflection points.

Segment 1 of core 53 had a loss of 51.97 percent between room temperature and $135 \text{ }^{\circ}\text{C}$, and segment 2 of core 53 had an average loss of 91.39 percent between room temperature and about $100 \text{ }^{\circ}\text{C}$. Segment 2 of core 54 had a loss of 35.52 percent between room temperature and $130 \text{ }^{\circ}\text{C}$. Segments 1 and 2 of core 57 had average losses of 47.6 percent (between $30 \text{ }^{\circ}\text{C}$ and $153 \text{ }^{\circ}\text{C}$) and 20 percent (between $31 \text{ }^{\circ}\text{C}$ and $120 \text{ }^{\circ}\text{C}$), respectively.

B2.3 VAPOR PHASE MEASUREMENT

Combustible gas headspace tests were conducted on May 9, 1996 and on June 27, 1997. These measurements support the safety screening DQO (Dukelow et al. 1995). The flammability of the headspace vapors was 0 percent of the LFL in both tests. The ammonia concentration was 150 ppmv in 1996 and 100 ppmv in 1997. The TOC concentration was 5 ppmv in 1996 and 0 ppmv in 1997. Oxygen (O₂) concentrations were 20.8 and 20.9. No vapor samples have been taken or are scheduled for tank 241-T-105.

B2.4 HISTORICAL SAMPLE RESULTS

Analytical data for tank 241-T-105 is available for a 1974 liquid sample. Sample T-4927 was dark amber in color, and had traces of solids (Wheeler 1974). No other information regarding the sampling event was available. The earliest sample information available was for a sample analyzed March 1965 (Godfrey 1965). No information was available regarding sample handling, sample depth, or the riser. The 1974 and 1965 samples were taken before the tank was interim stabilized and are not representative of current tank contents.

1997 ANALYTICAL RESULTS

Table B2-12. Tank 241-T-105 Analytical Results: Aluminum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	14,200	26,100	20,200 ^{QCd,e,h}
S97T002007	Clear crystals	Lower half	59,000	837	29,900 ^{QCc,e,h}
S97T002016	Dark crystals	Lower half	172,000	193,000	1.83E+05 ^{QCd}
S97T001699	207:1	Lower half	30,100	40,500	35,300 ^{QCc}
S97T001712	207:2	Upper half	21,400	23,600	22,500
S97T001705		Lower half	23,000	21,000	22,000 ^{QCc}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	341	360	351
S97T001679	205:2	Drainable liquid	189	194	192
S97T001692	207:1	Drainable liquid	485	480	483

Table B2-13. Tank 241-T-105 Analytical Results: Antimony (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	< 86.8	< 87.5	< 87.2
S97T002007	Clear crystals	Lower half	< 23.5	< 37.8	< 30.6
S97T002016	Dark crystals	Lower half	< 24.8	< 17.3	< 21.1
S97T001699	207:1	Lower half	< 86.3	< 86.7	< 86.5
S97T001712	207:2	Upper half	< 85.5	< 85	< 85.3
S97T001705		Lower half	< 85.6	< 86	< 85.8
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	< 24.1	< 24.1	< 24.1
S97T001679	205:2	Drainable liquid	< 24.1	< 24.1	< 24.1
S97T001692	207:1	Drainable liquid	< 24.1	< 24.1	< 24.1

Table B2-14. Tank 241-T-105 Analytical Results: Arsenic (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	<145	<146	<146
S97T002007	Clear crystals	Lower half	<39.2	<63	<51.1
S97T002016	Dark crystals	Lower half	<41.4	<28.9	<35.1
S97T001699	207:1	Lower half	<144	<145	<145
S97T001712	207:2	Upper half	<142	<142	<142
S97T001705		Lower half	<143	<143	<143
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-15. Tank 241-T-105 Analytical Results: Barium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	88.5	89.5	89
S97T002007	Clear crystals	Lower half	<19.6	<31.5	<25.6
S97T002016	Dark crystals	Lower half	<20.7	<14.4	<17.6
S97T001699	207:1	Lower half	<71.9	<72.3	<72.1
S97T001712	207:2	Upper half	<71.2	<70.8	<71
S97T001705		Lower half	<71.3	<71.7	<71.5
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<20.1	<20.1	<20.1
S97T001679	205:2	Drainable liquid	<20.1	<20.1	<20.1
S97T001692	207:1	Drainable liquid	<20.1	<20.1	<20.1

Table B2-16. Tank 241-T-105 Analytical Results: Beryllium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	<7.23	<7.29	<7.26
S97T002007	Clear crystals	Lower half	<1.96	<3.15	<2.55
S97T002016	Dark crystals	Lower half	<2.07	<1.44	<1.75
S97T001699	207:1	Lower half	<7.19	<7.23	<7.21
S97T001712	207:2	Upper half	<7.12	<7.08	<7.1
S97T001705		Lower half	<7.13	<7.17	<7.15
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<2	<2	<2
S97T001679	205:2	Drainable liquid	<2	<2	<2
S97T001692	207:1	Drainable liquid	<2	<2	<2

Table B2-17. Tank 241-T-105 Analytical Results: Bismuth (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	1,600	1,670	1,640
S97T002007	Clear crystals	Lower half	107	65.6	86.3 ^{QC:c}
S97T002016	Dark crystals	Lower half	166	156	161
S97T001699	207:1	Lower half	2,090	2,280	2,190
S97T001712	207:2	Upper half	27,100	27,900	27,500
S97T001705		Lower half	40,300	38,100	39,200 ^{QC:c}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-18. Tank 241-T-105 Analytical Results: Boron (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	72.6	<72.9	<72.8
S97T002007	Clear crystals	Lower half	160	660	410 ^{QC}
S97T002016	Dark crystals	Lower half	150	100	125 ^{QC}
S97T001699	207:1	Lower half	104	75.1	89.5 ^{QC}
S97T001712	207:2	Upper half	<71.2	<70.8	<71
S97T001705		Lower half	<71.3	<71.7	<71.5
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<20.1	<20.1	<20.1
S97T001679	205:2	Drainable liquid	<20.1	<20.1	<20.1
S97T001692	207:1	Drainable liquid	<20.1	<20.1	<20.1

Table B2-19. Tank 241-T-105 Analytical Results: Cadmium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	7.89	10.7	9.29 ^{QC}
S97T002007	Clear crystals	Lower half	<1.96	<3.15	<2.55
S97T002016	Dark crystals	Lower half	<2.07	<1.44	<1.75
S97T001699	207:1	Lower half	<7.19	<7.23	<7.21
S97T001712	207:2	Upper half	7.17	<7.08	<7.13
S97T001705		Lower half	8	<7.17	<7.59
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<2	2.61	<2.3
S97T001679	205:2	Drainable liquid	<2	<2	<2
S97T001692	207:1	Drainable liquid	2.23	<2	<2.12

Table B2-20. Tank 241-T-105 Analytical Results: Calcium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	496	466	481
S97T002007	Clear crystals	Lower half	112	127	120
S97T002016	Dark crystals	Lower half	218	168	193 ^{OC:0}
S97T001699	207:1	Lower half	1,070	1,140	1,110
S97T001712	207:2	Upper half	555	486	521
S97T001705		Lower half	625	519	572
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	72.2	73.3	72.8
S97T001679	205:2	Drainable liquid	64.6	63.5	64
S97T001692	207:1	Drainable liquid	80.3	79.1	79.7

Table B2-21. Tank 241-T-105 Analytical Results: Cerium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	< 145	< 146	< 146
S97T002007	Clear crystals	Lower half	< 39.2	< 63	< 51.1
S97T002016	Dark crystals	Lower half	< 41.4	< 28.9	< 35.1
S97T001699	207:1	Lower half	< 144	< 145	< 145
S97T001712	207:2	Upper half	< 142	< 142	< 142
S97T001705		Lower half	< 143	< 143	< 143
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	< 40.1	< 40.1	< 40.1
S97T001679	205:2	Drainable liquid	< 40.1	< 40.1	< 40.1
S97T001692	207:1	Drainable liquid	< 40.1	< 40.1	< 40.1

Table B2-22. Tank 241-T-105 Analytical Results: Chromium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	657	669	663
S97T002007	Clear crystals	Lower half	4.89	8.07	6.48 ^{QC:c}
S97T002016	Dark crystals	Lower half	5.24	5.53	5.38
S97T001699	207:1	Lower half	636	697	667
S97T001712	207:2	Upper half	2,200	2,190	2,200
S97T001705		Lower half	1,720	1,830	1,780
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	251	265	258
S97T001679	205:2	Drainable liquid	244	248	246
S97T001692	207:1	Drainable liquid	154	152	153

Table B2-23. Tank 241-T-105 Analytical Results: Cobalt (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	<28.9	<29.2	<29
S97T002007	Clear crystals	Lower half	<7.84	<12.6	<10.2
S97T002016	Dark crystals	Lower half	<8.27	<5.77	<7.02
S97T001699	207:1	Lower half	<28.8	<28.9	<28.9
S97T001712	207:2	Upper half	<28.5	<28.3	<28.4
S97T001705		Lower half	<28.5	<28.7	<28.6
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<8.02	<8.02	<8.02
S97T001679	205:2	Drainable liquid	<8.02	<8.02	<8.02
S97T001692	207:1	Drainable liquid	<8.02	<8.02	<8.02

Table B2-24. Tank 241-T-105 Analytical Results: Copper (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	< 14.5	< 14.6	< 14.6
S97T002007	Clear crystals	Lower half	26.4	< 6.3	< 16.3
S97T002016	Dark crystals	Lower half	38.7	29.7	34.2 ^{QC:c}
S97T001699	207:1	Lower half	23.4	23.7	23.5
S97T001712	207:2	Upper half	69.4	945	507 ^{QC:c}
S97T001705		Lower half	24.7	492	258 ^{QC:c}
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	< 4.01	< 4.01	< 4.01
S97T001679	205:2	Drainable liquid	< 4.01	< 4.01	< 4.01
S97T001692	207:1	Drainable liquid	7.34	7.28	7.31

Table B2-25. Tank 241-T-105 Analytical Results: Iron (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	11,700	12,100	11,900
S97T002007	Clear crystals	Lower half	201	72.2	137 ^{QC:c}
S97T002016	Dark crystals	Lower half	534	485	510 ^{QC:c}
S97T001699	207:1	Lower half	9,860	11,200	10,500
S97T001712	207:2	Upper half	31,800	33,900	32,900
S97T001705		Lower half	35,900	33,800	34,900 ^{QC:c}
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	< 20.1	< 20.1	< 20.1
S97T001679	205:2	Drainable liquid	< 20.1	< 20.1	< 20.1
S97T001692	207:1	Drainable liquid	< 20.1	< 20.1	< 20.1

Table B2-26. Tank 241-T-105 Analytical Results: Lanthanum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	<72.3	<72.9	<72.6
S97T002007	Clear crystals	Lower half	<19.6	<31.5	<25.6
S97T002016	Dark crystals	Lower half	<20.7	<14.4	<17.6
S97T001699	207:1	Lower half	<71.9	<72.3	<72.1
S97T001712	207:2	Upper half	<71.2	<70.8	<71
S97T001705		Lower half	<71.3	<71.7	<71.5
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<20.1	<20.1	<20.1
S97T001679	205:2	Drainable liquid	<20.1	<20.1	<20.1
S97T001692	207:1	Drainable liquid	<20.1	<20.1	<20.1

Table B2-27. Tank 241-T-105 Analytical Results: Lead (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	473	470	472
S97T002007	Clear crystals	Lower half	<39.2	<63	<51.1
S97T002016	Dark crystals	Lower half	<41.4	<28.9	<35.1
S97T001699	207:1	Lower half	412	415	414
S97T001712	207:2	Upper half	828	865	847
S97T001705		Lower half	1,010	835	923
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-28. Tank 241-T-105 Analytical Results: Lithium (ICP).¹

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	111	110	111
S97T002007	Clear crystals	Lower half	4.1	<6.3	<5.2
S97T002016	Dark crystals	Lower half	5.21	6	5.61
S97T001699	207:1	Lower half	<14.4	<14.5	<14.4
S97T001712	207:2	Upper half	42	44.2	43.1
S97T001705		Lower half	123	106	115
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<4.01	<4.01	<4.01
S97T001679	205:2	Drainable liquid	97.8	100	98.9
S97T001692	207:1	Drainable liquid	<4.01	<4.01	<4.01

Note:

¹Lithium bromide was used as tracer fluid. Lithium is not a constituent in tank waste.

Table B2-29. Tank 241-T-105 Analytical Results: Magnesium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	1,130	1,140	1,140
S97T002007	Clear crystals	Lower half	<39.2	<63	<51.1
S97T002016	Dark crystals	Lower half	54.5	43.4	49 ^{QC}
S97T001699	207:1	Lower half	802	857	830
S97T001712	207:2	Upper half	361	359	360
S97T001705		Lower half	286	274	280
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-30. Tank 241-T-105 Analytical Results: Manganese (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	12,500	12,700	12,600 ^{QC}
S97T002007	Clear crystals	Lower half	15.2	16	15.6
S97T002016	Dark crystals	Lower half	115	106	111
S97T001699	207:1	Lower half	9,160	10,200	9,680
S97T001712	207:2	Upper half	3,690	3,710	3,700
S97T001705		Lower half	137	130	134
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<4.01	<4.01	<4.01
S97T001679	205:2	Drainable liquid	<4.01	<4.01	<4.01
S97T001692	207:1	Drainable liquid	<4.01	<4.01	<4.01

Table B2-31. Tank 241-T-105 Analytical Results: Molybdenum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	<72.3	<72.9	<72.6
S97T002007	Clear crystals	Lower half	<19.6	<31.5	<25.6
S97T002016	Dark crystals	Lower half	<20.7	<14.4	<17.6
S97T001699	207:1	Lower half	<71.9	<72.3	<72.1
S97T001712	207:2	Upper half	<71.2	<70.8	<71
S97T001705		Lower half	<71.3	<71.7	<71.5
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	75.7	81.1	78.4
S97T001679	205:2	Drainable liquid	72.3	73.6	72.9
S97T001692	207:1	Drainable liquid	75.5	76.2	75.8

Table B2-32. Tank 241-T-105 Analytical Results: Neodymium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	<145	<146	<146
S97T002007	Clear crystals	Lower half	<39.2	<63	<51.1
S97T002016	Dark crystals	Lower half	<41.4	<28.9	<35.1
S97T001699	207:1	Lower half	<144	<145	<145
S97T001712	207:2	Upper half	<142	<142	<142
S97T001705		Lower half	<143	<143	<143
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-33. Tank 241-T-105 Analytical Results: Nickel (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	132	141	137
S97T002007	Clear crystals	Lower half	<7.84	<12.6	<10.2
S97T002016	Dark crystals	Lower half	<8.27	7.92	<8.09
S97T001699	207:1	Lower half	73.6	84.4	79
S97T001712	207:2	Upper half	63	57.8	60.4
S97T001705		Lower half	66	59.4	62.7
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	28.9	27.8	28.4
S97T001679	205:2	Drainable liquid	38.2	38.7	38.5
S97T001692	207:1	Drainable liquid	28.3	25.9	27.1

Table B2-34. Tank 241-T-105 Analytical Results: Phosphorus (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	1,450	1,450	1,450 ^{QC:c}
S97T002007	Clear crystals	Lower half	68,400	86,100	77,300 ^{QC:c,e}
S97T002016	Dark crystals	Lower half	355	395	375
S97T001699	207:1	Lower half	1,430	1,400	1,420
S97T001712	207:2	Upper half	1,460	1,480	1,470
S97T001705		Lower half	1,800	1,560	1,680 ^{QC:c}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	1,510	1,610	1,560
S97T001679	205:2	Drainable liquid	1,840	1,870	1,860
S97T001692	207:1	Drainable liquid	1,460	1,470	1,470 ^{QC:d}

Table B2-35. Tank 241-T-105 Analytical Results: Potassium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	<723	<729	<726 ^{QC:d}
S97T002007	Clear crystals	Lower half	<196	<315	<256
S97T002016	Dark crystals	Lower half	<207	<144	<176
S97T001699	207:1	Lower half	<719	<723	<721
S97T001712	207:2	Upper half	<712	<708	<710
S97T001705		Lower half	<713	<717	<715 ^{QC:d}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	507	584	546
S97T001679	205:2	Drainable liquid	539	514	527
S97T001692	207:1	Drainable liquid	546	571	559

Table B2-36. Tank 241-T-105 Analytical Results: Samarium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	<145	<146	<146
S97T002007	Clear crystals	Lower half	<39.2	<63	<51.1
S97T002016	Dark crystals	Lower half	<41.4	<28.9	<35.1
S97T001699	207:1	Lower half	<144	<145	<145
S97T001712	207:2	Upper half	<142	<142	<142
S97T001705		Lower half	<143	<143	<143
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-37. Tank 241-T-105 Analytical Results: Selenium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<40.1	<40.1	<40.1
S97T001679	205:2	Drainable liquid	<40.1	<40.1	<40.1
S97T001692	207:1	Drainable liquid	<40.1	<40.1	<40.1

Table B2-38. Tank 241-T-105 Analytical Results: Silicon (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	5,700	5,760	5,730 ^{QC:b,e}
S97T002007	Clear crystals	Lower half	1,200	4,150	2,680 ^{QC:b,d,e,h}
S97T002016	Dark crystals	Lower half	514	300	4,07 ^{QC:b,d,e}
S97T001699	207:1	Lower half	3,290	2,640	2,970 ^{QC:b,e}
S97T001712	207:2	Upper half	14,700	14,400	14,600 ^{QC:b}
S97T001705		Lower half	18,000	1,010	9,510 ^{QC:b,e,e,h}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	29.5	30.6	30.1
S97T001679	205:2	Drainable liquid	47.9	55.6	51.8
S97T001692	207:1	Drainable liquid	42.8	43.5	43.1

