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ENGINEERING DATA TRANSMITTAL

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BD-7400-172-1R

Tank Characterization Report for Single-Shell Tank 241-U-102

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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-U-102. This report supports the requirements of the Tri-Party Agreement Milestone M-44-10.

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UC-2070

Tank Characterization Report for Single-Shell Tank 241-U-102

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CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TERMS

1C	first cycle decontamination waste
μCi/g	microcuries per gram
μCi/gal	microcuries per gallon
μCi/mL	microcuries per milliliter
μeq/g	microequivalents per gram
μg	microgram
μg C/g	micrograms carbon per gram
μg/g	micrograms per gram
ANOVA	analysis of variance
ASTM	American Society for Testing and Materials
BL	low-level waste from all B Plant operations
Btu/hr	British thermal units per hour
CF	concentration factor
Ci	curies
Ci/L	curies per liter
CI	confidence interval
cm	centimeter
CSR	waste from cesium recovery from supernatants
CWP1	PUREX waste with Al cladding, 1956-60
CWP2	PUREX waste with Al cladding, 1961-72

LIST OF TERMS (Continued)

CWR1	REDOX waste with Al cladding fuel, 1952-60
CWR2	REDOX waste with Al cladding fuel and some Zr fuel, 1961-72
DL	drainable liquid
DOE	U. S. Department of Energy
DQO	data quality objectives
DSC	differential scanning calorimetry
DW	decontamination waste
EB	evaporator bottoms
ft	feet
g	gram
g/cc	grams per cubic centimeter
GEA	gamma energy analysis
g/L	grams per liter
g/mL	grams per milliliter
HDW	Hanford defined waste
HTCE	historical tank content estimate
IC	ion chromatography
ICP	inductively coupled plasma spectroscopy
in.	inch
J/g	joules per gram
kg	kilogram
kgal	kilogallon
kL	kiloliter
L	liter
LANL	Los Alamos National Laboratory
LEL	lower explosive limit
LFL	lower flammability limit
LL	lower limit
m	meter
M	moles per liter
mg	milligrams
mm	millimeter
mR/hr	millirem per hour
MT	metric ton
MW	metal waste
n/a	not applicable
n/r	not reviewed
P1	PUREX waste, 1955-62
P2	PUREX waste, 1963-67
PF	partitioning factor
PHMC	Project Hanford Management Contractor

LIST OF TERMS (Continued)

PN	partially neutralized
ppm	parts per million
QC	quality control
R waste/sludge	REDOX waste/sludge
R1	REDOX waste generated 1952-57
RCW	REDOX process cladding waste
REDOX	reduction-oxidation
REML	restricted maximum likelihood
RPD	relative percent difference
RSD	relative standard deviation
RSltCk	saltcake from self-concentration in S and SX Farms
RSST	reactive system screening tool
S	analytically determined inventory
SACS	Surveillance Analysis Computer System
SAP	sampling and analysis plan
SMM	supernatant mixing model
SMMS2	SMM model saltcake waste generated from 242-S Evaporator/Crystallizer from 1977 until 1980
SMMT2	SMM model saltcake waste generated from 242-T Evaporator/Crystallizer from 1955 until 1965
SpG	specific gravity
T1SltCk	242-T Evaporator saltcake waste, 1951-56
TCP	tank characterization plan
TCR	tank characterization report
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TLM	tank layer model
TOC	total organic carbon
TRU	transuranic
TSAP	tank sampling and analysis plan
TWRS	Tank Waste Remediation System
UL	upper limit
UR	uranium recovery waste
W	watts
WSTRS	waste status and transaction record summary
wt%	weight percent

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1.0 INTRODUCTION

One of the major functions of the Tank Waste Remediation System (TWRS) is to characterize wastes in support of waste management and disposal activities at the Hanford Site. Analytical data from sampling and analysis, along with 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-U-102. The objectives of this report are: 1) to use characterization data in response to technical issues associated with 241-U-102 waste; and 2) to provide a standard characterization of this waste in terms of a best-basis inventory estimate. The response to technical issues is summarized in Section 2.0, and the best-basis inventory estimate is presented in Section 3.0. Recommendations regarding safety status and additional sampling needs are provided in Section 4.0. Supporting data and information are contained in the appendices. This report also supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1996) milestone M-44-10.

1.1 SCOPE

Characterization information presented in this report originated from sample analyses and known existing (historical) sources. While only the results of recent sample events will be used to fulfill the requirements of the data quality objectives (DQOs), other information can be used to support (or question) conclusions derived from these results. Historical information for tank 241-U-102, provided in Appendix A, included surveillance information, records pertaining to waste transfers and tank operations, and expected tank contents derived from a process knowledge model.

The recent sampling events listed in Table 1-1, as well as sample data obtained prior to 1989, are summarized in Appendix B along with the sampling results. The results of the 1996 core sampling events, also reported in the laboratory data package (Steen 1996a and 1996b, Hu and Steen 1996), satisfied the data requirements specified in the tank characterization plan (TCP) for this tank (Hu and Winkelman 1996). The statistical analysis and numerical manipulation of data used in issue resolution are reported in Appendix C. Appendix D contains the evaluation to establish the best-basis inventory estimate.
A bibliography that resulted from an in-depth literature search of all known information sources applicable to tank 241-U-102 and its respective waste types is contained in Appendix E. The reports listed in Appendix E may be found in the Tank Characterization Resource Center.

Table 1-1. Summary of Recent Sampling.

Sample/date	Phase	Location	Segmentation	Recovery
Vapor sample (5/1/96)	Gas	Tank headspace, Riser 19, 6 m (20 ft) below top of riser	n/a	Good
Push-Mode Sample Core 143 (4/16/1996 - 4/22/1996	Solid/ liquid	Riser 19	Analytical sample in half segment level; also includes core composite sample	Partial core (obtained 5.5 segments out of 7 expected segments)
Push-Mode Sample Core 144 (4/26/1996 - 4/30/1996)	Solid/ liquid	Riser 9	Analytical sample in half segment level; also includes core composite sample	Partial core (obtained 5.8 segments out of 7 expected segments)

1.2 TANK BACKGROUND

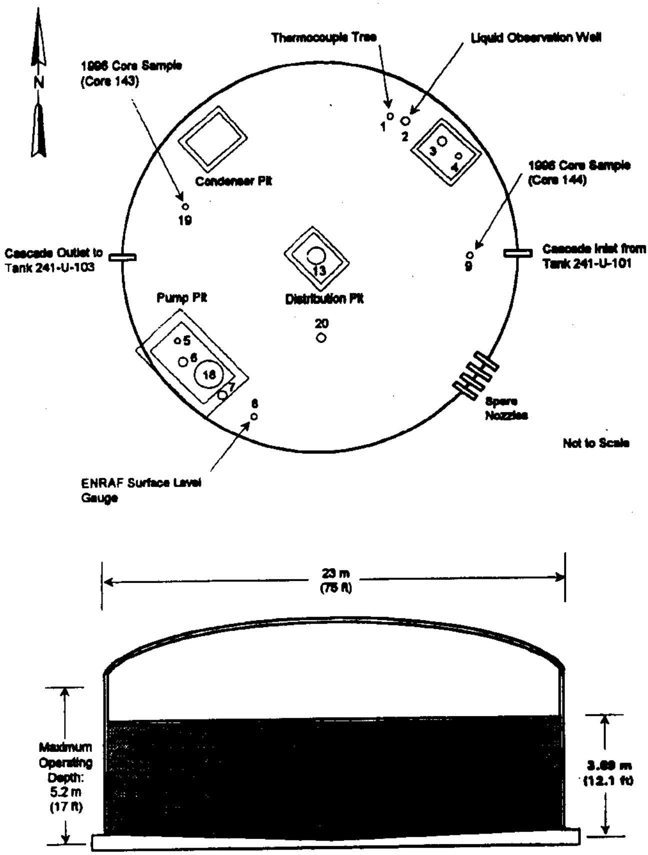
Tank 241-U-102 is a single-shell tank located in the U Tank Farm in the Hanford Site's 200 West Area. It is the second in a cascade series of three tanks that includes tanks 241-U-101 and 241-U-103. Tank 241-U-102 went into service in the second quarter of 1946, when metal waste began cascading into the tank. The tank was full by the first quarter of 1947, and waste began cascading into tank 241-U-103. The cascading continued in 1953 and 1954. Periodically between 1953 and 1957, metal waste was transferred from the tank to U Plant for uranium recovery. The tank was sluiced in the third quarter of 1955 and the fourth quarter of 1956. The heel was sluiced and the tank was declared empty during the first quarter of 1957. After the tank was declared empty, it began to receive reduction-oxidation (REDOX) waste. Other waste types received by the tank include supernatant and evaporator waste from various tanks, and a nitric acid/potassium permanganate solution waste from 242-S Evaporator neutralization operations. Tank 241-U-102 was declared inactive in 1979 and was partially isolated in 1982.

A description of tank 241-U-102 and its status are presented in Table 1-2 and Figure 1-1. The tank has an operating capacity of 2,006 kL (530 kgal), and presently contains an estimated 1,419 kL (375 kgal) of non-complexed waste. Of this total volume, 68 kL (18 kgal) is estimated to be supernatant, 163 kL (43 kgal) is predicted to be sludge, and 1,188 kL (314 kgal) is estimated to be saltcake (Hanlon 1996 and Appendix D).

Table 1-2. Description and Status of Tank 241-U-102.

TANK DESCRIPTION	
Type	Single-shell
Constructed	1943-1944
In-service	1946
Diameter	23.0 m (75.0 ft)
Operating depth	5.2 m (17 ft)
Capacity	2,006 kL (530 kgal)
Bottom shape	Dish
Ventilation	Passive
TANK STATUS	
Waste classification	Complexed
Total waste volume	1,419 kL (375 kgal)
Supernatant volume	68 kL (18 kgal)
Sludge volume	163 kL (43 kgal)
Saltcake volume	1,188 kL (314 kgal)
Waste surface level (7/3/96)	3.69 m (12.1 ft)
Temperature (7/87 - 12/96)	14.9 °C (58.8 °F) to 36 °C (96 °F)
Integrity	Sound
Watch List	None
SAMPLING DATES	
Core samples and tank headspace flammability	April/May 1996
SERVICE STATUS	
Declared inactive	1979
Partially isolated	December 1982

Figure 1-1. Description and Status of Tank 241-U-102.



Total Tank Volume:	2,006 kL (530 kgal)	Not to Scale
Waste Volume (May 1996):	1,419 kL (375 kgal)	
Sludge Volume (May 1996):	163 kL (43 kgal)	
Saltcake Volume (May 1996):	1,188 kL (314 kgal)	
Supernatant Volume (May 1996):	68 kL (18 kgal)	

2.0 RESPONSE TO TECHNICAL ISSUES

Several technical issues have been identified for tank 241-U-102 and summarized in *the Tank Waste Characterization Basis* (Brown et al. 1996). They are:

Safety screening:

- Does the waste pose or contribute to any recognized potential safety problems?

Organic complexants:

- Do the organic complexant salts in the tank exist in sufficient concentrations with nitrates and/or nitrites and at sufficiently high temperatures such that the organic complexants could support a propagating chemical reaction?

Vapor screening:

- Is there a potential for worker hazards associated with the toxicity of constituents in any fugitive vapor emissions from the tank?

Historical model evaluation:

- Is the predicted waste inventory, generated by a model based on process knowledge and historical information (Agnew et al. 1996), representative of the current tank waste inventory based on the analysis of the actual tank waste sample?

Waste compatibility:

- Are there safety or operational problems with the waste in tank U-102 that could inhibit the transfer of pumpable liquid from the tank into a double-shell receiver tank?

These issues can be evaluated through the data quality objective (DQO) process (Banning 1996), which provides a systematic planning tool for determining the type, quantity, and quality of data needed to support a decision. The available data quality objectives for the above issues are: *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995); *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue* (Turner et al. 1995); *Historical Model Evaluation Data Requirements* (Simpson and McCain 1996); and *Data Quality Objectives for the Tank Farms Waste Compatibility Program* (Fowler 1995).

Tank 241-U-102 Characterization Plan (TCP) (Hu and Winkelman 1996) and *Tank 241-U-102 Push Mode Core Sampling and Analysis Plan (TSAP)* (Hu 1996a and 1996b) integrate all applicable DQOs and provide the types of sampling and analysis used to collect information in order to address the above issues. Data from the recent analysis of two push-mode cores samples (Steen 1996a and 1996b; Hu and Steen 1996) and tank headspace flammability measurements based on the TSAP, as well as available historical information and modeling results, provided the means to respond to these issues. This response is detailed in the following sections. See Appendix B for sample and analysis data for tank 241-U-102.

A brief response to each of the technical issues listed above is given here:

- No flammable gas has been observed and no criticality condition identified. Two samples' differential scanning calorimetry (DSC) results exceeded the threshold limit of 480 J/g (Dukelow et al. 1995). Further investigation shows that both total organic carbon (TOC) and cyanide concentrations are well below the threshold limits, and reactive system screening tool (RSST) experiments show extremely weak exothermic reaction and no propagation.

- No TOC concentration result or one-sided 95 percent confidence interval upper limit exceeded the 3 wt% (dry weight basis) TOC limit, which led to the conclusion that insufficient fuel was present to support a propagating reaction according to the organic complexant safety DQO. Nevertheless, the segments with TOC concentrations higher than 1.5 wt% (dry weight basis) have a moisture content of at least 35 percent, which is well above the identified 17 wt% needed to prevent a possible propagating reaction.

- Vapor screening sampling has not been performed. Samples are scheduled to be taken in January 1997.

- Because of the hardness of the waste, no bottom sludge waste samples were collected by the push-mode core sampling method to compare with the "metal waste" layer identified by the tank layer model (TLM) (Agnew et al. 1996). The analytical results of core composite samples made from the collected partial core samples were used to compare with the concentration of supernatant mixing model (SMM) saltcake waste generated from the 242-S Evaporator/Crystallizer from 1977 until 1980 (SMMS2) and SMM saltcake waste generated from the 242-T Evaporator/Crystallizer from 1955 until 1965 (SMMT2). The SMMS2 and SMMT2 layers were generated from the SMM (Agnew et al. 1996).

- The average TOC wet concentrations are 12.4 and 17.8 g/L. These TOC results clearly reconfirm the preliminary classification of complexant waste for U-102 (Estey 1996). The transuranic (TRU) activities (with mean 0.0139 μCi/g) reported for these samples were very close to earlier reported values. Although less than 0.1 μCi/g, the activities are significantly higher than those typically experienced with non-complexant waste liquids. The reported inductively-coupled plasma spectoscopy (ICP) values seem consistent for a near-saturated salt solution with specific gravities reported in the range of 1.35 to 1.40.

2.1 SAFETY SCREENING

The data needed to screen the waste in tank 241-U-102 for potential safety problems is documented in *Tank Safety Screening Data Quality Objective*, Rev. 2 (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 of these conditions is addressed separately below. The safety screening DQO requires complete vertical profiles of the tank waste in order to perform the evaluation. Because of the hardness of the waste in the lower regions of the tank, full vertical profiles could not be obtained using this push mode core sampling; approximately the bottom 66 cm (26 in.) of waste below riser 19 and the bottom 61 cm (24 in.) below riser 9 could not be sampled. Thus, the following discussion is based on the analytical results from the obtained partial core segments.

2.1.1 Exothermic Conditions (Energetics)

The first requirement outlined in the safety screening DQO (Dukelow et al. 1995) is to ensure that insufficient exothermic constituents (organic or ferrocyanide) exist in tank 241-U-102 to cause a safety hazard. Because of this requirement, energetics in the tank 241-U-102 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 if the energetics exceed the safety threshold limit. The threshold limit for energetics is -480 J/g on a dry weight basis.

The DSC analyses revealed that nearly all samples displayed exothermic behavior. Two samples contained results that exceeded the safety screening notification threshold of -480 J/g; the mean dry weight result from the upper and lower half subsegment of segment two from core 143 had exotherms with enthalpy changes of -534.0 and -617.3 J/g (see Appendix C, Table C1-2), respectively. Because these samples exceeded the threshold, it was necessary to determine whether high TOC or high total cyanide concentrations were causing this higher exothermic behavior. The TOC concentration, adiabatic calorimetry testing, and energy equivalent calculation are discussed in Section 2.2, "Organic Complexant Safety." Because the ferrocyanide issue has been resolved and closed out (Cash 1996b), the following information will support this conclusion. Cyanide analysis was performed for samples that exceeded the DSC limit. The mean cyanide concentrations for these two samples were 30.1 and 21.0 μg/g using the EDTA addition and water distillation methods, respectively. This low concentration corresponds to less than 1 J/g equivalent energy and contributes insignificantly to the enthapy change observed.

2.1.2 Flammable Gas

Vapor phase measurements, taken in the tank headspace prior to the push-mode core sampling in May 1996, indicated that no flammable gas was detected (0 percent of the lower flammability limit). Data from these vapor phase measurements are presented in Appendix B.

2.1.3 Criticality

The potential for criticality can be assessed from the total alpha activity data. The safety screening DQO notification limit is 1 g/L (Dukelow et al. 1995). Because the laboratory reported total alpha activity in units of μCi/g, the 1-g/L threshold was converted to 32.7 μCi/g for the solids using the formula of 61.5 (μCi/mL)/solid density (g/mL). The limit for solids was conservatively based on the highest density value for a single sample, 1.88 g/mL. The analytical mean for the solid phase was 0.192 μCi/g. This result, and the one-sided 95 percent confidence interval upper limit, were well below the DQO limits for all samples. (See Appendix C, Table C1-1). Therefore, there are no criticality issue concerns.

2.2 ORGANIC COMPLEXANT SAFETY

Based on a tank's fuel and moisture concentrations, the *Organic Complexant Safety Data Quality Objective* (Turner et al. 1995) establishes a set of criteria to categorize the tank as safe, conditionally safe, or unsafe. The criteria are applied to tanks that have or potentially have organic complexant safety issues as mentioned in the beginning of this section. Tank 241-U-102 was recently added to the list of tanks with organic complexant issues (Cash 1996a). According to the organic complexant safety DQO, a minimum fuel concentration to support a propagating reaction is 3 wt% TOC on a dry-weight basis. This criterion can be evaluated by the analytical results of the TOC concentration or the exothermic energy (J/g).

For tank 241-U-102, as discussed earlier in the safety screening section, almost all the samples show exotherms. The dry weight basis TOC concentrations for all analyzed samples and one-sided 95 percent confidence interval upper limits were below this 3 wt% (or 30,000 μg/g) TOC limit. The highest dry weight basis TOC value is 23,600 μg/g and the highest one-sided 95 percent confidence interval upper limit is 27,700 μg/g (see Appendix C, Table C1-4). The exothermic energies for these values are -162 J/g and -189 J/g, respectively (see Appendix C, Table C1-2).

Segments 2 upper and lower half from core 143 have DSC values exceeding the -480-J/g DSC limit. The TOC values in dry-weight basis of these two samples are 15,100 and 16,300 μg C/g with one-sided 95 percent confidence interval upper limits of 19,200 and 22,300 μg C/g (see Appendix C), respectively. The moisture content for those two sample are 51 and 50 percent, respectively.

According to the organic DQO, the sample with greatest exothermic value is required to have adiabatic calorimetry testing. The highest DSC value observed was 624 J/g dry from segment 2, lower half of core 143. The RSST analysis was performed on this segment, and the result (Bechtold 1996) shows that there are very weak propagating reactions.

Based on the fuel concentration criteria and decision logic of the organic DQO, this tank does not have sufficient fuel to support a propagating reaction. Even though two samples exceeded the DSC limit, the TOC concentration is less than 3 wt% and the moisture content is well above 17 percent to prevent the propagating reaction if there is any. The RSST indicated a very weak exothermic reaction and no propagation. For the bottom REDOX sludge layer, no analytical data are available; however, it is expected to contain no organic fuel. This analysis shows that no organic complexant safety concerns exist for this tank.

An effort is underway, however, to perform organic speciation analyses for samples that show relatively high TOC concentrations (Reynolds 1996). This effort includes tank 241-U-102 segment 6, upper half of core 144 with TOC value of 23,600 μg/g (dry).

2.3 VAPOR SCREENING

The vapor screening sampling and analysis will address whether toxic constituents in any vapor emissions from the tank can cause worker hazards. Vapor screening of tank U-102 has been scheduled for January 1997, and the results will be incorporated in a future revision of this TCR.

2.4 HISTORICAL EVALUATION

The purpose of the historical evaluation is to determine whether the model, based on process knowledge and historical information (Agnew et al. 1995), predicts tank inventories that are in agreement with tank inventories based on sampling and analysis. If the historical model can be shown to accurately predict the waste characteristics as observed through sample characterization, there is a possibility that the amount of total sampling and analysis needed may be reduced. Data requirements for this evaluation are documented in *Historical Model Evaluation Data Requirements*, Rev. 1 (Simpson and McCain 1996). The DQO identifies tank 241-U-102 as spatially complicated in nature.

According to *Hanford Tank Chemical and Radionuclide Inventories: Hanford Defined Waste (HDW) Model, Rev. 3* (Agnew et al. 1996), the TLM identified a 163-kL (43-kgal) layer of metal waste sludge 28 cm (11 in.) thick in the bottom of the tank. Further investigation of the waste transfer record shows that this sludge layer is REDOX waste (see Appendix D). Because of the hardness of the waste, push-mode sampling equipment could not reach waste lower than 64 cm (25 in.) from the tank bottom. Thus, no comparison and gateway analysis between the analytical results and model prediction was made for this sludge layer. Further evaluation of the sludge layer will be made when the analytical results are available.

The SMM model identified the remainder of the waste as SMMS2 and SMMT2 evaporator bottoms saltcake waste and predicted the concentrations of the analytes in these concentrated supernatant wastes. Core composites sample were prepared to evaluate the predictions made in Agnew et al. (1996). As presented in the Appendix D, the comparisons between the core composite results and the historical predictions were favorable for anions, density, and weight percent water, and reasonable for many of the other analytes. It would appear that, at this level of evaluation, the predictions made in Agnew et al. (1996) are reasonably valid for a majority of the analytes.

2.5 WASTE COMPATIBILITY

In accordance with Fowler (1995), tank 241-U-102 (a single-shell tank) was analyzed to assess the safety and operational implications of commingling its supernatant waste with the waste in the double-shell tank systems, and to provide preliminary identification of the waste type. Safety considerations included energetics, criticality, flammable gas generation and accumulation, corrosion and leakage, and unwanted chemical reactions. Operational considerations included TRU segregation, heat load limits of the receiving tank, plugged pipelines and equipment, and complexant waste segregation. Not all of the operational considerations were within the scope of this report, notably the potential chemical reactivity of the waste in a variety of different situations, and the tendency of the waste to plug piping and equipment.

2.5.1 Safety Decision Rules Evaluation

Table 2-1 presents the analyses used to evaluate the waste in terms of the safety considerations for waste compatibility. The primary decision variable, the decision criteria threshold, and the supernatant analytical results from the 1996 core sampling event are listed for each safety issue.

The waste compatibility DQO decision criteria threshold specify that the absolute value of the exotherm/endotherm ratio must be < 1.0 for any transfer to be allowed. The analytical results for both supernatant samples were less than this limit, the highest ratio being 0.13 (Steen 1996b). Also, no organic layer was present in the waste. The potential for criticality is assessed through the waste compatibility DQO by establishing a decision threshold for plutonium at 0.013 g/L. This threshold converts to 0.800 μCi/mL (using the ^{239}Pu factor of 0.0615 Ci/g), as displayed in note 1 of Table 2-1. The analytical result of 8.18E-04 μCi/mL for $^{239/240}$Pu was well below this threshold.

The waste compatibility DQO flammable gas decision threshold requires the specific gravity of the source waste to be < 1.3 before any transfer is allowed. If this condition is not met, then the specific gravity weighted mean of the commingled wastes must be $\leq$ 1.41. The analytical result for the supernatant from tank 241-U-102 was 1.38.

The waste compatibility DQO also specifies three additional decision rules regarding safety. The first of these specifies several waste composition limits to control corrosion (Table 2-2). The corrosivity of the waste must be controlled to prolong the life of the tanks' carbon steel components. The limits for corrosion protection as stated in the waste compatibility DQO are based on the receiving tank temperature and the concentrations of corrosion-inhibiting chemicals such as sodium hydroxide and salts of nitrate and nitrite, which are added to the waste. The limits given in Table 2-1 apply to tanks with operating temperatures of ≤ 100 °C (212 °F).

The analytical results from the 1996 supernatant samples for nitrate, nitrite, and hydroxide all met the corrosion composition limits. The second decision rule states that no high-level waste will be accepted for transfer to a tank identified as a Watch List tank without U. S. Department of Energy approval. The final decision rule states that potential chemical compatibility hazards are to be identified prior to acceptance of waste into any double-shell tank, and the source wastes shall be categorized according to a compatibility matrix specified in Fowler (1995).

2.5.2 Operations Decision Rules Evaluation

The waste compatibility program requires a formal operations analysis of non-routine transfers before they are approved. Several criteria are applicable when evaluating the feasibility of a waste transfer between tanks: the segregation of TRU and non-TRU waste; avoiding excess heat generation; high-phosphate waste; complexant waste segregation; tank waste type; and waste pumpability. Three of these criteria are listed and compared to the analytical results in Table 2-2.