Table B2-39. Tank 241-T-105 Analytical Results: Silver (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	44.2	46.9	45.5 ^{QC:c}
S97T002007	Clear crystals	Lower half	12.5	14.9	13.7
S97T002016	Dark crystals	Lower half	<4.14	<2.89	<3.51
S97T001699	207:1	Lower half	49.2	55.4	52.3
S97T001712	207:2	Upper half	<14.2	<14.2	<14.2
S97T001705		Lower half	<14.3	<14.3	<14.3
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	6.6	7.62	7.11
S97T001679	205:2	Drainable liquid	6.15	5.89	6.02
S97T001692	207:1	Drainable liquid	7.34	7.15	7.25

Table B2-40. Tank 241-T-105 Analytical Results: Sodium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	69,600	69,500	69,600 ^{QC,d}
S97T002007	Clear crystals	Lower half	167,000	208,000	1.88E+05 ^{QC,e}
S97T002016	Dark crystals	Lower half	3,310	3,230	3270 ^{QC,d}
S97T001699	207:1	Lower half	68,900	65,700	67,300
S97T001712	207:2	Upper half	78,600	84,500	81,600
S97T001705		Lower half	80,600	73,500	77,100 ^{QC,e}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	95,300	101,000	98,200 ^{QC,d}
S97T001679	205:2	Drainable liquid	90,700	91,600	91,200
S97T001692	207:1	Drainable liquid	94,000	93,700	93,900 ^{QC,d}

Table B2-41. Tank 241-T-105 Analytical Results: Strontium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	201	204	203
S97T002007	Clear crystals	Lower half	<3.92	<6.3	<5.11
S97T002016	Dark crystals	Lower half	8	6.66	7.33
S97T001699	207:1	Lower half	120	131	126
S97T001712	207:2	Upper half	191	196	194
S97T001705		Lower half	299	276	288
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<4.01	<4.01	<4.01
S97T001679	205:2	Drainable liquid	<4.01	<4.01	<4.01
S97T001692	207:1	Drainable liquid	<4.01	<4.01	<4.01

Table B2-42. Tank 241-T-105 Analytical Results: Sulfur (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	3,100	3,100	3,100
S97T002007	Clear crystals	Lower half	80.6	73.8	77.2
S97T002016	Dark crystals	Lower half	153	131	142
S97T001699	207:1	Lower half	3,540	3,410	3,480
S97T001712	207:2	Upper half	3,170	3,210	3,190
S97T001705		Lower half	2,950	2,820	2,890
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	5,520	5,840	5,680
S97T001679	205:2	Drainable liquid	5,130	5,200	5,170
S97T001692	207:1	Drainable liquid	5,510	5,430	5,470 ^{QC:d}

Table B2-43. Tank 241-T-105 Analytical Results: Thallium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	432	394	413
S97T002007	Clear crystals	Lower half	<78.4	<126	<102
S97T002016	Dark crystals	Lower half	<82.7	<57.7	<70.2
S97T001699	207:1	Lower half	<288	<289	<289
S97T001712	207:2	Upper half	<285	<283	<284
S97T001705		Lower half	<285	<287	<286
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<80.2	<80.2	<80.2
S97T001679	205:2	Drainable liquid	<80.2	<80.2	<80.2
S97T001692	207:1	Drainable liquid	<80.2	<80.2	<80.2

Table B2-44. Tank 241-T-105 Analytical Results: Titanium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	46.8	50.4	48.6
S97T002007	Clear crystals	Lower half	<3.92	<6.3	<5.11
S97T002016	Dark crystals	Lower half	<4.14	<2.89	<3.51
S97T001699	207:1	Lower half	32.8	33.3	33
S97T001712	207:2	Upper half	<14.2	<14.2	<14.2
S97T001705		Lower half	18.6	14.4	16.5 ^{QC}
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<4.01	<4.01	<4.01
S97T001679	205:2	Drainable liquid	<4.01	<4.01	<4.01
S97T001692	207:1	Drainable liquid	<4.01	<4.01	<4.01

Table B2-45. Tank 241-T-105 Analytical Results: Total Uranium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001687	205:2	Lower half	11,600	12,000	11,800
S97T002007	Clear crystals	Lower half	<196	<315	<256
S97T002016	Dark crystals	Lower half	336	219	278 ^{QC}
S97T001699	207:1	Lower half	5,210	5,840	5,530
S97T001712	207:2	Upper half	1,550	1,490	1,520
S97T001705		Lower half	<713	<717	<715
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	<200	<200	<200
S97T001679	205:2	Drainable liquid	<200	<200	<200
S97T001692	207:1	Drainable liquid	<200	<200	<200

Table B2-46. Tank 241-T-105 Analytical Results: Vanadium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	<72.3	<72.9	<72.6
S97T002007	Clear crystals	Lower half	29.7	<31.5	<30.6
S97T002016	Dark crystals	Lower half	<20.7	<14.4	<17.6
S97T001699	207:1	Lower half	<71.9	<72.3	<72.1
S97T001712	207:2	Upper half	<71.2	<70.8	<71
S97T001705		Lower half	<71.3	<71.7	<71.5
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<20.1	<20.1	<20.1
S97T001679	205:2	Drainable liquid	<20.1	<20.1	<20.1
S97T001692	207:1	Drainable liquid	<20.1	<20.1	<20.1

Table B2-47. Tank 241-T-105 Analytical Results: Zinc (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	102	140	121 ^{QC}
S97T002007	Clear crystals	Lower half	29.1	41.4	35.3 ^{QC}
S97T002016	Dark crystals	Lower half	108	79	93.5 ^{QC}
S97T001699	207:1	Lower half	152	146	149
S97T001712	207:2	Upper half	225	202	214
S97T001705		Lower half	765	692	729
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<4.01	<4.01	<4.01
S97T001679	205:2	Drainable liquid	<4.01	<4.01	<4.01
S97T001692	207:1	Drainable liquid	<4.01	<4.01	<4.01

Table B2-48. Tank 241-T-105 Analytical Results: Zirconium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
S97T001687	205:2	Lower half	94.4	56.8	75.6 ^{QC,c,e}
S97T002007	Clear crystals	Lower half	4.66	9.28	6.97 ^{QC,c,e}
S97T002016	Dark crystals	Lower half	4.56	4.47	4.52 ^{QC,c,e}
S97T001699	207:1	Lower half	60.8	26.4	43.6 ^{QC,c,e}
S97T001712	207:2	Upper half	101	80.5	90.8 ^{QC,c,e}
S97T001705		Lower half	< 14.3	< 14.3	< 14.3 ^{QC,c,e}
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	< 4.01	< 4.01	< 4.01
S97T001679	205:2	Drainable liquid	< 4.01	< 4.01	< 4.01
S97T001692	207:1	Drainable liquid	< 4.01	< 4.01	< 4.01

Table B2-49. Tank 241-T-105 Analytical Results: Bromide (IC).¹

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T001688	205:2	Lower half	1,090	1,060	1,080
S97T002008	Clear crystals	Lower half	<782	<2,080	<1,430
S97T002017	Dark crystals	Lower half	522	<454	<488
S97T001700	207:1	Lower half	<528	<520	<524
S97T001713	207:2	Upper half	455	442	449
S97T001706		Lower half	1,030	985	1,010
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<1,280	<1,280	<1,280
S97T001679	205:2	Drainable liquid	1,780	1,800	1,790
S97T001692	207:1	Drainable liquid	<265	<265	<265

Note:

¹Lithium bromide was used as tracer fluid. Bromide is not a constituent in tank waste.

Table B2-50. Tank 241-T-105 Analytical Results: Chloride (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T001688	205:2	Lower half	418	379	399
S97T002008	Clear crystals	Lower half	298	342	320
S97T002017	Dark crystals	Lower half	75	202	138 ^{QC:c}
S97T001700	207:1	Lower half	578	400	489 ^{QC:c}
S97T001713	207:2	Upper half	384	398	391
S97T001706		Lower half	349	316	332
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	341	373	357
S97T001679	205:2	Drainable liquid	319	305	312
S97T001692	207:1	Drainable liquid	595	584	589

Table B2-51. Tank 241-T-105 Analytical Results: Fluoride (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T001688	205:2	Lower half	499	454	477
S97T002008	Clear crystals	Lower half	22,700	23,000	22,800
S97T002017	Dark crystals	Lower half	153	194	174 ^{QC}
S97T001700	207:1	Lower half	421	381	401
S97T001713	207:2	Upper half	556	562	559
S97T001706		Lower half	502	464	483
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	638	624	631
S97T001679	205:2	Drainable liquid	660	596	628
S97T001692	207:1	Drainable liquid	633	615	624

Table B2-52. Tank 241-T-105 Analytical Results: Nitrate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001688	205:2	Lower half	25,600	24,700	25,200
S97T002008	Clear crystals	Lower half	1,520	3,910	2,720 ^{QC:s}
S97T002017	Dark crystals	Lower half	1,660	2,210	1,930 ^{QC:s}
S97T001700	207:1	Lower half	25,800	25,600	25,700
S97T001713	207:2	Upper half	24,800	24,500	24,600
S97T001706		Lower half	22,200	20,900	21,600
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	39,000	38,800	38,900
S97T001679	205:2	Drainable liquid	36,800	36,400	36,600
S97T001692	207:1	Drainable liquid	35,800	35,900	35,900

Table B2-53. Tank 241-T-105 Analytical Results: Nitrite (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001688	205:2	Lower half	37,600	35,700	36,700
S97T002008	Clear crystals	Lower half	1,300	2,990	2,150 ^{QC:s}
S97T002017	Dark crystals	Lower half	1,610	2,470	2,040 ^{QC:s}
S97T001700	207:1	Lower half	37,700	36,800	37,300
S97T001713	207:2	Upper half	34,200	34,000	34,100
S97T001706		Lower half	32,000	29,800	30,900
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	56,900	58,700	57,800
S97T001679	205:2	Drainable liquid	56,000	53,800	54,900
S97T001692	207:1	Drainable liquid	51,500	51,700	51,600

Table B2-54. Tank 241-T-105 Analytical Results: Phosphate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001688	205:2	Lower half	4,010	3,790	3,900
S97T002008	Clear crystals	Lower half	221,000	231,000	226,000
S97T002017	Dark crystals	Lower half	1,430	2,290	1,860 ^{QC:}
S97T001700	207:1	Lower half	2,920	3,100	3,010
S97T001713	207:2	Upper half	3,390	3,370	3,380
S97T001706		Lower half	2,710	2,900	2,810
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	4,600	4,440	4,520
S97T001679	205:2	Drainable liquid	5,230	6,010	5,620
S97T001692	207:1	Drainable liquid	3,910	3,720	3,820

Table B2-55. Tank 241-T-105 Analytical Results: Sulfate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
S97T001688	205:2	Lower half	10,600	10,600	10,600
S97T002008	Clear crystals	Lower half	1,620	2,330	1980 ^{QC:}
S97T002017	Dark crystals	Lower half	666	1,120	893 ^{QC:}
S97T001700	207:1	Lower half	11,100	10,800	11,000
S97T001713	207:2	Upper half	9,400	9,360	9,380
S97T001706		Lower half	8,170	7,790	7,980
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
S97T001676	205:1	Drainable liquid	17,100	17,200	17,100
S97T001679	205:2	Drainable liquid	16,900	17,100	17,000
S97T001692	207:1	Drainable liquid	14,400	14,300	14,400

Table B2-56. Tank 241-T-105 Analytical Results: Oxalate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
S97T001688	205:2	Lower half	<444	<447	<446
S97T002008	Clear crystals	Lower half	<657	<1,740	<1,200
S97T002017	Dark crystals	Lower half	598	<382	<490
S97T001700	207:1	Lower half	<444	<437	<440
S97T001713	207:2	Upper half	5,150	4,870	5,010
S97T001706		Lower half	<436	<437	<436
Liquids			µg/mL	µg/mL	µg/mL
S97T001676	205:1	Drainable liquid	<1,070	<1,070	<1,070
S97T001679	205:2	Drainable liquid	<1,070	<1,070	<1,070
S97T001692	207:1	Drainable liquid	1,240	1,230	1,230

Table B2-57. Tank 241-T-105 Analytical Results: Bulk Density.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			g/mL	g/mL	g/mL
S97T001685	205:2	Lower half	1.34	n/a	1.34
S97T001695	207:1	Lower half	1.32	n/a	1.32
S97T001708	207:2	Upper half	1.49	n/a	1.49
S97T001702		Lower half	1.53	n/a	1.53

Table B2-58. Tank 241-T-105 Analytical Results: Percent Water (TGA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
S97T001685	205:2	Lower half	69	55.5	62.3
S97T001697	207:1	Lower half	61.6	71.7	66.7
S97T001709	207:2	Upper half	54.7	49.2	51.9
S97T001703		Lower half	56.2	53.8	55
Liquids			%	%	%
S97T001675	205:1	Drainable liquid	76.1	76.3	76.2
S97T001679	205:2	Drainable liquid	76.9	76.9	76.9

Table B2-59. Tank 241-T-105 Analytical Results: Specific Gravity.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			unitless	unitless	unitless
S97T001675	205:1	Drainable liquid	1.17	1.18	1.17
S97T001679	205:2	Drainable liquid	1.2	1.19	1.2

Table B2-60. Tank 241-T-105 Analytical Results: Total Alpha.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
S97T001675	205:1	Drainable liquid	0.00405	0.00234	0.0032 ^{QC}
S97T001679	205:2	Drainable liquid	<0.00177	<0.00348	<0.00263
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
S97T001686	205:2	Lower half	0.539	0.553	0.546
S97T001698	207:1	Lower half	0.307	0.269	0.288
S97T001711	207:2	Upper half	0.566	0.587	0.577
S97T001704		Lower half	0.141	0.151	0.146

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Table B2-61. Tank 241-T-105 Analytical Results: Cesium (Atomic Absorption).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-6793	53:1	Whole	< 700	< 700	< 700 ^{QC:e}
33-6793	54:1	Whole	< 1,000	< 1,000	< 1,000 ^{QC:a}
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-8794	53:1	Whole	< 140	< 140	< 140 ^{QC:e}
33-8794	54:1	Whole	< 200	< 200	< 200

Table B2-62. Tank 241-T-105 Analytical Results: Mercury
(Cold Vapor Atomic Absorption).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-5798	53:1	Whole	41	32.7	36.85 ^{QC:e}
33-5798	54:1	Whole	11.8	10.2	11 ^{QC:e}

Table B2-63. Tank 241-T-105 Analytical Results: Aluminum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	30,000	32,700	31,350 ^{QC:b}
33-8755	54:1	Whole	1.52E+05	1.55E+05	1.54E+05 ^{QC:b,d}
41-8755		Homogenization test	1.84E+05	1.73E+05	1.79E+05 ^{QC:b,d}
40-8755		Homogenization test	1.86E+05	1.90E+05	1.88E+05 ^{QC:b}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	37,400	41,100	39,250 ^{QC:d}
33-6755	54:1	Whole	1.52E+05	1.50E+05	1.51E+05 ^{QC:d}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	152	154	153
33-7755	54:1	Whole	348	476	412 ^{QC:e}

Table B2-64. Tank 241-T-105 Analytical Results: Antimony (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	< 126	< 125	< 125.5 ^{QC:a}
33-8755	54:1	Whole	< 128	< 128	< 128 ^{QC:a}
41-8755		Homogenization test	< 127	< 128	< 127.5
40-8755		Homogenization test	< 129	< 129	< 129
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	< 103	< 104	< 103.5
33-6755	54:1	Whole	< 105	< 103	< 104
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	25.4	22	23.7
33-7755	54:1	Partial	< 132	< 132	< 132

Table B2-65. Tank 241-T-105 Analytical Results: Arsenic (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<26.5	<26.1	<26.3
33-8755	54:1	Whole	<26.8	<26.9	<26.85
41-8755		Homogenization test	<26.6	<26.8	<26.7
40-8755		Homogenization test	<26.9	<26.9	<26.9
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	<14.8	<14.8	<14.8
33-6755	54:1	Whole	<14.9	26	<20.45
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<3.08	<3.08	<3.08
33-7755	54:1	Whole	<27.7	<27.7	<27.7

Table B2-66. Tank 241-T-105 Analytical Results: Beryllium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<2.94	<2.9	<2.92
33-8755	54:1	Whole	<2.97	<2.99	<2.98
41-8755		Homogenization test	<2.95	<2.98	<2.965
40-8755		Homogenization test	<2.99	<2.99	<2.99
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	<1.48	<1.48	<1.48
33-6755	54:1	Whole	<1.49	<1.47	<1.48
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<0.308	<0.308	<0.308
33-7755	54:1	Whole	<3.08	<3.08	<3.08

Table B2-67. Tank 241-T-105 Analytical Results: Bismuth (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	1,190	1,320	1,255 ^{QC:a}
33-8755	54:1	Whole	1,360	1,440	1,400 ^{QC:a}
41-8755		Homogenization test	1,300	1,470	1,385 ^{QC:a}
40-8755		Homogenization test	1,300	1,280	1,290 ^{QC:a}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	999	1,110	1,054.5 ^{QC:c}
33-6755	54:1	Whole	1,190	1,570	1,380 ^{QC:c,e}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<6.47	<6.46	<6.465 ^{QC:c}
33-7755	54:1	Whole	<44.1	<44.1	<44.1

Table B2-68. Tank 241-T-105 Analytical Results: Boron (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<22.5	<22.2	<22.35 ^{QC:b}
33-8755	54:1	Whole	<22.8	<22.9	<22.85 ^{QC:b}
41-8755		Homogenization test	<22.6	<22.8	<22.7 ^{QC:b}
40-8755		Homogenization test	<23	<23	<23 ^{QC:b}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	<4.92	<4.94	<4.93
33-6755	54:1	Whole	<4.98	<4.9	<4.94
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	321	284	302.5 ^{QC:b}
33-7755	54:1	Whole	320	415	367.5 ^{QC:c}

Table B2-69. Tank 241-T-105 Analytical Results: Cadmium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	26.2	12.9	19.55 ^{QC:a,e}
33-8755	54:1	Whole	5.26	<3.98	<4.62
41-8755		Homogenization test	<3.94	15.9	<9.92
40-8755		Homogenization test	4.35	5.67	5.01 ^{QC:a,e}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	18.3	20.1	19.2
33-6755	54:1	Whole	12.1	11	11.55
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	4.1	1.52	2.81 ^{QC:e}
33-7755	54:1	Whole	<4.1	<4.11	<4.105

Table B2-70. Tank 241-T-105 Analytical Results: Calcium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	1,410	1,590	1,500 ^{QC:b}
33-8755	54:1	Whole	1,380	1,290	1,335 ^{QC:b}
41-8755		Homogenization test	1,320	1,340	1,330 ^{QC:b}
40-8755		Homogenization test	1,120	1,170	1,145 ^{QC:b}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	7,170	2,930	5,050 ^{QC:e}
33-6755	54:1	Whole	1,580	3,000	2,290 ^{QC:e,e}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	108	126	117
33-7755	54:1	Whole	209	705	457 ^{QC:e}

Table B2-71. Tank 241-T-105 Analytical Results: Cerium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<40.2	<39.7	<39.95
33-8755	54:1	Whole	<40.6	<40.8	<40.7
41-8755		Homogenization test	<40.4	<40.7	<40.55
40-8755		Homogenization test	<40.9	<40.9	<40.9
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	122	102	112
33-6755	54:1	Whole	39.3	52.7	46 ^{QC}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<6.99	<6.97	<6.98
33-7755	54:1	Whole	<42.1	<42.1	<42.1

Table B2-72. Tank 241-T-105 Analytical Results: Chromium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	679	774	726.5
33-8755	54:1	Whole	285	283	284
41-8755		Homogenization test	277	267	272
40-8755		Homogenization test	241	275	258
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	619	606	612.5
33-6755	54:1	Whole	250	254	252
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	201	200	200.5 ^{QC,b}
33-7755	54:1	Whole	94.3	96.3	95.3

Table B2-73. Tank 241-T-105 Analytical Results: Iron (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	63,100	28,000	45,550 ^{QC:d,e}
33-8755	54:1	Whole	9,700	8,470	9,085 ^{QC:d}
41-8755		Homogenization test	8,020	26,400	17,210 ^{QC:e}
40-8755		Homogenization test	12,700	11,400	12,050
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	33,700	47,500	40,600 ^{QC:d,e}
33-6755	54:1	Whole	25,000	26,000	25,500
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	2.01	3.28	2.645 ^{QC:e}
33-7755	54:1	Whole	16.8	19.6	18.2

Table B2-74. Tank 241-T-105 Analytical Results: Lanthanum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	16.8	31.9	24.35 ^{QC:e}
33-8755	54:1	Whole	< 15.9	< 15.9	< 15.9
41-8755		Homogenization test	< 15.7	< 15.9	< 15.8
40-8755		Homogenization test	< 16	< 16	< 16
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	< 8.37	< 8.4	< 8.385
33-6755	54:1	Whole	< 8.47	< 8.33	< 8.4
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	< 1.75	< 1.74	< 1.745
33-7755	54:1	Whole	< 16.4	< 16.4	< 16.4

Table B2-75. Tank 241-T-105 Analytical Results: Lead (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	859	739	799
33-8755	54:1	Whole	302	236	269 ^{QC}
41-8755		Homogenization test	196	396	296 ^{QC}
40-8755		Homogenization test	320	211	265.5 ^{QC}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	630	578	604
33-6755	54:1	Whole	326	277	301.5
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	< 6.37	10	< 8.185
33-7755	54:1	Whole	< 39	48.3	< 43.65

Table B2-76. Tank 241-T-105 Analytical Results: Lithium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	4.87	<3.87	<4.37
33-8755	54:1	Whole	<3.96	4.18	<4.07
41-8755		Homogenization test	<3.94	5.32	<4.63
40-8755		Homogenization test	<3.99	<3.99	<3.99
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	4.16	4.32	4.24
33-6755	54:1	Whole	2.37	3.51	2.94 ^{QC}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<0.411	<0.41	<0.4105
33-7755	54:1	Whole	<4.1	<4.11	<4.105

Table B2-77. Tank 241-T-105 Analytical Results: Magnesium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	935	1,120	1,027.5
33-8755	54:1	Whole	1,070	1,130	1,100
41-8755		Homogenization test	1,110	1,060	1,085 ^{QC:b}
40-8755		Homogenization test	959	1,040	999.5
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	1,220	1,280	1,250
33-6755	54:1	Whole	997	918	957.5
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	6.23	6.56	6.395
33-7755	54:1	Whole	19.8	25	22.4 ^{QC:c}

Table B2-78. Tank 241-T-105 Analytical Results: Manganese (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	17,900	21,800	19,850 ^{QC,d}
33-8755	54:1	Whole	3,400	3,250	3,325
41-8755		Homogenization test	3,030	3,070	3,050
40-8755		Homogenization test	2,970	2,830	2,900
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	18,000	17,800	17,900 ^{QC,d}
33-6755	54:1	Whole	3,190	2,420	2,805 ^{QC,d,e}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	0.783	0.936	0.8595
33-7755	54:1	Whole	<3.08	<3.08	<3.08

Table B2-79. Tank 241-T-105 Analytical Results: Molybdenum (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	38.1	43.3	40.7
33-8755	54:1	Whole	28.3	27.5	27.9
41-8755		Homogenization test	20.4	23	21.7
40-8755		Homogenization test	20.6	24.8	22.7
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	37.2	41.8	39.5
33-6755	54:1	Whole	23.7	23.9	23.8
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	47.5	47.9	47.7
33-7755	54:1	Whole	21.3	22.1	21.7

Table B2-80. Tank 241-T-105 Analytical Results: Neodymium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	159	145	152
33-8755	54:1	Whole	<59.5	<59.7	<59.6
41-8755		Homogenization test	<59.1	73.4	<66.25
40-8755		Homogenization test	<59.9	<59.9	<59.9
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	96.1	124	110.05 ^{QC}
33-6755	54:1	Whole	<40.8	40.6	<40.7
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<8.43	<8.41	<8.42
33-7755	54:1	Whole	<61.5	<61.6	<61.55

Table B2-81. Tank 241-T-105 Analytical Results: Nickel (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	91.1	102	96.55
33-8755	54:1	Whole	64.5	67.6	66.05
41-8755		Homogenization test	63.7	71.8	67.75
40-8755		Homogenization test	56.7	56.9	56.8
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	13.8	14	13.9
33-7755	54:1	Whole	11.5	<11.3	<11.4

Table B2-82. Tank 241-T-105 Analytical Results: Phosphorus (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	1,710	1,900	1,805
33-8755	54:1	Whole	1,210	1,150	1,180
41-8755		Homogenization test	1,140	1,130	1,135
40-8755		Homogenization test	976	1,180	1,078 ^{QC:d}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	1,910	2,000	1,955
33-6755	54:1	Whole	1,160	1,060	1,110
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	911	871	891
33-7755	54:1	Whole	314	523	418.5 ^{QC:d,e}

Table B2-83. Tank 241-T-105 Analytical Results: Potassium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	346	449	397.5 ^{QC,a,e}
33-8755	54:1	Whole	234	191	212.5
41-8755		Homogenization test	210	155	182.5 ^{QC,a,e}
40-8755		Homogenization test	231	276	253.5
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	369	377	373
33-7755	54:1	Whole	237	121	179 ^{QC,e}

Table B2-84. Tank 241-T-105 Analytical Results: Samarium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<43.1	<42.6	<42.85
33-8755	54:1	Whole	57.6	55.1	56.35 ^{QC:a}
41-8755		Homogenization test	68.1	106	87.05 ^{QC:a,e}
40-8755		Homogenization test	<43.9	63.8	<53.85 ^{QC:a,e}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	94.8	78.8	86.8
33-6755	54:1	Whole	61.9	46.1	54 ^{QC:e}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<9.66	<9.64	<9.65
33-7755	54:1	Whole	<45.1	<45.2	<45.15

Table B2-85. Tank 241-T-105 Analytical Results: Selenium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	< 61.8	< 60.9	< 61.35 ^{QC:a,c}
33-8755	54:1	Whole	< 62.4	< 62.7	< 62.55 ^{QC:a,c}
41-8755		Homogenization test	< 62	< 62.6	< 62.3 ^{QC:a,c}
40-8755		Homogenization test	< 62.9	< 62.9	< 62.9 ^{QC:a,c}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	< 42.8	< 43	< 42.9 ^{QC:c}
33-6755	54:1	Whole	< 43.3	< 42.6	< 42.95
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	< 8.94	< 8.92	< 8.93 ^{QC:c}
33-7755	54:1	Whole	< 64.6	74.7	< 69.65 ^{QC:a,c}

Table B2-86. Tank 241-T-105 Analytical Results: Silicon (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	2,380	2,120	2,250 ^{QC:b}
33-8755	54:1	Whole	90	54.9	72.45 ^{QC:b,c}
41-8755		Homogenization test	243	332	287.5 ^{QC:b,c}
40-8755		Homogenization test	216	244	230 ^{QC:b}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	6,420	9,110	7,765 ^{QC:c}
33-6755	54:1	Whole	6,640	5,760	6,200
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	514	466	490 ^{QC:d}
33-7755	54:1	Whole	946	1,060	1,003 ^{QC:b,d}

Table B2-87. Tank 241-T-105 Analytical Results: Silver (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	9.96	16.9	13.43 ^{QC:a,e}
33-8755	54:1	Whole	20.1	19.5	19.8 ^{QC:a,c}
41-8755		Homogenization test	21.6	16.2	18.9 ^{QC:a,e}
40-8755		Homogenization test	17.8	20.2	19 ^{QC:a}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	66.4	72.2	69.3
33-6755	54:1	Whole	25.9	20.3	23.1 ^{QC:c}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	4.89	5.43	5.16
33-7755	54:1	Whole	<6.15	<6.16	<6.155 ^{QC:c}

Table B2-88. Tank 241-T-105 Analytical Results: Sodium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	63,300	73,900	68,600 ^{QC:b,d}
33-8755	54:1	Whole	44,900	43,200	44,050 ^{QC:b,d}
41-8755		Homogenization test	43,200	41,700	42,450 ^{QC:b,d}
40-8755		Homogenization test	38,900	41,400	40,150 ^{QC:b,d}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	61,400	62,800	62,100 ^{QC:d}
33-6755	54:1	Whole	40,800	31,800	36,300 ^{QC:d,e}
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	60,300	60,800	60,550 ^{QC:d}
33-7755	54:1	Whole	37,500	39,200	38,350 ^{QC:c}

Table B2-89. Tank 241-T-105 Analytical Results: Strontium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	121	136	128.5
33-8755	54:1	Whole	163	170	166.5
41-8755		Homogenization test	166	163	164.5
40-8755		Homogenization test	152	159	155.5
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	126	133	129.5
33-6755	54:1	Whole	161	145	153
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	0.917	1.04	0.9785
33-7755	54:1	Whole	<3.08	<3.08	<3.08

Table B2-90. Tank 241-T-105 Analytical Results: Sulfur (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	2,990	3,630	3,310 ^{QC,b}
33-8755	54:1	Whole	1,940	1,860	1,900
41-8755		Homogenization test	1,970	1,860	1,915 ^{QC,b}
40-8755		Homogenization test	1,620	1,830	1,725 ^{QC,b}
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	3,370	3,570	3,470
33-6755	54:1	Whole	1,830	1,710	1,770
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	3,450	3,460	3,455 ^{QC,d}
33-7755	54:1	Whole	1,950	2,160	2,055

Table B2-91. Tank 241-T-105 Analytical Results: Thallium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	<79.4	<78.3	<78.85 ^{QC:a}
33-8755	54:1	Whole	97.8	104	100.9 ^{QC:a,c}
41-8755		Homogenization test	<79.7	<80.4	<80.05 ^{QC:a}
40-8755		Homogenization test	91.9	<80.8	<86.35
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	<80.7	<81	<80.85
33-6755	54:1	Whole	<81.7	<80.4	<81.05
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<16.9	<16.8	<16.85
33-7755	54:1	Whole	<83.1	<83.2	<83.15

Table B2-92. Tank 241-T-105 Analytical Results: Titanium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	57	79	68 ^{QC:e}
33-8755	54:1	Whole	47.7	51.6	49.65
41-8755		Homogenization test	48.7	47.2	47.95
40-8755		Homogenization test	43.6	46	44.8
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	257	486	371.5 ^{QC:e}
33-6755	54:1	Whole	82.3	85.6	83.95
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	<0.308	<0.308	<0.308
33-7755	54:1	Whole	<3.08	<3.08	<3.08

Table B2-93. Tank 241-T-105 Analytical Results: Zirconium (ICP).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: acid digest			µg/g	µg/g	µg/g
25-8755	53:1	Whole	89.9	87.9	88.9
33-8755	54:1	Whole	< 14.4	11.1	< 12.75
41-8755		Homogenization test	17.1	78.4	47.75 ^{QC}
40-8755		Homogenization test	73.5	74	73.75
Solids: fusion			µg/g	µg/g	µg/g
25-6775	53:1	Whole	176	115	145.5 ^{QC}
33-6755	54:1	Whole	99.8	83.5	91.65
Solids: water digest			µg/g	µg/g	µg/g
25-7755	53:1	Whole	< 0.719	< 0.718	< 0.7185
33-7755	54:1	Whole	< 6.15	< 6.16	< 6.155

Table B2-94. Tank 241-T-105 Analytical Results: Total Uranium (Laser Fluorimetry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			µg/g	µg/g	µg/g
25-6740	53:1	Whole	8,390	9,090	8,740
33-6740	54:1	Whole	10,200	8,880	9,540
Liquids			µg/mL	µg/mL	µg/mL
19-5740	53:2	Drainable liquid	8.48	7.02	7.75 ^{QC}

Table B2-95. Tank 241-T-105 Analytical Results: Hexavalent Chromium (Cr+6).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
25-7769	53:1	Whole	< 18.3	< 18.3	< 18.3
33-7769	54:1	Whole	< 18.3	< 18.3	< 18.3

Table B2-96. Tank 241-T-105 Analytical Results: Ammonia (Distillation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
33-7728	54:1	Whole	<20	<20	<20
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5728	53:2	Drainable liquid	<400	<400	<400

Table B2-97. Tank 241-T-105 Analytical Results: pH Measurement.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			unitless	unitless	unitless
25-5715	53:1	Whole	11.31	11.27	11.29
33-5715	54:1	Whole	12.05	12.07	12.06
Liquids			unitless	unitless	unitless
19-5713	53:2	Drainable liquid	12	12.01	12.005
22-5713	54:2	Drainable liquid	8.26	8.29	8.275

Table B2-98. Tank 241-T-105 Analytical Results: Chloride (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7771	53:1	Whole	504	517	510.5
33-7771	54:1	Whole	293	294	293.5
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	226	232	229
22-5771	54:2	Drainable liquid	8.54	9.06	8.8

Table B2-99. Tank 241-T-105 Analytical Results: Fluoride (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	< 10.1	< 10.1	< 10.1 ^{QC:d}
22-5771	54:2	Drainable liquid	1.26	1.26	1.26

Table B2-100. Tank 241-T-105 Analytical Results: Nitrate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7771	53:1	Whole	26,400	27,400	26,900
33-7771	54:1	Whole	15,500	15,500	15,500
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	8,060	8,180	8,120
22-5771	54:2	Drainable liquid	5.47	5.65	5.56

Table B2-101. Tank 241-T-105 Analytical Results: Nitrite (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7771	53:1	Whole	37,000	38,700	37,850
33-7771	54:1	Whole	21,500	22,100	21,800
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	11,700	11,600	11,650
22-5771	54:2	Drainable liquid	50.3	47.8	49.05

Table B2-102. Tank 241-T-105 Analytical Results: Phosphate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7771	53:1	Whole	2,670	2,550	2,610
33-7771	54:1	Whole	1,760	1,770	1,765
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	1,600	1,560	1,580
22-5771	54:2	Drainable liquid	<1	<1	<1

Table B2-103. Tank 241-T-105 Analytical Results: Sulfate (IC).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7771	53:1	Whole	10,700	11,000	10,850
33-7771	54:1	Whole	6,210	6,290	6,250
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5771	53:2	Drainable liquid	3,480	3,500	3,490
22-5771	54:2	Drainable liquid	41.6	41.9	41.75

Table B2-104. Tank 241-T-105 Analytical Results: Hydroxide (Titration).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-5724	53:1	Whole	<1,250	<1,250	<1,250
33-5724	54:1	Whole	<125	<125	<125
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5729	53:2	Drainable liquid	376	357	366.5

Table B2-105. Tank 241-T-105 Analytical Results: Cyanide (Distillation/Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-5777	53:1	Whole	7.85	25.1	16.475 ^{QC:c}
33-5777	54:1	Whole	5.84	6.67	6.255

Table B2-106. Tank 241-T-105 Analytical Results: Nitrite (Spectrophotometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7779	53:1	Whole	277	275	276 ^{QC:c}
33-7779	54:1	Whole	738	688	713
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5779	53:2	Drainable liquid	17,400	17,600	17,500

Table B2-107. Tank 241-T-105 Analytical Results: Total Organic Carbon (Furnace Oxidation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			$\mu\text{g/mL}$	$\mu\text{g/mL}$	$\mu\text{g/mL}$
19-5726	53:2	Drainable liquid	913	935	924
Solids: water digest			$\mu\text{g/g}$	$\mu\text{g/g}$	$\mu\text{g/g}$
25-7726	53:1	Whole	3,960	4,290	4,125
33-7726	54:1	Whole	5,060	5,060	5,060

Table B2-108. Tank 241-T-105 Analytical Results: Total Organic Carbon (Persulfate Oxidation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			µg/g	µg/g	µg/g
93-07986-J1	54:1	Whole	2,790	2,440	2,615
93-07987-J1	57:1	Whole	5,380	5,180	5,280
93-07988-J1	57:2	Whole	1,630	1,630	1,630