The first criterion listed called for the segregation of TRU from non-TRU elements in the waste. If the TRU concentration in the tank is ≥ 0.1 μCi/g, then the waste must be transferred to a TRU storage tank only. The mean analytical result of 0.0139 μCi/g, which was based on ^{241}Am and $^{239/240}$Pu data, was well below the TRU threshold, indicating that the waste may be transferred to a non-TRU tank.

Table 2-1. Safety Decision Variables and Criteria for the Waste Compatibility Data Quality Objective.

Safety Issue	Primary Decision Variable	Decision Criteria Threshold	Analytical Result
Energetics/ organic layer	Total fuel content/ organic layer	1.0 exotherm/endotherm ratio Presence of organic layer	< 1.0 for all ratios No organic layer
Criticality	$^{239/240}Pu$	0.800 μCi/mL[1]	8.18E-04 μCi/mL
Flammable gas accumulation	Waste density	SpG of source waste < 1.3; or SpG of commingled wastes $\leq$ 1.41	1.38
Corrosion[2]	Concentration of nitrate, hydroxide, and nitrite	$[NO_3^-] > 3.0$ <u>M</u>; and 0.3 <u>M</u> $\leq [OH^-] \leq$ 10.0 <u>M</u>; and $[OH^-] + [NO_2^-] \geq$ 1.2 <u>M</u>	$[NO_3^-]$ = 3.95 <u>M</u> $[OH^-]$ = 1.34 <u>M</u> $[NO_2^-]$ = 2.28 <u>M</u>

Notes:

[1]Although the actual decision criterion listed in the DQO was 0.013 g/L, $^{239/240}Pu$ was measured in μCi/mL. To convert the notification limit for $^{239/240}Pu$ into the same units as those used by the laboratory, it was assumed that all alpha decay originated from ^{239}Pu. Using the specific activity of ^{239}Pu (0.0615 Ci/g), the decision criterion may be converted to 0.800 μCi/mL as shown:

$$\left(\frac{0.013\ g}{L}\right)\left(\frac{1\ L}{10^3\ mL}\right)\left(\frac{0.0615\ Ci}{1\ g}\right)\left(\frac{10^6\ \mu Ci}{1\ Ci}\right) = 0.800\ \frac{\mu Ci}{mL}.$$

[2]These criteria apply for receiving tank operating temperatures of $\leq$ 100 °C (212 °F). Strictly speaking, the waste compatibility DQO only specifies waste composition limits for double-shell tanks. Therefore, these comparisons are made for informational purposes only.

Table 2-2. Waste Compatibility Operations Decision Rules.

Operations Issue	Primary Decision Variable	Decision Criteria Threshold	Supernatant Mean Analytical Result
Transuranics	TRU elements: (^{241}Am), ($^{239/240}Pu$)	0.1 μCi/g (TRU)	0.0139 μCi/g[1]
Heat load	Heat generation rate	11,700 W (40,000 Btu/hr)	113 W (386 Btu/hr)
High-phosphate waste	(PO_4^{-3})	0.1 <u>M</u> (PO_4^{-3})	0.0401 <u>M</u>

Note:

[1]The analytical mean results of 8.18E-04 μCi/mL for $^{239/240}Pu$ and 0.0183 μCi/mL for ^{241}Am were converted to 5.93E-04 μCi/g and 0.0133 μCi/g, respectively, by dividing by the supernatant density of 1.38 g/mL.

The heat generation threshold depends on the operating specification document limit for a given tank. The heat generation limit for tank 241-U-102 was 11,700 W (40,000 Btu/hr) (Smith 1986). The estimated supernatant heat load based on the analytical results was 113 W (386 Btu/hr), far below this limit.

High-phosphate waste, defined as > 0.1 M, is not to be mixed with defined concentrations of certain other waste types. If mixed with high nitrate-salt-content waste, it can cause crystallization, resulting in plugged pumps and equipment that make future waste handling difficult. Because the phosphate concentration of tank 241-U-102 was 0.0401 M, this issue was not a concern.

The last three operations issues are not comparable to analytical results, and are thus outside the scope of this report. They are mentioned for informational purposes only. The first of these is that if a source waste stream is designated as complexant, then any waste transfer must be to a complexant waste receiver tank. Second, the tank waste types have been preliminarily categorized as complexant waste because the TOC exceeds the criteria of 10 g/L according to a compatibility matrix; the final waste type confirmation is based on the boildown test. All transfers must be in accordance with this matrix. Finally, the inputs to the waste pumpability issue are density, viscosity, and volume percent solids, along with the pipe diameter and pump velocity (Fowler 1995).

2.6 OTHER TECHNICAL ISSUES

A factor in assessing tank safety is the heat generation from radioactive decay and the resultant temperature increase of the waste. The heat value was calculated using the data from the 1996 sampling effort (Steen 1996b) to be 2,340 W (8,000 Btu/hr). The Agnew et al. (1996) estimate of heat load was 2,630 W (8,990 Btu/hr), and the estimate by Kummerer (1995) was 1,670 W (5,701 Btu/hr). All of these estimates are well below the 11,700-W (40,000-Btu/hr) threshold differentiating high-heat from low-heat tanks (Smith 1986). The concentrations and projected inventories of the two primary contributors to tank heat load are presented in Table 2-3. The available average tank temperatures trended down from 35.5 °C (96 °F) to 27 °C (81 °F) (see Figure A4-2) from January 1987 to date.

2.7 SUMMARY

All analyses performed to address potential safety issues showed that no primary analyte exceeded safety decision threshold limits, except for two subsamples that were above the DSC threshold limit of -480 J/g. The followup secondary analyses for these two samples (for TOC concentration and cyanide concentration) are well below the limit. The RSST analysis also shows a weak exothermic reaction and no propagation. For the waste compatibility issue, none of the analysis results were above the criteria of safety consideration and the waste was confirmed as complexant waste. Unfortunately, no waste was available for the bottom sludge layer comparison. However, the SMM model prediction of the constituent concentration for the SMMT2 and SMMS2 layers is reasonably good when compared with the analytical results. The evaluation results of tank 241-U-102 technical issues are summarized in Table 2-4.

Table 2-3. Tank 241-U-102 Projected Heat Load.

Radionuclide	Heat generation rate	Inventory	Heat load
Solids	**W/Ci**	**Ci**	**W**
^{137}Cs	0.00472[1]	3.42E+05	1,610
^{90}Sr	0.00669[2]	91,400	611
Supernatant	**μCi/mL**	**Ci**	**W**
^{137}Cs	0.00472[1]	23,100	109
^{90}Sr	0.00669[2]	600	4
Total			2,334 W

Notes:

[1]For $^{137}Cs/^{137}Ba$ (Kirkpatrick and Brown 1984)

[2]For $^{90}Sr/^{90}Y$ (Kirkpatrick and Brown 1984)

Table 2-4. Evaluation Results of Tank 241-U-102 Technical Issues.

Issue	Sub-issue	Result
Safety screening	Energetics	Two samples exceeded the DSC threshold limit of 480 J/g dry weight.
	Flammable gas	Vapor measurement reported at 0 percent of lower flammability limit (combustible gas meter).
	Criticality	All analyses and one-sided 95 percent confidence interval upper limits were well below the total alpha limit of 32.7 μCi/g for solids.
Organic complexant	Fuel concentration	No sample exceeded the TOC concentration threshold of 3 wt% dry weight. Conclusion: insufficient fuel to support propagating reaction.
	Moisture content	Moisture content is at least 35 wt% for the segments that have TOC concentrations higher than 1.5 wt%.
Historical (gateway analysis)	Because of the waste's hardness, no sample of the TLM model metal waste layer was collected for a gateway analysis. Analytical results of core composite samples were compared with the concentrated waste identified in SMM model.	
Waste compatibility	Based on the supernatant analysis results, none of the results were above the criteria of safety consideration. The waste in the tank was confirmed preliminarily to be "complexant waste."	
Vapor sampling	Sampling and analysis have not been performed.	

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 that is suitable for long-term storage. 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 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. Not surprisingly, the information derived from these different approaches is often inconsistent.

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various tank waste management activities (Hodgson and LeClair 1996). As part of this effort, the following evaluation provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-U-102.

Available tank waste information for tank 241-U-102 included:

- Data from two push-mode core samples that were collected in 1996 (see Appendix B for data). The core samples provided incomplete core recovery. Only the top 80 percent (about 269 cm [106 in.]) of waste was sampled.

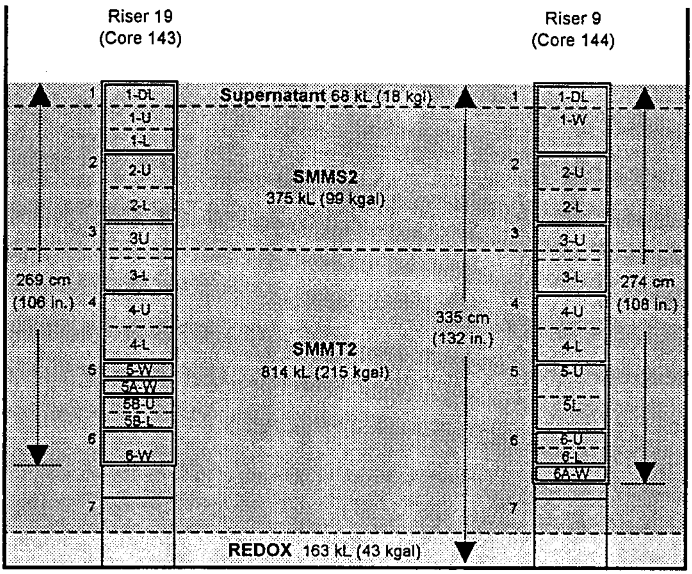
- The inventory estimate for this tank generated from the Hanford Defined Waste (HDW) model (Agnew et al. 1996). See Appendix A, Section A3.2, for the model estimate.

- The analytical data from tanks 241-S-101 (Kruger et al. 1996), 241-S-104 (DiCenso et al. 1994) and 241-S-107 (Simpson et al. 1996) were used for the composition estimates of reduction and oxidation (REDOX) process waste.

To derive a best-basis inventory for tank 241-U-102, the evaluation of tank waste information for the tank was performed (see Appendix D for detail) that included the following:

- A model was established to calculate a standard inventory (see Figure 3-1). It contains the top 1,257 kL (331 kgal) of evaporator concentrated saltcake waste with a mass basis of 1.98E+09 g for solid and 1.7E+07 mL for liquid, and the bottom 164 kL (43 kgal) of REDOX waste with a mass basis of 1.7E+09 g for the sludge. In the HDW model this saltcake layer was separated into SMMS2 and SMMT2 layers.

Figure 3-1 Tank 241-U-102 Inventory Profile



Note: 1. Every full segment is 48 cm (19 in.). Due to waste hardness, partial segments were collected starting from the location of segment 5 on core 143 and the location of segment 6 on core 144.
2. HDW model's SMMS2 and SMMT2 layers cannot be differentiated using analytical data.

HDW Model (Agnew et al. 1996)

- Evaporator Concentrates 1257 kL (332 kgal) (89%)
- REDOX Sludge 163 kL (43 kgal) (11%)

Extrusion Results

- Obtained sample segment from 1996 core sampling
- Segment not available
- 1-DL: Segment 1, drainable liquid sample
- 1-W: Segment 1, whole solid sample
- 5B-U: Segment 5B, upper half solid sample
- 6-L: Segment 6, lower half solid sample

- The waste transaction record was reviewed. Analysis suggests that the waste type comprising the bottom sludge layer is REDOX instead of metal waste as reported in Agnew's model.

- The tank waste volume was determined by examining the waste level measurements from several risers, waste transfer history, and in-tank photos. The data suggested that the waste volume was consistent with the number stated in Hanlon (1996). This assessment indicates the waste level does not significantly vary throughout the tank.

- The analytical data from two 1996 push-mode core samples of tank 241-U-102 (see Appendix B, Section B2.0) were evaluated. This partial core sample (80 percent of the full core profile) provides analytical results. These sample data correspond to the SMMS2 and SMMT2 saltcake layers described in Agnew's HDW model. No stratification was observed, in terms of sample appearance and assessment of the analytical results at the subsegment level.

- Both the analytical results and the HDW model were reviewed to derive a saltcake layer composition and inventory. An evaluation of analytical results against SMM model predictions was performed, and a comparison of SMMS2 layer between tank 241-U-102 and four other tanks was performed.

- Comparisons with the R sludge concentrations from tank 241-S-101, 241-S-104, 241-S-107 were made to derive a sludge layer composition and inventory. These results were also evaluated against the HDW composition for REDOX waste (R1, R2 and CWR). The average of the analytical results of REDOX waste from these tanks was used to construct the bottom sludge layer composition.

Based on this evaluation, a best-basis total inventory of tank 241-U-102 was developed by adding the evaporator concentrated saltcake inventory (in Appendix D, Table D2-2) and REDOX sludge inventory (in Appendix D, Table D2-3). The non-radioactive component inventory are listed in Table 3-1, and and Table 3-2 contains the radioactive component inventory.

In summary, this evaluation shows that the tank 241-U-102 analytical results for evaporator concentrates (saltcake) are similar to the saltcake wastes sampled and analyzed from other tanks with similar process histories. It also shows the analytical results are in reasonable agreement with the SMM model (Agnew et al. 1996) prediction. From comparison of the data, the saltcakes (SMMS2 and SMMT2) in the HDW model resemble each other. For the REDOX sludge layer, the projected inventory was derived from the analytical results of tanks 241-S-101, 241-S-104 and 241-S-107. The analytical results of REDOX waste in these tanks are consistent and close to one another. However, the REDOX analytical results do not agree with the HDW model's REDOX waste composition.

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102.

Analyte	Total inventory (kg)	Basis[1]	Comment
Al	65,200	E	More than half of Al comes from REDOX sludge
B	176	E	
Ca	680	E	
Cl	9,550	E	
TIC	98,380	E	
Cr	5,980	E	
Fe	1,440	E	
K	3,410	E	
Mn	808	E	
Na	5.61E+05	E	
Ni	193	E	
P	7,910	E	
Pb	148	E	
S	10,700	E	
NO_2	1.07E+05	E	
NO_3	6.61+05	E	
Pb	148	E	
PO_4	24,900	E	
Si	694	E	
SO_4	30,000	E	
TOC	17,100	E	
TIC	98,380	E	
Zn	66.5	E	
Zr	26.3	E	

Notes:

[1]E = Engineering assessment-based

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102.

Analyte	Total inventory (Ci)	Basis[1]	Comment
^{90}Sr	1.6E+05	E	
^{137}Cs	3.18E+05	E	

Notes:

[1]E = Engineering assessment-based

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

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4.0 SUMMARY AND RECOMMENDATIONS

The waste in tank 241-U-102 was core sampled in April and May 1996. The solids were analyzed in accordance with the safety screening, organic, and historical DQOs, and the drainable liquid was analyzed in accordance with the safety screening, organic, and waste compatibility DQOs. Furthermore, a characterization best-basis inventory was developed for the tank contents.

Regarding the safety evaluation, comparisons were made between the analytical results and the decision criteria thresholds listed in the safety screening and organic DQOs. Two samples contained exothermic reactions with changes in enthalpy above the DQO limit of -480 J/g dry weight. The mean dry weight DSC result for the upper and lower half subsegment of segment two of core 143 were -534.0 and -617.3 J/g dry weight. The moisture contents of these samples were 50.82 and 49.72 wt%, respectively, and the dry TOC concentrations are 15,100 and 16,300 μg C/g, respectively. The RSST test showed weak exothermic reaction and no propagation. Three subsegments had thermogravimetric analysis (TGA) results below the 17 wt% specified by the organic DQO. However, none of these subsegments contained exothermic reactions with changes in enthalpy greater than the -480 J/g dry weight limit. Another six subsegments had 95 percent confidence interval lower limits below 17 percent. None of these samples exhibited exothermic reactions or the upper limit to one-sided 95 percent confidence interval on the mean exceeding the safety screening limit. The organic DQO decision threshold for TOC concentration is 3 wt%, or 30,000 μg C/g dry weight. All TOC results, on a dry weight basis, were below the limit. Cyanide was analyzed on the two subsegments that displayed the high exothermic reactions. The overall cyanide mean of 30.1 μg/g was far below the limit of 39,000 μg/g. This result is consistent with the waste transaction record, which shows no evidence that this tank collects cyanide-containing compound.

The remaining requirements of the safety screening DQO were satisfied. The total alpha activity mean was 0.192 μCi/g for the solids. The single highest one-sided 95 percent confidence interval upper limit was 0.697 μCi/g, far below the decision threshold of 32.7 μCi/g (solids). The decision threshold for flammable gas concentration is 25 percent of the LFL. Combustible gas meter readings registered 0 percent of the LFL.

Based on analytical results, the estimated tank heat load was 2,340 W (8,000 Btu/hr). The Agnew et al. (1996) estimate of the tank heat load was 2,630 W (8,990 Btu/hr), and the estimate based on the headspace temperature was 1,670 W (5,701 Btu/hr) (Kummerer 1995). All three estimates were below the 11,700-W (40,000-Btu/hr) high-heat threshold (Smith 1986).

The historical DQO attempts to quantify the errors associated with predicting tank waste composition based on waste transaction history and waste type compositions. According to the transaction record (Agnew et al. 1995), a sludge layer was predicted to be present in the bottom 28 cm (11 in.) of the tank. Unfortunately, because of the hardness of the waste, no sample was collected from this region of waste in the tank. The historical DQO gateway analysis was not performed. However, the SMM model prediction for the SMM layer was evaluated by comparing the core composite means with the concentration estimates provided in Agnew et al. (1996). The comparison gave varying results; the means for anions, density, and weight percent water agreed well. Generally, reasonable agreement was found for the remaining analytes.

The waste compatibility DQO has several safety criteria that pertain to the mixing of wastes transferred from different sources. The requirements regarding the exotherm/endotherm ratio, criticality, and corrosion limits were all satisfactorily met. The flammable gas accumulation decision threshold to transfer waste to a double-shell tank required the specific gravity of the source waste to be less than 1.3, or the weighted mean of the commingled wastes to be less than or equal to 1.41. The analytical mean result for tank 241-U-102 was 1.38.

The waste compatibility DQO also requires an operations analysis of non-routine transfers before they are approved, and several decision criteria apply. The analytical mean for TRU elements was below the decision threshold, allowing the waste to be transferred to a non-TRU tank. The heat load level was well below the tank operation specification limit, and the phosphate concentration was below the level that would cause crystallization and plugging of equipment. Three other operations were not comparable to analytical data, and were thus beyond the scope of this report.

Table 4-1 summarizes the status of Project Hanford Management Contractor (PHMC) TWRS Program Office review and acceptance of the sampling and analysis results reported in this tank characterization report. All DQO issues required to be addressed by sampling and analysis are listed in column one of Table 4-1. The second column indicates whether the requirements of the DQO were met by the sampling and analysis activities performed and is answered with a "yes" or a "no." The third column indicates concurrence and acceptance by the program in TWRS that is responsible for the DQO that the sampling and analysis activities performed adequately meet the needs of the DQO. A "yes" or "no" in column three indicates acceptance or disapproval of the sampling and analysis information presented in the TCR. If the results/information have not yet been reviewed, "n/r" is shown in the column. If the results/information have been reviewed, but acceptance or disapproval has not been decided, "n/d" is shown in the column.

Table 4-1. Acceptance of Tank 241-U-102 Sampling and Analysis.

Issue	Evaluation Performed	PHMC TWRS Program Office Acceptance
Safety screening DQO	Partial	Partial
Organic complexant DQO	Partial	Partial
Historical evaluation DQO	Partial	Partial
Waste compatibility DQO	Complete	Yes
Vapor screening	No	n/a

Because of the hardness of the waste, this push-mode core sampling could reach the waste no further than roughly 66 cm (26 in.) and 61 cm (24 in.) from the tank bottom for core 143 and 144, respectively. Consequently, this sampling event did not meet the safety screening DQO criteria for two full vertical profile samples, and the full evaluation could not be completed for the organic complexant safety and historical DQOs. According to the waste transaction record and HDW Model (Agnew et al. 1995 and 1996), the bottom 28 cm (11 in.) of waste is expected to be a REDOX sludge layer, and the rest of the 61-cm (24-in.) depth of unsampled segments is expected to be similar to the collected evaporator concentrates waste.

Table 4-2 summarizes the status of TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. The evaluations specifically outlined in this report are the gateway analysis and the evaluation to determine whether the tank is safe, conditionally safe, or unsafe. Column one lists the different evaluations performed in this report. Columns two and three are in the same format as Table 4-1. The manner in which concurrence and acceptance are summarized is also the same as that in Table 4-1. The safety categorization of the tank is listed as "partial" in Table 4-2 because the full depth of the waste was not sampled. However, none of the analyses performed on the push mode core samples indicate any safety problems.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-U-102.

Issue	Evaluation Performed	PHMC TWRS Program Office Acceptance
Historical "gateway" analysis	No	No
Core composite sample comparison	Yes	n/r
Waste type classification	Yes	Yes
Safety categorization (tank is safe)	No	Partial

Note:
n/r = Not reviewed

Overall, the available samples, historical data information, and evaluation of the current analytical results on the various DQOs give no indications that the tank's status is unsafe according to the safety screening DQO. Resampling of tank 241-U-102 using rotary mode sampling has been recommended in order to obtain the two full-depth profiles required by the safety screening DQO (Hu and Steen 1996). Further evaluation of the information available on tank 241-U-102 is recommended to determine if additional samples are needed to categorize the tank as "safe."

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5.0 REFERENCES

Agnew, S. F., R. A. Corbin, T. B. Duran, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1995, *Waste Status and Transaction Record Summary for the Southwest Quadrant*, WHC-SD-WM-TI-614, Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1996, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 3*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Banning, D. L., 1996, *Data Quality Objective Procedure*, WHC-IP-1216, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Bechtold, D. B., 1996, *RSST Adiabatic Calorimetry of U-102 Sludge Sample* (internal memorandum 75764-PCS96-092 to F. H. Steen, September 16), Westinghouse Hanford Company, Richland, Washington.

Brown, T. M., S. J. Eberlein, J. W. Hunt, and T. J. Kunthara, 1996, *Tank Waste Characterization Basis*, WHC-SD-WM-TA-164, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Cash, R. J., 1996a, *Scope Increase of "Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue", Rev. 2* (internal memorandum 79300-96-029 to S. J. Eberlein, July 12), Westinghouse Hanford Company, Richland, Washington.

Cash, R. J., 1996b, *Cancelation of Ferrocyanide DQO Requirement*, (internal memorandum 79300-96-031 to S. J. Eberlein, July 22), Westinghouse Hanford Company, Richland, Washington.

DiCenso, A. T., L. C. Amato, J. D. Franklin, G. L. Nuttall, K. W. Johnson, P. Sathyanarayana, and B. C. Simpson, 1994, *Tank Characterization Report for Single-Shell Tank 241-S-104,* WHC-SD-WM-ER-370, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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.

Ecology, EPA, and DOE, 1996, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Estey, S. D., 1996, *Organic and TRU Screening for 200 West Area SST Interim Stabilization Activities*, WHC-SD-WM-TI-722, Rev. 0., Westinghouse Hanford Company, Richland, Washington.

Fowler, K. D., 1995, *Data Quality Objectives for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. M., 1996, *Waste Tank Summary Report for Month Ending September 30, 1996*, WHC-EP-0182-101, Westinghouse Hanford Company, Richland, Washington.

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. 1, Lockheed Martin Hanford Corporation, Richland, Washington.

Hu, T. A., 1996a, *Tank 241-U-102 Push Mode Core Sampling and Analysis Plan*, WHC-SD-WM-TSAP-082, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hu, T. A., 1996b, *Compatibility Grab Sampling and Analysis Plan*, WHC-SD-WM-TSAP-037, Rev. 1-E, Westinghouse Hanford Company, Richland, Washington.

Hu, T. A., and F. H. Steen, 1996, *45-Day Safety Screening Report for Tank 241-U-102, Push Mode Cores 143 and 144*, WHC-SD-WM-DP-189, Rev. 0-A, Westinghouse Hanford Company, Richland, Washington.

Hu, T. A., and W. D. Winkelman, 1996, *Tank 241-U-102 Tank Characterization Plan*, WHC-SD-WM-TP-451, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Kirkpatrick, T. D., and R. C. Brown, 1984, *Basis and Values for Specific Activity and Decay Heat Generation Rates for Selected Radionuclide*, RHO-SD-RE-TI-131, Rev. 0, Rockwell Hanford Operations, Richland, Washington.

Kruger, A. A., B. J. Morris, and F. J. Fergestrom, 1996, *Tank Characterization Report for Single-Shell Tank 241-S-101*, WHC-SD-WM-ER-613, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Kummerer, M., 1995, *Topical Report on Heat Removal Characteristics of Waste Storage Tanks*, WHC-SD-WM-SARR-010, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Reynolds, D. A., 1996, *Samples to Ship to PNNL for Organic Speciation* (internal letter 74A30-96-047 to K. M. Hall, October 28), Lockheed Martin Hanford Corporation, Richland, Washington.