Table B2-109. Tank 241-T-105 Analytical Results: Total Inorganic Carbon (Persulfate Oxidation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			µg/g	µg/g	µg/g
93-07986-J1	54:1	Whole	4,890	4,680	4,790
93-07987-J1	57:1	Whole	4,000	3,710	3,860
93-07988-J1	57:2	Whole	3,150	3,350	3,250

Table B2-110: Tank 241-T-105 Analytical Results: Total Inorganic Carbon.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			µg/g	µg/g	µg/g
25-7727	53:1	Whole	7,510	7,800	7,655
33-7727	54:1	Whole	3,850	3,500	3,675
Liquids			µg/mL	µg/mL	µg/mL
19-5727	53:2	Drainable liquid	2,960	3,020	2,990

Table B2-111. Tank 241-T-105 Analytical Results: Plutonium-238 to Plutonium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.193	0.19	0.1915

Table B2-112. Tank 241-T-105 Analytical Results: Plutonium-239 to Plutonium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	96.469	96.239	96.354

Table B2-113. Tank 241-T-105 Analytical Results: Plutonium-240 to Plutonium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	3.188	3.328	3.258

Table B2-114. Tank 241-T-105 Analytical Results: Plutonium-241 to Plutonium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.11	0.16	0.135 ^{QC}

Table B2-115. Tank 241-T-105 Analytical Results: Plutonium-242 to Plutonium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.04	0.08	0.06 ^{QC}

Table B2-116. Tank 241-T-105 Analytical Results: Uranium-234 to Uranium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.006	0.006	0.006

Table B2-117. Tank 241-T-105 Analytical Results: Uranium-235 to Uranium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.688	0.688	0.688

Table B2-118. Tank 241-T-105 Analytical Results: Uranium-236 to Uranium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	0.006	0.006	0.006

Table B2-119. Tank 241-T-105 Analytical Results: Uranium-238 to Uranium Ratio (Mass Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			%	%	%
93-7985-H-1	54:1	Whole	99.3	99.3	99.3

Table B2-120. Tank 241-T-105 Analytical Results: Total Alpha.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7725	53:1	Whole	0.00559	0.00519	0.00539
33-7725	54:1	Whole	0.00338	0.00345	0.003415
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5725	53:2	Drainable liquid	0.0266	0.0285	0.02755 ^{QC,d}
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6725	53:1	Whole	0.815	0.823	0.819
33-6725	54:1	Whole	0.485	0.464	0.4745

Table B2-121. Tank 241-T-105 Analytical Results: Total Alpha Pu (Alpha Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
93-7985-H-1	54:1	Whole	0.408	0.368	0.388

Table B2-122. Tank 241-T-105 Analytical Results: Americium-241 (Alpha Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6782	53:1	Whole	0.374	0.416	0.395 ^{QC:c}
33-6782	54:1	Whole	0.0957	0.0818	0.08875 ^{QC:c}
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5782	53:2	Drainable liquid	8.270E-05	8.290E-05	8.280E-05 ^{QC:c}

Table B2-123. Tank 241-T-105 Analytical Results: Plutonium-238 (Alpha Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5782	53:2	Drainable liquid	<2.450E-04	---	<2.450E-04 ^{QC}

Table B2-124. Tank 241-T-105 Analytical Results: Plutonium-239/40 (Alpha Spectrometry).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6781	53:1	Whole	0.137	0.135	0.136
33-6781	54:1	Whole	0.153	0.128	0.1405
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5782	53:2	Drainable liquid	1.880E-04	---	1.880E-04 ^{QC:c}

Table B2-125. Tank 241-T-105 Analytical Results: Total Beta (Beta Proportional Counting).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7720	53:1	Whole	46.9	50.2	48.55
33-7720	54:1	Whole	27.1	26.6	26.85
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5720	53:2	Drainable liquid	24	23.3	23.65
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6720	53:1	Whole	1,260	1,250	1,255 ^{QC:b}
33-6720	54:1	Whole	510	432	471

Table B2-126. Tank 241-T-105 Analytical Results: Strontium-90 (Beta Proportional Counting).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6782	53:1	Whole	407	395	401
33-6786	54:1	Whole	173	146	159.5
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5786	53:2	Drainable liquid	0.382	0.365	0.3735 ^{QC:a}

Table B2-127. Tank 241-T-105 Analytical Results: Americium-241 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<0.767	<0.77	<0.7685
33-6730	54:1	Whole	<0.134	<0.125	<0.1295
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.163	<0.164	<0.1635
28-9730		Residual solids	1.3	1.64	1.47 ^{QC:c}
33-7730	54:1	Whole	<0.129	<0.13	<0.1295
37-9730	54:1	Residual solids	0.296	0.193	0.2445 ^{QC:c}

Table B2-128. Tank 241-T-105 Analytical Results: Antimony-125 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
28-9730	53:1	Residual solids	0.59	0.74	0.665 ^{QC}

Table B2-129. Tank 241-T-105 Analytical Results: Cerium/Praseodymium-144 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<1.74	<1.74	<1.74
33-6730	54:1	Whole	<0.187	<0.177	<0.182
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.243	<0.245	<0.244
28-9730		Residual solids	<0.398	<0.674	<0.536
33-7730	54:1	Whole	<0.193	<0.194	<0.1935
37-9730		Residual solids	<0.342	<0.207	<0.2745

Table B2-130. Tank 241-T-105 Analytical Results: Cesium-134 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<0.106	<0.0992	<0.1026
33-6730	54:1	Whole	<0.00757	<0.00721	<0.00739
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0115	<0.0126	<0.01205
28-9730		Residual solids	<0.0173	<0.032	<0.02465
33-7730	54:1	Whole	<0.0112	<0.012	<0.0116
37-9730		Residual solids	<0.0116	<0.00761	<0.009605

Table B2-131. Tank 241-T-105 Analytical Results: Cesium-137 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	61	62.7	61.85
33-6730	54:1	Whole	38.1	35.2	36.65
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	40.7	40.8	40.75
28-9730		Residual solids	53.3	77.92	65.61 ^{QC:e}
33-7730	54:1	Whole	23.9	23.8	23.85
37-9730		Residual solids	57.5	33.5	45.5 ^{QC:e}

Table B2-132. Tank 241-T-105 Analytical Results: Cobalt-60 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<0.0909	<0.0913	<0.0911
33-6730	54:1	Whole	<0.00688	0.0195	<0.01319
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0136	<0.0131	<0.01335
28-9730		Residual solids	0.043	0.0634	0.0532 ^{QC:e}
33-7730	54:1	Whole	<0.0117	<0.0119	<0.0118
37-9730		Residual solids	0.0254	0.0213	0.02335

Table B2-133. Tank 241-T-105 Analytical Results: Europium-154 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	1.24	<0.295	<0.7675
33-6730	54:1	Whole	0.247	0.218	0.2325
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0372	<0.0371	<0.03715
28-9730		Residual solids	2.7	3.3	3
33-7730	54:1	Whole	<0.0418	<0.0344	<0.0381
37-9730		Residual solids	0.71	0.438	0.574 ^{QC:0}

Table B2-134. Tank 241-T-105 Analytical Results: Europium-155 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	1.19	<0.486	<0.838
33-6730	54:1	Whole	0.216	0.196	0.206
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0748	<0.0743	<0.07455
28-9730		Residual solids	3.2	4	3.6 ^{QC:0}
33-7730	54:1	Whole	<0.0583	<0.0592	<0.05875
37-9730		Residual solids	0.761	0.484	0.6225 ^{QC:0}

Table B2-135. Tank 241-T-105 Analytical Results: Potassium-40 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<2.95	<2.92	<2.935
33-6730	54:1	Whole	<0.152	<0.151	<0.1515
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	0.324	<0.322	<0.323
28-9730		Residual solids	<0.0562	<0.099	<0.0776
33-7730	54:1	Whole	0.396	0.316	0.356 ^{QC}
37-9730		Residual solids	<0.0606	<0.0353	<0.04795

Table B2-136. Tank 241-T-105 Analytical Results: Ruthenium-103 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<0.164	<0.164	<0.164
33-6730	54:1	Whole	<0.0236	<0.023	<0.0233
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0354	<0.0353	<0.03535
28-9730		Residual solids	<0.0244	<0.0438	<0.0341
33-7730	54:1	Whole	<0.0274	<0.0275	<0.02745
37-9730		Residual solids	<0.0245	<0.015	<0.01975

Table B2-137. Tank 241-T-105 Analytical Results: Ruthenium/Rhodium-106 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<1.93	<2.14	<2.035
33-6730	54:1	Whole	<0.31	<0.296	<0.303
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.451	<0.482	<0.4665
28-9730		Residual solids	<0.34	<0.621	<0.4805
33-7730	54:1	Whole	<0.391	<0.385	<0.388
37-9730		Residual solids	<0.31	<0.19	<0.25

Table B2-138. Tank 241-T-105 Analytical Results: Thorium-228 (GEA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6730	53:1	Whole	<0.261	<0.268	<0.2645
33-6730	54:1	Whole	<0.0355	<0.0336	<0.03455
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-7730	53:1	Whole	<0.0517	<0.0514	<0.05155
28-9730		Residual solids	<0.048	<0.0828	<0.0654
33-7730	54:1	Whole	<0.0409	<0.0414	<0.04115
37-9730		Residual solids	<0.0456	<0.0279	<0.03675

Table B2-139. Tank 241-T-105 Analytical Results: Carbon-14 (Liquid Scintillation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
28-7788	53:1	Whole	9.270E-04	0.00173	0.0013285 ^{QC:a,c}
37-7788	54:1	Whole	5.850E-04	7.840E-04	6.845E-04 ^{QC:e}

Table B2-140. Tank 241-T-105 Analytical Results: Tritium (Liquid Scintillation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
28-7787	53:1	Whole	0.0227	0.0253	0.024 ^{QC:c}
37-7787	54:1	Whole	4.140E-04	0.00132	8.670E-04 ^{QC:c}

Table B2-141. Tank 241-T-105 Analytical Results: Technetium-99 (Liquid Scintillation).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: fusion			$\mu\text{Ci/g}$	$\mu\text{Ci/g}$	$\mu\text{Ci/g}$
25-6782	53:1	Whole	<0.17	<0.167	<0.1685 ^{QC:c}
33-6784	54:1	Whole	0.399	0.345	0.372 ^{QC:c}
Liquids			$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$	$\mu\text{Ci/mL}$
19-5784	53:2	Drainable liquid	0.0649	0.0605	0.0627 ^{QC:c}

Table B2-142. Tank 241-T-105 Analytical Results: Weight Percent Solids (Percent Solids).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
33-5710	54:1	Whole	73.48	73.29	73.385
93-09787	57:1	Whole	52	---	52
93-09788	57:2	Whole	75	---	75
93-07985-K	54:1	Whole	74.9	76.3	75.6

Table B2-143. Tank 241-T-105 Analytical Results: Weight Percent Centrifuged Solids (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
93-09787	57:1	Whole	98	---	98

Table B2-144. Tank 241-T-105 Analytical Results: Weight Percent Residual Solids (Percent Solids).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			%	%	%
37-9710	54:1	Whole	37.95	67.48	52.715 ^{QC:c}

Table B2-145. Tank 241-T-105 Analytical Results: Density (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			g/mL	g/mL	g/mL
Not given	53:1	Whole	0.89 ¹	---	0.89
Not given	54:1	Whole	2.01 ¹	---	2.01
93-09787	57:1	Whole	1.1 ¹	---	1.1
93-09787		Whole (1:3 dilution)	1.03 ²	---	1.03
93-09787		Whole (1:1 dilution)	1.12 ²	---	1.12
93-09787		Whole	1.54 ²	---	1.54
93-09788	57:2	Whole	1.07 ¹	---	1.07
93-09788		Whole	1.74 ²	---	1.74
Liquids			g/mL	g/mL	g/mL
Not given	53:2	Drainable liquid	0.88 ¹	---	0.88
Not given	54:1	Drainable liquid	1.48 ¹	---	1.48
Not given	54:2	Drainable liquid	0.97 ¹	---	0.97

Notes:

¹Density estimated by dividing sample mass by the sample volume²Analytically measured density

Table B2-146. Tank 241-T-105 Analytical Results: Density of Solids Centrifuged from Supernatant (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			g/mL	g/mL	g/mL
93-09787	57:1	Whole	1.0	---	1.0

Table B2-147. Tank 241-T-105 Analytical Results: Centrifuged Solids Density (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			g/mL	g/mL	g/mL
93-09787	57:1	Whole	1.56	---	1.56

Table B2-148. Tank 241-T-105 Analytical Results: Specific Gravity.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Liquids			unitless	unitless	unitless
19-5706	53:2	Drainable liquid	1.05	1.05	1.05
22-5706	54:2	Drainable liquid	0.986	0.984	0.985

Table B2-149. Tank 241-T-105 Analytical Results: Volume Percent Settled Solids (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
93-09787	57:1	Whole (1:3 dilution)	39	---	39
93-09787		Whole (1:1 dilution)	70	---	70
93-09787		Whole	100	---	100
93-09788	57:2	Whole (1:3 dilution)	17	---	17
93-09788		Whole (1:1 dilution)	31	---	31
93-09788		Whole	100	---	100

Table B2-150. Tank 241-T-105 Analytical Results: Volume Percent Centrifuged Solids (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
93-09787	57:1	Whole	96	---	96
93-09788	57:2	Whole	98	---	98

Table B2-151. Tank 241-T-105 Analytical Results: Total Dissolved Solids (Percent Solids).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids: water digest			%	%	%
25-7705	53:1	Whole	0.24	0.32	0.28 ^{QC}
33-7705	54:1	Whole	0.09	0.12	0.105 ^{QC}

Table B2-152. Tank 241-T-105 Analytical Results: Consistency Factor (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			Pa sec	Pa sec	Pa sec
93-07987	57:1	Whole (1:1 dilution)	0.036	0.028	0.032 ^{QC}

Table B2-153. Tank 241-T-105 Analytical Results: Flow Behavior Index (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			unitless	unitless	unitless
93-07987	57:1	Whole (1:1 dilution)	.074	0.86	0.8

Table B2-154. Tank 241-T-105 Analytical Results: Yield Point (Physical Properties).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			Pa	Pa	Pa
93-07987	57:1	Whole	6.8	6.0	6.4

Table B2-155. Tank 241-T-105 Analytical Results: Exothermic Results (DSC).

Sample Number	Sample Location	Sample Portion	Transition	Result	Duplicate	Mean
Solids				J/g	J/g	J/g
93-07987	57:1	Whole	2	167	180	174
9-5711	53:1	Whole	2	30.3	---	13

Table B2-156. Tank 241-T-105 Analytical Results: Percent Water (TGA).

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Mean
Solids			%	%	%
9-5712	53:1	Whole	51.97	---	51.97
8-5712	54:1	Whole	35.52	---	35.52
93-07987	57:1	Whole	48.7	46.5	47.6
93-07988	57:2	Whole	19.8	19.1	20
Liquids			%	%	%
19-5712	53:2	Drainable liquid	91.42	91.36	91.39

B3.0 ASSESSMENT OF CHARACTERIZATION RESULTS

This section discusses the overall quality and consistency of the current sampling results for tank 241-T-105 and provides the results of an analytical-based inventory calculation.

This section also evaluates sampling and analysis factors that may impact data interpretation. These factors are used to assess overall data quality and consistency and to identify limitations in data use. The assessments are based only on the 1997 core sample results.

B3.1 FIELD OBSERVATIONS

Sample recovery for the 1997 samples was generally good except for core 205, segment 4, in which the valve was open resulting in a poor sample recovery. Segment 1 of core 207 and segment 2 of core 205 contained clear and dark crystals which could not be broken up in the laboratory. Two segments were obtained from both cores. Liner liquid in core 207 was mostly hydrostatic head fluid. Except for the open valve, samples were obtained without incident.

B3.2 QUALITY CONTROL ASSESSMENT

The usual QC assessment includes an evaluation of the appropriate standard recoveries, spike recoveries, duplicate analyses, and blanks that are performed in conjunction with chemical analyses. All pertinent QC tests were conducted on the 1997 samples. The SAP (Field 1997) established specific criteria for all analytes. Sample and duplicate pairs, which had one or more QC results outside the specified criteria, were identified by superscripts in the data summary tables.

As noted previously, the QC review for IC and ICP analyses was limited to only those analytes requested (that is, bromide and lithium). Other IC and ICP analytes are listed in the data tables but are considered "opportunistic." Specific quality checks and reviews for these analytes were not conducted.

The standard and spike recovery results provide an estimate of analysis accuracy. If a standard or spike recovery is above or below the given criterion, the analytical results may be biased high or low, respectively. The precision is estimated by the RPD, which is defined as the absolute value of the difference between the primary and duplicate samples, divided by their mean, times 100.

The standard recoveries, RPDs, and spike recoveries were within the required limits for most analytes. Total alpha results had a high RPD for one drainable liquid sample, but this was attributed to an alpha activity near the detection limit; no reruns were requested. No sample exceeded the criterion for preparation blanks; therefore, contamination was not a problem.

In summary, the vast majority of QC results were within the boundaries specified in the SAPs. The discrepancies mentioned here and footnoted in the data summary tables should not impact data validity or use.

B3.3 DATA CONSISTENCY CHECKS

Comparisons of different analytical methods can help to assess data consistency and quality. Several correlations were possible with the data set provided by the two core samples, including comparisons of phosphorous and sulfur as analyzed by ICP with phosphate and sulfate as analyzed by IC. In addition, mass and charge balances were calculated to help assess overall data consistency.

B3.3.1 Comparison of Results from Different Analytical Methods

The following data consistency checks compare results from two analytical methods. Close agreement between the two methods strengthens the credibility of both results, but a poor agreement brings the reliability of the data into question.

Phosphorus is determined by ICP, and phosphate is determined by IC. Assuming that all phosphorus is present as phosphate yielded mean sludge concentrations of 4,505 $\mu\text{g/g}$ for the acid-digested sample. The phosphate value by IC was 2,840 $\mu\text{g/g}$. This indicates about 63 percent of the phosphorous is water soluble. For drainable liquid, the phosphate value from ICP was 4,995 $\mu\text{g/mL}$. This compares reasonably well with the phosphate IC value of 4,560 $\mu\text{g/mL}$ for drainable liquid, indicating that nearly all the phosphorus in the drainable liquid is present as phosphate.

Sulfur is considered to be present as the sulfate ion and appears to be completely water soluble. The sulfate concentrations calculated from the ICP acid digest for sulfur were 8,640. This value is below the IC water-digested sulfate concentration of 9,450 $\mu\text{g/g}$. The values for drainable liquid were 16,320 $\mu\text{g/mL}$ for sulfate calculated from the ICP value for sulfur and 15,700 $\mu\text{g/mL}$ for sulfate by IC.

B3.3.2 Mass and Charge Balances

The principle objective in performing mass and charge balances is to determine whether measurements are consistent. Mass and charge balances were calculated separately for sludge and drainable liquid analytical results. The mass and charge balance calculations include only those analytes listed in Section B3.4 which were detected at a concentration of 1,000 $\mu\text{g/g}$ (1,000 $\mu\text{g/mL}$ for drainable liquids) or greater.

B3.3.2.1 Solids. Except for sodium and bismuth, all analytes were assumed to be present in their most common hydroxide, or oxide forms. Because precipitates are neutral species, all positive charge was attributed to the sodium cations. Bismuth was assumed to be present as bismuth phosphate.

The anions were assumed to be present as sodium salts and were expected to balance the positive charge exhibited by the cations. The concentrations of the cations listed in Table B3-1, the anions listed in Table B3-2, and the weight percent water results were ultimately used to calculate the mass balance. The mass balance can be calculated from the formula below. The factor 0.0001 is the conversion factor from $\mu\text{g/g}$ to weight percent.

$$\begin{aligned}\text{Mass balance} &= \% \text{ Water} + 0.0001 \times \{\text{Total Analyte Concentration}\} \\ &= \% \text{ Water} + 0.0001 \times \{[\text{Al}(\text{OH})_3] + [\text{BiPO}_4] + [\text{FeO}(\text{OH})] + [\text{MnO}_2] \\ &\quad + [\text{Na}^+] + [\text{SiO}_2] + [\text{NO}_3^-] + [\text{NO}_2^-] + [\text{PO}_4^{3-}] + [\text{SO}_4^{2-}] + \\ &\quad [\text{UO}_2^{2+}]\}\end{aligned}$$

The total analyte concentration calculated from the above equation was 402,400 $\mu\text{g/g}$. The mean weight percent water was 60.4 percent, as determined by TGA. The mass balance resulting from adding the weight percent water to the total analyte concentration was 100.6 percent, as shown in Table B3-3.

The charge balance is the ratio of total cations ($\mu\text{eq/g}$) to total anions ($\mu\text{eq/g}$).

$$\text{Total cations } (\mu\text{eq/g}) = [\text{Na}^+]/23.0 + [\text{UO}_2^{2+}]/135 = +2,810 \mu\text{eq/g}$$

$$\begin{aligned}\text{Total anions } (\mu\text{eq/g}) &= [\text{NO}_3^-]/62.0 + [\text{NO}_2^-]/46.0 + [\text{PO}_4^{3-}]/31.7 + [\text{SO}_4^{2-}]/48.0 = \\ &\quad -2,878 \mu\text{eq/g}\end{aligned}$$

The charge balance obtained by dividing the sum of the positive charges by the sum of the negative charges was 0.933.

In summary, the above calculations yield reasonable mass and charge balance values (close to 1.00 for charge balance and 100 percent for mass balance), indicating the analytical results are generally consistent.

Table B3-1. Solids Cation Mass and Charge Data.

Analyte	Concentration ($\mu\text{g/g}$)	Assumed Species	Concentration of Assumed Species ($\mu\text{g/g}$)	Charge ($\mu\text{eq/g}$)
Aluminum	63,300	$\text{Al}(\text{OH})_3$	183,000	0
Bismuth	8,130	BiPO_4	11,900	0
Iron	22,900	$\text{FeO}(\text{OH})$	36,400	0
Manganese	9,820	MnO_2	15,500	0
Sodium	63,900	Na^+	63,900	2,780
Silicon	4,670	SiO_2	10,000	0
Uranium	7,260	UO_2^{2+}	8,240	61.0
Total			328,940	2,841

Table B3-2. Solids Anion Mass and Charge Data.

Analyte	Concentration ($\mu\text{g/g}$)	Assumed Species	Concentration of Assumed Species ($\mu\text{g/g}$)	Charge ($\mu\text{eq/g}$)
Nitrate	24,300	NO_3^-	24,300	1,176
Nitrite	35,200	NO_2^-	35,200	1,530
Phosphate (ICP)	4,510	PO_4^{3-}	4,510	142
Sulfate (IC)	9,450	SO_4^{2-}	9,450	197
Total			73,460	3,045

Table B3-3. Solids Mass Balance Totals.

Totals	Concentrations ($\mu\text{g/g}$)
Total from Table B3-1	328,940
Total from Table B3-2	73,460
Weight percent water	604,000
Grand total	1,006,400

B3.3.2.2 Drainable Liquids. Except for sodium, all analytes were assumed to be present in their most common hydroxide, or oxide forms. Because precipitates are neutral species, all positive charge was attributed to the sodium cations.

The anions were assumed to be present as sodium salts and were expected to balance the positive charge exhibited by the cations. The concentrations of the cations listed in Table B3-4, the anions listed in Table B3-5, and the weight percent water results were ultimately used to calculate the mass balance. The mass balance can be calculated from the formula below. The factor 0.0001 is the conversion factor from $\mu\text{g/g}$ to weight percent.

$$\begin{aligned}\text{Mass balance} &= \% \text{ Water} + 0.0001 \times \{\text{Total Analyte Concentration}\}/\text{SpG} \\ &= \% \text{ Water} + 0.0001 \times \{[\text{Na}^+] + [\text{NO}_3^-] + [\text{NO}_2^-] + [\text{PO}_4^{3-}] + [\text{SO}_4^{2-}]\}/1.18\end{aligned}$$

The total analyte concentration calculated from the above equation was 174,915 $\mu\text{g/g}$. The mean weight percent water was 76.6 percent, as determined by TGA. The mass balance resulting from adding the weight percent water to the total analyte concentration was 94.0 percent, as shown in Table B3-6.

The charge balance is the ratio of total cations ($\mu\text{eq/mL}$) to total anions ($\mu\text{eq/mL}$).

$$\text{Total cations } (\mu\text{eq/mL}) = [\text{Na}^+]/23.0 = +4,100$$

$$\text{Total anions } (\mu\text{eq/mL}) = [\text{NO}_3^-]/62.0 + [\text{NO}_2^-]/46.0 + [\text{PO}_4^{3-}]/31.7 + [\text{SO}_4^{2-}]/48.0 = -2,264$$

The charge balance yields a positive net charge of 1,836 $\mu\text{eq/mL}$ that is not accounted for by the analytical data. Assuming all the charge imbalance is caused by hydroxide, which was not analyzed, the concentration of hydroxide would be 31,200 $\mu\text{g/mL}$, and the total mass balance for the sample would be 97.1 percent.

In summary, the above calculations yield reasonable mass and charge balance values (close to 1.00 for charge balance and 100 percent for mass balance [assuming the net positive charge balance is caused by the absence of hydroxide]), indicating that the analytical results are generally consistent.

Table B3-4. Liquid Cations Mass and Charge Data.

Analyte	Concentration ($\mu\text{g/g}$)	Assumed Species	Concentration of Assumed Species ($\mu\text{g/mL}$)	Charge ($\mu\text{eq/mL}$)
Sodium	94,400	Na^+	94,400	4,100
Total			94,400	4,100

Table B3-5. Liquid Anions Mass and Charge Data.

Analyte	Concentration ($\mu\text{g/mL}$)	Assumed Species	Concentration of Assumed Species ($\mu\text{g/mL}$)	Charge ($\mu\text{eq/mL}$)
Nitrate	37,100	NO_3^-	37,100	-598
Nitrite	54,200	NO_2^-	54,200	-1,180
Phosphate (ICP)	4,995	PO_4^{3-}	4,995	-158
Sulfate (IC)	15,720	SO_4^{2-}	15,720	-328
Total			112,000	-2,264

Table B3-6. Liquids Mass Balance Totals.

Totals	Concentrations ($\mu\text{g/g}$)
Total from Table B3-4	94,400/1.18
Total from Table B3-5	112,000/1.18
Weight percent water	766,000
Grand total	940,600

B3.4 MEANS AND CONFIDENCE INTERVALS

B3.4.1 Solid Data

A nested analysis of variance model was fit to the 1997 and 1993 core segment data. Mean values and 95 percent confidence intervals on the mean were determined from the analysis of variance.

The composition of crystals observed in core 205, segment 2 samples was not included in estimating mean values for the solids. Four variance components were used in the calculations. The variance components represent concentration differences between risers, segments, laboratory samples, and analytical replicates. The model is:

$$Y_{ijk} = \mu + R_i + S_{ij} + L_{ijk} + A_{ijk},$$

$$I=1,2,\dots,a; j=1,2,\dots,b_i; k=1,2,\dots,c_{ij}; m=1,2,\dots,n_{ijk}$$

where

- Y_{ijk} = concentration from the m^{th} analytical result of the k^{th} sample of the j^{th} segment of the i^{th} riser
- μ = the mean
- R_i = the effect of the i^{th} riser
- S_{ij} = the effect of the j^{th} segment from the i^{th} riser
- L_{ijk} = the effect of the k^{th} sample from the j^{th} segment of the i^{th} riser
- A_{ijk} = the analytical error
- a = the number of risers
- b_i = the number of segments from the i^{th} riser
- c_{ij} = the number of samples from the j^{th} segment of the i^{th} riser
- n_{ijk} = the number of analytical results from the ijk^{th} sample.

The variables R_i , S_{ij} , and L_{ijk} are random effects. These variables, as well as A_{ijk} , are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(R)$, $\sigma^2(S)$, $\sigma^2(L)$ and $\sigma^2(A)$, respectively.

The restricted maximum likelihood method was used to estimate the mean concentration and standard deviation of the mean for all analytes that had 50 percent or more of their reported values greater than the detection limit. The mean value and standard deviation of the mean were used to calculate the 95 percent confidence intervals. Table B3-7 gives the mean, degrees of freedom, and confidence interval for each constituent.

Some analytes had results below the detection limit. In these cases, the value of the detection limit was used for nondetected results. For analytes with a majority of results below the detection limit, a simple average is all that is reported.

The lower and upper limits, LL(95 percent) and UL(95 percent), of a two-sided 95 percent confidence interval on the mean were calculated using the following equation:

$$\begin{aligned} \text{LL}(95\%) &= \hat{\mu} - t_{(df, 0.025)} \times \hat{\sigma}(\hat{\mu}), \\ \text{UL}(95\%) &= \hat{\mu} + t_{(df, 0.025)} \times \hat{\sigma}(\hat{\mu}). \end{aligned}$$

In this equation, $\hat{\mu}$ is the restricted maximum likelihood estimate of the mean concentration, $\hat{\sigma}(\hat{\mu})$ is the restricted maximum likelihood estimate of the standard deviation of the mean, and $t_{(df, 0.025)}$ is the quantile from Student's *t* distribution with *df* (degrees of freedom). The degrees of freedom equals the number of risers with data minus one. In cases where the lower limit of the confidence interval was negative, it is reported as zero.

Table B3-7. 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (2 sheets)

Analyte	Method	$\hat{\mu}$	df	LL	UL	Units
Aluminum	ICP:A	6.33E+04	3	0.00E+00	1.82E+05	μg/g
Antimony ¹	ICP:A	<1.07E+02	n/a	n/a	n/a	μg/g
Arsenic ¹	ICP:A	<8.52E+01	n/a	n/a	n/a	μg/g
Barium ¹	ICP:A	<7.59E+01	n/a	n/a	n/a	μg/g
Beryllium ¹	ICP:A	<5.07E+00	n/a	n/a	n/a	μg/g
Bismuth	ICP:A	8.13E+03	3	0.00E+00	2.88E+04	μg/g
Boron ¹	ICP:A	<4.95E+01	n/a	n/a	n/a	μg/g
Bromide ¹	IC:W	7.94E+02	1	0.00E+00	3.26E+03	μg/g
Cadmium ¹	ICP:A	1.04E+01	3	1.15E+00	1.96E+01	μg/g
Calcium	ICP:A	9.80E+02	3	3.42E+02	1.62E+03	μg/g
Cerium ¹	ICP:A	<9.21E+01	n/a	n/a	n/a	μg/g
Chloride	IC:W	4.09E+02	3	2.83E+02	5.36E+02	μg/g
Chromium	ICP:A	8.65E+02	3	0.00E+00	1.81E+03	μg/g
Cobalt ¹	ICP:A	<2.87E+01	n/a	n/a	n/a	μg/g

Table B3-7. 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (2 sheets)

Analyte	Method	$\bar{\mu}$	df	LL	UL	Units
Copper ¹	ICP:A	1.82E+02	1	0.00E+00	1.92E+03	μg/g
Fluoride	IC:W	4.73E+02	1	1.86E+01	9.28E+02	μg/g
Gross alpha	ALPHA:F	3.05E-01	3	1.60E-01	8.50E-01	μg/g
Iron	ICP:A	2.29E+04	3	6.38E+02	4.51E+04	μg/g
Lanthanum ¹	ICP:A	<4.49E+01	n/a	n/a	n/a	μg/g
Lead	ICP:A	5.69E+02	3	1.96E+02	9.42E+02	μg/g
Lithium ¹	ICP:A	4.18E+01	3	0.00E+00	1.10E+02	μg/g
Magnesium	ICP:A	8.99E+02	3	4.05E+02	1.39E+03	μg/g
Manganese	ICP:A	9.82E+03	3	0.00E+00	2.12E+04	μg/g
Molybdenum ¹	ICP:A	5.22E+01	3	1.42E+01	9.03E+01	μg/g
Neodymium ¹	ICP:A	<1.14E+02	n/a	n/a	n/a	μg/g
Nickel	ICP:A	9.11E+01	3	3.88E+01	1.43E+02	μg/g
Nitrate	IC:W	2.29E+04	3	1.51E+04	3.07E+04	μg/g
Nitrite	IC:W	3.28E+04	3	2.14E+04	4.42E+04	μg/g
Oxalate ¹	IC:W	<1.58E+03	n/a	n/a	n/a	μg/g
Phosphate	IC:W	2.84E+03	3	1.45E+03	4.23E+03	μg/g
Phosphorus	ICP:A	1.47E+03	3	1.03E+03	1.90E+03	μg/g
Potassium ¹	ICP:A	5.14E+02	3	1.15E+02	9.12E+02	μg/g
Samarium ¹	ICP:A	<1.02E+02	n/a	n/a	n/a	μg/g
Silicon	ICP:A	4.67E+03	3	0.00E+00	1.17E+04	μg/g
Silver ¹	ICP:A	2.89E+01	3	2.59E+00	5.53E+01	μg/g
Sodium	ICP:A	6.39E+04	3	4.13E+04	8.65E+04	μg/g
Strontium	ICP:A	1.75E+02	3	1.04E+02	2.46E+02	μg/g
Sulfate	IC:W	9.45E+03	3	6.63E+03	1.23E+04	μg/g
Sulfur	ICP:A	2.88E+03	3	1.78E+03	3.97E+03	μg/g
Thallium ¹	ICP:A	<2.02E+02	n/a	n/a	n/a	μg/g
Titanium ¹	ICP:A	4.58E+01	3	1.55E+01	7.60E+01	μg/g
Uranium ¹	ICP:A	7.26E+03	1	0.00E+00	6.11E+04	μg/g
Vanadium ¹	ICP:A	<7.18E+01	n/a	n/a	n/a	μg/g
Zinc	ICP:A	3.03E+02	1	0.00E+00	2.12E+03	μg/g
Zirconium ¹	ICP:A	5.59E+01	3	2.08E+01	9.10E+01	μg/g

Note:

¹A "less than" value was used in the calculations.

B3.4.2 Liquid Data

A nested analysis of variance model was fit to the 1997 core sample liquid data. The 1993 data were not included in this analysis because core 54 drainable liquids were believed to be mostly hydrostatic head fluid (Silvers and Sasaki 1993) and were not analyzed; little drainable liquid was recovered in core 53 samples. Table B3-8 gives the mean, degrees of freedom, and confidence interval for each constituent.

Three variance components were used in the calculations. The variance components represent concentration differences between risers, laboratory samples, and analytical replicates. The model is:

$$Y_{ijk} = \mu + R_i + L_{ij} + A_{ijk},$$

$$I=1,2,\dots,a; j=1,2,\dots,b_i; m=1,2,\dots,n_{ij};$$

where

- Y_{ijk} = concentration from the k^{th} analytical result of the j^{th} sample of the i^{th} riser
- μ = the mean
- R_i = the effect of the i^{th} riser
- L_{ij} = the effect of the j^{th} sample from the i^{th} riser
- A_{ijk} = the analytical error
- a = the number of risers
- b_i = the number of samples from the i^{th} riser
- n_{ij} = the number of analytical results from the ij^{th} sample.

The variables R_i , and L_{ij} are random effects. These variables, as well as A_{ijk} , are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(R)$, $\sigma^2(L)$, and $\sigma^2(A)$, respectively.