Simpson, B. C., and D. J. McCain, 1996, *Historical Model Evaluation Data Requirements*, WHC-SD-WM-DQO-018, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Simpson, B. C., J. G. Field, D. W. Engel and D. S. Daly, 1996, *Tank Characterization Report for Single-Shell Tank 241-S-107*, WHC-SD-WM-ER-589, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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

Steen, F. H., 1996a, *45-Day Safety Screening Results for Tank 241-U-102, Push Mode Cores 143 and 144*, WHC-SD-WM-DP-189, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Steen, F. H., 1996b, *Final Report for Tank 241-U-102, Cores 143 and 144*, WHC-SD-WM-DP-189, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Turner, D. A., H. Babad, L. L. Buckley, and J. E. Meacham, 1995, *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue*, WHC-SD-WM-DQO-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

HISTORICAL TANK INFORMATION

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APPENDIX A

HISTORICAL TANK INFORMATION

Appendix A describes tank 241-U-102 based on historical information. For this report, historical information includes any information about the tank's fill history, waste types, surveillance, or modeling data. This information is necessary to provide a balanced assessment of the sampling and analytical results.

This appendix contains the following information:

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

All previous sampling results are given in Appendix B.

A1.0 CURRENT TANK STATUS

According to the current waste compatibility study, the waste was classified as complexed waste. As of August 31, 1996, tank 241-U-102 contained an estimated 1,419 kL (375 kgal) of waste (Table A1-1). The liquid part of this waste was classified as complexed. The solid and liquid waste volumes are estimated using a combination of a photographic evaluation and a manual tape. Detailed waste volume information is given in Appendix D, Section D1.0.

Tank 241-U-102 was declared inactive in 1979 (Anderson 1990) and was partially isolated in December 1982 (Brevick et al. 1994). The tank is not on a Watch List, is considered sound, and is passively ventilated. All monitoring systems were in compliance with documented standards as of August 31, 1996 (Hanlon 1996).

Table A1-1. Estimated Tank Contents.

Waste Form	Estimated Volume	
	kL	kgal
Supernatant liquid	68	18
Sludge	163	43
Saltcake	1,188	314
Total waste	1,419	375
Interstitial liquid	477	126
Drainable liquid remaining	545	144
Pumpable liquid remaining	606	160

Note:
For definitions and calculation methods refer to Appendix C of Hanlon (1996).

A2.0 TANK DESIGN AND BACKGROUND

The 241-U Tank Farm was constructed during 1943 and 1944 in the 200 West Area. The farm contains twelve 100 series tanks and four 200 series tanks. The 100 series tanks have a capacity of 2,006 kL (530 kgal), and a diameter of 23 m (75 ft) (Leach and Stahl 1996).

The 241-U Tank Farm was designed for nonboiling waste with a maximum fluid temperature of 104 °C (220 °F). A cascade overflow line 76 mm (3 in.) in diameter connects tank 241-U-102 as second in a cascade series of three tanks beginning with tank 241-U-101 and finishing with 241-U-103. Each tank in the cascade series is set 305 mm (1 ft) lower in elevation from the preceding tank. The cascade overflow height is approximately 4.9 m (16 ft) from the tank bottom and 600 mm (2 ft) below the top of the steel liner.

The tank has a dished bottom with a 1.2-m (4-ft) radius knuckle. Tank 241-U-102 was designed with a primary mild steel liner (ASTM A283 Grade C) and a concrete dome with various risers. The tank is set on a reinforced concrete foundation. 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 a welded-wire-reinforced mixture of cement, sand and water. Two coats of primer were sprayed on all exposed interior tank surfaces (Rogers and Daniels 1944). The tank ceiling dome was covered with three applications of magnesium zinc fluorosilicate 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. This tank was covered with approximately 2.1 m (7 ft) of overburden.

Tank 241-U-102 has 13 risers, according to the drawings. The risers range in diameter from 100 mm (4 in.) to 1.1 m (42 in.). Table A2-1 shows numbers, diameters, and descriptions of the risers and the nozzles. A plan view that depicts the riser configuration is shown as Figure A2-1. Risers 9 and 19, 100 mm (4 in.) in diameter, and riser 7, 300 mm (12 in.) in diameter, are available for sampling (Lipnicki 1996). A tank cross-section showing the approximate waste level, along with a schematic of the tank equipment, is shown in Figure A2-2.

A3.0 PROCESS KNOWLEDGE

The sections below: 1) provide information about the transfer history that involved waste transferred in and out of tank 241-U-102; 2) present an estimate of the tanks contents.

A3.1 WASTE TRANSFER HISTORY

Tank 241-U-102 began receiving metal waste (MW) via the cascade line from tank 241-U-101 in the second quarter of 1946. The tank continued to receive waste from the cascade line until the second quarter of 1954. Metal waste from the $BiPO_4$ process was sent from tank 241-U-102 to tank 241-U-103 via the cascade line from the first quarter of 1947 until the second quarter of 1954. In the second and fourth quarter of 1953, the third quarter of 1955, the third and fourth quarters of 1956, and the first quarter of 1957, MW from the tank was sent to U Plant for uranium recovery. During the fourth quarter of 1955 and the second quarter of 1957, the tank received MW, most likely from U Plant. In the third quarter of 1956, the tank received MW from tank 241-U-101. The tank was sluiced in the third and fourth quarters of 1955. The heel was sluiced and the tank was declared empty during the first quarter of 1957. After the tank was declared empty, it began to receive REDOX waste from tanks 241-SX-102 and 241-SW-111. The tank received supernatant from tanks 241-C-104, 241-TX-108, 241-TX-106, 241-TX-118, 241-SY-102, 241-U-107, and 241-U-101 between the second quarter of 1978 and the first quarter of 1979. Supernatant from tank 241-U-102 was sent to tanks 241-S-110, 241-U-111, and 241-SY-102 between the first quarter of 1974 and the third quarter of 1979. The tank received evaporator waste from tank 241-TX-106 during the second quarter of 1975. During the fourth quarter of 1977 and the first quarter of 1978, the tank received nitric acid and potassium permanganate solution waste from evaporator operations. In the fourth quarter of 1992, saltwell liquor waste was pumped from the tank to tank 241-AW-106. Table A3-1 summarizes the major transfers and estimated waste volumes that involve receipt of waste by tank 241-U-102.

Table A2-1. Tank 241-U-102 Risers.
(Alstad 1993, Tran 1993, Vitro 1988)

Riser Number	Diameter (in.)	Description and Comments
1	4	Thermocouple tree
2	12	B-436 Liquid observation well
3	12	Sluice nozzle, weather covered
4	4	Dip tube, weather covered
5	4	Dip tube, weather covered
6	12	Sluice nozzle, weather covered
7	12	B-222 Observation port
8	4	ENRAF[1] 854 (ECN-625944 11/17/95) Benchmark (CEO-37528 12/11/86) [prior Food Instrument Corporation gauge]
9	4	Breather filter
13	36	Saltwell pump
18	42	Sludge pump, weather covered
19	4	Sludge measurement port [Benchmark CEO-37528 12/11/86]
20	12	Spare
Nozzle Number	**Diameter (in.)**	**Description and Comments**
N1	3	Cascade inlet from tank 241-U-101
N2	3	Cascade outlet to tank 241-U-103
N3	4	Spare
N4	4	Spare
N5	4	Spare
N6	4	Spare

[1]ENRAF is a registered trademark of ENRAF Corporation, Houston, Texas.

Figure A2-1. Riser Configuration for Tank 241-U-102.

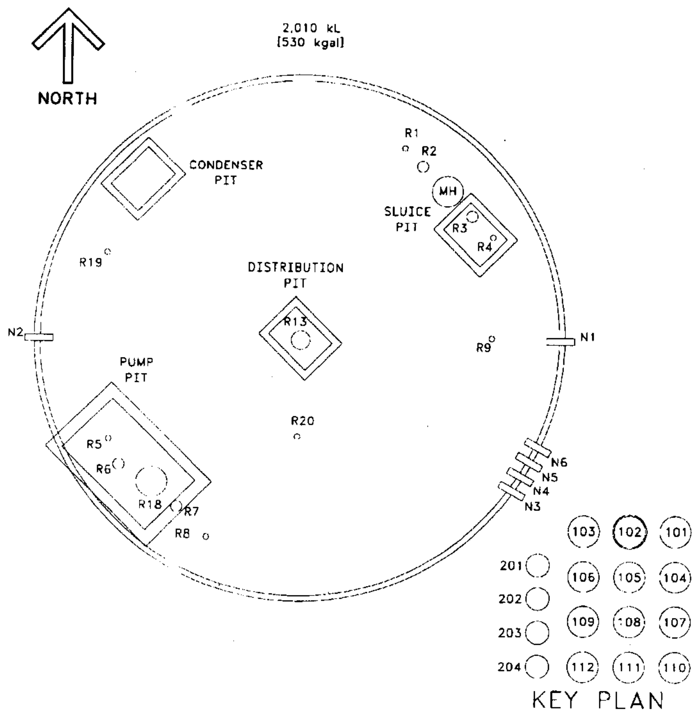


Figure A2-2. Tank 241-U-102 Cross-Section.

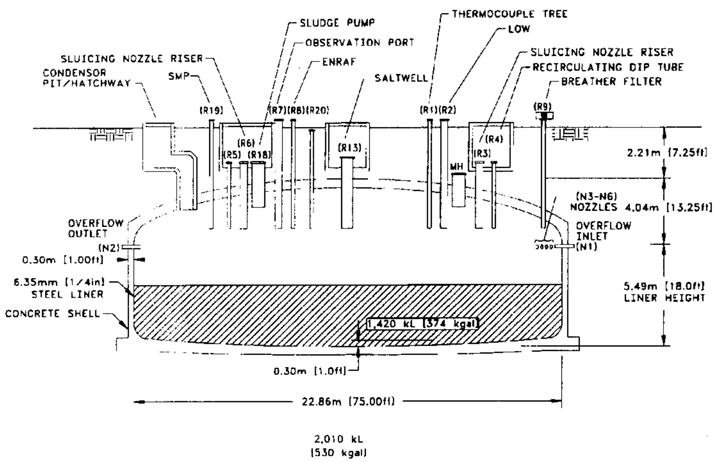


Table A3-1. Summary of Tank 241-U-102 Waste Input History.[1]

Transfer Source	Waste Type Received	Time Period	Estimated Waste Volume[2]	
			kL	kgal
241-U-101	Metal waste	1946 - 1954	8,766	2,316
U Plant	Metal waste	1955	178	47
241-U-101	Metal waste	1956	2,006	530
241-SX-102 241-SX-111	REDOX	1958	1,786	472
241-C-104, 241-TX-108, 241-SY-102, 241-U-107, and 241-U-101	Supernatant waste	1958 - 1979	7,643	2,019
241-TX-106	Evaporator waste	1975	356	94
241-TX-118	Evaporator waste	1975, 1976	727	192
241-S-102	Evaporator waste	1976	814	215
Evaporator neutralization operations	$HNO_3/KMnO_4$ solution waste	1977 - 1978	110	29

Notes:

[1]Agnew et al. (1996b)

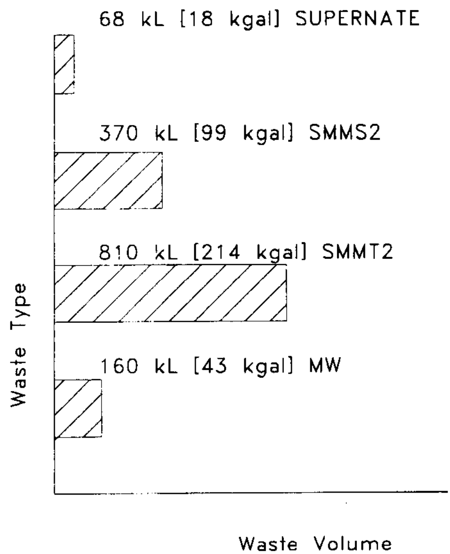
[2]Waste volumes and types are best estimates based on historical data.

A3.2 HISTORICAL ESTIMATION OF TANK CONTENTS

Following is an estimate of the contents of tank 241-U-102 based on historical transfer data and process records. The historical data used for the estimate are from the *Waste Status and Transaction Record Summary for the Southwest Quadrant* (WSTRS) (Agnew et al. 1996b) and the *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 3* (Agnew et al. 1996a). Agnew et al. (1996a) 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 WSTRS is a balanced, tank-by-tank, quarterly summary spreadsheet of waste transactions. Using the WSTRS, the TLM defines the sludge and saltcake layers within each tank. The SMM uses information from both the WSTRS and the TLM to describe the supernatants and evaporator concentrates within each of the tanks. Together, the WSTRS, HDW, TLM, and SMM are used to determine each tank's inventory estimate. In some cases, the available data are incomplete, reducing the reliability of the transfer data and the derived modeling results. Thus, these model predictions are considered estimates that require further evaluation using analytical data.

Based on the TLM and the SMM, tank 241-U-102 contains three layers of waste, not including the 68 kL (18 kgal) of supernatant, listed from the last deposit into the tank to the first deposit: 375 kL (99 kgal) of 242-S Evaporator salt slurry (SMMS2), 810 kL (214 kgal) of 242-T Evaporator saltcake (SMMT2), and 163 kL (43 kgal) of MW sludge waste. The MW is a combination of two types of metal waste: metal waste from bismuth phosphate, 1944 to 1951 (MW1); and metal waste from bismuth phosphate, 1942 to 1956 (MW2). The SMMS2 and SMMT2 waste compositions are calculated by the SMM and are considered concentrated supernatant. A graphical representation of the estimated waste types and volumes for these layers can be seen in Figure A3-1. An estimate of tank contents reported by Agnew (1996a) is shown in Table A3-2.

Figure A3-1. Tank Layer Model for Tank 241-U-102.



However, the waste transfer record shows that this sludge layer shoud be REDOX waste instead of metal waste (see Appendix D, Section D1.0). The best-basis tank inventory will calculate the chemical constituent using the REDOX sludge layer.

Table A3-2. Tank 241-U-102 Inventory Estimate. (Agnew et al. 1996a) (2 sheets)

Total Inventory Estimate[1]			
Physical Properties			
Total waste	2.26E+06 kg (374 kgal)		
Heat load	2,630 W (8,990 Btu/hr)		
Bulk density	1.60 g/mL		
Water wt%	35.9		
Total organic carbon wt% carbon (wet)	0.842		
Chemical Constituents	**M**	**ppm**	**kg[2]**
Na^+	11.6	1.67E+05	3.77E+05
Al^{3+}	1.44	24,300	54,900
Fe^{3+} (total Fe)	0.021	734	1,660
Cr^{3+}	0.0522	1,700	3,840
Bi^{3+}	0.00144	189	426
La^{3+}	5.07E-05	4.42	9.98
Hg^{2+}	9.33E-06	1.17	2.65
Zr (as $ZrO(OH)_2$)	0.00101	57.6	130
Pb^{2+}	9.87E-04	128	289
Ni^{2+}	0.00631	232	525
Sr^{2+}	1.69E-05	0.928	2.10
Mn^{4+}	0.00359	124	279
Ca^{2+}	0.0429	1,080	2,440
K^+	0.0538	1,320	2,980
OH^-	7.71	82,100	1.85E+05
NO_3^-	4.91	1.91E+05	4.31E+05
NO_2^-	2.10	60,500	1.37E+05
CO_3^{2-}	0.656	24,700	55,700
PO_4^{3-}	0.140	8,300	18,800
SO_4^{2-}	0.248	14,900	33,700
Si (as SiO_3^{2-})	0.0754	1,330	3,000
F^-	0.0816	971	2,190
Cl^-	0.196	4,350	9,840
$C_6H_5O_7^{3-}$	0.0267	3,160	7,130

Table A3-2. Tank 241-U-102 Inventory Estimate. (Agnew et al. 1996a) (2 sheets)

Total Inventory Estimate[1]			
Chemical Constituents	**M**	**ppm**	**kg[2]**
$EDTA^{4-}$	0.0180	3,260	7,360
$HEDTA^{3-}$	0.0341	5,850	13,200
glycolate	0.0972	4,570	10,300
acetate	0.00634	234	529
oxalate	4.34E-05	2.39	5.41
DBP	0.0181	3,020	6,840
Butanol	0.0181	843	1,900
NH_3	0.0553	589	1,330
$Fe(CN)_6^{4-}$	0	0	0
Radiological Constituents	**Ci/L**	**μCi/g**	**Ci[2]**
Pu		0.0502	1.90 (kg)
U	0.240 (M)	35,800 (μg/g)	81,000 (kg)
Cs	0.234	147	3.32E+05
Sr	0.113	70.9	1.60E+05

Notes:

[1]These predictions have not been validated and should be used with caution.

[2]Differences appear to exist among the inventories in this column and the inventories calculated from the two sets of concentrations. These differences are being evaluated.

A4.0 SURVEILLANCE DATA

Tank 241-U-102 surveillance includes surface level measurements (liquid and solid) and temperature monitoring inside the tank (waste and headspace). The data provide the basis for determining tank integrity.

Liquid level measurements may indicate if a tank has a major leak. Solid surface level measurements provide an indication of the physical changes in and the consistency of the solid layers. Tank 241-U-102 has a liquid observation well, located in riser 2, to measure interstitial liquid levels, and six drywells located around the perimeter of the tank to allow monitoring of any increased radiation caused by waste leakage. No radioactivity above background has been detected in these drywells.

A4.1 SURFACE-LEVEL READINGS

The surface level of the waste is monitored with an ENRAF™ system through riser 8. On July 3, 1996, the surface level from the manual mode ENRAF™ system was 3.69 m (12.1 ft). The manual ENRAF™ readings, which began on January 4, 1996, are approximately 36 cm (14 in.) higher than Food Instrument Corporation gauge readings on the same date. On February 8, 1996 the reference point for the ENRAF™ system was changed from the side wall of the tank to the bottom center of the dish, thus accounting for 30 cm (12 in.) of the increase in waste surface level. The other 5 cm (2 in.) can be attributed to error in the Food Instrument Corporation gauge. A graphical representation of the tank volume history is presented in Figure A4-1.

A4.2 INTERNAL TANK TEMPERATURES

Tank 241-U-102 has a thermocouple tree located in riser 1 with 11 thermocouples to monitor the waste temperature. Elevations are available for all thermocouples. Plots of the individual thermocouple readings can be found in the U Tank Farm supporting document for the HTCE (Brevick et al. 1994).

Temperature data, obtained from the Surveillance Analysis Computer System (SACS) (WHC 1996), were recorded from July 1987 to the current date. Data were available for all 11 thermocouples, with the exception of thermocouples 5, 8, 9, and 11, which have no measurements after April 1, 1995. The mean temperature from the SACS data is 27.9 °C (82.2 °F) with a minimum of 14.9 °C (58.8 °F) and a maximum of 36 °C (96 °F). The mean temperature of the SACS data over the last year (July 1995 through July 1996) is 28.2 °C (82.7 °F) with a minimum of 22.6 °C (72.9 °F) and a maximum of 31.2 °C (88.2 °F). On July 11, 1996, the low temperature recorded was 23.9 °C (75.0 °F) on thermocouple 10 (located in the vapor space). The high temperature recorded was 29.2 °C (84.6 °F) on thermocouple 2 (located in the waste). A graph of high temperatures is provided as Figure A4-2.

A4.3 TANK 241-U-102 PHOTOGRAPHS

The June 1989 photographic montage of the tank 241-U-102 interior shows the waste surface to be a mix of supernatant and saltcake. A discarded level measurement tape is visible on the surface. A Food Instrument Corporation probe can be seen contacting the waste surface in the foreground. Saltwell pumping has occurred since the photos were taken; therefore, the photographic montage may not accurately indicate the current appearance of the tank's waste.

Figure A4-1. Tank 241-U-102 Level History.

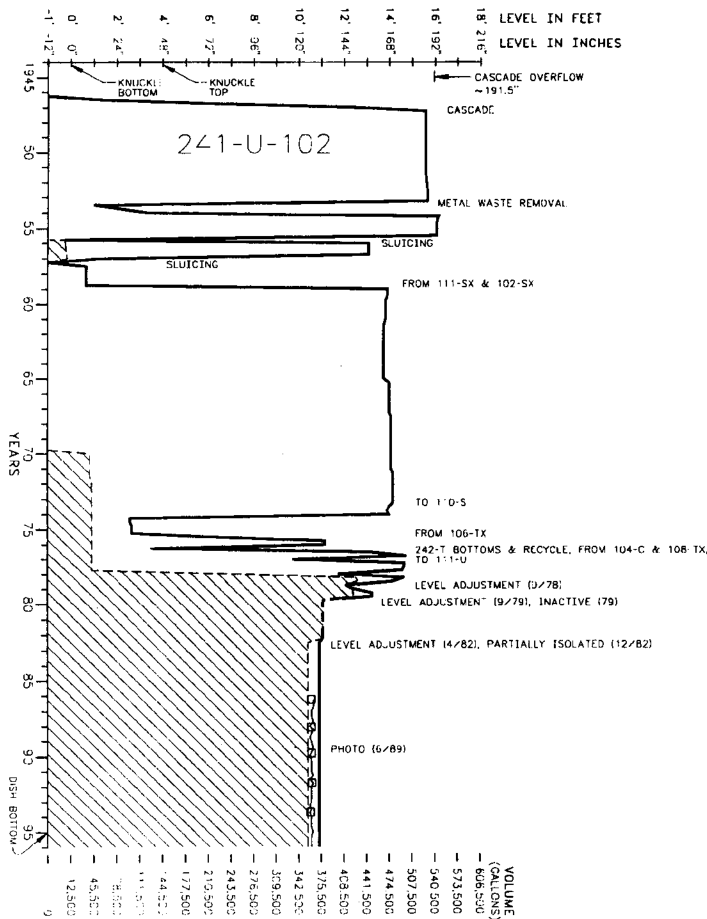
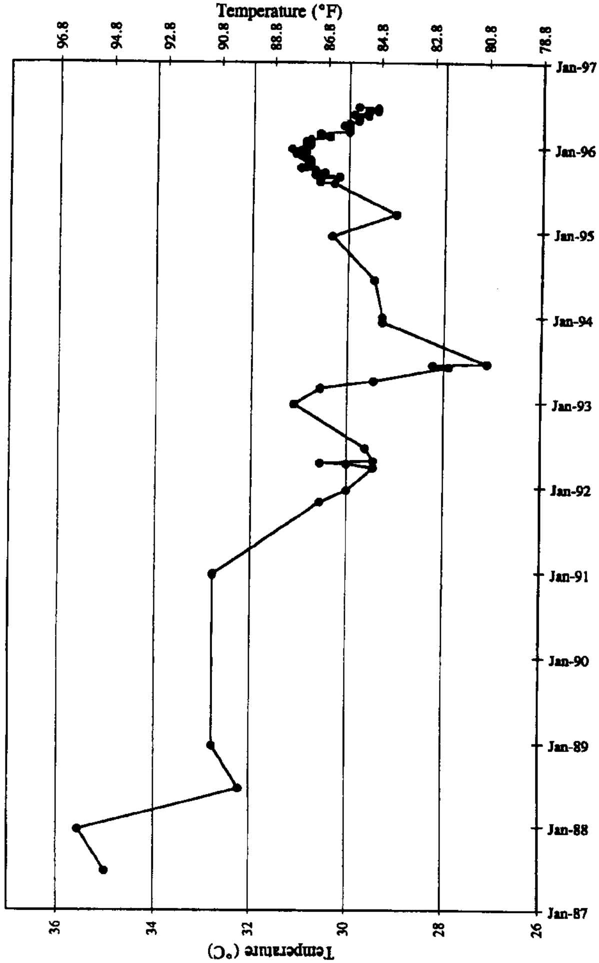


Figure A4-2. Weekly High Temperature Plot for Tank 241-U-102.



A5.0 APPENDIX A REFERENCES

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1996a, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 3*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. A. Corbin, T. B. Duran, and K. A. Jurgensen, 1996b, *Waste Status and Transaction Record Summary for the Southwest Quadrant*, WHC-SD-WM-TI-614, Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

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

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

Brevick, C. H., L. A. Gaddis, and E. D. Johnson, 1994, *Supporting Document for the Historical Tank Content Estimate for U Tank Farm*, WHC-SD-WM-ER-325, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. M., 1996, *Waste Tank Summary Report for Month Ending August 31, 1996*, WHC-EP-0182-101, Westinghouse Hanford Company, Richland, Washington.

Leach, C. E., and S. M. Stahl, 1996, *Hanford Site Tank Farm Facilities Interim Safety Basis*, WHC-SD-WM-ISB-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Lipnicki, J., 1996, *Waste Tank Risers Available for Sampling*, WHC-SD-WM-TI-710, Rev. 3, Westinghouse Hanford Company, Richland, Washington.

Rogers, R. D., and H. T. Daniels, 1944, *Specifications for Construction of Composite Storage Tanks Bldg. #241 at Hanford Engineer Works*, CVI-73550, E. I. Du Pont de Nemours & Co., Richland, Washington.

Vitro Engineering Corporation, 1988, *Piping Waste Tank Isolation TK 241-U-102*, Drawing H-2-73149, Rev. 4, Vitro Engineering Corporation, Richland, Washington.

WHC, 1996, Surveillance Analysis Computer System (SACS), in: SYBASE/Visual Basic [Mainframe], Available: Hanford Local Area Network (HLAN), Westinghouse Hanford Company, Richland, Washington; or Tank Waste Information Network System (TWINS), Pacific Northwest National Laboratory, Richland, Washington.

APPENDIX B

SAMPLING OF TANK 241-U-102

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APPENDIX B

SAMPLING OF TANK 241-U-102

Appendix B provides sampling and analysis information for each known sampling event for tank 241-U-102 and provides an assessment of the auger sample results.

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

Future sampling of tank 241-U-102 will be appended to the above list.

B1.0 TANK SAMPLING OVERVIEW

This section describes the April/May 1996 sampling and analysis event for tank 241-U-102. The core sampling was performed to satisfy the requirements of the *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995), *Historical Model Evaluation Data Requirements* (Simpson and McCain 1996), *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue* (Turner et al. 1995), and *Data Quality Objectives for the Waste Compatibility Program* (Fowler 1995). Two push-mode cores were taken from the tank and analyzed in accordance with the *Tank 214-U-102 Push Mode Core Sampling and Analysis Plan* (Hu 1996a) and the *Compatibility Grab Sampling and Analysis Plan* (Hu 1996b). The sampling and analysis plan (SAP) integrated the sampling and analytical requirements of the DQOs. Table B1-1 summarizes these requirements. Prior to and during the sampling event, a tank headspace vapor flammability test was performed in accordance with the safety screening DQO. Further discussions of the sampling and analysis procedures can be found in the *Tank Characterization Reference Guide* (DeLorenzo et al. 1994).

Descriptions of three historical sampling events have also been included in section B1.4 for informational purposes.

Table B1-1. Integrated Data Quality Objective Primary Requirements for the April 1996 Sampling Event for Tank 241-U-102. (Hu 1996a and 1996b)

Applicable DQOs	Sampling Requirements	Primary Analytical Requirements[1]
Safety screening (Dukelow et al. 1995)	Core samples from a minimum of two risers separated radially to the maximum extent possible. Flammability monitoring of tank headspace.	▸ Energetics ▸ Moisture content ▸ Total alpha activity[2] ▸ Bulk density/specific gravity ▸ Visual check for presence of organic layer (liquids only) ▸ Headspace gas flammability
Organic complexant (Turner et al. 1995)	Two vertical profiles of the liquid and solid portions of the tank waste.	▸ Energetics ▸ Moisture content ▸ TOC ▸ Visual check for presence of organic layer (liquids only)
Historical model evaluation (Simpson and McCain 1996)	Two vertical profiles of the tank waste.	▸ Energetics ▸ Moisture ▸ Bulk density ▸ Selected anions by IC ▸ Selected metals by ICP ▸ TOC/TIC ▸ Total beta[3] ▸ ^{90}Sr[3], ^{137}Cs, total uranium[3]
Waste compatibility (Fowler 1995)	Liquid samples from one riser at three depths.[4]	▸ Energetics ▸ Moisture content ▸ TOC/TIC ▸ Selected metals by ICP ▸ Selected anions by IC ▸ pH ▸ OH by titration ▸ ^{241}Am, ^{137}Cs, ^{90}Sr, $^{239/240}$Pu ▸ Density ▸ Visual check for presence of organic layer

Notes:

[1]Primary analyses required for core composites, liquid segments, and solids half segments.
[2]Analysis required for bottom-half segments only.
[3]Primary analysis required on core composite solids.
[4]Grab sampling in February 1996 collected insufficient material to perform an analysis. The supernatant samples from 1966 core sampling were used to perform analyses required by the compatability DQO.

B1.1 DESCRIPTION OF SAMPLING EVENT

Based on the waste type, waste volume, historical sample results and in-tank photos, the push-mode core sampling method was chosen to obtain vertical profiles of the tank waste. Two push-mode cores, 143 and 144, with a total of 16 segments, were collected from risers 19 and 9 respectively in tank 241-U-102 between April 16 and April 30, 1996. Full 48-cm (19-in.) samples were pushed and collected in segments 1 through 4 for Core 143 and in segments 1 through 5 for core 144. Because of the hardness of the waste, segments 5 and 6 for core 143 and segment 6 for core 144 were partially (less than 48 cm (19 in.) collected. These partially collected samples, labeled as segments 5, 5A, 5B, 6 and 6A of Core 143 and segments 6 and 6A of core 144, were 33 cm (13 in.) or less in length.

Because of the hardness of the waste, 3.78 L (1 gal) of LiBr solution was added to soften the waste prior to collecting segment 5A of core 143 and segment 6A of core 144. Because LiBr solution was used in sampling these partial segments, LiBr solution contamination was expected. An LiBr field blank was produced and delivered to the laboratory in accordance with the tank sampling and analysis plan (Hu 1996a) in order to gauge external water contamination of the segments. According to chain-of-custody records, during the collection of segment 5 of core 144 the sampler body separated from the main sampler assembly after the sample had been pushed. The sampler body had to be retrieved from the drill string with the use of a special tool.

Several attempts were made to obtain samples of the hard waste on the tank bottom. It was concluded that the push-mode method would not be able to collect the hard waste in the tank bottom approximately 66 cm (26 in.) and 61 cm (24 in.) from the bottom under risers 19 and 9, respectively (Hu and Steen 1996).

B1.2 SAMPLE HANDLING

All samples were received by the 222-S Laboratory between April 17 and May 8, 1996 (Steen 1996a). Table B1-2 presents a description of the core samples along with other sampling information.

The samples were extruded, photographed, subsampled, and analyzed as prescribed in the sampling and analysis plan (Hu 1996a and 1996b). Samples were prepared for analysis by separating solids from each segment into half segments (upper and lower halves). Because of limited sample recovery, upper half subsamples only were prepared for core 143 segments 5A and 6, and core 144 segment 6A. Also as a result of limited recovery, the solids in core 143 segment 5 were separated from liner liquid into a whole segment sample. No sample material was recovered from the bottom-most segment of core 143 (segment 6A).

Table B1-2. Subsampling Scheme and Sample Description. (Steen 1996a) (2 sheets)

Segment-Portion	Date Sampled Received Extruded	Sample Weights (g)	Drill String Dose Rate (mR/hr)	Sample Description
Core 143 (from Riser 19)				
1-U	4/16/96 4/23/96 4/24/96	171.5	1,200	The solids were dark gray and resembled a wet mixture of sludge and saltcake (15 cm [6 in.] extruded). The liquid was yellow and clear.
1-L		49.0		
1-DL		105.7		
2-U	4/16/96 4/17/96 4/24/96	228.9	1,200	The solids were medium gray and resembled a wet mixture of sludge and saltcake (48 cm [19 in.] extruded).
2-L		172.2		
3-U	4/16/96 4/17/96 4/24/96	202.3	1,500	The solids were medium gray and resembled a wet mixture of sludge and saltcake (48 cm [19 in.] extruded).
3-L		198.6		
4-U	4/16/96 4/23/96 4/24/96	210.2	1,500	The solids were medium gray and resembled a damp sludge (48 cm [19 in.] extruded).
4-L		206.2		
5-W	4/16/96 4/23/96 4/29/96	80.6	300	The solids were medium gray and resembled a damp crystalline saltcake (13 cm [5 in.] extruded). Liner liquid (109.4 g) was clear and colorless.
5A-W	4/16/96 4/17/96 4/29/96	186.9	1,000	The solids were medium gray and resembled a damp crystalline saltcake (20 cm [8 in.] extruded).
5B-U	4/22/96 4/30/96 5/07/96	108.4	1,700	The solids were light to medium gray and resembled a wet crystalline saltcake (30 cm [12 in.] extruded).
5B-L		170.4		
6-W	4/22/96 5/08/96 5/13/96	245.9	1,200	The solids were medium gray and resembled a moist saltcake (28 cm [9 in.] extruded).

Table B1-2. Subsampling Scheme and Sample Description. (Steen 1996a) (2 sheets)

Segment-Portion	Date Sampled Received Extruded	Sample Weights (g)	Drill String Dose Rate (mR/hr)	Sample Description
Core 144 (from Riser 9)				
1-W	4/26/96 4/30/96 5/06/96	63.5	1,500	The drainable liquid was grayish brown and opaque. The solids were grayish brown and resembled a wet crystalline saltcake (8 cm [3 in.] extruded).
1-DL		303.3		
2-U	4/26/96 4/30/96 5/06/96	169.7	1,000	The solids were medium gray and resembled a damp crystalline saltcake (41 cm [16 in.] extruded).
2-L		205.1		
3-U	4/29/96 4/30/96 5/06/96	167.3	1,000	The solids were medium gray and resembled a damp crystalline saltcake (36 cm [14 in.] extruded).
3-L		149.5		
4-U	4/29/96 5/08/96 5/13/96	234.6	1,500	The solids were medium gray and resembled a wet salt (48 cm [19 in.] extruded).
4-L		224.4		
5-U	4/29/96 5/08/96 5/13/96	182.8	1,600	The solids were medium gray and resembled a moist salt (46 cm [18 in.] extruded).
5-L		237.3		
6-U	4/30/96 5/08/96 5/13/96	134.6	1,700	The solids were light to medium gray and resembled a moist salt (33 cm [13 in.] extruded).
6-L		161.2		
6A-W	4/30/96 5/03/96 5/14/96	31.2	400	The solids were medium brown and resembled a wet salt (2 cm [1 in.] extruded).
FB-DL	4/29/96 5/08/96 5/13/96	212.6	< 0.5	The field blank was a clear, colorless liquid.

Notes:

DL = drainable liquid
FB = field blank
L = lower half
U = upper half
W = whole segment

Drainable liquid, collected from segment 1 of each core, was analyzed separately from the solids. About 110 g of liner liquid were recovered from core 143 segment 5 and archived. As required by the historical model DQO, composite samples for each core were prepared as summarized in Table B1-3.

B1.3 SAMPLE ANALYSIS

The analyses performed on the subsegments were those required by the safety screening, organic complexant, historical model evaluation, and waste compatibility DQOs. Required analyses varied depending on the waste matrix. The safety screening and organic DQOs required analysis of the energetics by DSC and moisture content by TGA in all solids subsegments, core composites, and liquids. Additional primary analytical requirements of the four DQOs are listed below by DQO (unless otherwise noted, the analyses were performed on the solids subsegments, core composites, and drainable liquid): 1) safety screening - total alpha activity through proportional counting, bulk density/specific gravity, visual examination for the presence of an organic layer (liquid only); 2) organic - TOC; 3) historical model (not applicable to drainable liquid) - selected anions by IC, selected metals by ICP, total inorganic carbon (TIC), TOC, and ^{137}Cs, and ^{90}Sr, total uranium, and total beta activity on the composite samples only; 4) waste compatibility (liquid only) - density, pH, TIC, TOC, selected metals by ICP, selected anions by IC, OH^- by titration, ^{241}Am, ^{137}Cs, ^{90}Sr, $^{239/240}$Pu, visual examination for the presence of an organic layer (liquid samples only). Analyses for lithium and bromide were also required to check for contamination by the solution used to soften the waste during sampling.

The waste compatibility DQO is primarily focused on the analytical results of liquid samples, which are normally obtained by the grab sampling method. However, a March 1996 grab sampling event for tank 241-U-102 did not obtain enough liquid sample to perform the analyses; therefore, the waste compatibility DQO was integrated into the April/May 1996 core sampling event, and the requirements of the DQO were applied to the drainable liquid.

In addition to the core sample analyses, the tank headspace flammability was measured using a combustible gas meter prior to and during the core sampling. Results for additional analytes were obtained during the ICP, ion chromatography (IC), and gamma energy analyses (GEA). These results are reported on an opportunistic basis as requested by Kristofzski (1996).

Secondary analyses required by the DQOs were performed when results from the primary analyses exceeded DQO-defined limits. Only those secondary analyses that had not already been performed as primary analyses are discussed here. Cyanide analyses were requested for two samples that exceeded the DSC notification limit, as stated in the safety screening DQO.

Table B1-3. Core 143 and 144 Composite Samples.

Core	Segment	Segment Portion	Sample Material Used to Build Composite (g)
143	1	Upper ½	5
		Lower ½	5
	2	Upper ½	10
		Lower ½	10
	3	Upper ½	10
		Lower ½	10
143	4	Upper ½	10
		Lower ½	10
	5	Whole	5
	5A	Upper ½	5
	6	Upper ½	5
144	1	Lower ½	5
	2	Upper ½	10
		Lower ½	10
	3	Upper ½	10
		Lower ½	10
	4	Upper ½	10
		Lower ½	10
	5	Upper ½	10
		Lower ½	10
	6	Upper ½	10
		Lower ½	10
	6A	Upper ½	5

The DSC and TGA analyses were performed in duplicate on direct subsamples. Total alpha, ^{90}Sr, and GEA were performed in duplicate on direct subsamples for the liquids; solid samples were prepared by performing a fusion digestion in duplicate. Liquid subsamples were prepared for ICP analysis by an acid adjustment of the direct subsample; solid subsamples were prepared by performing both acid and fusion digestions. The IC analyses were performed on direct liquid subsamples; the solid subsamples were prepared by performing a water digestion. Total beta was performed on solid core composite subsamples that were prepared by performing a fusion digestion in duplicate.

Quality control checks included, when appropriate, laboratory control standards, matrix spikes, duplicate analyses, and sample preparation blanks. Results of quality control checks and their implications on data quality are presented in Section B3.3.

A list of all samples by core, segment portion, LABCORE identification number, and their associated analyses, is shown in Table B1-4. The samples were prepared from homogenized material from subsegments (or whole segments, as applicable). Core 144 segment 6A did not provide enough material to perform a bulk density analysis. No other deviations from the SAP were reported. Table B1-5 summarizes the analytical methods, sample preparation methods, and analytical procedures for the requested suite of analyses.

B1.4 PREVIOUS SAMPLING EVENTS

Several historical sampling and analysis events are available for tank 241-U-102. The first occurred in 1976, the second in 1977, and the third in 1993. Because tank 241-U-102 was active at the time of the first two sampling events, the results may no longer be representative of the tank's contents, and have been included in this report for informational purposes only. The results of the 1993 sampling event should represent the liquid waste currently in the tank.

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 143			
1	Upper ½	2326	TIC/TOC, DSC, TGA
		2438	ICP (fusion digest), GEA, total alpha
		2468	ICP (acid digest)
		2476	IC (water digest)
		2325	Bulk density
	Lower ½	2329	TIC/TOC, DSC, TGA
		2443	ICP (fusion digest), GEA, total alpha
		2469	ICP (acid digest)
		2478	IC (water digest)
		2328	Bulk Density
	DL	2323	DSC, TGA, total alpha, IC, ICP, SpG
		2524	TOC, OH^-, pH, TIC, ^{241}Am, GEA, $^{239/240}$Pu, ^{90}Sr

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 143			
2	Upper ½	2332 2444 2470 2479 2331	TIC/TOC, DSC, TGA, CN^- ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2335 2445 2471 2480 2334	TIC/TOC, DSC, TGA, CN^- ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
3	Upper ½	2338 2446 2472 2481 2337	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2341 2447 2473 2482 2340	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
4	Upper ½	2344 2448 2474 2483 2343	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2347 2449 2475 2491 2346	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
5	Whole	2500 2518 2519 2520 2498	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 143			
5A	Upper ½	2501 2521 2522 2523 2499	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
5B	Upper ½	2665 2671 2673 2675 2663	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2666 2672 2674 2676 2664	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
6	Upper ½	2755 2757 2758 2759 2754	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
Composite	n/a	3678 3680 3682 3684 3668	TIC/TOC, DSC, TGA ICP (fusion digest), U (phosphorescence), total alpha, GEA, total beta, ^{90}Sr ICP (acid digest) IC (water digest) bulk density

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 144			
1	Lower ½	2632 2648 2650 2652 2551	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
	DL	2549 3622	DSC, TGA, total alpha, IC, ICP, SpG TIC/TOC, ^{241}Am, ^{90}Sr, $^{239/240}$Pu, GEA, OH^-, pH
2	Upper ½	2646 2654 2656 2659 2554	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
2	Lower ½	2633 2649 2651 2653 2552	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
3	Upper ½	2647 2655 2657 2660 2555	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2636 2662 2658 2661 2553	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 144			
4	Upper ½	2775 2793 2799 2805 2781	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2776 2796 2800 2806 2782	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
5	Upper ½	2777 2794 2801 2807 2783	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2778 2797 2802 2808 2784	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
6	Upper ½	2779 2795 2803 2809 2785	TIC/TOC, DSC, TGA ICP (fusion digest), GEA ICP (acid digest) IC (water digest) Bulk density
	Lower ½	2780 2798 2804 2810 2786	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest) Bulk density
6A	Upper ½	3609 3610 3686 3612	TIC/TOC, DSC, TGA ICP (fusion digest), GEA, total alpha ICP (acid digest) IC (water digest)

Table B1-4. Summary of Samples and Analyses. (Steen 1996b) (6 sheets)

Segment	Segment Portion	LABCORE Number[1]	Analyses
Core 144			
Composite	n/a	3670 3675 3676 3677 3669	TIC/TOC, DSC, TGA ICP (fusion digest), U (phosphorescence), total alpha, GEA, beta, ^{90}Sr ICP (acid) IC (water digest) bulk density
Field blank	n/a	2762	DSC, TGA, total alpha, IC, ICP, SpG, TIC/TOC
Lithium bromide blank	n/a	2511	ICP, IC

Notes:

[1]All of the LABCORE identification numbers listed are preceded by "S96T00".

n/a = not applicable
SpG = specific gravity

Table B1-5. Analytical Procedures. (Steen 1996b) (2 sheets)

Analyte	Method	Preparation Procedure	Analytical Procedure[1]
Energetics	DSC: Mettler™ Perkin-Elmer™	n/a	LA-514-113, Rev. C-1 LA-514-114, Rev. C-1
	Reactive systems screening tool	n/a	WHC-SD-WM-TP-104
Percent water	TGA: Mettler™ Perkin-Mettler™	n/a	LA-560-112, Rev. B-1 LA-514-114, Rev. C-1
Solid bulk density	Centrifuge cones and electronic balance	n/a	LO-160-103, Rev. B-0
Liquid specific gravity	n/a	n/a	LA-510-112, Rev. C-3
TOC	Persulfate/ coulometry	n/a	LA-342-100, Rev. D-0 (solids) LA-344-105, Rev. C-0 (liquid)
TIC	Persulfate/coulometry	n/a	LA-342-100, Rev. D-0 (solids) LA-622-102, Rev. C-0 (liquid)
Metals	ICP: Jarrell-Ash ICP 800A System™	Solid: LA-505-159, Rev. D-0 LA-549-101, Rev. F-0	LA-505-151, Rev. D-3 LA-505-161, Rev. B-1
Anions	IC: Dionex 4500i™ system	LA-504-101, Rev. E-0 (solids only)	LA-533-105, Rev. D-1
Cyanide	Distillation	n/a	LA-695-102, Rev. A-0 LA-695-103, Rev. A-0
Total alpha activity	Alpha proportional counting	LA-549-101, Rev. F-0 (solids only)	LA-508-101, Rev. D-2
Total beta activity	Beta proportional counting	LA-549-101, Rev. F-0 (solids only)	LA-508-101, Rev. D-2
Total uranium	Phosphorescence	LA-549-141, Rev. F-0 (solids only)	LA-925-009, Rev. A-1

Table B1-5. Analytical Procedures. (Steen 1996b) (2 sheets)

Analyte	Method	Preparation Procedure	Analytical Procedure[1]
$^{89/90}Sr$	Separating and counting	LA-549-141, Rev. F-0 (solids only)	LA-220-101, Rev. D-1
^{137}Cs	Gamma energy analysis	LA-549-101, Rev. F-0 (solids only)	LA-548-121, Rev. E-0
Hydroxide (liquid only)	Potentiometric titration	n/a	LA-211-102, Rev. C-0
^{241}Am (liquid only)	Separation and counting	n/a	LA-953-103, Rev. B-0
^{239}Pu (liquid only)	Separation and counting	n/a	LA-943-128, Rev. B-0
pH	pH electrode	n/a	LA-212-106, Rev. A-0
Flammable gas	Combustible gas meter	n/a	WHC-IP-0030 IH 1.4 and IH 2.1

Notes:

Dionex 4500i™ is a registered trademark of Dionex Corporation, Sunnyvale, California.

Jarrell-Ash ICP 800A System™ is a registered trademark of Jarrell-Ash, Inc., Menlo Park, California.
Mettler™ is a registered trademark of Mettler Electronics, Anaheim, California.

Perkin-Elmer™ is a registered trademark of Perkins Research and Manufacturing Company, Inc., Canoga Park, California.

[1]Internal procedures of Westinghouse Hanford Company, Richland, Washington.

B2.0 ANALYTICAL RESULTS

This section presents the analytical results associated with cores 143 and 144 from May 1996 push-mode core sampling, which were collected and analyzed to satisfy the DQO document requirements specified in Table B1-1. Sampling and analysis requirements of the tank 241-U-102 core samples were performed as directed in Hu (1996a and 1996b). In addition, the analytical results from historical sampling events (analyses prior to 1989) are also summarized in this section. These historical sampling results have not been validated and should be used with caution.

Table B2-1. Tank 241-U-102 Analytical Data Presentation Tables.

Analytical Data Section	Table Number
B2.1.1 Physical Data of 1996 Core Sampling	B2-2 to B2-5
B2.1.2 Chemical Data of 1996 Core Sampling	B2-6 to B2-54
B2.1.3 Radiochemical Data of 1996 Core Sampling	B2-55 to B2-63
B2.2 Tank Headspace Vapor Sample Data of 1996	B2-64
B2.3 Historical Data of 1976, 1977 and 1993	B2-65 to B2-67

B2.1 1996 CORE SAMPLING RESULTS

This section summarizes the analytical results from core samples 143 and 144. The subsections below present chemical data summaries and information concerning physical analyses and radionuclide measurement. All the analytical raw data tables (B2-2 to B2-63) will be listed in Section B2.1.4. Analytical results for cores 143 and 144 were taken from revisions 0 (Steen 1996a) and 0-A (Hu and Steen 1996) of the 45-day data report and from the final data package (Steen 1996b).

B2.1.1 Physical Data Measurement

This subsection summarizes the analytical results of thermal analyses, density, pH value, and visual check for the presence of an organic layer.

B2.1.1.1 Thermogravimetric Analysis (TGA). During a TGA, the mass of a sample is measured while its temperature is increased at a constant rate. Nitrogen is passed over the sample during the heating to remove any released gases. Any decrease in the mass of a sample represents a loss of gaseous matter from the sample either 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 200 °C [392 °F]) is due to water evaporation.

The TGA results for tank 241-U-102 are presented in Table B2-2. All samples exhibited a large weight loss between the ambient temperature and 200 °C (392 °F).

The moisture content of the supernatant samples ranged from 40.23 to 52.29 weight percent, with a mean of 48.4 percent. Solid samples exhibited weight percent water results from 7.68 to 55.46, with a mean of 35.0 percent. Waste heterogeneity and small sample sizes led to large relative percent differences between some sample-duplicate pairs.

B2.1.1.2 Differential Scanning Calorimetry (DSC). During a DSC analysis, heat absorbed or emitted by a substance is measured while the substance is exposed to a linear increase in temperature. While the substance is being heated, nitrogen is passed over the waste material to remove any gases being released. The onset temperature for an endothermic (characterized by or causing the absorption of heat) or exothermic (characterized by or causing the release of heat) event is determined graphically.

The DSC results, including peak temperatures and magnitude of enthalpy changes on a wet weight basis, are presented in Table B2-3. All of the samples exhibited an initial endothermic reaction, which represents the evaporation of free and interstitial water. All but one of the samples exhibited an exothermic reaction either in the second or third transition, or both. Fourteen samples had small exotherms in the fourth transition, which was listed as a footnote at the end of the table. When compiling the DSC data for this report, all exothermic reactions that occurred in different transitions were added up to calculate the dry weight basis DSC for comparison with program requirements (see Appendix C).

B2.1.1.3 Bulk Density. Bulk density measurements were performed on all 26 of the solid samples as required by the SAP. Density measurements ranged from 1.55 to 1.88 g/mL. The bulk density results are presented in Table B2-4. The mean bulk density of the solid waste in the tank was 1.67 g/mL. Segment 6A from core 144 was not analyzed for density because there was insufficient sample.

B2.1.1.4 Specific Gravity. Specific gravity measurements were performed on the liquid samples. Specific gravity measurements ranged from 1.341 to 1.402. The mean specific gravity of the liquids was 1.38. Table B2-4 also presents the specific gravity results.

B2.1.1.5 Visible Organic Layer. The drainable liquid samples were examined for a visible organic layer. No organic layer was observed.

B2.1.1.6 pH. Measurements for pH were conducted on the supernatant portion of the tank contents in accordance with the waste compatibility DQO (Fowler 1995). The results were very consistent, yielding a mean of 13.2. The pH results are provided in Table B2-5.

B2.1.1.7 RSST Result. The reactive system screening tool (RSST) adiabatic calorimetry analysis was performed on the solid sample of the upper half of segment 2 from core 143, which has the highest DSC exothermic value. The sample was dried over low heat to a constant weight. The sample self-heated weakly after traversing an endotherm at 300 to

310 °C (572 to 590 °F) and no propagation was observed. The plot of temperature rate versus temperature shows that the temperature increasing rate droped to almost zero around 400 °C (752 °F) after a small peak. A plot of temperature versus time also supports the "no propagation" observation, showing that the temperature increases linearly to 380 °C (716 °C) after 370 minutes and then maintains. (Bechtold 1996).

B2.1.2 Chemical Data

This subsection summarizes the analytical results of ICP, IC, TOC/TIC, and cyanide analyses.