Table B3-8. 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Liquid Data. (2 sheets)

Analyte	Method	\bar{x}	df	LL	UL	Units
Aluminum	ICP	3.62E+02	1	0.00E+00	1.69E+03	µg/mL
Antimony ¹	ICP	<2.41E+01	n/a	n/a	n/a	µg/mL
Arsenic ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Barium ¹	ICP	<2.01E+01	n/a	n/a	n/a	µg/mL
Beryllium ¹	ICP	<2.00E+00	n/a	n/a	n/a	µg/mL
Bismuth ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Boron ¹	ICP	<2.01E+01	n/a	n/a	n/a	µg/mL
Bromide ¹	IC	<1.11E+03	n/a	n/a	n/a	µg/mL
Cadmium ¹	ICP	<2.14E+00	n/a	n/a	n/a	µg/mL
Calcium	ICP	7.32E+01	1	2.22E+00	1.44E+02	µg/mL
Cerium ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Chloride	IC	4.61E+02	1	0.00E+00	2.08E+03	µg/mL
Chromium	ICP	2.03E+02	1	0.00E+00	8.32E+02	µg/mL
Cobalt ¹	ICP	<8.02E+00	n/a	n/a	n/a	µg/mL
Copper ¹	ICP	<5.11E+00	n/a	n/a	n/a	µg/mL
Fluoride	IC	6.28E+02	1	5.15E+02	7.40E+02	µg/mL
Iron ¹	ICP	<2.01E+01	n/a	n/a	n/a	µg/mL
Lanthanum ¹	ICP	<2.01E+01	n/a	n/a	n/a	µg/mL
Lead ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Lithium ¹	ICP	<3.56E+01	n/a	n/a	n/a	µg/mL
Magnesium ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Manganese ¹	ICP	<4.01E+00	n/a	n/a	n/a	µg/mL
Molybdenum	ICP	7.57E+01	1	5.57E+01	9.57E+01	µg/mL
Neodymium ¹	ICP	<4.01E+01	n/a	n/a	n/a	µg/mL
Nickel	ICP	3.13E+01	1	0.00E+00	7.70E+01	µg/mL
Nitrate	IC	3.71E+04	1	2.54E+04	4.88E+04	µg/mL
Nitrite	IC	5.42E+04	1	2.41E+04	8.43E+04	µg/mL
Oxalate ¹	IC	<1.13E+03	n/a	n/a	n/a	µg/mL
Phosphate	IC	4.56E+03	1	0.00E+00	1.24E+04	µg/mL
Phosphorus	ICP	1.63E+03	1	1.35E+02	3.12E+03	µg/mL
Potassium	ICP	5.44E+02	1	3.86E+02	7.01E+02	µg/mL

Table B3-8. 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Liquid Data. (2 sheets)

Analyte	Method	\bar{x}	df	LL	UL	Units
Samarium ¹	ICP	<4.01E+01	n/a	n/a	n/a	μg/mL
Selenium ¹	ICP	<4.01E+01	n/a	n/a	n/a	μg/mL
Silicon	ICP	4.16E+01	1	0.00E+00	1.22E+02	μg/mL
Silver	ICP	6.79E+00	1	1.86E+00	1.17E+01	μg/mL
Sodium	ICP	9.44E+04	1	6.85E+04	1.20E+05	μg/mL
Strontium ¹	ICP	<4.01E+00	n/a	n/a	n/a	μg/mL
Sulfate	IC	1.57E+04	1	0.00E+00	3.29E+04	μg/mL
Sulfur	ICP	5.44E+03	1	3.54E+03	7.34E+03	μg/mL
Thallium ¹	ICP	<8.02E+01	n/a	n/a	n/a	μg/mL
Titanium ¹	ICP	<4.01E+00	n/a	n/a	n/a	μg/mL
Uranium ¹	ICP	<2.00E+02	n/a	n/a	n/a	μg/mL
Vanadium ¹	ICP	<2.01E+01	n/a	n/a	n/a	μg/mL
Zinc ¹	ICP	<4.01E+00	n/a	n/a	n/a	μg/mL
Zirconium ¹	ICP	<4.01E+00	n/a	n/a	n/a	μg/mL

Note:

¹ A "less than" value was used in the calculations.

B4.0 APPENDIX B REFERENCES

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APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

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APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

Appendix C documents the results of the analyses and statistical and numerical manipulations required by the DQOs applicable for tank 241-T-105. The analyses required for tank 241-T-105 are reported as follows:

- **Section C1.0:** Statistical analysis and numerical manipulations supporting the safety screening DQO (Dukelow et al. 1995)
- **Section C2.0:** Appendix C References.

C1.0 STATISTICS FOR THE SAFETY SCREENING DATA QUALITY OBJECTIVE

The safety screening DQO (Dukelow et al. 1995) defines decision limits in terms of one-sided 95 percent confidence intervals. The safety screening DQO limits are 41 $\mu\text{Ci/g}$ for gross alpha and 480 J/g for DSC.

Confidence intervals were calculated for the mean values from each laboratory sample. The data used in the computations were from the data package of the 1997 core sampling event. Table C1-1 has the gross alpha results. There were no exothermic reactions in any 1997 DSC sample.

The upper limit (UL) of a one-sided 95 percent confidence interval on the mean is

$$\hat{\mu} + t_{(df, 0.05)} \hat{\sigma}_{\hat{\mu}}$$

In this equation, $\hat{\mu}$ is the arithmetic mean of the data, $\hat{\sigma}_{\hat{\mu}}$ is the estimate of the standard deviation of the mean, and $t_{(df, 0.05)}$ is the quantile from Student's t distribution with df (degrees of freedom). The degrees of freedom equals the number of samples minus one.

For sample numbers with at least one value above the detection limit, the upper limit of a 95 percent confidence interval is given in Table C1-1. Each confidence interval can be used to make the following statement. If the upper limit is less than 41 $\mu\text{Ci/g}$ (61.5 $\mu\text{Ci/mL}$ for drainable liquid), reject the null hypothesis that the alpha is greater than or equal to 41 $\mu\text{Ci/g}$ (61.5 $\mu\text{Ci/mL}$ for drainable liquid) at the 0.05 level of significance.

Twenty-one of 26 gross alpha results were above the detection limit. The UL closest to the threshold was 8.23E-01 $\mu\text{Ci/g}$, for core 53, segment 1. This is well below the limit of 41 $\mu\text{Ci/g}$.

Table C1-1. 95 Percent Upper Confidence Limits for Gross Alpha.

Lab Sample ID	Description	μ	df	UL	Units
19-5725	Core 53 segment 2	2.76E-02	1	3.35E-02	$\mu\text{Ci/mL}$
25-6725	Core 53 segment 1	8.19E-01	1	8.44E-01	$\mu\text{Ci/g}$
25-7725	Core 53 segment 1	5.39E-03	1	6.65E-03	$\mu\text{Ci/g}$
33-6725	Core 54 segment 1	4.74E-01	1	5.41E-01	$\mu\text{Ci/g}$
33-7725	Core 54 segment 1	3.42E-03	1	3.64E-03	$\mu\text{Ci/g}$
S97T001675	Core 205, segment 1	3.20E-03	1	8.59E-03	$\mu\text{Ci/mL}$
S97T001681 ¹	Core 205, segment 2	1.42E-03	1	2.02E-03	$\mu\text{Ci/mL}$
S97T001686F	Core 205, segment 2, lower half	5.46E-01	1	5.90E-01	$\mu\text{Ci/g}$
S97T001698F	Core 207, segment 1, lower half	2.88E-01	1	4.08E-01	$\mu\text{Ci/g}$
S97T001704F	Core 207, segment 2, lower half	1.46E-01	1	1.78E-01	$\mu\text{Ci/g}$
S97T001711F	Core 207, segment 2, upper half	5.76E-01	1	6.43E-01	$\mu\text{Ci/g}$

Note:

¹ A "less than" value was used in the calculation.

C2.0 APPENDIX C REFERENCES

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APPENDIX D

**EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR
SINGLE-SHELL TANK 241-T-105**

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-T-105

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-T-105 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task.

D1.0 CHEMICAL INFORMATION SOURCES

As part of this effort, an evaluation was made of available chemical information for tank 241-T-105, including the following:

- Analytical results from cores 53 and 54 samples obtained in 1993 and cores 205 and 207 samples obtained in 1997 (see Appendix B)
- Analytical data from tanks containing bismuth phosphate process first decontamination cycle waste (1C1)
- Analytical data from tanks which contain REDOX high-level waste and REDOX cladding waste
- The HDW model document (Agnew et al. 1997a) which provides tank content estimates in terms of component concentrations and inventories.

D2.0 COMPARISON OF COMPONENT INVENTORY VALUES

Previous best-basis inventories and HDW model inventories are compared in Tables D2-1 and D2-2. The chemical species are reported without charge designation according to the best-basis inventory convention. The tank volume used to generate these inventories is 371 kL (98 kgal). This volume is reported in Hanlon (1998) and Agnew et al. (1997a). The density used to calculate the previous best-basis inventory was 1.64 g/mL, based on 1993 sample measurements. This density is higher than the 1.24 value reported in Agnew et al.

The previous best-basis inventory was based in part on 1993 sample results. However, a significant difference was noted between sampling results and HDW model estimates for aluminum, bismuth, and manganese. This indicated the sample represents CW waste but probably does not represent the 2C waste type. As a result, the previous best-basis inventory was derived by combining 1993 core sample results for tank 241-T-105 with analytical results for other tanks containing REDOX cladding waste and 2C waste types (LMHC 1998).

Table D2-1. Previous Best Basis and Historical Tank Content Inventory Estimates for Nonradioactive Components in Tank 241-T-105. (2 sheets)

Analyte	Previous Best Basis Inventory ¹ (kg)	HDW Model Inventory Estimate ² (kg)
Al	17,000	1,150
Bi	7,500	6,490
Ca	2,200	1,860
Cl	240	338
CO ₃	17,200	2,780
Cr	360	72.0
F	1,200	1,160
Fe	8,600	10,400
Hg	1	1.85
K	190	81.1
La	0	0.00
Mn	7,000	0.00
Na	38,000	37,500
Ni	28	27.1
NO ₂	4,000	1,630
NO ₃	31,000	22,000
OH	42,500	13,800
Pb	280	0.00
PO ₄	20,000	36,700
Si	4,300	1,060
SO ₄	5,800	1,520
Sr	85	0
TOC	0	0

Table D2-1. Previous Best Basis and Historical Tank Content Inventory Estimates for Nonradioactive Components in Tank 241-T-105. (2 sheets)

Analyte	Previous Best Basis Inventory ¹ (kg)	HDW Model Inventory Estimate ² (kg)
U _{total}	1,000	4,740
Zr	21	2.20

Notes:

¹Effective date, September 30, 1996 (LMHC 1998)²Agnew et al. (1997a)Table D2-2. Previous Best Basis and Historical Tank Content Inventory Estimates for Radioactive Components in Tank 241-T-105.¹

Analyte	Previous Best-Basis Inventory ² (Ci)	HDW Model Inventory ³ (Ci)
²⁴¹ Am	520	0.0372
¹²⁵ Sb	400	0.00399
¹⁴ C	0.61	0.0169
¹³⁷ Cs	30,000	1,860
⁶⁰ Co	23	0.00413
¹⁵⁴ Eu	1,000	0.0763
¹⁵⁵ Eu	1,100	0.443
^{239/240} Pu	84	26.6
⁹⁰ Sr	1.7E+05	1,630
⁹⁹ Tc	230	0.117
³ H	7.6	0.0811

Notes:

¹Curie values are decayed to January 1, 1994.²Effective September 30, 1996 (LMHC 1998)³Agnew et al. (1997a)

D3.0 COMPONENT INVENTORY EVALUATION

The following evaluation of tank contents was performed to identify potential errors and/or missing information that would influence the sampling-based and HDW model component inventories.

D3.1 WASTE HISTORY OF TANK 241-T-105

Tank 241-T-105 is the middle tank in a cascade that includes tanks 241-T-104 and 241-T-106. In 1946, tank 241-T-105 began receiving 2C waste (Anderson 1990 and Agnew et al. 1997b). The waste was sent directly from T Plant to tank 241-T-105, bypassing tank 241-T-104. The 2C waste cascaded from tank 241-T-105 to tank 241-T-106 when tank 241-T-105 was full.

In 1948, the cascade line from tank 241-T-104 to tank 241-T-105 was used to transfer 1C waste from tank 241-T-104. This 1C waste was combined with cladding waste from the removal of aluminum fuel element cladding. The cladding waste comprised about seven percent of the 1C/CW waste stream. The cascade from tank 241-T-104 to tank 241-T-105 was used for transfer of 1C/CW waste until the last additions of 1C/CW waste from T Plant were made in 1954. In 1954, supernatant in tank 241-T-105 was transferred to cribs.

The tank began receiving CW at the beginning of 1955, and it was full by the end of 1956. This waste settled in the tank until 1967 when the supernatant was transferred to cribs. Agnew et al. (1997a) says that CW originated from the reduction oxidation (REDOX) process, but Anderson (1990) says the CW originated from the BiPO_4 process. Waste transaction records in Agnew et al. (1997b) indicate BiPO_4 was added rather than REDOX process aluminum cladding waste. However, the measurable difference between the two types of cladding waste is probably negligible.

In 1967, tank 241-T-105 was filled with dilute 300 Area laboratory waste. Much of the supernatant in tank 241-T-105 was sent to the 242-T Evaporator in 1967 and 1968.

Additional dilute wastes were sent to tank 241-T-105 from 1968 to 1973. These waste types probably did not contribute significantly to the tank's solids volume. These wastes consisted of decontamination waste from T Plant, some supernatant transferred from other single-shell tanks, B Plant low-level waste, and ion exchange waste. In 1974, most of the supernatant was transferred from tank 241-T-105.

Based on the process history, it is expected that 2C waste fills the tank bottom. The 1C waste makes up another layer. The records indicate that cladding waste may reside above the 1C waste.

D3.2 CONTRIBUTING WASTE TYPES

The following waste types are predicted for tank 241-T-105.

Expected Solids

Anderson (1990), Hill et al. (1995): 1C, 2C, CW

Agnew et al. (1997a and 1997b): 1C, 2C

Model-Based Predicted Current Inventory (Agnew et al. 1997a)

Waste Type	Waste Volume kL (kgal)
1C2	98 (26)
2C2	273 (72)

where

1C	=	first decontamination cycle BiPO_4 waste
2C	=	second decontamination cycle BiPO_4 waste
RCW	=	REDOX process aluminum cladding waste
CW	=	BiPO_4 process aluminum cladding waste.

The 1997 and 1993 analytical results for tank 241-T-105 indicate much higher concentrations of aluminum and lower concentrations of bismuth in the waste solids than would be predicted from waste that contained only 1C and 2C waste from the BiPO_4 process. These results suggest a significant proportion of the waste that was sampled consists of CW which contains the precipitated aluminum resulting from neutralization of the dissolved aluminum fuel cladding. Agnew et al. (1997a) does not predict any CW beyond that mixed with the 1C waste in the tank.

The waste transaction record (Agnew et al. 1997b) shows that 980 kL (259 kgal) of CW was introduced into the tank during 1955 and 1956. Although the transaction records show that this waste was removed in 1967, it is likely that a significant portion of the precipitated solids remained on the waste surface.

D3.3 ASSUMPTIONS USED

Because 1997 samples indicated the presence of REDOX cladding waste and 2C waste types, the sample means (where available) were used to compute the best-basis inventory for this tank. The samples showed the waste was highly heterogeneous both vertically and horizontally. Tank samples show a larger amount of liquids in the risers sampled, than predicted by Hanlon (1998) for the entire tank. Tank photos indicate the presence of liquids and floating solids in part of the tank, but also indicate that most of the surface has no liquid, and small area of the waste surface appears to be dry solids (Brevick et al. 1997). Because the

tank is interim stabilized, it is assumed the sample results do not represent the total amount of free liquid in the tank, and Hanlon (1998) drainable liquid volumes are assumed to be present as free liquid.

The relative volumes of CWR and 1C or 2C waste were not apparent from the sample results. Therefore, it was assumed the sample solids results represent all three waste types. The HDW values were used for radionuclide inventory estimates when no sample results were available.

D3.4 METHODOLOGY FOR ESTIMATING TANK 241-T-105 INVENTORY

D3.4.1 Solids

Table 3-1 compares average tank 241-T-105 solids analytical results (see Appendix B3.4) with average 1C and CWR sludge composition for other tanks (Kupfer et al. 1997), and compositions predicted by Agnew (1997a).

The table indicates the tank contains R/CWR waste, as evidenced by sample concentrations for aluminum, chromium, strontium and cesium which are significantly lower in 1C waste. The tank also clearly contains 1C waste, as evidenced by the high concentrations of bismuth, phosphate, and fluoride found in tank samples. These analytes are found at much lower concentrations in R/CWR waste.