B2.1.2.1 Inductively Coupled Plasma Data. Solid waste samples were prepared for ICP analysis either by fusion or acid digestion. The fusion digestion results of potassium should be discarded because potassium is used in the digestion procedure (KOH fusion). Also, the nickel results from the KOH-fusion-prepared sample should be ignored because a nickel crucible was used for the fusion preparation. The liquid samples were prepared for analysis by an acid adjustment of the direct subsample. Only the quality control (QC) parameters for the required analytes (Al, Ca, Cr, Fe, K, Li, Mn, Na, P, S, Si, U) were reviewed. Other "opportunistic" analytes are included but were not reviewed for adherence to QC parameters. The ICP results can be found in Tables B2-6 to B2-42.

B2.1.2.2 Ion Chromatographic Results. The IC analysis was performed on direct subsamples of liquid samples. The solid subsamples were prepared by water digest. The IC results can be found in Tables B2-43 to B2-52.

B2.1.2.3 Total Organic and Total Inorganic Carbon. Analyses for TOC/TIC were performed on all solid samples using the persulfate/coulometry analyses. The liquid samples were analyzed using the furnace/coulometry method. Results are shown in Tables B2-53 and B2-54.

B2.1.2.4 Cyanide Results. Cyanide analysis was required as a secondary analysis for samples from the upper and lower halves of segment 2, core 143, of which two samples exceeded the DSC threshold of -480 J/g. Cyanide analyses were performed using microdistillation and coulometry. The cyanide by water method is for the determination of total cyanide in samples that contain only soluble cyanide compounds. The cyanide by EDTA addition method was used for insoluble cyanide complexes in the samples being analyzed. The results can be found in Table B2-45.

B2.1.2.5 Lithium Bromide Results. Lithium bromide tracer water was used to soften the waste to facilitate core sampling. All the segments were subjected to a lithium analysis by ICP and a bromide analysis by IC to check for possible external water intrusion. The lithium results for the fusion digest preparation samples were all below detection limit (less than 240 μg/g). Most of the lithium results in acid digest preparation samples were less than the detection limit, except for segments 5A and 6 from core 143 and segment 6A from core 144. The highest concentration was 44.1 μg/g. The bromide results were all below the detection limit (less than 1,500 μg/g). The lithium and bromide results are shown in Tables B2-22 and B2-43.

B2.1.3 Radiochemical Analysis Data

This subsection summarizes the analytical results of total alpha, total beta, gamma energy analysis and radionuclide analysis.

B2.1.3.1 Total Alpha Results. Total alpha activities were performed on fused samples for lower half solids and on direct samples for liquid. The highest total alpha value is 0.644 μCi/g for solids and 0.042 μCi/g for liquid. Results are shown in Table B2-55.

B2.1.3.2 Total Beta. Total beta activity was performed on the solid core composite samples using fusion digest preparation. The mean total beta is 276 μCi/g. The results are shown in Table B2-56.

B2.1.3.3 Gamma Energy Analysis (GEA). GEA was performed on fused samples for solids and on direct samples for liquid. Americium-241, cesium-137, cobalt-60, and europium-154/155 were observed. The results are shown in Tables B2-57 through B2-61.

B2.1.3.4 Radionuclide Analysis. The plutonium-239/240 concentration was measured for two liquid samples and ranged from 7.88E-4 to 8.78E-4 μCi/mL. The results are shown in Tables B2-62 and B2-57. Strontium-89/90 was measured in fused composite and liquid samples. The results are shown in Table B2-63.

B2.1.4 Analytical Data Tables

This subsection shows the chemical and radiological characteristics of tank 241-U-102 in table form and in terms of the specific concentrations of metals, ions, radionuclides, total carbon, and physical properties. The data table for each analyte lists the following: laboratory sample identification, sample origin (core/segment/subsegment), an original and duplicate result for each sample, and a sample mean. The data are listed in standard notation for values greater than 0.001 and less than 100,000. Values outside these limits are listed in scientific notation.

The Sample Number column lists the laboratory sample from which the analyte was measured. For information on sampling rationale, sampling locations, and sampling events, see Section 3.0.

Column two describes the core and segment from which each sample was derived. The first number listed is the core number. It is followed by a colon and segment number.

Column three contains the name of the segment portion from which the sample was taken: half segment, drainable liquid (DL), or composite.

The Result and Duplicate columns are self-explanatory. The Sample Mean column is the average of the result and duplicate values. All values, including those below the detection level (indicated by the less-than symbol, $<$), were averaged. Unless both sample values were nondetected, the mean was expressed as a detected value.

The result and duplicate values were originally reported to more significant figures than shown in the tables. The means were calculated by the laboratory, in a consistent manner, using the original data. The means may appear to have been rounded up in some cases and rounded down in others. However, this is because the analytical results are shown in the tables to only three significant figures, not because the means were incorrectly calculated.

The four QC parameters assessed on the tank 241-U-102 samples were standards, spikes, duplicates, and blanks. The QC results for cores 143 and 144 were summarized in Section 5.1.2. More specific information is provided with each of the following appendix tables. Sample and duplicate pairs in which any of the QC parameters were outside their specified limits are footnoted in column 6 with an a, b, c, d, e, or f as follows:

-"QC:a" indicates the standard recovery was below the QC limit.

-"QC:b" indicates the standard recovery was above the QC limit.

-"QC:c" indicates the spike recovery was below the QC limit.

-"QC:d" indicates the spike recovery was above the QC limit.

-"QC:e" indicates the RPD was outside the QC limits.

-"QC:f" indicates there was some blank contamination.

The analytical results were evaluated in accordance with the sampling and analysis plan (Hu 1996a and 1996b).

Table B2-2. Tank 241-U-102 Analytical Results: Weight Percent Water. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result		Duplicate		Sample Mean
Solids			% H_2O	Temp. Range (°C)	% H_2O	Temp. Range (°C)	% H_2O
S96T002326[1]	143:1	Upper ½	41.5	40-160	40.3	40-170	40.9
S96T002329[2]		Lower ½	51.79	21-250	51.35	20-250	51.57
S96T002332[1]	143:2	Upper ½	50.3	40-200	51.41	40-270	50.85
S96T002335[1]		Lower ½	50.52	40-250	48.92	40-190	49.72
S96T002338[1]	143:3	Upper ½	42.94	40-240	43.6	40-240	43.27
S96T002341[1]		Lower ½	31.61	40-170	33.17	40-190	32.39
S96T002344[2]	143:4	Upper ½	22.44	35-250	14.78	35-250	18.61[QC:e]
S96T002344[1]			28.1	40-160	31.81	40-160	29.95
S96T002347[2]		Lower ½	46.82	35-270	43.2	35-260	45.01
S96T002500[1]	143:5	Whole	15.72	40-180	16.48	40-170	16.1
S96T002501[1]	143:5A	Upper ½	17.19	40-210	17.11	40-200	17.15
S96T002665[1]	143:5B	Upper ½	40.24	40-200	32.66	40-200	36.45
S96T002666[1]		Lower ½	46.26	40-270	42.96	40-240	44.61
S96T002755[1]	143:6	Upper ½	41.68	40-170	40.7	40-190	41.19
S96T002632[1]	144:1	Lower ½	40.77	40-160	38.2	40-160	39.48
S96T002646[2]	144:2	Upper ½	38.93	35-190	37.05	35-200	37.99
S96T002646[1]			33.09	n/a	33.69	n/a	33.39
S96T002633[1]		Lower ½	33.61	40-170	33.85	40-160	33.73
S96T002647[1]	144:3	Upper ½	7.68	40-140	10.46	40-160	9.07[QC:e]
S96T002647			11.59	n/a	10.25	n/a	10.92
S96T002636[2]	144:3	Lower ½	11.72	35-190	12.51	35-200	12.12
S96T002636[1]			12.63	n/a	12.66	n/a	12.64
S96T002775[1]	144:4	Upper ½	24.47	40-200	20.1	40-180	22.29
S96T002776[1]		Lower ½	30.1	40-200	29.9	40-200	30
S96T002777[1]	144:5	Upper ½	35.9	40-200	33.7	40-200	34.8
S96T002778[1]		Lower ½	40.04	40-190	37.04	40-180	38.54
S96T002779[1]	144:6	Upper ½	50.1	40-270	55.46	40-170	52.78
S96T002780[1]		Lower ½	44.9	40-350	44.08	40-360	44.49
S96T003609[1]	144:6A	Upper ½	28.09	35-190	20.5	35-190	24.3[QC:e]

Table B2-2. Tank 241-U-102 Analytical Results: Weight Percent Water. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result		Duplicate		Sample Mean
Composite							
S96T003678[1]	143	n/a	43.36	40-180	40.68	40-210	42.02
S96T003670[1]	144	n/a	37.06	40-260	35.32	40-200	36.19
Liquids							
S96T002323[1]	143:1	DL	50.93	40-205	50.28	40-200	50.61
S96T002549[1]	144:1	DL	52.29	40-250	40.23	40-270	46.26[QC:e]

Notes:

[1] Mettler™

[2] Perkin-Elmer™

Table B2-3. Tank 241-U-102 Analytical Results: Differential Scanning Calorimetry. (3 sheets)

Sample Number	Core: Segment	Segment Portion	Run	Sample Weight	Transition 1		Transition 2		Transition 3	
Solids				mg	Peak Temp. (°C)	Δ H (J/g)	Peak Temp. (°C)	Δ H (J/g)	Peak Temp. (°C)	Δ H (J/g)
S96T002326[1]	143: 1	Upper ½	1	13.20	120	1107	250	-69.8	--	--
			2	17.30	123	1064	249	-66.6	--	--
S96T002329[1]		Lower ½	1	12.84	129	1290	250	-53.1	--	--
			2	11.25	129	1242	251	-51.9	--	--
S96T002332[2]	143: 2	Upper ½	1	13.52	122	828.2	241	-187.2	332	-45.7[3]
			2	13.92	116	873.7	239	-225.9	332	-57.6[4]
S96T002335[2]		Lower ½	1	12.60	123	812.0	241	-263.7	330	-33.1[5]
			2	14.44	122	816.8	241	-266.6	334	-38.7[6]
S96T002338[2]	143: 3	Upper ½	1	21.22	124	933.4	243	-44.3	400	-16.7
			2	18.51	128	1013	247	-50.5	408	-14.3
S96T002341[2]		Lower ½	1	10.07	109	1088	240	-45.7	406	-20.0
			2	33.35	119	916.4	263	-69.3	404	-17.2
S96T002344[1]	143: 4	Upper ½	1	13.10	103	478.4	--	--	--	--[QC:e]
			2	46.41	139	747.5	289	16.3	392	-11.7
			3	40.24	137	855.2	284	14.24	394	-8.05
S96T002347[1]		Lower ½	1	41.07	133	965.9	286	7.69	--	--[QC:e]
			2	39.2	142	852.5	252	-33.4	395	-57.2[QC:e]
S96T002500[2]	143: 5	Whole	1	28.86	107	499.5	275	100.5	388	-16.6
			2	25.27	143	343.6	287	107.2	384	-15.5
S96T002501[2]	143: 5A	Upper ½	1	41.91	146	444.0	282	67.9	420	-19.0
			2	46.79	144	498.5	280	95.7	405.8	-15.5
S96T002665[2]	143: 5B	Upper ½	1	36.00	127	610.0	278	-193[QC:e]	--	--
			2	33.28	123	864.7	249	-54.8[QC:e]	332	-43.3
S96T002665[1]			1	23.12	126	1,050	249	-151.9	303	-6.39
			2	11.43	122	1,077	248	-136.5	302	-4.95
S96T002666[2]		Lower ½	1	12.75	117	968.4	247	-86.1	412	-11.3
			2	34.05	115	906.9	249	-50.2	324	-66.6

Table B2-3. Tank 241-U-102 Analytical Results: Differential Scanning Calorimetry. (3 sheets)

Sample Number	Core: Segment	Segment Portion	Run	Sample Weight	Transition 1		Transition 2		Transition 3	
Solids				mg	Peak Temp. (°C)	ΔH (J/g)	Peak Temp. (°C)	ΔH (J/g)	Peak Temp. (°C)	ΔH (J/g)
S96002755[2]	143: 6	Upper ½	1	35.20	113	835.1	249	-53.8	406	-16.4
			2	28.72	123	890.2	249	-50.9	414	-11.3
S96T002632[2]	144: 1	Lower ½	1	29.89	121	1,000	26.4	28.9	390	-48.5
			2	19.97	109	1,505	234	22.4	394	-41.9
S96T002646[1]	144: 2	Upper ½	1	8.52	111	653.6	243.4	-39.4[QC:e]	--	--
			2	27.24	132	767.2	232	3.99	292	27.6[7]
S96T002633[2]		Lower ½	1	21.58	128	791	248	-45.0	300	20.8[8]
			2	34.89	115	670.5	254	-31.0	299	18.7[9]
S96T002647[2]	144: 3	Upper ½	1	33.82	111	416.6	296	131.3	394	-18.3[QC:e]
			2	30.44	109	342.3	294	139.8	393.9	-29.6[QC:e]
S96T002636[1]		Lower ½	1	20.57	108	195.1	305	132.1	365	-18.2
			2	25.53	110.7	260	299	132.9	359	-22.2
S96T002775[2]	144: 4	Upper ½	1	27.52	142	546.5	250	-13.6	285	33.8[10]
			2	34.51	141	556.7	250	-19.4	281	25.9[11]
S96T002776[2]		Lower ½	1	15.13	105	1,524	268	44.2	388	-29.9[QC:e]
			2	10.96	121	1,988	270	69.4	386	-41.7[QC:e]
S96T002777[2]	144: 5	Upper ½	1	21.77	133	1,362	246	-53.4	394	-34.2
			2	10.97	107	1,188	238	-55.0	390	-40.0
S96T002778[2]		Lower ½	1	24.39	121	1,537	249	-94.9[QC:e]	320	-44.1
			2	16.35	120	1,783	246	-45.0[QC:e]	278	21.6[12]
S96T002778		Lower ½	1	24.40	109	524	214	-43.5	276	39.9
			2	17.70	111	655.4	240	-52.9	274	29.8
S96T002779[2]	144: 6	Upper ½	1	13.84	108	1,746	246	-36.0	280	11.5[13]
			2	15.75	128	1,915	247	-51.4	280	16.4[14]
S96T002780[2]		Lower ½	1	12.29	105	1,191	262	148.8	410	-14.4[QC:e]
			2	13.49	107	1,352	270	132.9	413	-19.8[QC:e]
S96T003609	144: 6A	Upper ½	1	11.72	105	622	274	85.4	412	-15.8
			2	24.59	138	530.4	275	70.1	426	-14.8

Table B2-3. Tank 241-U-102 Analytical Results: Differential Scanning Calorimetry. (3 sheets)

Sample Number	Core: Segment	Segment Portion	Run	Sample Weight	Transition 1		Transition 2		Transition 3	
Solid: core composites										
S96003678	143	n/a	1	13.74	110	912.6	242	-124.6	395	-35.5
			2	20.29	133	947.6	246	-85.4	397	-42.8
S96003670	144	n/a	1	15.56	108	828.4	241	-126.2	301	-24.9[15]
			2	26.68	145	844.1	247	-88.8	307	-12.2[16]
Liquids										
S96T002323[2]	143: 1	DL	1	14.94	122	989.1	243	-61.0	326	-60.9
			2	19.20	119	1,033	243	-65.1	330	-59.0
S96T002549[2]	144: 1	DL	1	21.68	120	873.6	243	-96.9	326	-14.6[QC:e]
			2	11.64	120	2,023	242	-104.3	326	-42.3[QC:e]

Notes:

[1]Perkin-Elmer™
[2]Mettler™
[3]Fourth transition was measured at 442 °C with a ΔH of -3.4 J/g
[4]Fourth transition was measured at 444 °C with a ΔH of -5.4 J/g
[5]Fourth transition was measured at 434 °C with a ΔH of -10.5 J/g
[6]Fourth transition was measured at 435 °C with a ΔH of -8.5 J/g
[7]Fourth transition was measured at 370 °C with a ΔH of -1.6 J/g
[8]Fourth transition was measured at 390 °C with a ΔH of -24.2 J/g
[9]Fourth transition was measured at 390 °C with a ΔH of -37.1 J/g
[10]Fourth transition was measured at 386 °C with a ΔH of -21.5 J/g
[11]Fourth transition was measured at 380 °C with a ΔH of -16.6 J/g
[12]Fourth transition was measured at 325 °C with a ΔH of -14.5 J/g
[13]Fourth transition was measured at 316 °C with a ΔH of -11.5 J/g
[14]Fourth transition was measured at 322 °C with a ΔH of -25.2 J/g
[15]Fourth transition was measured at 389 °C with a ΔH of -33.8 J/g
[16]Fourth transition was measured at 393 °C with a ΔH of -27.3 J/g

Table B2-4. Tank 241-U-102 Analytical Results: Bulk Density/Specific Gravity. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: direct			g/mL	g/mL	g/mL
S96T002325	143:1	Upper ½	1.61	n/a	1.61
S96T002328		Lower ½	1.81	n/a	1.81
S96T002331	143:2	Upper ½	1.69	n/a	1.69
S96T002334		Lower ½	1.64	n/a	1.64
S96T002337	143:3	Upper ½	1.65	n/a	1.65
S96T002340		Lower ½	1.64	n/a	1.64
S96T002343	143:4	Upper ½	1.62	n/a	1.62
S96T002346		Lower ½	1.61	n/a	1.61
S96T002498	143:5	Whole	1.88	n/a	1.88
S96T002499	143:5A	Upper ½	1.71	n/a	1.71
S96T002663	143:5B	Upper ½	1.65	n/a	1.65
S96T002664		Lower ½	1.55	n/a	1.55
S96T002754	143:6	Upper ½	1.61	n/a	1.61
S96T002551	144:1	Lower ½	1.67	n/a	1.67
S96T002554	144:2	Upper ½	1.67	n/a	1.67
S96T002552		Lower ½	1.81	n/a	1.81
S96T002555	144:3	Upper ½	1.71	n/a	1.71
S96T002553		Lower ½	1.70	n/a	1.70
S96T002781	144:4	Upper ½	1.70	n/a	1.70
S96T002782		Lower ½	1.61	n/a	1.61
S96T002783	144:5	Upper ½	1.63	n/a	1.63
S96T002784		Lower ½	1.77	n/a	1.77
S96T002785	144:6	Upper ½	1.61	n/a	1.61
S96T002786		Lower ½	1.67	n/a	1.67

Table B2-4. Tank 241-U-102 Analytical Results: Bulk Density/Specific Gravity. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Composites: direct			g/mL	g/mL	g/mL
S96T003668	143	n/a	1.68	n/a	1.68
S96T003669	144	n/a	1.65	n/a	1.65
Liquids: direct			g/mL	g/mL	g/mL
S96T002323	143:1	DL	1.397	1.402	1.399
S96T002549	144:1	DL	1.363	1.341	1.352

Table B2-5. Tank 241-U-102 Analytical Results: pH.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Liquids: direct			**unitless**	**unitless**	**unitless**
S96T002524	143:1	DL	13.27	n/a	13.27
S96T003622	144:1	DL	13.01	13.09	13.05

Table B2-6. Tank 241-U-102 Analytical Results: Aluminum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	10,400	10,200	10,300
S96T002443		Lower ½	5,840	5,700	5,770
S96T002444	143:2	Upper ½	9,600	10,700	10,200
S96T002445		Lower ½	15,000	15,900	15,400
S96T002446	143:3	Upper ½	17,100	17,000	17,000
S96T002447		Lower ½	17,400	16,800	17,100
S96T002448	143:4	Upper ½	17,400	18,400	17,900
S96T002449		Lower ½	20,500	21,300	20,900
S96T002518	143:5	Whole	9,410	12,800	11,100[QC:e]
S96T002521	143:5A	Upper ½	10,800	10,600	10,700
S96T002671	143:5B	Upper ½	19,100	19,400	19,200
S96T002672		Lower ½	25,400	27,800	26,600
S96T002757	143:6	Upper ½	20,000	18,900	19,400
S96T002648	144:1	Lower ½	22,100	19,900	21,000
S96T002654	144:2	Upper ½	12,400	12,500	12,400
S96T002649		Lower ½	10,500	10,400	10,400
S96T002655	144:3	Upper ½	6,530	6,820	6,680
S96T002662		Lower ½	6,350	6,330	6,340
S96T002793	144:4	Upper ½	13,100	14,000	13,600
S96T002796		Lower ½	16,800	14,700	15,800
S96T002794	144:5	Upper ½	19,400	19,800	19,600
S96T002797		Lower ½	18,200	17,500	17,800
S96T002795	144:6	Upper ½	25,700	26,000	25,800
S96T002798		Lower ½	17,900	17,700	17,800
S96T003610	144:6A	Upper ½	10,600	10,800	10,700
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper ½	8,800	7,050	7,920[QC:e]
S96T002469		Lower ½	5,310	4,420	4,860[QC:d]
S96T002470	143:2	Upper ½	9,190	9,720	9,460
S96T002471		Lower ½	12,200	13,100	12,600[QC:d]
S96T002472	143:3	Upper ½	13,200	14,200	13,700
S96T002473		Lower ½	16,100	14,400	15,200
S96T002474	143:4	Upper ½	13,200	19,600	16,400[QC:d,e]
S96T002475		Lower ½	15,800	17,900	16,800

Table B2-6. Tank 241-U-102 Analytical Results: Aluminum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002519	143:5	Whole	7,890	8,690	8,290
S96T002522	143:5A	Upper ½	8,530	8,040	8,280
S96T002673	143:5B	Upper ½	16,500	15,100	15,800
S96T002674		Lower ½	20,200	14,300	17,200[QC:e]
S96T002758	143:6	Upper ½	15,000	14,800	14,900
S96T002650	144:1	Lower ½	14,100	17,200	15,600[QC:d]
S96T002656	144:2	Upper ½	11,500	11,300	11,400
S96T002651		Lower ½	9,430	9,110	9,270[QC:d]
S96T002657	144:3	Upper ½	5,220	6,330	5,780
S96T002658		Lower ½	5,780	5,590	5,680
S96T002799	144:4	Upper ½	12,100	11,700	11,900
S96T002800		Lower ½	15,300	14,700	15,000
S96T002801	144:5	Upper ½	17,100	18,100	17,600
S96T002802		Lower ½	16,700	19,300	18,000
S96T002803	144:6	Upper ½	22,800	22,900	22,800
S96T002804		Lower ½	15,100	16,200	15,600
S96T003686	144:6A	Upper ½	12,400	10,500	11,400
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	19,200	18,200	18,700
S96T003675	144	n/a	18,900	16,500	17,700
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	16,800	17,100	17,000[QC:d]
S96T003676	144	n/a	16,600	15,800	16,200
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143:1	DL	18,500	18,800	18,600
S96T002549	144:1	DL	17,000	17,600	17,300[QC:d]

Table B2-7. Tank 241-U-102 Analytical Results: Antimony. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	< 1,120	< 1,150	< 1,140
S96T002443		Lower ½	< 1,200	< 1,140	< 1,170
S96T002444	143:2	Upper ½	< 1,210	< 1,200	< 1,210
S96T002445		Lower ½	< 1,210	< 1,190	< 1,200
S96T002446	143:3	Upper ½	< 1,050	< 1,040	< 1,050
S96T002447		Lower ½	< 1,220	< 1,200	< 1,210
S96T002448	143:4	Upper ½	< 1,270	< 1,290	< 1,280
S96T002449		Lower ½	< 1,350	< 1,420	< 1,390
S96T002518	143:5	Whole	< 1,300	< 1,170	< 1,240
S96T002521	143:5A	Upper ½	< 1,310	< 1,400	< 1,360
S96T002671	143:5B	Upper ½	< 1,320	< 1,270	< 1,300
S96T002672		Lower ½	< 1,200	< 1,200	< 1,200
S96T002757	143:6	Upper ½	< 1,120	< 1,210	< 1,170
S96T002648	144:1	Lower ½	< 1,190	< 1,210	< 1,200
S96T002654	144:2	Upper ½	< 1,140	< 1,100	< 1,120
S96T002649		Lower ½	< 1,200	< 1,160	< 1,180
S96T002655	144:3	Upper ½	< 1,210	< 1,110	< 1,160
S96T002662		Lower ½	< 1,110	< 1,100	< 1,110
S96T002793	144:4	Upper ½	< 1,180	< 1,220	< 1,200
S96T002796		Lower ½	< 1,200	< 1,160	< 1,180
S96T002794	144:5	Upper ½	< 1,180	< 1,180	< 1,180
S96T002797		Lower ½	< 1,210	< 1,160	< 1,190
S96T002795	144:6	Upper ½	< 1,220	< 1,190	< 1,210
S96T002798		Lower ½	< 1,180	< 1,190	< 1,190
S96T003610	144:6A	Upper ½	< 1,210	< 1,230	< 1,220
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper ½	< 27.80	< 26.8	< 27.3
S96T002469		Lower ½	< 28.00	< 29.2	< 28.6
S96T002470	143:2	Upper ½	< 26.60	< 27.7	< 27.2
S96T002471		Lower ½	< 27.50	< 27.1	< 27.3
S96T002472	143:3	Upper ½	< 29.40	< 28.2	< 28.8
S96T002473		Lower ½	< 26.00	< 29.5	< 27.8
S96T002474	143:4	Upper ½	< 31.00	< 28.6	< 29.8
S96T002475		Lower ½	< 31.90	< 33.5	< 32.7

Table B2-7. Tank 241-U-102 Analytical Results: Antimony. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**μg/g**	**μg/g**	**μg/g**
S96T002519	143:5	Whole	< 27.20	< 30.7	< 29.0
S96T002522	143:5A	Upper ½	< 29.00	< 26.1	< 27.6
S96T002673	143:5B	Upper ½	< 26.60	< 30.6	< 28.6
S96T002674		Lower ½	< 29.50	< 30.4	< 30.0
S96T002758	143:6	Upper ½	< 26.90	< 28.1	< 27.5
S96T002650	144:1	Lower ½	< 59.20	< 57.9	< 58.6
S96T002656	144:2	Upper ½	< 58.70	< 57.0	< 57.9
S96T002651		Lower ½	< 57.60	< 55.6	< 56.6
S96T002657	144:3	Upper ½	< 55.60	< 59.4	< 57.5
S96T002658		Lower ½	< 53.80	< 54.2	< 54.0
S96T002799	144:4	Upper ½	< 54.30	< 55.7	< 55.0
S96T002800		Lower ½	< 57.80	< 58.2	< 58.0
S96T002801	144:5	Upper ½	< 53.90	< 52.8	< 53.4
S96T002802		Lower ½	< 56.50	< 59.5	< 58.5
S96T002803	144:6	Upper ½	< 54.30	< 55.7	< 55.0
S96T002804		Lower ½	< 56.20	< 54.4	< 55.3
S96T003686	144:6A	Upper ½	< 26.20	26.7	26.5
Composites: fusion digest			**μg/g**	**μg/g**	**μg/g**
S96T003680	143	n/a	< 1,330	< 1,330	< 1,330
S96T003675	144	n/a	< 1,320	< 1,240	< 1,280
Composites: acid digest			**μg/g**	**μg/g**	**μg/g**
S96T003682	143	n/a	< 30.90	< 27.7	< 29.3
S96T003676	144	n/a	< 28.80	< 29.1	< 29.0
Liquids: direct			**μg/mL**	**μg/mL**	**μg/mL**
S96T002323	143:1	DL	< 24.10	< 24.1	< 24.1
S96T002549	144:1	DL	< 24.10	< 24.1	< 24.1

Table B2-8. Tank 241-U-102 Analytical Results: Arsenic. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143: 3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3
S96T002474	143: 4	Upper ½	< 51.60	< 47.7	< 49.7
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5

Table B2-8. Tank 241-U-102 Analytical Results: Arsenic. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 49.9
S96T002758	143: 6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144: 1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144: 5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-9 Tank 241-U-102 Analytical Results: Barium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 976
S96T002444	143: 2	Upper ½	< 1,010	< 997	< 1,000
S96T002445		Lower ½	< 1,010	< 989	< 1,000
S96T002446	143: 3	Upper ½	< 876	< 871	< 874
S96T002447		Lower ½	< 1,020	< 998	< 1,010
S96T002448	143: 4	Upper ½	< 1,060	< 1,070	< 1,070
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143: 5	Whole	< 1,080	< 972	< 1,030
S96T002521	143: 5A	Upper ½	< 1,090	< 1,160	< 1,130
S96T002671	143: 5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143: 6	Upper ½	< 933	< 1,010	< 972
S96T002648	144: 1	Lower ½	< 988	< 1,010	< 999
S96T002654	144: 2	Upper ½	< 947	< 920	< 934
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144: 3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144: 4	Upper ½	< 981	< 1,020	< 1,000
S96T002796		Lower ½	< 997	< 970	< 984
S96T002794	144: 5	Upper ½	< 985	< 984	< 985
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144: 6	Upper ½	< 1,020	< 991	< 1,010
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144: 6A	Upper ½	< 1,010	< 1,020	< 1,020
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 23.10	< 22.3	< 22.7
S96T002469		Lower ½	< 23.30	< 24.3	< 23.8
S96T002470	143: 2	Upper ½	< 22.20	< 23.1	< 22.7
S96T002471		Lower ½	< 22.90	< 22.6	< 22.8
S96T002472	143: 3	Upper ½	< 24.50	< 23.5	< 24.0
S96T002473		Lower ½	< 21.70	< 24.6	< 23.2

Table B2-9 Tank 241-U-102 Analytical Results: Barium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	< 25.80	< 23.8	< 24.8
S96T002475		Lower ½	< 26.60	< 27.9	< 27.3
S96T002519	143: 5	Whole	< 22.70	< 25.6	< 24.2
S96T002522	143: 5A	Upper ½	< 24.20	< 21.8	< 23.0
S96T002673	143: 5B	Upper ½	< 22.10	< 25.5	< 23.8
S96T002674		Lower ½	< 24.60	< 25.3	< 25.0
S96T002758	143: 6	Upper ½	< 22.40	< 23.5	< 23.0
S96T002650	144: 1	Lower ½	< 49.30	< 48.2	< 48.8
S96T002656	144: 2	Upper ½	< 48.90	< 47.5	< 48.2
S96T002651		Lower ½	< 48.00	< 46.3	< 47.2
S96T002657	144: 3	Upper ½	< 46.30	< 49.5	< 47.9
S96T002658		Lower ½	< 44.80	< 45.2	< 45.0
S96T002799	144: 4	Upper ½	< 45.20	< 46.4	< 45.8
S96T002800		Lower ½	< 48.10	< 48.5	< 48.3
S96T002801	144: 5	Upper ½	< 44.90	< 44.0	< 44.5
S96T002802		Lower ½	< 47.00	< 49.6	< 48.3
S96T002803	144: 6	Upper ½	< 45.30	< 46.4	< 45.9
S96T002804		Lower ½	< 46.80	< 45.3	< 46.1
S96T003686	144: 6A	Upper ½	< 21.80	22.3	22.1
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 25.80	< 23.0	< 24.4
S96T003676	144	n/a	< 24.00	< 24.2	< 24.1
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 20.10	< 20.1	< 20.1
S96T002549	144: 1	DL	< 20.10	< 20.1	< 20.1

Table B2-10. Tank 241-U-102 Analytical Results: Beryllium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 93.00	< 95.4	< 94.2
S96T002443		Lower ½	< 99.90	< 95.2	< 97.6
S96T002444	143: 2	Upper ½	< 101	< 99.7	< 100
S96T002445		Lower ½	< 101	< 98.9	< 100
S96T002446	143: 3	Upper ½	< 87.60	< 87.1	< 87.4
S96T002447		Lower ½	< 102	< 99.8	< 101
S96T002448	143: 4	Upper ½	< 106	< 107	< 107
S96T002449		Lower ½	< 112	< 118	< 115
S96T002518	143: 5	Whole	< 108	< 97.2	< 103
S96T002521	143: 5A	Upper ½	< 109	< 116	< 113
S96T002671	143: 5B	Upper ½	< 110	< 106	< 108
S96T002672		Lower ½	< 100	< 100	< 100
S96T002757	143: 6	Upper ½	< 93.30	< 101	< 97.2
S96T002648	144: 1	Lower ½	< 98.80	< 101	< 99.9
S96T002654	144: 2	Upper ½	< 94.70	< 92.0	< 93.4
S96T002649		Lower ½	< 99.90	< 96.7	< 98.3
S96T002655	144: 3	Upper ½	< 101	< 92.4	< 96.7
S96T002662		Lower ½	< 92.70	< 92.1	< 92.4
S96T002793	144: 4	Upper ½	< 98.10	< 102	< 100
S96T002796		Lower ½	< 99.70	< 97.0	< 98.4
S96T002794	144: 5	Upper ½	< 98.50	< 98.4	< 98.5
S96T002797		Lower ½	< 101	< 96.6	< 98.8
S96T002795	144: 6	Upper ½	< 102	< 99.1	< 101
S96T002798		Lower ½	< 98.30	< 99.5	< 98.9
S96T003610	144: 6A	Upper ½	< 101	< 102	< 102
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 2.310	< 2.23	< 2.27
S96T002469		Lower ½	< 2.330	< 2.43	< 2.38
S96T002470	143: 2	Upper ½	< 2.220	< 2.31	< 2.27
S96T002471		Lower ½	< 2.290	< 2.26	< 2.28

Table B2-10. Tank 241-U-102 Analytical Results: Beryllium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002472	143: 3	Upper ½	< 2.450	< 2.35	< 2.40
S96T002473		Lower ½	< 2.170	< 2.46	< 2.32
S96T002474	143: 4	Upper ½	< 2.580	< 2.38	< 2.48
S96T002475		Lower ½	< 2.660	< 2.79	< 2.73
S96T002519	143: 5	Whole	< 2.270	< 2.56	< 2.42
S96T002522	143: 5A	Upper ½	< 2.420	< 2.18	< 2.30
S96T002673	143: 5B	Upper ½	< 2.210	< 2.55	< 2.38
S96T002674		Lower ½	< 2.460	< 2.53	< 2.50
S96T002758	143: 6	Upper ½	< 2.240	< 2.35	< 2.30
S96T002650	144: 1	Lower ½	< 4.930	< 4.82	< 4.88
S96T002656	144: 2	Upper ½	< 4.890	< 4.75	< 4.82
S96T002651		Lower ½	< 4.800	< 4.63	< 4.72
S96T002657	144: 3	Upper ½	< 4.630	< 4.95	< 4.79
S96T002658		Lower ½	< 4.480	< 4.52	< 4.50
S96T002799	144: 4	Upper ½	< 4.520	< 4.64	< 4.58
S96T002800		Lower ½	< 4.810	< 4.85	< 4.83
S96T002801	144: 5	Upper ½	< 4.490	< 4.40	< 4.45
S96T002802		Lower ½	< 4.700	< 4.96	< 4.83
S96T002803	144: 6	Upper ½	< 4.530	< 4.64	< 4.59
S96T002804		Lower ½	< 4.680	< 4.53	< 4.61
S96T003686	144: 6A	Upper ½	< 2.180	2.23	2.21
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 111	< 111	< 111
S96T003675	144	n/a	< 110	< 103	< 107
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 2.580	< 2.30	< 2.44
S96T003676	144	n/a	< 2.400	< 2.42	< 2.41
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 2.000	< 2.00	< 2.00
S96T002549	144: 1	DL	< 2.000	< 2.00	< 2.00

Table B2-11. Tank 241-U-102 Analytical Results: Bismuth. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5

Table B2-11. Tank 241-U-102 Analytical Results: Bismuth. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002472	143: 3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3
S96T002474	143: 4	Upper ½	< 51.60	< 47.7	< 49.7
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 49.9
S96T002758	143: 6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144: 1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144: 5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-12. Tank 241-U-102 Analytical Results: Boron. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 976
S96T002444	143: 2	Upper ½	< 1,010	< 997	< 1,000
S96T002445		Lower ½	< 1,010	< 989	< 1,000
S96T002446	143: 3	Upper ½	< 876	< 871	< 874
S96T002447		Lower ½	< 1,020	< 998	< 1,010
S96T002448	143: 4	Upper ½	< 1,060	< 1,070	< 1,070
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143: 5	Whole	< 1,080	< 972	< 1,030
S96T002521	143: 5A	Upper ½	< 1,090	< 1,160	< 1,130
S96T002671	143: 5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143: 6	Upper ½	< 933	< 1,010	< 972
S96T002648	144: 1	Lower ½	< 988	< 1,010	< 999
S96T002654	144: 2	Upper ½	< 947	< 920	< 934
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144: 3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144: 4	Upper ½	< 981	< 1,020	< 1,000
S96T002796		Lower ½	< 997	< 970	< 984
S96T002794	144: 5	Upper ½	< 985	< 984	< 985
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144: 6	Upper ½	< 1,020	< 991	< 1,010
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144: 6A	Upper ½	< 1,010	< 1,020	< 1,020
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	41.3	31.8	36.55
S96T002469		Lower ½	56.9	31.9	44.4
S96T002470	143: 2	Upper ½	91.4	50.4	70.9
S96T002471		Lower ½	41.2	40.1	40.65
S96T002472	143: 3	Upper ½	43.3	46.4	44.85
S96T002473		Lower ½	99.9	106	103

Table B2-12. Tank 241-U-102 Analytical Results: Boron. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	52.2	63.7	57.95
S96T002475		Lower ½	104	46.5	75.25
S96T002519	143: 5	Whole	25.6	48.5	37.05
S96T002522	143: 5A	Upper ½	< 24.20	22.7	23.5
S96T002673	143: 5B	Upper ½	37.5	45.4	41.45
S96T002674		Lower ½	45.7	45.6	45.65
S96T002758	143: 6	Upper ½	41.3	32.2	36.75
S96T002650	144: 1	Lower ½	< 49.30	120	84.7
S96T002656	144: 2	Upper ½	86.8	118	102.4
S96T002651		Lower ½	55.7	63.6	59.65
S96T002657	144: 3	Upper ½	86.8	110	98.4
S96T002658		Lower ½	103	99.6	101.3
S96T002799	144: 4	Upper ½	82.5	96.8	89.65
S96T002800		Lower ½	90.0	123	106.5
S96T002801	144: 5	Upper ½	103	118	110.5
S96T002802		Lower ½	121	148	134.5
S96T002803	144: 6	Upper ½	122	131	126.5
S96T002804		Lower ½	98.1	120	109
S96T003686	144: 6A	Upper ½	102	126	114
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,010
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	73.5	71.9	72.7
S96T003676	144	n/a	95.2	78.5	86.85
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	83.2	88.7	85.95
S96T002549	144: 1	DL	74.9	77.3	76.1

Table B2-13. Tank 241-U-102 Analytical Results: Cadmium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 93.00	< 95.4	< 94.2
S96T002443		Lower ½	< 99.90	< 95.2	< 97.6
S96T002444	143: 2	Upper ½	< 101	< 99.7	< 100
S96T002445		Lower ½	< 101	< 98.9	< 100
S96T002446	143: 3	Upper ½	< 87.60	< 87.1	< 87.4
S96T002447		Lower ½	< 102	< 99.8	< 101
S96T002448	143: 4	Upper ½	< 106	< 107	< 107
S96T002449		Lower ½	< 112	< 118	< 115
S96T002518	143: 5	Whole	< 108	< 97.2	< 103
S96T002521	143: 5A	Upper ½	< 109	< 116	< 113
S96T002671	143: 5B	Upper ½	< 110	< 106	< 108
S96T002672		Lower ½	< 100	< 100	< 100
S96T002757	143: 6	Upper ½	< 93.30	< 101	< 97.2
S96T002648	144: 1	Lower ½	< 98.80	< 101	< 99.9
S96T002654	144: 2	Upper ½	< 94.70	< 92.0	< 93.4
S96T002649		Lower ½	< 99.90	< 96.7	< 98.3
S96T002655	144: 3	Upper ½	< 101	< 92.4	< 97.6
S96T002662		Lower ½	< 92.70	< 92.1	< 92.4
S96T002793	144: 4	Upper ½	< 98.10	< 102	< 100
S96T002796		Lower ½	< 99.70	< 97.0	< 98.4
S96T002794	144: 5	Upper ½	< 98.50	< 98.4	< 98.5
S96T002797		Lower ½	< 1.01	< 96.6	< 48.8
S96T002795	144: 6	Upper ½	< 102	< 99.1	< 101
S96T002798		Lower ½	< 98.30	< 99.5	< 98.9
S96T003610	144: 6A	Upper ½	< 101	< 102	< 102
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	7.78	7.17	7.475
S96T002469		Lower ½	2.50	< 2.43	2.47
S96T002470	143: 2	Upper ½	4.23	4.78	4.505
S96T002471		Lower ½	6.17	6.26	6.215
S96T002472	143: 3	Upper ½	5.98	6.17	6.075
S96T002473		Lower ½	8.34	7.05	7.695

Table B2-13. Tank 241-U-102 Analytical Results: Cadmium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	9.47	4.8	7.135
S96T002475		Lower ½	7.73	8.64	8.185
S96T002519	143: 5	Whole	3.59	3.59	3.59
S96T002522	143: 5A	Upper ½	< 2.420	2.85	2.64
S96T002673	143: 5B	Upper ½	4.29	3.60	3.945
S96T002674		Lower ½	5.05	10.0	7.525
S96T002758	143: 6	Upper ½	4.10	4.50	4.3
S96T002650	144: 1	Lower ½	11.7	10.7	11.2
S96T002656	144: 2	Upper ½	7.72	< 4.75	6.24
S96T002651		Lower ½	5.05	6.24	5.645
S96T002657	144: 3	Upper ½	< 4.630	< 4.95	< 4.79
S96T002658		Lower ½	< 4.480	< 4.52	< 4.50
S96T002799	144: 4	Upper ½	5.21	4.95	5.08
S96T002800		Lower ½	6.08	7.41	6.745
S96T002801	144: 5	Upper ½	8.00	8.44	8.22
S96T002802		Lower ½	6.34	7.21	6.775
S96T002803	144: 6	Upper ½	6.66	5.93	6.295
S96T002804		Lower ½	5.57	4.75	5.16
S96T003686	144: 6A	Upper ½	3.73	3.42	3.575
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 111	< 111	< 111
S96T003675	144	n/a	< 110	< 103	< 107
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	7.77	8.07	7.92
S96T003676	144	n/a	7.30	7.43	7.365
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	5.15	5.83	5.49
S96T002549	144: 1	DL	5.77	5.19	5.48

Table B2-14. Tank 241-U-102 Analytical Results: Calcium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	332	327	329.5
S96T002469		Lower ½	203	202	202.5
S96T002470	143: 2	Upper ½	249	288	268.5
S96T002471		Lower ½	336	310	323
S96T002472	143: 3	Upper ½	273	340	306.5[QC:e]
S96T002473		Lower ½	324	403	363.5[QC:e]

Table B2-14. Tank 241-U-102 Analytical Results: Calcium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	342	317	329.5
S96T002475		Lower ½	322	383	352.5
S96T002519	143: 5	Whole	257	241	249
S96T002522	143: 5A	Upper ½	230	213	221.5
S96T002673	143: 5B	Upper ½	246	307	276.5[QC:e]
S96T002674		Lower ½	331	356	343.5
S96T002758	143: 6	Upper ½	321	274	297.5
S96T002650	144: 1	Lower ½	460	390	425
S96T002656	144: 2	Upper ½	383	391	387
S96T002651		Lower ½	270	237	253.5
S96T002657	144: 3	Upper ½	239	188	213.5[QC:e]
S96T002658		Lower ½	207	159	183[QC:e]
S96T002799	144: 4	Upper ½	590	207	398.5[QC:e]
S96T002800		Lower ½	256	243	249.5
S96T002801	144: 5	Upper ½	343	315	329
S96T002802		Lower ½	294	318	306
S96T002803	144: 6	Upper ½	339	290	314.5
S96T002804		Lower ½	301	309	305
S96T003686	144: 6A	Upper ½	149	139	144
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	217	243	230
S96T003676	144	n/a	198	196	197
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	268	270	269
S96T002549	144: 1	DL	233	242	237.5

Table B2-15. Tank 241-U-102 Analytical Results: Cerium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143: 3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3

Table B2-15. Tank 241-U-102 Analytical Results: Cerium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	< 51.60	< 47.7	< 49.7
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 49.9
S96T002758	143: 6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144: 1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144: 5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-16. Tank 241-U-102 Analytical Results: Chromium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	4,750	4,860	4,800
S96T002443		Lower ½	902	1,020	961
S96T002444	143: 2	Upper ½	1,450	1,740	1,600
S96T002445		Lower ½	2,900	2,950	2,920
S96T002446	143: 3	Upper ½	3,320	2,750	3,040
S96T002447		Lower ½	3,060	2,960	3,010
S96T002448	143: 4	Upper ½	5,250	5,290	5,270
S96T002449		Lower ½	3,520	3,610	3,560
S96T002518	143: 5	Whole	1,320	1,430	1,380
S96T002521	143: 5A	Upper ½	1,190	1,210	1,200
S96T002671	143: 5B	Upper ½	1,290	1,310	1,300
S96T002672		Lower ½	1,520	1,520	1,520
S96T002757	143: 6	Upper ½	1,430	1,410	1,420
S96T002648	144: 1	Lower ½	7,050	6,870	6,960
S96T002654	144: 2	Upper ½	2,790	2,860	2,820
S96T002649		Lower ½	2,560	2,450	2,500
S96T002655	144: 3	Upper ½	2,460	2,340	2,400
S96T002662		Lower ½	1,750	1,690	1,720
S96T002793	144: 4	Upper ½	2,100	1,990	2,040
S96T002796		Lower ½	2,540	2,090	2,320
S96T002794	144: 5	Upper ½	3,340	3,380	3,360
S96T002797		Lower ½	2,350	2,240	2,300
S96T002795	144: 6	Upper ½	1,990	1,930	1,960
S96T002798		Lower ½	1,160	1,280	1,220
S96T003610	144: 6A	Upper ½	1,310	1,100	1,200
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	4,380	3,650	4,020
S96T002469		Lower ½	745	626	685.5
S96T002470	143: 2	Upper ½	1,350	1,480	1,420
S96T002471		Lower ½	1,980	1,780	1,880[QC:e]
S96T002472	143: 3	Upper ½	2,260	2,220	2,240
S96T002473		Lower ½	2,220	2,910	2,560[QC:e]

Table B2-16. Tank 241-U-102 Analytical Results: Chromium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	3,510	1,070	2,290[QC:e]
S96T002475		Lower ½	2,570	2,650	2,610
S96T002519	143: 5	Whole	906	1,030	968[QC:c]
S96T002522	143: 5A	Upper ½	812	805	808.5
S96T002673	143: 5B	Upper ½	897	942	919.5
S96T002674		Lower ½	1,080	4,110	2,600[QC:e]
S96T002758	143: 6	Upper ½	1,040	1,080	1,060
S96T002650	144: 1	Lower ½	5,860	5,570	5,720
S96T002656	144: 2	Upper ½	2,390	2,410	2,400
S96T002651		Lower ½	2,060	2,010	2,040
S96T002657	144: 3	Upper ½	1,660	1,940	1,800
S96T002658		Lower ½	1,500	1,470	1,480
S96T002799	144: 4	Upper ½	2,430	1,710	2,070[QC:e]
S96T002800		Lower ½	2,060	2,070	2,060
S96T002801	144: 5	Upper ½	2,790	3,030	2,910
S96T002802		Lower ½	1,890	2,060	1,980
S96T002803	144: 6	Upper ½	1,230	1,320	1,280
S96T002804		Lower ½	1,070	969	1,020
S96T003686	144: 6A	Upper ½	1,070	1,160	1,120
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	2,860	2,740	2,800
S96T003675	144	n/a	2,280	2,140	2,210
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	2,680	2,860	2,770[QC:d]
S96T003676	144	n/a	2,130	2,050	2,090
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	298	302	300
S96T002549	144: 1	DL	254	262	258

Table B2-17. Tank 241-U-102 Analytical Results: Cobalt. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 372	< 382	< 377
S96T002443		Lower ½	< 399	< 381	< 390
S96T002444	143: 2	Upper ½	< 405	< 399	< 402
S96T002445		Lower ½	< 405	< 396	< 401
S96T002446	143: 3	Upper ½	< 351	< 348	< 350
S96T002447		Lower ½	< 407	< 399	< 403
S96T002448	143: 4	Upper ½	< 423	< 428	< 426
S96T002449		Lower ½	< 450	< 474	< 462
S96T002518	143: 5	Whole	< 433	< 389	< 411
S96T002521	143: 5A	Upper ½	< 436	< 465	< 451
S96T002671	143: 5B	Upper ½	< 441	< 423	< 432
S96T002672		Lower ½	< 401	< 402	< 402
S96T002757	143: 6	Upper ½	< 373	< 404	< 389
S96T002648	144: 1	Lower ½	< 395	< 403	< 399
S96T002654	144: 2	Upper ½	< 379	< 368	< 374
S96T002649		Lower ½	< 399	< 387	< 393
S96T002655	144: 3	Upper ½	< 402	< 370	< 386
S96T002662		Lower ½	< 371	< 368	< 370
S96T002793	144: 4	Upper ½	< 392	< 408	< 400
S96T002796		Lower ½	< 399	< 388	< 394
S96T002794	144: 5	Upper ½	< 394	< 394	< 394
S96T002797		Lower ½	< 403	< 387	< 395
S96T002795	144: 6	Upper ½	< 407	< 396	< 402
S96T002798		Lower ½	< 393	< 398	< 396
S96T003610	144: 6A	Upper ½	< 403	< 410	< 407
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 9.260	< 8.93	< 9.10
S96T002469		Lower ½	< 9.320	< 9.73	< 9.53
S96T002470	143: 2	Upper ½	< 8.870	< 9.25	< 9.06
S96T002471		Lower ½	< 9.160	< 9.03	< 9.10
S96T002472	143: 3	Upper ½	< 9.810	< 9.41	< 9.61
S96T002473		Lower ½	< 8.680	< 9.82	< 9.25