Table D3-1. Solids Composition for R1, CWR1, and 1C Waste Types, and Predictions for the Composition of Tank 241-T-105 Solids. (3 sheets)

Analyte	Average R/CWR ¹ ($\mu\text{g/g}$)	HDW R1 ($\mu\text{g/g}$) ²	HDW CWR1 ($\mu\text{g/g}$) ²	Average 1C ¹ ($\mu\text{g/g}$)	HDW 1C1 ² ($\mu\text{g/g}$)	241-T-105 solids ($\mu\text{g/g}$) ³
Al	100,000	107,000	171,000	15,000	11,700	63,300
Bi	<42.2	0	0	16,700	9,440	8,130
Ca	268	5,020	2,730	1,250	2,210	980
CO ₃	4,140	7,510	4,090	8,430	3,310	22,900 ⁵
Cl	2,370	1,040	141	900	794	409
Cr	1,920	1,830	59.8	795	183	865
F	<120	0	0	9,510	1,910	473
Fe	1,613	32,200	5,200	14,300	14,250	22,900
Hg	<0.126	NR	462	<0.318	15.4	23.9 ⁵
K	432	250	33.9	270	190	514

Table D3-1. Solids Composition for R1, CWR1, and 1C Waste Types, and Predictions for the Composition of Tank 241-T-105 Solids. (3 sheets)

Analyte	Average R/CWR ¹ ($\mu\text{g/g}$)	HDW R1 ($\mu\text{g/g}$) ²	HDW CWR1 ($\mu\text{g/g}$) ²	Average 1C ¹ ($\mu\text{g/g}$)	HDW 1C ¹ ($\mu\text{g/g}$)	241-T-105 solids ($\mu\text{g/g}$) ³
La	<10.8	0	0	<35	0	<44.9
Mn	1,330	0	0	140	0	9,820
Na	97,800	106,000	102,000	92,300	87,000	63,900
Ni	118	1,690	33.7	68	51	91.1
NO ₂	30,433	38,200	24,900	12,600	7,860	32,800
NO ₃	122,500	187,000	20,000	91,100	46,500	22,900
Pb	33.2	0	13,800	300	0	569
PO ₄	<1,730	0	0	76,600	79,200	4,510
Si	1,250	129	319	6,990	4,550	4,670
SO ₄	1,489	569	455	9,290	3,620	9,450
Sr	420	0	0	298	0	175
TOC	1,730	0	0	940	0	4,590 ⁵
U	7,690	207	24,400	6,300	35,100	7,260
Zr	66.9	0	0	113	16	55.9
Radionuclides ($\mu\text{Ci/g}$)⁴						
Total alpha	NR	NR	NR	NR	NR	0.505
⁹⁰ Sr	288	528.6	1.16	25.8	5.51	280 ⁵
¹³⁷ Cs	77.6	31.9	1.33	20.0	6.21	32.3 ⁵
¹³⁴ Cs	NR	1.55E-05	9.34E-07	NR	7.5E-08	<0.055 ⁵
²⁴¹ Am	NR	0.00461	0.000231	NR	2.2E-05	0.242 ⁵
¹²⁵ Sb	NR	0.000747	4.46E-06	NR	4.7E-06	0.665 ⁵
¹⁴ C	NR	0.00129	6.16E-06	NR	6.3E-05	0.001 ⁵
⁶⁰ Co	NR	0.000509	2.66E-05	NR	8.7E-06	0.038 ⁵
¹⁵⁴ Eu	NR	0.0123	0.000648	NR	0.00012	1.79 ⁵
¹⁵⁵ Eu	NR	0.188	0.00471	NR	0.00093	2.11 ⁵
²³⁸ Pu	NR	0.00377	0.0142	NR	3.9E-05	2.45E-04 ⁵
^{239/240} Pu	NR	NR	NR	NR	NR	0.138 ⁵
²³⁹ Pu	NR	0.269	0.908	NR	0.0122	NR
²⁴⁰ Pu	NR	0.0385	0.128	NR	0.00072	NR

Table D3-1. Solids Composition for R1, CWR1, and 1C Waste Types, and Predictions for the Composition of Tank 241-T-105 Solids. (3 sheets)

Analyte	Average R/CWR ¹ ($\mu\text{g/g}$)	HDW R1 ($\mu\text{g/g}$) ²	HDW CWR1 ($\mu\text{g/g}$) ²	Average 1C ¹ ($\mu\text{g/g}$)	HDW 1C1 ¹ ($\mu\text{g/g}$)	241-T-105 solids ($\mu\text{g/g}$) ³
⁹⁹ Tc	NR	0.00902	0.000442	NR	0.00043	0.372 ⁵
³ H	NR	0.0167	0.000571	NR	0.00025	0.012 ⁵
Density (g/mL)	1.77	1.76	1.77	1.40	1.38	1.45

Notes:

NR = Not reported

¹Average of analyte concentrations for selected tanks (Kupfer 1997)²Agnew et al. (1997a)³Average for 1993 and 1997 core samples (see Appendix B3.4)⁴Radiomucclides are decayed to January 1, 1994.⁵Sample results were obtained for 1993 core samples only.

D3.4.2 Liquids

Table D3-2 compares tank 241-T-105 free liquid sample concentrations with supernatant composition estimates for 1C and CWR1 (Agnew et al 1997a). Because no supernatant is predicted in the tank, Agnew (1997a) does not predict a separate liquid composition for tank 241-T-105. The table indicates that the free liquid in the tank is a mixture of the CWR1 and 1C1 supernatant waste types.

Table D3-2. Liquid Composition for Tank 241-T-105. (2 sheets)

Analyte	HDW 1C1 ¹ ($\mu\text{g/g}$)	HDW CWR1 ¹ ($\mu\text{g/g}$)	T-105 Sample Results ² ($\mu\text{g/mL}$)
Al	0	26,300	362
Bi	760	0	<40.1
Ca	328	296	73.2
CO ₃	22,100	443	NR
Cl	1,390	315	461
Cr	320	133	203
F	3,340	0	628

Table D3-2. Liquid Composition for Tank 241-T-105. (2 sheets)

Analyte	HDW ICI ¹ ($\mu\text{g/g}$)	HDW CWR1 ¹ ($\mu\text{g/g}$)	T-105 Sample Results ² ($\mu\text{g/mL}$)
Fe	102	91.5	< 20.1
Hg	1.83	1.64	NR
K	333	75.6	544
La	0	0	< 20.1
Mn	0	0	< 4.01
Na	54,600	68,300	94,400
Ni	88.9	75.2	31.3
NO ₂	9,280	55,000	54,200
NO ₃	87,300	45,300	37,100
Pb	0	272	< 40.1
PO ₄	13,000	0	4,995
Si	870	711	41.6
SO ₄	6,330	1,014	15,700
Sr	0	0	< 4.01
TOC	0	0	NR
U	866	780	< 200
Zr	27.6	0	< 4.01
Radionuclides ($\mu\text{Ci/g}$) ³			
Total alpha	NR	NR	0.00265 ($\mu\text{Ci/mL}$)
⁹⁰ Sr	9.64	2.58	NR
¹³⁷ Cs	10.9	2.96	NR
Specific gravity	1.10	1.22	1.18

Notes:

¹Agnew et al. (1997a)²Average for 1997 samples (see Appendix B3.4)³Radionuclides decayed to January 1, 1994.

D3.5 ESTIMATED INVENTORY OF COMPONENTS

Estimated sample-based inventories were calculated and compared with HDW model-based inventories in Table D3-3. The solids inventory for tank 241-T-105 in Table D3-3 was determined by multiplying sample concentrations by an average sample density of 1.45 and a volume of 284 kL (75 kgal) (total tank volume less free liquid volume). The best-basis liquid inventory for the tank was calculated by multiplying sample concentrations by a volume of 87 kL (23 kgal). Based on sample observations, this assumes the interstitial liquid predicted by Hanlon (1998) is present as free liquid in the tank.

Table D3-3. Estimated Inventory for Tank 241-T-105. (2 sheets)

Analyte	Sample-Based Solids Inventory (kg)	Sample-Based Supernatant Inventory (kg)	Total Sample-Based Inventory (kg)	HDW Model-Based Inventory ¹
Al	26,100	31.5	26,100	1,150
Bi	3,350	3.49	3,350	6,490
Ca	404	6.37	410	1,860
CO ₃	9,430	NR	9,430	2,780
Cl	168	40.1	208	338
Cr	356	17.7	374	72.0
F	195	54.6	250	1,160
Fe	9,430	1.75	9,430	10,400
Hg	9.84	NR	9.84	1.85
K	212	47.3	259	81.1
La	18.5	1.75	20.2	0
Mn	4,040	0.35	4,040	0
Na	26,300	8,210	34,500	37,500
Ni	37.5	2.72	40.2	27.1
NO ₂	13,500	4,720	18,220	1,630
NO ₃	9,430	3,230	12,700	22,000
Pb	234	3.49	237	27.1
PO ₄	1,860	435	2,290	36,700
Si	1,920	3.62	1,920	1,060
SO ₄	3,890	1,370	5,260	1,520
Sr	72.1	0.35	72.5	0

Table D3-3. Estimated Inventory for Tank 241-T-105. (2 sheets)

Analyte	Sample-Based Solids Inventory (kg)	Sample-Based Supernatant Inventory (kg)	Total Sample-Based Inventory (kg)	HDW Model-Based Inventory ¹
TOC	1,890	NR	1,890	0
U	2,990	17.4	3,010	9,980
Zr	23.0	0.35	23.4	2.20
Radionuclides (Ci)^{2,3}				
⁹⁰ Sr	115,000	0	115,000	1,630
¹³⁷ Cs	13,300	0	13,300	1,860
¹³⁴ Cs	22.7	0	22.7	1.71E-04
²⁴¹ Am	99.7	0	99.7	0.0372
¹²⁵ Sb	274	0	274	0.00399
¹⁴ C	0.41	0	0.41	0.0169
⁶⁰ Co	15.7	0	15.7	0.00413
¹⁵⁴ Eu	737	0	737	0.0763
¹⁵⁵ Eu	869	0	869	0.443
²³⁸ Pu	0.100	0	0.100	0.106
²³⁹ Pu	54.8	0	54.8	24.9
²⁴⁰ Pu	2.06	0	2.06	1.68
⁹⁹ Tc	153	0	153	0.117
³ H	4.94	0	4.94	0.0811

Notes:

¹Agnew et al. (1997a)²Radionuclide values decayed to January 1, 1994.³Radionuclide sample results were obtained for 1993 core samples only.

Observations regarding these inventories are noted, by component, in the following text.

Bismuth. The sample-based inventory for bismuth was about half the value of the HDW model inventory. The HDW model inventory values are high because no R/CWR waste is predicted in the model.

Chromium. This sample-based inventory for chromium was about five times higher than the HDW model-based inventory because the HDW model assumes there is no R/CWR waste in

the tank and that no Cr precipitated in the 1C and 2C waste streams. Although CWR waste is expected to be low in Cr, R waste is much higher comparatively.

Iron. Relatively good agreement was observed between the sample-based iron inventory and HDW model-based inventory. This is somewhat surprising because no iron is expected in the CWR waste type except from corrosion. Higher corrosion than expected is a possible explanation for the comparable analytical value.

Aluminum. The sample-based aluminum inventory was about 20 times greater than that predicted by the HDW model. This is attributed to the large amount of R/CWR waste which was not predicted by the HDW model.

Manganese. The HDW model predicts no manganese in tank 241-T-105. Records do not indicate additions of Mn as part of the flowsheet. However, significant quantities of Mn were detected in the sample. The source may be waste from decontamination of equipment at T Plant using KMnO_4 . Agnew et al. (1997b) shows that decontamination waste was added to tank 241-T-105 in 1968 and 1969.

Sodium. Relatively good agreement was observed between the sample-based sodium inventory and the HDW model-based inventory. Sodium is expected at similar concentrations in the R/CWR waste and 1C/2C waste.

Silicon. The sample-based silicon inventory compares well with the HDW model. This is somewhat surprising because the HDW model does not predict any CWR waste in the tank, which is expected to have significant lower concentrations of Si.

Fluoride. The sample-based fluoride inventory was significantly lower than the HDW model-based inventory because the R/CWR waste types are expected to contain little or no fluoride.

Potassium. The sample-based inventory for potassium was about three times higher than the HDW model-based inventory. The HDW model shows K in the 1C defined waste. It is probably present as a contaminant from sodium hydroxide which was used to neutralize the acidic wastes. Analyses indicate the presence of K which provides substantive evidence that K entered the tank as a contaminant. In addition, Agnew et al. (1997b) indicates that K may have been added (as KMnO_4) from decontamination activities at T Plant.

Nitrate/Nitrite. The sample-based nitrate inventory is approximately one half that predicted by the HDW model. However, the sample-based nitrite inventory is significantly higher than predicted by the HDW model. When combined, the total nitrate and nitrite analytical inventories are slightly higher than the HDW model-based inventories.

Phosphate. The sample-based phosphate inventory was approximately 16 times lower than the HDW model-based inventory. A large inventory was predicted by the HDW because of the

high concentration of phosphate in the 1C/2C waste types. Little or no phosphate is expected in the R or CWR waste types which were not predicted by HDW model.

Sulfate. The HDW model-based inventory estimate is about three times lower than the sample-based inventory for sulfate. This was surprising because 1C and 2C waste is expected to contain higher concentrations of sulfate than R/CWR waste.

Hydroxide. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valence of other analytes. This charge balance approach is consistent with that used by Agnew et al. (1997a).

Strontium-90 and Cesium-137. The sample-based inventories for ^{90}Sr and ^{137}Cs were higher than HDW model-based inventories. This was expected because R/CWR waste (not predicted in the HDW model but considered present) contains much greater radioactivity than the 1C/2C waste.

Alpha isotopes. Sample data for plutonium isotopes corresponded relatively well with HDW model calculations. However, ^{241}Am was detected at significantly higher levels than predicted by the HDW model, and the combined sample values for plutonium and americium isotopes are not consistent with the average total alpha sample values. Data indicates the presence of higher levels of ^{241}Am than are reported in the HDW model, but the sample data is not as consistent for plutonium isotopes. Consequently, best-basis values were determined assuming ^{241}Am values are correct and calculating plutonium isotope inventories based on total alpha ratioed to plutonium isotope values in the HDW model.

D4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

Information about chemical, radiological, and/or physical properties is used to perform safety analyses, engineering evaluations, and risk assessments associated with waste management activities, as well as regulatory issues. These activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing them into a form that is suitable for long-term storage/disposal.

Chemical and radiological inventory information are generally derived using three approaches: 1) component inventories are estimated using the results of sample analyses; 2) component inventories are predicted using the HDW model based on process knowledge and historical information; or 3) a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material usage, and other operating data.

An effort is underway to provide waste inventory estimates that will serve as the standard characterization for management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available chemical information for tank 241-T-105 was performed including the following information:

- Data from core samples from tank 241-T-105 collected in 1997 and 1993
- Representative sample data for 1C and CW waste types (Kupfer et al. 1997)
- An inventory estimate generated by the HDW model (Agnew et al. 1997a).

The evaluation supports using the sample-based results as the best-basis inventory for this tank. Where sample results were not available, engineering evaluations based on sample results for other tanks containing 1C and CW waste (Kupfer et al. 1997) are used as the best basis. Where isotope-specific sample data is not available, the HDW model values, or a combination of sample results and HDW model values, are used to determine radionuclide inventories.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr , ^{137}Cs , $^{239/240}\text{Pu}$, and total uranium (or total beta and total alpha), while other key radionuclides such as ^{60}Co , ^{99}Tc , ^{129}I , ^{154}Eu , ^{155}Eu , and ^{241}Am , have been infrequently reported. For this reason, it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions. These computer models are described in Kupfer et al. 1997, Section 6.1, and in Watrous and Wootan 1997. Model generated values for radionuclides in any of 177 tanks are reported in Agnew et al. 1997b. The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result, if available.

Tables D4-1 and D4-2 show the best-basis inventory estimate for tank 241-T-105. Mercury values were specified in Simpson (1998). Radionuclide curie values are decayed to January 1, 1994.

The inventory values reported in Tables D4-1 and D4-2 are subject to change. Refer to the Tank Characterization Database (LMHC 1998) for the most current inventory values.

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-T-105 (Effective April 1, 1998).

Analyte	Total Inventory (kg)	Basis (S, M, C or E) ¹	Comment
Al	26,100	S	
Bi	3,350	S	
Ca	410	S	
Cl	208	S	
TIC as CO ₃	9,430	S	
Cr	374	S	
F	250	S	
Fe	9,430	S	
Hg	8.28	E	Per change package 7 (Simpson 1998)
K	259	S	
La	20.20	S	
Mn	4,040	S	
Na	34,500	S	
Ni	40.2	S	
NO ₂	18,220	S	
NO ₃	12,700	S	
OH _{TOTAL}	69,400	C	Charge balance spreadsheet
Pb	237	S	
PO ₄	2,290	S	ICP analysis
Si	1,920	S	
SO ₄	5,260	S	IC analysis
Sr	72.5	S	
TOC	1,890	S	
U _{TOTAL}	3,010	S	
Zr	23.4	S	

Note:

¹S = Sample-based (see Appendix B), M = HDW model-based, E = engineering assessment, and C = calculated by charge balance; includes oxides as hydroxides, not including CO₃, NO₂, NO₃, PO₄, SO₄, and SiO₃.

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-112. Decayed to January 1, 1994 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E) ¹	Comment
³ H	4.94	S	
¹⁴ C	0.41	S	
⁵⁹ Ni	0.00480	M	
⁶⁰ Co	15.7	S	
⁶³ Ni	0.435	M	
⁷⁹ Se	0.00357	M	
⁹⁰ Sr	115,000	S	
⁹⁰ Y	115,000	S	Based on ⁹⁰ Sr activity
⁹³ Zr	0.0169	M	
^{93m} Nb	0.0142	M	
⁹⁹ Tc	153	S	
¹⁰⁶ Ru	1.88E-09	M	
^{113m} Cd	0.0426	M	
¹²⁵ Sb	274	S	
¹²⁶ Sn	0.00538	M	
¹²⁹ I	2.22E-04	M	
¹³⁴ Cs	22.7	S	
¹³⁷ Cs	13,300	S	
^{137m} Ba	12,600	S	Based on 0.946 of ¹³⁷ Cs activity
¹⁵¹ Sm	13.2	M	
¹⁵² Eu	0.00586	M	
¹⁵⁴ Eu	737	S	
¹⁵⁵ Eu	869	S	
²²⁶ Ra	8.76E-07	M	
²²⁷ Ac	4.49E-06	M	
²²⁸ Ra	2.25E-11	M	
²²⁹ Th	4.37E-09	M	
²³¹ Pa	9.88E-06	M	
²³² Th	4.74E-12	M	
²³² U	2.29E-05	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-112.
Decayed to January 1, 1994 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E) ¹	Comment
²³³ U	1.06E-06	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁴ U	0.989	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁵ U	0.0437	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁶ U	0.00983	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁷ Np	7.28E-04	M	
²³⁸ Pu	0.422	S	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁸ U	1.01	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
²³⁹ Pu	99.1	S/M	Based on alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴⁰ Pu	6.68	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴¹ Am	99.7	S	
²⁴¹ Pu	10.6	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴² Cm	0.287	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴² Pu	4.41E-05	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴³ Am	7.07E-04	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴³ Cm	0.00588	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
²⁴⁴ Cm	0.0168	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes

Note:

¹S = sample-based (see Appendix B), M = HDW model-based (Agnew et al. 1997a), E = engineering assessment-based.

D5.0 APPENDIX D REFERENCES

- Anderson, J. D., 1990, *A History of the 200 Area Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.
- Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997a, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.
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APPENDIX E

BIBLIOGRAPHY FOR TANK 241-T-105

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APPENDIX E

BIBLIOGRAPHY FOR TANK 241-T-105

Appendix E provides a bibliography that supports the characterization of tank 241-T-105. This bibliography is an in-depth literature search of all known information sources that provide sampling, analysis, surveillance, and modeling information, as well as processing occurrences associated with tank 241-T-105 and its respective waste types.

The references in this bibliography are separated into three broad categories containing references broken down into subgroups. These categories and their subgroups are listed below.

I. NON-ANALYTICAL DATA

- Ia. Models/Waste Type Inventories/Campaign Information
- Ib. Fill History/Waste Transfer Records
- Ic. Surveillance/Tank Configuration
- Id. Sample Planning/Tank Prioritization
- Ie. Data Quality Objectives/Customers of Characterization Data

II. ANALYTICAL DATA - SAMPLING OF TANK WASTE AND WASTE TYPES

- IIa. Sampling of Tank 241-T-105
- IIb. Sampling of 1C, 2C, and CW Waste Types

III. COMBINED ANALYTICAL/NON-ANALYTICAL DATA

- IIIa. Inventories using Campaign and Analytical Information
- IIIb. Compendium of Existing Physical and Chemical Documented Data Sources

This bibliography is broken down into the appropriate sections of material to use, with an annotation at the end of each reference describing the information source. Where possible, a reference is provided for information sources. Most of the information listed below is available in the Lockheed Martin Hanford Corporation Tank Characterization and Safety Resource Center.

I. NON-ANALYTICAL DATA

Ia. Models/Waste Type Inventories/Campaign Information

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

- Contains single-shell tank fill history and primary campaign/waste type information to 1981.

Jungfleisch, F. M., and B. C. Simpson, 1993, *Preliminary Estimation of the Waste Inventories in Hanford Tanks Through 1980*, WHC-SD-WM-TI-057, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

- Contains a model based on process knowledge and radioactive decay estimations for different compositions of process waste streams assembled for total solutions and solids compositions per tank. Assumptions about waste/waste types and solubility parameters/constraints are also given.

Hodgson, K. M., and M. D. LeClair, 1996, *Work Plan for Defining a Standard Inventory Estimate for Wastes Stored in Hanford Site Underground Tanks*, WHC-SD-WM-WP-311, Rev. 1A, Lockheed Martin Hanford, Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Gives a plan for defining a standard inventory estimate for wastes stored in tanks at the Hanford Site.

Schneider, K. J., 1951, *Flow Sheet and Flow Diagrams of Precipitation Separations Process*, Drawing HW-23043, General Electric Company, Richland, Washington.

- Contains compositions of first cycle waste before its transfer to 200 East Area waste tanks.

Ib. Fill History/Waste Transfer Records

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Waste Status and Transaction Record Summary (WSTRS)* Rev. 4, LA-UR-97-311, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Contains spreadsheets showing all available data on tank additions and transfers.

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

- Contains single-shell tank fill history and primary campaign/waste type information up to 1981.

Ic. Surveillance/Tank Configuration

Alstad, A. T., 1993, *Riser Configuration Document for Single-Shell Waste Tanks*, WHC-SD-RE-TI-053, Rev. 9, Westinghouse Hanford Company, Richland, Washington.

- Shows tank riser locations in relation to tank aerial view and a description of the risers and their contents.

Bergmann, L. M., 1991, *Single-Shell Tank Isolation Safety Analysis Report*, WHC-SD-WM-SAR-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Contains safety analysis report on isolation of single-shell tanks.

Baumhardt, R. J., 1988, *Interim Isolation of Tanks 105-T, 109-T and 104-S*, (letter 8856251 to R. E. Gerton, October 12), Westinghouse Hanford Company, Richland, Washington.

- Documents interim isolation of tank 241-T-105 on September 30, 1988.

Lipnicki, J., 1996, *Waste Tank Risers Available for Sampling*, WHC-SD-WM-TI-710, Rev. 4, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Assesses riser locations for each tank; however not all tanks are included/completed. Includes estimate of what risers are available for sampling.

Tran, T. T., 1993, *Thermocouple Status Single-Shell and Double-Shell Waste Tanks*, WHC-SD-WM-TI-553, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains information about the status of thermocouples in Hanford Site tanks.

Welty, R. K., 1988, *Waste Storage Tank Status and Leak Detection Criteria*, WHC-SD-WM-TI-356, Vol. 2, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Describes the nature, scope, and frequency of surveillance employed for waste storage tanks, states action criteria for response to data deviations, and presents tank data reviews between June 15, 1973, and June 15, 1988. Also provides information on sample planning and tank prioritization.

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

- Provides an integrated approach to characterizing Hanford Site tank waste samples. The scope of this plan is defined by the characterization activities necessary for safely storing, maintaining, treating, and disposing onsite, or packaging for offsite disposal, all tank wastes.

Brown, T. M., J. W. Hunt, and L. J. Fergestrom, 1997, *Tank Characterization Technical Sampling Basis*, HNF-SD-WM-TA-164, Rev. 3, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Summarizes the technical basis for characterizing tank waste and assigns a priority number to each tank.

DOE-RL, 1996, *Recommendation 93-5 Implementation Plan*, DOE/RL-94-0001, Rev. 1, U.S. Department of Energy, Richland, Washington.

- Describes the organic solvents issue and other tank issues.

Field, J. G., 1997, *Tank 241-T-105 Push Mode Core Sampling and Analysis Plan*, HNF-SD-WM-TSAP-134, Rev. 0C, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains sampling and analysis requirements for tank 241-T-105 based on applicable DQOs.

Field, J. G., 1997, *Tank 241-T-105 Sample Analysis*, (internal memorandum 74620-97-213 to A. D. Rice, August 20), Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains changes and clarifications to the sampling and analysis plan for handling sodium crystals found in 1997 core samples.

Grimes, G. W., 1977, *Hanford Long-Term Defense High-Level Waste Management Program Waste Sampling and Characterization Plan*, RHO-CD-137, Rockwell Hanford Operations, Richland, Washington.

- Early characterization planning document.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*.

- Provides information regarding safety measures for waste stored in tanks at the Hanford Site.

Rich, H. S., and L. M. Sasaki, 1993, *Letter of Instruction for Physical Analysis of Single-Shell Tank 241-T-105 Core 57*, (letter 9355141 to A. G. King of Pacific Northwest Laboratory, June 21), Westinghouse Hanford Company, Richland, Washington.

- Provides instructions for the physical analyses of core 57 samples by the Pacific Northwest Laboratory 325 Laboratory.

Waldo, E. J., 1993, *Core Sampling Recovery Test Strategy*, WHC-SD-WM-TP-170, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains instructions for the core sampling recovery test.

Winkelman, W. D., M. R. Adams, T. M. Brown, J. W. Hunt, D. J. McCain, L. J. Fergestrom, 1997, *Fiscal Year 1997-1998 Waste Information Requirements Document*, HNF-SD-WM-PLN-126, Rev. 0A, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains *Hanford Federal Facility Agreement and Consent Order* requirement-driven TWRS Characterization Program information.

Winters, W. I., L. Jensen, L. M. Sasaki, R. L. Weiss, J. F. Keller, A. J. Schmidt, and M. G. Woodruff, 1989, *Waste Characterization Plan for the Hanford Site Single-Shell Tanks*, WHC-EP-0210, Westinghouse Hanford Company, Richland, Washington.

- Early version of characterization planning document.

Ie. Data Quality Objectives and Customers of Characterization Data

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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Meacham, J. E., D. L. Banning, M. R. Allen, and L. D. Muhlestein, 1997, *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue*, HNF-SD-WM-DQO-026, Rev. 0, DE&S Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains requirements for the organic solvents DQO.

Osborne, J. W., and L. L. Buckley, 1995, *Data Quality Objectives for Tank Hazardous Vapor Safety Screening*, WHC-SD-WM-DQO-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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Schreiber, R. D., 1997, *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements*, HNF-SD-WM-RD-060, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains requirements, methodology, and logic for analyses to support organic complexant issue resolution.

II. ANALYTICAL DATA - SAMPLING OF TANK WASTE AND WASTE TYPES

IIa. Sampling of Tank 241-T-105

Cromar, R. D., S. R. Wilmarth, and L. Jensen, 1994, *Statistical Characterization Report for Single-Shell Tank 241-T-105*, WHC-SD-WM-TI-653, Rev. 0 Westinghouse Hanford Company, Richland, Washington.

- Contains statistical characterization report for tank 241-T-105.

Esch, R. A., 1997, *Tank 241-T-105, Cores 205 and 207 Analytical Results for the Final Report*, HNF-SD-WM-DP-265, Rev. 0, Waste Management Federal Services of Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains laboratory results for 1997 push core sample analyses.

Giamberardini, K. K., 1993, *222-S Laboratories Single-Shell Tank Waste Characterization, Tank-T-105 Core 57 Data Package*, WHC-SD-WM-DP-040, Rev. 0B, Westinghouse Hanford Company, Richland, Washington.

- Contains data package for core 57.

Godfrey, W. L., 1965, *242-T Evaporator Feed*, (internal letter to S. J. Beard, September 24), General Electric Company, Richland, Washington.

- Contains 242-T Evaporator feed analytical results.

Herting, D. L., 1993, *Mass/Charge Balance for Tank T-105*, (internal memorandum 12110-PCL93-084 to K. L. Kocher, September 28), Westinghouse Hanford Company, Richland, Washington.

- Contains mass and charge balance for tank 241-T-105. The calculations are based on the 1993 sampling event.

Kocher, K. L., 1993, *WHC-222-S and PNL Laboratories Single-Shell Tank Waste Characterization, Tank T-105 Cores 53 and 54 Data Packages (Narrative) and Validation Summaries*, WHC-SD-WM-DP-047, Rev. 0B, Westinghouse Hanford Company, Richland, Washington.

- Contains data packages for the data from cores 53 and 54, obtained from tank 241-T-105 in 1993.

Sasaki, L. M., and H. S. Rich, 1993, *Letter of Instruction for Extrusion of Core Samples During Core Sampling Recovery Testing*, (internal memorandum 7K220-93-045 to J. G. Kristofzski, May 24), Westinghouse Hanford Company, Richland, Washington.

- Provides instructions to the 222-S Laboratory for extrusion of sample.

Sasaki, L. M., and H. S. Rich, 1993, *Letter of Instruction on Tank 241-T-105 Core 57 Analytical Requirements*, (internal memorandum 7K220-93-052 to J. G. Kristofzski, June 16), Westinghouse Hanford Company, Richland, Washington.

- Provides confirmation of sample being sent to 325 Laboratory.

Silvers, K. L., and L. M. Sasaki, 1993, *Letter of Instruction for Tank T-105 Analysis Priorities*, (internal memorandum 7K220-93-022 to K. L. Kocher, April 20), Westinghouse Hanford Company, Richland, Washington.

- Prioritizes the analyses of samples collected in 1993.

Wheeler, R. E., 1974, *Analysis of Tank Farm Samples Sample: T-4927, 105T*, Atlantic Richfield Hanford Company, Richland, Washington.

- Documents the analysis of sample T-4927.

IIb. Sampling of 1C, 2C, and CW Waste Types

Remund, K. M., J. M. Tingey, P. G. Heasler, J. J. Toth, F. M. Ryan, S. A. Hartley, and C. J. Benar, 1997, *Tank Characterization Report for Single-Shell Tank 241-B-111*, WHC-SD-WM-ER-549, Rev. 1A, Westinghouse Hanford Company, Richland, Washington.

- Provides characterization information and interprets the data from sampling events of tank 241-B-111. Typical example of 2C waste type.

III. COMBINED ANALYTICAL/NON-ANALYTICAL DATA

IIIa. Inventories from Campaign and Analytical Information

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Rev. 4*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Contains waste type summaries and primary chemical compound/analyte and radionuclide estimates for sludge, supernatant, and solids.

Allen, G. K., 1976, *Estimated Inventory of Chemicals Added to Underground Waste Tanks, 1944 - 1975*, ARH-CD-601B, Atlantic Richfield Hanford Company, Richland, Washington.

- Contains major components for waste types and some assumptions. Purchase records are used to estimate chemical inventories.

Allen, G. K., 1975, *Hanford Liquid Waste Inventory As Of September 30, 1974*, ARH-CD-229, Atlantic Richfield Hanford Company, Richland, Washington.

- Contains major components for waste types, and some assumptions.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Historical Tank Content Estimate for the Southwest Quadrant of the Hanford 200 Area*, WHC-SD-WM-ER-351, Rev. 1, Fluor Daniel Northwest, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains summary information from the supporting document as well as in-tank photograph collages and the solid composite inventory estimates Rev. 0 and Rev. 0A.

Schmittroth, F. A., 1995, *Consequence Ranking of Radionuclides in Hanford Tank Wastes*, WHC-SD-WM-RPT-163, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Contains radionuclide analyses for Hanford tanks.

IIIb. Compendium of Data from Other Documented Physical and Chemical Data Sources

Agnew, S. F., and J. G. Watkin, 1994, *Estimation of Limiting Solubilities for Ionic Species in Hanford Waste Tank Supernates*, LA-UR-94-3590, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Gives solubility ranges used for key chemical and radionuclide components based on supernatant sample analyses.

Brevick, C. H., L. A. Gaddis, and E. D. Johnson, 1996, *Tank Waste Source Term Inventory Validation, Vol I & II*, WHC-SD-WM-ER-400, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

- Contains a quick reference to sampling information in spreadsheet or graphical form for 23 chemicals and 11 radionuclides for all tanks.

Brevick, C. H., J. L. Stroup, and J. W. Funk, 1997, *Supporting Document for the Historical Tank Content Estimate for T Tank Farm*, WHC-SD-WM-ER-320, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains historical data and solid inventory estimates. The appendices contain the following information: Appendix C - Level History AutoCAD sketch; Appendix D - Temperature Graphs; Appendix E - Surface Level Graph; Appendix F- Tank Riser location; Appendix G - In-Tank Photographs.

Colton, N. G., 1996, *Status Report: Pretreatment Chemistry Evaluation-Wash and Leach Factors for the Single-Shell Tank Waste Inventory*, PNNL-1129, Pacific Northwest National Laboratory, Richland, Washington.

- Contains sludge wash data for all single-shell tanks evaluated since 1986.

De Lorenzo, D. S., A. T. Dicenso, D. B. Hiller, K. W. Johnson, J. H. Rutherford, D. J. Smith, and B. C. Simpson, 1994, *Tank Characterization Reference Guide*, WHC-SD-WM-648, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

- Provides a broad background of information relating to the characterization of Hanford Site tank wastes.

Dukelow, G. T., 1975, *Increasing Dry Well Radiation Levels Adjacent to Waste Tanks T-105 & T-108*, OR-75-02, Atlantic Richfield Hanford Company, Richland, Washington.

- Contains information about increased radiation in dry well 50-04/05-10.

Hanlon, B. M., 1998, *Waste Tank Summary Report for Month Ending February 28, 1998*, HNF-EP-0182-119, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

- Contains a monthly summary of the following: fill volumes, Watch List tanks, occurrences, integrity information, equipment readings, equipment status, tank location, and other miscellaneous tank information.

Hartley, S. A., G. Chen, C. A. Lopresti, T. A. Ferryman, A. M. Liebetrau, K. M. Remund, and S. A. Allen, 1996, *A Comparison of Historical Tank Contents Estimates (HTCE) Model, Rev. 3, and Sample Based Estimates*, PNNL-11429, Pacific Northwest National Laboratory, Richland, Washington.

- Contains a statistical evaluation of the HDW inventory estimate against analytical values from 12 existing TCR reports using a select component data set.

Husa, E. I., 1993, *Hanford Site Waste Storage Tank Information Notebook*, WHC-EP-0625, Westinghouse Hanford Company, Richland, Washington.

- Contains in-tank photographs and summaries on the tank description, leak detection system, and tank status.

Husa, E. I., 1995, *Hanford Waste Tank Preliminary Dryness Evaluation*, WHC-SD-WM-TI-703, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Assesses relative dryness between tanks.

Jensen, H. F., 1974, *Symptoms of Leakage from Liquid Level Drop and Dry Well Activity in Waste Tank T-105*, OR-74-108, Atlantic Richfield Hanford Company, Richland, Washington.

- Contains information about increased radiation in dry well 50-09-10.

Remund, K. M., and B. C. Simpson, 1996, *Hanford Waste Tank Grouping Study*, PNNL-11433, Pacific Northwest National Laboratory, Richland, Washington.

- Contains a statistical evaluation to group tasks into classes with similar waste properties.

Shelton, L. W., 1996, *Chemical and Radionuclide Inventory for Single- and Double-Shell Tanks*, (internal memorandum 74A20-96-30, to D. J. Washenfelter, February 28), Westinghouse Hanford Company, Richland, Washington.

- Contains an tank inventory estimate based on analytical information.

Shelton, L. W., 1995, *Chemical and Radionuclide Inventory for Single- and Double-Shell Tanks*, (internal memorandum 75520-95-007, to R. M. Orme, August 8), Westinghouse Hanford Company, Richland, Washington.

- Contains a tank inventory estimate based on analytical information.

Shelton, L. W., 1995, *Radionuclide Inventories for Single- and Double-Shell Tanks*, (internal memorandum 71320-95-002 to F. M. Cooney, February 14), Westinghouse Hanford Company, Richland, Washington.

- Contains a tank inventory estimate based on analytical information.

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