Table B2-17. Tank 241-U-102 Analytical Results: Cobalt. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	< 10.30	< 9.53	< 9.92
S96T002475		Lower ½	< 10.60	< 11.2	< 10.9
S96T002519	143: 5	Whole	< 9.070	< 10.2	< 9.64
S96T002522	143: 5A	Upper ½	< 9.680	< 8.70	< 9.19
S96T002673	143: 5B	Upper ½	< 8.860	< 10.2	< 9.53
S96T002674		Lower ½	< 9.830	< 10.1	< 9.97
S96T002758	143: 6	Upper ½	< 8.970	< 9.38	< 9.18
S96T002650	144: 1	Lower ½	< 19.70	< 19.3	< 19.5
S96T002656	144: 2	Upper ½	< 19.60	< 19.0	< 19.3
S96T002651		Lower ½	< 19.20	< 18.5	< 18.9
S96T002657	144: 3	Upper ½	< 18.50	< 19.8	< 19.2
S96T002658		Lower ½	< 17.90	< 18.1	< 18.0
S96T002799	144: 4	Upper ½	< 18.10	< 18.6	< 18.4
S96T002800		Lower ½	< 19.30	< 19.4	< 19.4
S96T002801	144: 5	Upper ½	< 18.00	< 17.6	< 17.8
S96T002802		Lower ½	< 18.80	< 19.8	< 19.3
S96T002803	144: 6	Upper ½	< 18.10	< 18.6	< 18.4
S96T002804		Lower ½	< 18.70	< 18.1	< 18.4
S96T003686	144: 6A	Upper ½	< 8.730	8.91	8.82
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 443	< 442	< 443
S96T003675	144	n/a	< 441	< 413	< 427
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 10.30	< 9.22	< 9.76
S96T003676	144	n/a	< 9.610	< 9.69	< 9.65
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 8.020	< 8.02	< 8.02
S96T002549	144: 1	DL	< 8.020	< 8.02	< 8.02

Table B2-18. Tank 241-U-102 Analytical Results: Copper. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143: 1	Upper ½	< 186	< 191	< 189
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143: 2	Upper ½	< 202	< 199	< 201
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143: 3	Upper ½	< 175	< 174	< 175
S96T002447		Lower ½	< 203	< 200	< 202
S96T002448	143: 4	Upper ½	218	< 214	216
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143: 5	Whole	< 217	< 194	< 206
S96T002521	143: 5A	Upper ½	< 218	< 233	< 226
S96T002671	143: 5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143: 6	Upper ½	< 187	< 202	< 195
S96T002648	144: 1	Lower ½	< 198	< 202	< 200
S96T002654	144: 2	Upper ½	< 189	< 184	< 187
S96T002649		Lower ½	< 200	< 193	< 197
S96T002655	144: 3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 185
S96T002793	144: 4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	< 199	< 194	< 197
S96T002794	144: 5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144: 6	Upper ½	< 203	< 198	< 201
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144: 6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143: 1	Upper ½	18.6	18.9	18.75
S96T002469		Lower ½	5.79	5.41	5.6
S96T002470	143: 2	Upper ½	10.1	9.28	9.69
S96T002471		Lower ½	12.3	11.8	12.05
S96T002472	143: 3	Upper ½	13.1	15.5	14.3
S96T002473		Lower ½	15.3	12.8	14.05

Table B2-18. Tank 241-U-102 Analytical Results: Copper. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	5.89	7.77	6.83
S96T002475		Lower ½	17.9	6.58	12.24
S96T002519	143: 5	Whole	< 4.530	< 5.12	< 4.83
S96T002522	143: 5A	Upper ½	< 4.840	< 4.35	< 4.60
S96T002673	143: 5B	Upper ½	< 4.430	< 5.11	< 4.77
S96T002674		Lower ½	6.07	< 5.06	< 5.57
S96T002758	143: 6	Upper ½	5.73	5.66	5.695
S96T002650	144: 1	Lower ½	21.4	15	18.2
S96T002656	144: 2	Upper ½	19.6	11.3	15.45
S96T002651		Lower ½	9.74	12.3	11.02
S96T002657	144: 3	Upper ½	< 9.260	13.2	11.2
S96T002658		Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144: 4	Upper ½	< 9.050	< 9.29	< 9.17
S96T002800		Lower ½	< 9.630	< 9.70	< 9.67
S96T002801	144: 5	Upper ½	10.7	10.4	10.55
S96T002802		Lower ½	< 9.410	9.94	9.68
S96T002803	144: 6	Upper ½	9.56	9.3	9.43
S96T002804		Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144: 6A	Upper ½	< 4.360	5.05	4.71
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 222	< 221	< 222
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	8.19	8.41	8.3
S96T003676	144	n/a	7.62	6.95	7.285
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	5.86	5.67	5.765
S96T002549	144: 1	DL	4.95	4.56	4.755

Table B2-19. Tank 241-U-102 Analytical Results: Iron. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	976	< 954	965
S96T002443		Lower ½	< 999	< 952	< 976
S96T002444	143: 2	Upper ½	< 1,010	< 997	< 1,000
S96T002445		Lower ½	< 1,010	< 989	< 1,000
S96T002446	143: 3	Upper ½	< 876	< 871	< 874
S96T002447		Lower ½	< 1,020	< 998	< 1,010
S96T002448	143: 4	Upper ½	< 1,060	< 1,070	< 1,070
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143: 5	Whole	< 1,080	< 972	< 1,030
S96T002521	143: 5A	Upper ½	< 1,090	< 1,160	< 1,130
S96T002671	143: 5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143: 6	Upper ½	< 933	< 1,010	< 972
S96T002648	144: 1	Lower ½	3,950	2,950	3,450[QC:e]
S96T002654	144: 2	Upper ½	< 947	< 920	< 934
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144: 3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144: 4	Upper ½	< 981	< 1,020	< 1,000
S96T002796		Lower ½	< 997	< 970	< 984
S96T002794	144: 5	Upper ½	< 985	< 984	< 985
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144: 6	Upper ½	< 1,020	< 991	< 1,010
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144: 6A	Upper ½	< 1,010	< 1,020	< 1,020
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	714	739	726.5
S96T002469		Lower ½	87.2	73.1	80.15
S96T002470	143: 2	Upper ½	175	188	181.5
S96T002471		Lower ½	170	170	170
S96T002472	143: 3	Upper ½	188	208	198
S96T002473		Lower ½	301	343	322

Table B2-19. Tank 241-U-102 Analytical Results: Iron. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	911	225	568[QC:e]
S96T002475		Lower ½	367	388	377.5
S96T002519	143: 5	Whole	181	208	194.5
S96T002522	143: 5A	Upper ½	143	153	148
S96T002673	143: 5B	Upper ½	194	176	185
S96T002674		Lower ½	236	978	607[QC:e]
S96T002758	143: 6	Upper ½	369	338	353.5
S96T002650	144: 1	Lower ½	2,830	1,810	2,320[QC:c,e]
S96T002656	144: 2	Upper ½	272	317	294.5
S96T002651		Lower ½	333	346	339.5
S96T002657	144: 3	Upper ½	319	318	318.5
S96T002658		Lower ½	306	295	300.5
S96T002799	144: 4	Upper ½	405	353	379
S96T002800		Lower ½	604	599	601.5
S96T002801	144: 5	Upper ½	500	531	515.5
S96T002802		Lower ½	350	377	363.5
S96T002803	144: 6	Upper ½	276	292	284
S96T002804		Lower ½	268	271	269.5
S96T003686	144: 6A	Upper ½	223	199	211
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	369	376	372.5
S96T003676	144	n/a	408	396	402
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 20.10	< 20.1	< 20.1
S96T002549	144: 1	DL	< 20.10	< 20.1	< 20.1

Table B2-20. Tank 241-U-102 Analytical Results: Lanthanum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			μg/g	μg/g	μg/g
S96T002438	143: 1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 976
S96T002444	143: 2	Upper ½	< 1,010	< 997	< 1,000
S96T002445		Lower ½	< 1,010	< 989	< 1,000
S96T002446	143: 3	Upper ½	< 876	< 871	< 874
S96T002447		Lower ½	< 1,020	< 998	< 1,010
S96T002448	143: 4	Upper ½	< 1,060	< 1,070	< 1,070
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143: 5	Whole	< 1,080	< 972	< 1,030
S96T002521	143: 5A	Upper ½	< 1,090	< 1,160	< 1,130
S96T002671	143: 5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143: 6	Upper ½	< 933	< 1,010	< 972
S96T002648	144: 1	Lower ½	< 988	< 1,010	< 999
S96T002654	144: 2	Upper ½	< 947	< 920	< 934
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144: 3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144: 4	Upper ½	< 981	< 1,020	< 1,000
S96T002796		Lower ½	< 997	< 970	< 984
S96T002794	144: 5	Upper ½	< 985	< 984	< 985
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144: 6	Upper ½	< 1,020	< 991	< 1,010
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144: 6A	Upper ½	< 1,010	< 1,020	< 1,020
Solids: acid digest			μg/g	μg/g	μg/g
S96T002468	143: 1	Upper ½	< 23.10	< 22.3	< 22.7
S96T002469		Lower ½	< 23.30	< 24.3	< 23.8
S96T002470	143: 2	Upper ½	< 22.20	< 23.1	< 22.7
S96T002471		Lower ½	< 22.90	< 22.6	< 22.8
S96T002472	143: 3	Upper ½	< 24.50	< 23.5	< 24.0
S96T002473		Lower ½	< 21.70	< 24.6	< 23.2

Table B2-20. Tank 241-U-102 Analytical Results: Lanthanum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	< 25.80	< 23.8	< 24.8
S96T002475		Lower ½	< 26.60	< 27.9	< 27.3
S96T002519	143: 5	Whole	< 22.70	< 25.6	< 24.2
S96T002522	143: 5A	Upper ½	< 24.20	< 21.8	< 23.0
S96T002673	143: 5B	Upper ½	< 22.10	< 25.5	< 23.8
S96T002674		Lower ½	< 24.60	< 25.3	< 25.0
S96T002758	143: 6	Upper ½	< 22.40	< 23.5	< 23.0
S96T002650	144: 1	Lower ½	< 49.30	< 48.2	< 48.8
S96T002656	144: 2	Upper ½	< 48.90	< 47.5	< 48.2
S96T002651		Lower ½	< 48.00	< 46.3	< 47.2
S96T002657	144: 3	Upper ½	< 46.30	< 49.5	< 47.9
S96T002658		Lower ½	< 44.80	< 45.2	< 45.0
S96T002799	144: 4	Upper ½	< 45.20	< 46.4	< 45.8
S96T002800		Lower ½	< 48.10	< 48.5	< 48.3
S96T002801	144: 5	Upper ½	< 44.90	< 44.0	< 44.5
S96T002802		Lower ½	< 47.00	< 49.6	< 48.3
S96T002803	144: 6	Upper ½	< 45.30	< 46.4	< 45.9
S96T002804		Lower ½	< 46.80	< 45.3	< 46.1
S96T003686	144: 6A	Upper ½	< 21.80	22.3	< 22.1
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 25.80	< 23.0	< 24.4
S96T003676	144	n/a	< 24.00	< 24.2	< 24.1
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 20.10	< 20.1	< 20.1
S96T002549	144: 1	DL	< 20.10	< 20.1	< 20.1

Table B2-21. Tank 241-U-102 Analytical Results: Lead. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143: 1	Upper ½	108	105	106.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	50	< 45.2	47.6
S96T002472	143: 3	Upper ½	< 49.00	51.4	50.2
S96T002473		Lower ½	71.3	72.1	71.7

Table B2-21. Tank 241-U-102 Analytical Results: Lead. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			μg/g	μg/g	μg/g
S96T002474	143: 4	Upper ½	569	< 47.7	308
S96T002475		Lower ½	77.6	77.3	77.45
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	585	317
S96T002758	143: 6	Upper ½	46.4	47.1	46.75
S96T002650	144: 1	Lower ½	258	194	226
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	175	120	147.5
S96T002801	144: 5	Upper ½	< 89.90	98.1	94.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			μg/g	μg/g	μg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			μg/g	μg/g	μg/g
S96T003682	143	n/a	64.6	67.7	66.15
S96T003676	144	n/a	72	69.5	70.75
Liquids: direct			μg/mL	μg/mL	μg/mL
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-22. Tank 241-U-102 Lithium Bromide Water Contamination Check: Lithium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate.	Sample Mean
Solids: fusion digest			μg/g	μg/g	μg/g
S96T002438	143:1	Upper ½	< 186	< 191	< 189
S96T002443	143:1	Lower ½	< 200	< 190	< 195
S96T002444	143:2	Upper ½	< 202	< 199	< 201
S96T002445	143:2	Lower ½	< 202	< 198	< 200
S96T002446	143:3	Upper ½	< 175	< 174	< 175
S96T002447	143:3	Lower ½	< 203	< 200	< 202
S96T002448	143:4	Upper ½	< 211	< 214	< 213
S96T002449	143:4	Lower ½	< 225	< 237	< 231
S96T002518	143:5	Whole	< 217	< 194	< 206
S96T002521	143:5A	Upper ½	< 218	< 233	< 226
S96T002671	143:5B	Upper ½	< 221	< 211	< 216
S96T002672	143:5B	Lower ½	< 201	< 201	< 201
S96T002757	143:6	Upper ½	< 187	< 202	< 195
S96T002648	144:1	Lower ½	< 198	< 202	< 200
S96T002654	144:2	Upper ½	< 189	< 184	< 187
S96T002649	144:2	Lower ½	< 200	< 193	< 197
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662	144:3	Lower ½	< 185	< 184	< 185
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796	144:4	Lower ½	< 199	< 194	< 197
S96T002794	144:5	Upper ½	< 197	< 197	< 197
S96T002797	144:5	Lower ½	< 201	< 193	< 197
S96T002795	144:6	Upper ½	< 203	< 198	< 201
S96T002798	144:6	Lower ½	< 197	< 199	< 198
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			μg/g	μg/g	μg/g
S96T002468	143:1	Upper ½	< 4.630	< 4.47	< 4.55
S96T002469	143:1	Lower ½	< 4.660	< 4.87	< 4.77
S96T002470	143:2	Upper ½	< 4.440	< 4.62	< 4.53
S96T002471	143:2	Lower ½	< 4.580	< 4.52	< 4.55
S96T002472	143:3	Upper ½	< 4.900	< 4.70	< 4.80
S96T002473	143:3	Lower ½	< 4.340	< 4.91	< 4.63
S96T002474	143:4	Upper ½	< 5.160	< 4.77	< 4.97
S96T002475	143:4	Lower ½	< 5.310	< 5.58	< 5.45

Table B2-22. Tank 241-U-102 Lithium Bromide Water Contamination Check: Lithium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest (cont'd)			**μg/g**	**μg/g**	**μg/g**
S96T002519	143:5	Whole	< 4.530	< 5.12	< 4.83
S96T002522	143:5A	Upper ½	8.68	8.23	8.455
S96T002673	143:5B	Upper ½	< 4.430	< 5.11	< 4.77
S96T002674	143:5B	Lower ½	< 4.920	< 5.06	< 4.99
S96T002758	143:6	Upper ½	15.7	15.8	15.75
S96T002650	144:1	Lower ½	< 9.870	< 9.65	< 9.76
S96T002656	144:2	Upper ½	< 9.780	< 9.51	< 9.65
S96T002651	144:2	Lower ½	< 9.600	< 9.26	< 9.43
S96T002657	144:3	Upper ½	< 9.260	< 9.90	< 9.58
S96T002658	144:3	Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144:4	Upper ½	< 9.050	< 9.29	< 9.17
S96T002800	144:4	Lower ½	< 9.630	< 9.70	< 9.67
S96T002801	144:5	Upper ½	< 8.990	< 8.80	< 8.90
S96T002802	144:5	Lower ½	< 9.410	< 9.92	< 9.67
S96T002803	144:6	Upper ½	< 9.050	< 9.29	< 9.17
S96T002804	144:6	Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144:6A	Upper ½	44.1	38.3	41.2
Composites: fusion digest			**μg/g**	**μg/g**	**μg/g**
S96T003680	143	n/a	< 222	< 221	< 222
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			**μg/g**	**μg/g**	**μg/g**
S96T003682	143	n/a	< 5.150	< 4.61	< 4.88
S96T003676	144comp	n/a	< 4.800	< 4.84	< 4.82
Liquids: direct			**μg/mL**	**μg/mL**	**μg/mL**
S96T002323	143:1	DL	< 4.010	< 4.01	< 4.01
S96T002549	144:1	DL	< 4.010	< 4.01	< 4.01
S96T002511	144: LiBr field blank		2,610	2,610	2,610

Table B2-23. Tank 241-U-102 Analytical Results: Magnesium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	47.1	< 44.7	45.9
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143: 3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3

Table B2-23. Tank 241-U-102 Analytical Results: Magnesium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	< 51.60	< 47.7	< 50.0
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 49.9
S96T002758	143: 6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144: 1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144: 5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-24. Tank 241-U-102 Analytical Results: Manganese. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143: 1	Upper ½	218	241	229.5
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143: 2	Upper ½	< 202	< 199	< 201
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143: 3	Upper ½	< 175	< 174	< 175
S96T002447		Lower ½	< 203	< 200	< 202
S96T002448	143: 4	Upper ½	384	379	381.5
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143: 5	Whole	< 217	< 194	< 206
S96T002521	143: 5A	Upper ½	< 218	< 233	< 226
S96T002671	143: 5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143: 6	Upper ½	< 187	< 202	< 195
S96T002648	144: 1	Lower ½	579	562	570.5
S96T002654	144: 2	Upper ½	< 189	< 184	< 187
S96T002649		Lower ½	< 200	< 193	< 197
S96T002655	144: 3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 185
S96T002793	144: 4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	244	213	228.5
S96T002794	144: 5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144: 6	Upper ½	< 203	< 198	< 201
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144: 6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143: 1	Upper ½	227	215	221
S96T002469		Lower ½	26.3	22.5	24.4
S96T002470	143: 2	Upper ½	56.6	61.7	59.15
S96T002471		Lower ½	59.4	56.1	57.75
S96T002472	143: 3	Upper ½	64.3	70.6	67.45
S96T002473		Lower ½	101	113	107

Table B2-24. Tank 241-U-102 Analytical Results: Manganese. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	306	68.4	187.2[QC:e]
S96T002475		Lower ½	116	128	122
S96T002519	143: 5	Whole	58.1	61.9	60.0
S96T002522	143: 5A	Upper ½	43.4	42.6	43.0
S96T002673	143: 5B	Upper ½	54.9	52.0	53.45
S96T002674		Lower ½	70.9	337	203.9[QC:e]
S96T002758	143: 6	Upper ½	72.8	72.2	72.5
S96T002650	144: 1	Lower ½	509	449	479
S96T002656	144: 2	Upper ½	86.4	85.3	85.85
S96T002651		Lower ½	119	111	115
S96T002657	144: 3	Upper ½	109	118	113.5
S96T002658		Lower ½	106	107	106.5
S96T002799	144: 4	Upper ½	130	115	122.5
S96T002800		Lower ½	211	213	212
S96T002801	144: 5	Upper ½	170	180	175
S96T002802		Lower ½	115	121	118
S96T002803	144: 6	Upper ½	82.6	86.3	84.45
S96T002804		Lower ½	69.2	68.3	68.75
S96T003686	144: 6A	Upper ½	57.8	53.2	55.5
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 222	< 221	< 222
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	119	123	121
S96T003676	144	n/a	131	123	127
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 4.010	< 4.01	< 4.01
S96T002549	144: 1	DL	< 4.010	< 4.01	< 4.01

Table B2-25. Tank 241-U-102 Analytical Results: Molybdenum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 976
S96T002444	143: 2	Upper ½	< 1,010	< 997	< 1,000
S96T002445		Lower ½	< 1,010	< 989	< 1,000
S96T002446	143: 3	Upper ½	< 876	< 871	< 874
S96T002447		Lower ½	< 1,020	< 998	< 1,010
S96T002448	143: 4	Upper ½	< 1,060	< 1,070	< 1,070
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143: 5	Whole	< 1,080	< 972	< 1,030
S96T002521	143: 5A	Upper ½	< 1,090	< 1,160	< 1,130
S96T002671	143: 5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143: 6	Upper ½	< 933	< 1,010	< 972
S96T002648	144: 1	Lower ½	< 988	< 1,010	< 999
S96T002654	144: 2	Upper ½	< 947	< 920	< 934
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144: 3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144: 4	Upper ½	< 981	< 1,020	< 1,000
S96T002796		Lower ½	< 997	< 970	< 984
S96T002794	144: 5	Upper ½	< 985	< 984	< 985
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144: 6	Upper ½	< 1,020	< 991	< 1,010
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144: 6A	Upper ½	< 1,010	< 1,020	< 1,020
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	28.4	25.3	26.85
S96T002469		Lower ½	< 23.30	< 24.3	< 23.8
S96T002470	143: 2	Upper ½	30.4	31.5	30.95
S96T002471		Lower ½	37.1	39.3	38.2
S96T002472	143: 3	Upper ½	37.9	39.1	38.5
S96T002473		Lower ½	45.6	40.3	42.95

Table B2-25. Tank 241-U-102 Analytical Results: Molybdenum. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	41.2	60.6	50.9
S96T002475		Lower ½	48.5	56.6	52.55
S96T002519	143: 5	Whole	24.1	26.1	25.1
S96T002522	143: 5A	Upper ½	26.7	26.5	26.6
S96T002673	143: 5B	Upper ½	51.7	46.2	48.95
S96T002674		Lower ½	64.2	42.7	53.45
S96T002758	143: 6	Upper ½	45.2	45.7	45.45
S96T002650	144: 1	Lower ½	< 49.30	< 48.2	< 48.8
S96T002656	144: 2	Upper ½	< 48.90	< 47.5	< 48.2
S96T002651		Lower ½	< 48.00	< 46.3	< 47.2
S96T002657	144: 3	Upper ½	< 46.30	< 49.5	< 47.9
S96T002658		Lower ½	< 44.80	< 45.2	< 45.0
S96T002799	144: 4	Upper ½	< 45.20	< 46.4	< 45.8
S96T002800		Lower ½	< 48.10	< 48.5	< 48.3
S96T002801	144: 5	Upper ½	49.7	49.1	49.4
S96T002802		Lower ½	48.0	54.0	51.0
S96T002803	144: 6	Upper ½	63.6	65.9	64.75
S96T002804		Lower ½	< 46.80	46.5	46.7
S96T003686	144: 6A	Upper ½	37.5	32.6	35.05
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	49.20	50.90	50.05
S96T003676	144	n/a	50.00	46.60	48.30
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	96.1	99.1	97.6
S96T002549	144: 1	DL	90.6	92.8	91.7

Table B2-26. Tank 241-U-102 Analytical Results: Neodymium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	< 1,860	< 1,910	< 1,890
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143: 2	Upper ½	< 2,020	< 1,990	< 2,010
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143: 3	Upper ½	< 1,750	< 1,740	< 1,750
S96T002447		Lower ½	< 2,030	< 2,000	< 2,020
S96T002448	143: 4	Upper ½	< 2,110	< 2,140	< 2,130
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143: 5	Whole	< 2,170	< 1,940	< 2,060
S96T002521	143: 5A	Upper ½	< 2,180	< 2,330	< 2,260
S96T002671	143: 5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143: 6	Upper ½	< 1,870	< 2,020	< 1,950
S96T002648	144: 1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144: 2	Upper ½	< 1,890	< 1,840	< 1,870
S96T002649		Lower ½	< 2,000	< 1,930	< 1,970
S96T002655	144: 3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,850
S96T002793	144: 4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,970
S96T002794	144: 5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144: 6	Upper ½	< 2,030	< 1,980	< 2,010
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144: 6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143: 2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143: 3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3

Table B2-26. Tank 241-U-102 Analytical Results: Neodymium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143: 4	Upper ½	< 51.60	< 47.7	< 49.7
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5
S96T002519	143: 5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143: 5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143: 5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 49.9
S96T002758	143: 6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144: 1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144: 2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144: 3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144: 4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144: 5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144: 6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144: 6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 2,220	< 2,210	< 2,220
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143: 1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144: 1	DL	< 40.10	< 40.1	< 40.1

Table B2-27. Tank 241-U-102 Analytical Results: Nickel. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	4,540	2,950	3,740
S96T002443		Lower ½	5,330	4,430	4,880
S96T002444	143: 2	Upper ½	2,530	4,820	3,680
S96T002445		Lower ½	2,920	2,820	2,870
S96T002446	143: 3	Upper ½	5,170	2,900	4,040
S96T002447		Lower ½	1,350	1,390	1,370
S96T002448	143: 4	Upper ½	1,960	5,700	3,830
S96T002449		Lower ½	2,000	1,100	1,550
S96T002518	143: 5	Whole	5,620	7,270	6,440
S96T002521	143: 5A	Upper ½	6,760	7,330	7,040
S96T002671	143: 5B	Upper ½	2,510	3,040	2,780
S96T002672		Lower ½	5,240	6,360	5,800
S96T002757	143: 6	Upper ½	5,420	3,150	4,280
S96T002648	144: 1	Lower ½	1,480	978	1,230
S96T002654	144: 2	Upper ½	4,420	1,050	2,740
S96T002649		Lower ½	1,020	557	788.5
S96T002655	144: 3	Upper ½	758	845	801.5
S96T002662		Lower ½	615	691	653
S96T002793	144: 4	Upper ½	5,950	2,600	4,280
S96T002796		Lower ½	421	718	569.5
S96T002794	144: 5	Upper ½	2,130	2,510	2,320
S96T002797		Lower ½	759	1,260	1,010
S96T002795	144: 6	Upper ½	1,170	6,890	4,030
S96T002798		Lower ½	7,160	6,690	6,920
S96T003610	144: 6A	Upper ½	1,530	1,970	1,750
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	79.4	69.3	74.35
S96T002469		Lower ½	36.1	31.0	33.55
S96T002470	143: 2	Upper ½	69.0	70.1	69.55
S96T002471		Lower ½	89.5	97.0	93.25

Table B2-27. Tank 241-U-102 Analytical Results: Nickel. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002472	143: 3	Upper ½	95.4	103	99.2
S96T002473		Lower ½	118	102	110
S96T002474	143: 4	Upper ½	99.7	85.9	92.8
S96T002475		Lower ½	97.5	110	103.8
S96T002519	143: 5	Whole	47.2	48.2	47.7
S96T002522	143: 5A	Upper ½	42.9	42.1	42.5
S96T002673	143: 5B	Upper ½	73.5	65.7	69.6
S96T002674		Lower ½	93.2	107	100.1
S96T002758	143: 6	Upper ½	75.0	73.9	74.45
S96T002650	144: 1	Lower ½	104	101	102.5
S96T002656	144: 2	Upper ½	92.0	82.7	87.35
S96T002651		Lower ½	75.5	73.3	74.4
S96T002657	144: 3	Upper ½	45.8	51.3	48.55
S96T002658		Lower ½	47.9	45.7	46.8
S96T002799	144: 4	Upper ½	84.0	77.7	80.85
S96T002800		Lower ½	112	108	110
S96T002801	144: 5	Upper ½	123	125	124
S96T002802		Lower ½	110	122	116
S96T002803	144: 6	Upper ½	116	119	117.5
S96T002804		Lower ½	81.3	86.8	84.05
S96T003686	144: 6A	Upper ½	74.2	63.2	68.7
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	513	670	591.5
S96T003675	144	n/a	759	1,060	909.5
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	110	113	111.5
S96T003676	144	n/a	106	100	103
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	128	130	129
S96T002549	144: 1	DL	122	125	123.5

Table B2-28. Tank 241-U-102 Analytical Results: Phosphorus. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	15,300	15,100	15,200
S96T002443		Lower ½	< 3,990	5,020	4,510
S96T002444	143: 2	Upper ½	4,410	3,990	4,200
S96T002445		Lower ½	5,200	5,300	5,250
S96T002446	143: 3	Upper ½	7,290	4,380	5,840[QC:e]
S96T002447		Lower ½	< 4,070	< 3,990	< 4,030
S96T002448	143: 4	Upper ½	< 4,230	< 4,280	< 4,260
S96T002449		Lower ½	< 4,500	< 4,740	< 4,620
S96T002518	143: 5	Whole	< 4,330	< 3,890	< 4,110
S96T002521	143: 5A	Upper ½	< 4,360	< 4,650	< 4,510
S96T002671	143: 5B	Upper ½	< 4,410	< 4,230	< 4,320
S96T002672		Lower ½	< 4,010	< 4,020	< 4,020
S96T002757	143: 6	Upper ½	< 3,730	< 4,040	< 3,890
S96T002648	144: 1	Lower ½	19,600	17,400	18,500
S96T002654	144: 2	Upper ½	8,360	7,970	8,160
S96T002649		Lower ½	4,560	4,690	4,620
S96T002655	144: 3	Upper ½	4,970	< 3,700	4,340
S96T002662		Lower ½	< 3,710	< 3,680	< 3,700
S96T002793	144: 4	Upper ½	< 3,920	< 4,080	< 4,000
S96T002796		Lower ½	< 3,990	< 3,880	< 3,940
S96T002794	144: 5	Upper ½	< 3,940	< 3,940	< 3,940
S96T002797		Lower ½	< 4,030	< 3,870	< 3,950
S96T002795	144: 6	Upper ½	< 4,070	< 3,960	< 4,020
S96T002798		Lower ½	< 3,930	< 3,980	< 3,960
S96T003610	144: 6A	Upper ½	< 4,030	< 4,100	< 4,070
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	14,500	11,300	12,900[QC:e]
S96T002469		Lower ½	3,210	3,510	3,360
S96T002470	143: 2	Upper ½	3,970	3,760	3,860
S96T002471		Lower ½	4,430	3,680	4,060[QC:c]

Table B2-28. Tank 241-U-102 Analytical Results: Phosphorus. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**μg/g**	**μg/g**	**μg/g**
S96T002472	143: 3	Upper ½	5,150	3,450	4,300[QC:e]
S96T002473		Lower ½	2,120	4,670	3,400[QC:e]
S96T002474	143: 4	Upper ½	1,840	1,040	1,440[QC:d,e]
S96T002475		Lower ½	1,270	1,500	1,380
S96T002519	143: 5	Whole	545	582	563.5
S96T002522	143: 5A	Upper ½	1,150	1,070	1,110
S96T002673	143: 5B	Upper ½	962	1,270	1,120[QC:e]
S96T002674		Lower ½	1,230	1,370	1,300
S96T002758	143: 6	Upper ½	1,240	1,300	1,270
S96T002650	144: 1	Lower ½	15,500	15,800	15,600[QC:c]
S96T002656	144: 2	Upper ½	6,500	6,130	6,320
S96T002651		Lower ½	4,200	3,630	3,920
S96T002657	144: 3	Upper ½	2,580	2,130	2,360
S96T002658		Lower ½	1,140	1,200	1,170
S96T002799	144: 4	Upper ½	7,130	2,620	4,880[QC:e]
S96T002800		Lower ½	1,270	898	1,080[QC:e]
S96T002801	144: 5	Upper ½	2,470	1,360	1,920[QC:e]
S96T002802		Lower ½	1,100	1,220	1,160
S96T002803	144: 6	Upper ½	1,220	1,340	1,280
S96T002804		Lower ½	1,840	1,200	1,520[QC:c,e]
S96T003686	144: 6A	Upper ½	1,530	2,290	1,910[QC:e]
Composites: fusion digest			**μg/g**	**μg/g**	**μg/g**
S96T003680	143	n/a	< 4,430	< 4,420	< 4,430
S96T003675	144	n/a	< 4,410	< 4,130	< 4,270
Composites: acid digest			**μg/g**	**μg/g**	**μg/g**
S96T003682	143	n/a	3,650	3,440	3,540
S96T003676	144	n/a	1,660	2,160	1,910
Liquids: direct			**μg/mL**	**μg/mL**	**μg/mL**
S96T002323	143: 1	DL	1,790	1,790	1,790
S96T002549	144: 1	DL	1,540	1,780	1,660

Table B2-29. Tank 241-U-102 Analytical Results: Potassium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143: 1	Upper ½	7.08E+06	n/a	
S96T002443		Lower ½	8.37E+06	n/a	
S96T002444	143: 2	Upper ½	7.48E+06	n/a	
S96T002445		Lower ½	7.03E+06	n/a	
S96T002446	143: 3	Upper ½	7.64E+06	n/a	
S96T002447		Lower ½	7.34E+06	n/a	
S96T002448	143: 4	Upper ½	8.65E+06	n/a	
S96T002449		Lower ½	8.35E+06	n/a	
S96T002518	143: 5	Whole	7.10E+06	n/a	
S96T002521	143: 5A	Upper ½	8.00E+06	n/a	
S96T002671	143: 5B	Upper ½	7.08E+06	n/a	
S96T002672		Lower ½	6.35E+06	n/a	
S96T002757	143: 6	Upper ½	6.93E+06	n/a	
S96T002648	144: 1	Lower ½	7.58E+06	n/a	
S96T002654	144: 2	Upper ½	7.29E+06	n/a	
S96T002649		Lower ½	9.44E+06	n/a	
S96T002655	144: 3	Upper ½	8.61E+06	n/a	
S96T002662		Lower ½	7.77E+06	n/a	
S96T002793	144: 4	Upper ½	9.21E+06	n/a	
S96T002796		Lower ½	7.73E+06	n/a	
S96T002794	144: 5	Upper ½	6.61E+06	n/a	
S96T002797		Lower ½	7.11E+06	n/a	
S96T002795	144: 6	Upper ½	8.42E+06	n/a	
S96T002798		Lower ½	9.25E+06	n/a	
S96T003610	144: 6A	Upper ½	5.72E+06	n/a	
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143: 1	Upper ½	1,350	1,200	1,280
S96T002469		Lower ½	1,100	934	1,020
S96T002470	143: 2	Upper ½	1,370	1,400	1,380
S96T002471		Lower ½	1,560	1,710	1,640
S96T002472	143: 3	Upper ½	1,640	1,810	1,720
S96T002473		Lower ½	2,010	1,750	1,880

Table B2-29. Tank 241-U-102 Analytical Results: Potassium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143: 4	Upper ½	1,590	2,180	1,880[QC:e]
S96T002475		Lower ½	1,670	2,050	1,860[QC:e]
S96T002519	143: 5	Whole	1,020	950	985[QC:c]
S96T002522	143: 5A	Upper ½	1,120	969	1,040
S96T002673	143: 5B	Upper ½	1,750	1,710	1,730
S96T002674		Lower ½	2,200	1,600	1,900[QC:e]
S96T002758	143: 6	Upper ½	1,610	1,610	1,610
S96T002650	144: 1	Lower ½	1,300	1,170	1,240
S96T002656	144: 2	Upper ½	1,610	1,520	1,560
S96T002651		Lower ½	1,380	1,260	1,320
S96T002657	144: 3	Upper ½	807	878	842.5
S96T002658		Lower ½	936	901	918.5
S96T002799	144: 4	Upper ½	1,680	1,570	1,620
S96T002800		Lower ½	1,720	1,610	1,660[QC:c]
S96T002801	144: 5	Upper ½	1,860	2,010	1,940
S96T002802		Lower ½	1,900	2,120	2,010
S96T002803	144: 6	Upper ½	2,530	2,570	2,550
S96T002804		Lower ½	1,740	1,850	1,800
S96T003686	144: 6A	Upper ½	1,720	1,370	1,540[QC:c,e]
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	5.90E+06	n/a	
S96T003675	144	n/a	7.29E+06	n/a	
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	2,060	2,050	2,060
S96T003676	144	n/a	1,940	1,830	1,880
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143: 1	DL	3,760	3,950	3,860
S96T002549	144: 1	DL	3,620	3,760	3,690

Table B2-30. Tank 241-U-102 Analytical Results: Samarium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	< 1,860	< 1,910	< 1,885
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143:2	Upper ½	< 2,020	< 1,990	< 2,005
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143:3	Upper ½	< 1,750	< 1,740	< 1,745
S96T002447		Lower ½	< 2,030	< 2,000	< 2,015
S96T002448	143:4	Upper ½	< 2,110	< 2,140	< 2,125
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143:5	Whole	< 2,170	< 1,940	< 2,055
S96T002521	143:5A	Upper ½	< 2,180	< 2,330	< 2,255
S96T002671	143:5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143:6	Upper ½	< 1,870	< 2,020	< 1,945
S96T002648	144:1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144:2	Upper ½	< 1,890	< 1,840	< 1,865
S96T002649		Lower ½	< 2,000	< 1,930	< 1,965
S96T002655	144:3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	<1,845
S96T002793	144:4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,965
S96T002794	144:5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144:6	Upper ½	< 2,030	< 1,980	< 2,005
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144:6A	Upper ½	< 2,010	< 2,050	<2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper ½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.7
S96T002470	143:2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143:3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.3

Table B2-30. Tank 241-U-102 Analytical Results: Samarium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143:4	Upper ½	< 51.60	< 47.7	< 49.7
S96T002475		Lower ½	< 53.10	< 55.8	< 54.5
S96T002519	143:5	Whole	< 45.30	< 51.2	< 48.3
S96T002522	143:5A	Upper ½	< 48.40	< 43.5	< 46.0
S96T002673	143:5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	< 49.20	< 50.6	< 50.0
S96T002758	143:6	Upper ½	< 44.80	< 46.9	< 45.9
S96T002650	144:1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144:2	Upper ½	< 97.80	< 95.1	< 96.5
S96T002651		Lower ½	< 96.0 0	< 92.6	< 94.3
S96T002657	144:3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144:4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.7
S96T002801	144:5	Upper ½	< 89.90	< 88.0	< 89.0
S96T002802		Lower ½	< 94.10	< 99.2	< 96.7
S96T002803	144:6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144:6A	Upper ½	< 43.60	< 44.6	< 44.1
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,215
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composite: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143:1	DL	< 40.10	< 40.1	< 40.1
S96T002549	144:1	DL	< 40.10	< 40.1	< 40.1

Table B2-31. Tank 241-U-102 Analytical Results: Selenium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper½	< 1,860	< 1,910	< 1,885
S96T002443		Lower ½	< 2,000	< 1,900	< 1,950
S96T002444	143:2	Upper ½	< 2,020	< 1,990	< 2,005
S96T002445		Lower ½	< 2,020	< 1,980	< 2,000
S96T002446	143:3	Upper ½	< 1,750	< 1,740	< 1,745
S96T002447		Lower ½	< 2,030	< 2,000	< 2,015
S96T002448	143:4	Upper ½	< 2,110	< 2,140	< 2,125
S96T002449		Lower ½	< 2,250	< 2,370	< 2,310
S96T002518	143:5	Whole	< 2,170	< 1,940	< 2,055
S96T002521	143:5A	Upper ½	< 2,180	< 2,330	< 2,255
S96T002671	143:5B	Upper ½	< 2,210	< 2,110	< 2,160
S96T002672		Lower ½	< 2,010	< 2,010	< 2,010
S96T002757	143:6	Upper ½	< 1,870	< 2,020	< 1,945
S96T002648	144:1	Lower ½	< 1,980	< 2,020	< 2,000
S96T002654	144:2	Upper ½	< 1,890	< 1,840	< 1,865
S96T002649		Lower ½	< 2,000	< 1,930	< 1,965
S96T002655	144:3	Upper ½	< 2,010	< 1,850	< 1,930
S96T002662		Lower ½	< 1,850	< 1,840	< 1,845
S96T002793	144:4	Upper ½	< 1,960	< 2,040	< 2,000
S96T002796		Lower ½	< 1,990	< 1,940	< 1,965
S96T002794	144:5	Upper ½	< 1,970	< 1,970	< 1,970
S96T002797		Lower ½	< 2,010	< 1,930	< 1,970
S96T002795	144:6	Upper ½	< 2,030	< 1,980	< 2,005
S96T002798		Lower ½	< 1,970	< 1,990	< 1,980
S96T003610	144:6A	Upper ½	< 2,010	< 2,050	< 2,030
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	< 46.30	< 44.7	< 45.5
S96T002469		Lower ½	< 46.60	< 48.7	< 47.65
S96T002470	143:2	Upper ½	< 44.40	< 46.2	< 45.3
S96T002471		Lower ½	< 45.80	< 45.2	< 45.5
S96T002472	143:3	Upper ½	< 49.00	< 47.0	< 48.0
S96T002473		Lower ½	< 43.40	< 49.1	< 46.25

Table B2-31. Tank 241-U-102 Analytical Results: Selenium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143:4	Upper ½	< 51.60	< 47.7	< 49.65
S96T002475		Lower ½	< 53.10	< 55.8	< 54.45
S96T002519	143:5	Whole	< 45.30	< 51.2	< 48.25
S96T002522	143:5A	Upper ½	< 48.40	< 43.5	< 45.95
S96T002673	143:5B	Upper ½	< 44.30	< 51.1	< 47.7
S96T002674		Lower ½	49.9	< 50.6	50.25
S96T002758	143:6	Upper ½	47.1	51.2	49.15
S96T002650	144:1	Lower ½	< 98.70	< 96.5	< 97.6
S96T002656	144:2	Upper ½	< 97.80	< 95.1	< 96.45
S96T002651		Lower ½	< 96.00	< 92.6	< 94.3
S96T002657	144:3	Upper ½	< 92.60	< 99.0	< 95.8
S96T002658		Lower ½	< 89.70	< 90.3	< 90.0
S96T002799	144:4	Upper ½	< 90.50	< 92.9	< 91.7
S96T002800		Lower ½	< 96.30	< 97.0	< 96.65
S96T002801	144:5	Upper ½	< 89.90	< 88.0	< 88.95
S96T002802		Lower ½	< 94.10	< 99.2	< 96.65
S96T002803	144:6	Upper ½	< 90.50	< 92.9	< 91.7
S96T002804		Lower ½	< 93.60	< 90.6	< 92.1
S96T003686	144:6A	Upper ½	< 43.60	44.6	44.1
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 2,220	< 2,210	< 2,215
S96T003675	144	n/a	< 2,210	< 2,070	< 2,140
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 51.50	< 46.1	< 48.8
S96T003676	144	n/a	< 48.00	< 48.4	< 48.2
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143:1	DL	41	41.4	41.2
S96T002549	144:1	DL	< 40.10	40.3	40.2

Table B2-32. Tank 241-U-102 Analytical Results: Silicon. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 975.5
S96T002444	143:2	Upper ½	< 1,010	< 997	< 1,003.5
S96T002445		Lower ½	2,910	< 989	1,949.5
S96T002446	143:3	Upper ½	< 876	< 871	< 873.5
S96T002447		Lower ½	< 1,020	< 998	< 1,009
S96T002448	143:4	Upper ½	< 1,060	< 1,070	< 1,065
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143:5	Whole	< 1,080	4380	2,730
S96T002521	143:5A	Upper ½	< 1,090	< 1,160	< 1,120
S96T002671	143:5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	3650	2,325
S96T002757	143:6	Upper ½	< 933	< 1,010	< 971.5
S96T002648	144:1	Lower ½	8,730	6,740	7,740[QC:e]
S96T002654	144:2	Upper ½	< 947	< 920	< 933.5
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144:3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144:4	Upper ½	< 981	< 1,020	< 1,000.5
S96T002796		Lower ½	< 997	2440	1,718.5
S96T002794	144:5	Upper ½	< 985	< 984	< 984.5
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144:6	Upper ½	1,700	7,820	4,760[QC:e]
S96T002798		Lower ½	2,320	< 995	1,657.5
S96T003610	144:6A	Upper ½	< 1,010	< 1,020	< 1,015
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	181	125	153[QC:e]
S96T002469		Lower ½	189	147	168[QC:e]
S96T002470	143:2	Upper ½	108	110	109
S96T002471		Lower ½	181	171	176
S96T002472	143:3	Upper ½	104	122	113
S96T002473		Lower ½	188	168	178

Table B2-32. Tank 241-U-102 Analytical Results: Silicon. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	106	110	108
S96T002475		Lower ½	157	164	160.5
S96T002519	143:5	Whole	104	123	113.5
S96T002522	143:5A	Upper ½	195	195	195
S96T002673	143:5B	Upper ½	111	107	109
S96T002674		Lower ½	124	132	128
S96T002758	143:6	Upper ½	143	163	153
S96T002650	144:1	Lower ½	239	193	216[QC:b,e]
S96T002656	144:2	Upper ½	69.1	119	94.05[QC:b,e]
S96T002651		Lower ½	121	126	123.5[QC:b]
S96T002657	144:3	Upper ½	52.8	148	100.4[QC:b,e]
S96T002658		Lower ½	149	138	143.5[QC:b]
S96T002799	144:4	Upper ½	60.	87.6	73.8[QC:e,b]
S96T002800		Lower ½	184	199	191.5[QC:b]
S96T002801	144:5	Upper ½	89.6	176	132.8[QC:b,e]
S96T002802		Lower ½	193	220	206.5[QC:b]
S96T002803	144:6	Upper ½	124	150	137[QC:b]
S96T002804		Lower ½	146	191	168.5[QC:b,e]
S96T003686	144:6A	Upper ½	569	454	511.5[QC:b,e]
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,070
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	151	146	148.5[QC:d,a]
S96T003676	144	n/a	169	142	155.5
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	137	109	123[QC:e]
S96T002549	144:1	DL	91.3	96.9	94.1

Table B2-33. Tank 241-U-102 Analytical Results: Silver. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143:1	Upper ½	< 186	< 191	< 188.5
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143:2	Upper ½	< 202	< 199	< 200.5
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143:3	Upper ½	< 175	< 174	< 174.5
S96T002447		Lower ½	< 203	< 200	< 201.5
S96T002448	143:4	Upper ½	< 211	< 214	< 212.5
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143:5	Whole	< 217	< 194	< 205.5
S96T002521	143:5A	Upper ½	< 218	< 233	< 225.5
S96T002671	143:5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143:6	Upper ½	< 187	< 4.92	< 95.96
S96T002648	144:1	Lower ½	< 198	< 202	< 200
S96T002654	144:2	Upper ½	< 189	< 184	< 186.5
S96T002649		Lower ½	< 200	< 193	< 196.5
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 184.5
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	< 199	< 194	< 196.5
S96T002794	144:5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144:6	Upper ½	< 203	< 198	< 200.5
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143:1	Upper ½	12.9	13.2	13.05
S96T002469		Lower ½	13.7	14.0	13.85
S96T002470	143:2	Upper ½	12.5	13.3	12.9
S96T002471		Lower ½	12.8	12.7	12.75
S96T002472	143:3	Upper ½	14.0	13.8	13.9
S96T002473		Lower ½	14.4	15.4	14.9

Table B2-33. Tank 241-U-102 Analytical Results: Silver. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	14.8	12.0	13.4
S96T002475		Lower ½	13.7	14.3	14.0
S96T002519	143:5	Whole	15.6	14.7	15.15
S96T002522	143:5A	Upper ½	14.4	14.1	14.25
S96T002673	143:5B	Upper ½	13.7	13.3	13.5
S96T002674		Lower ½	12.9	15.3	14.1
S96T002758	143:6	Upper ½	13.1	12.8	12.95
S96T002650	144:1	Lower ½	< 9.870	< 9.65	< 9.76
S96T002656	144:2	Upper ½	< 9.780	< 9.51	< 9.65
S96T002651		Lower ½	< 9.600	< 9.26	< 9.43
S96T002657	144:3	Upper ½	< 9.260	< 9.90	< 9.58
S96T002658		Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144:4	Upper ½	< 9.050	< 9.29	< 9.17
S96T002800		Lower ½	< 9.630	< 9.70	< 9.67
S96T002801	144:5	Upper ½	< 8.990	< 8.80	< 8.90
S96T002802		Lower ½	< 9.410	< 9.92	< 9.67
S96T002803	144:6	Upper ½	< 9.050	< 9.29	< 9.17
S96T002804		Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144:6A	Upper ½	15.1	15.7	15.4
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 220	< 221	< 221.5
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	14.7	14.3	14.5
S96T003676	144	n/a	14.9	14.9	14.9
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	17.7	18	17.85
S96T002549	144:1	DL	16.8	16.5	16.65

Table B2-34. Tank 241-U-102 Analytical Results: Sodium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper½	2.38E+05	2.37E+05	2.38E+05
S96T002443		Lower ½	2.70E+05	2.70E+05	2.70E+05
S96T002444	143:2	Upper ½	2.56E+05	2.55E+05	2.56E+05
S96T002445		Lower ½	2.07E+05	2.03E+05	2.05E+05
S96T002446	143:3	Upper ½	2.44E+05	2.36E+05	2.40E+05
S96T002447		Lower ½	2.54E+05	2.44E+05	2.49E+05
S96T002448	143:4	Upper ½	2.73E+05	2.80E+05	2.76E+05[QC:d]
S96T002449		Lower ½	2.53E+05	2.56E+05	2.54E+05[QC:d]
S96T002518	143:5	Whole	2.69E+05	2.74E+05	2.72E+05
S96T002521	143:5A	Upper ½	2.75E+05	2.81E+05	2.78E+05
S96T002671	143:5B	Upper ½	2.54E+05	2.70E+05	2.62E+05
S96T002672		Lower ½	2.32E+05	2.33E+05	2.32E+05
S96T002757	143:6	Upper ½	2.45E+05	2.45E+05	2.45E+05
S96T002648	144:1	Lower ½	2.31E+05	2.31E+05	2.31E+05
S96T002654	144:2	Upper ½	2.54E+05	2.51E+05	2.52E+05
S96T002649		Lower ½	2.83E+05	2.55E+05	2.69E+05
S96T002655	144:3	Upper ½	2.90E+05	2.78E+05	2.84E+05
S96T002662		Lower ½	2.91E+05	2.92E+05	2.92E+05
S96T002793	144:4	Upper ½	2.77E+05	2.72E+05	2.74E+05
S96T002796		Lower ½	2.66E+05	2.23E+05	2.44E+05
S96T002794	144:5	Upper ½	2.64E+05	2.78E+05	2.71E+05
S96T002797		Lower ½	2.64E+05	2.84E+05	2.74E+05
S96T002795	144:6	Upper ½	2.71E+05	2.63E+05	2.67E+05
S96T002798		Lower ½	2.72E+05	2.75E+05	2.74E+05[QC:c]
S96T003610	144:6A	Upper ½	2.51E+05	2.53E+05	2.52E+05
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper ½	1.72E+05	1.77E+05	1.74E+05[QC:d]
S96T002469		Lower ½	1.92E+05	1.94E+05	1.93E+05
S96T002470	143:2	Upper ½	1.76E+05	1.80E+05	1.78E+05
S96T002471		Lower ½	1.78E+05	1.70E+05	1.74E+05[QC:d]
S96T002472	143:3	Upper ½	1.83E+05	1.85E+05	1.84E+05
S96T002473		Lower ½	1.89E+05	2.05E+05	1.97E+05

Table B2-34. Tank 241-U-102 Analytical Results: Sodium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143:4	Upper ½	2.03E+05	1.63E+05	1.83E+05[QC:d,e]
S96T002475		Lower ½	1.75E+05	1.91E+05	1.83E+05
S96T002519	143:5	Whole	2.05E+05	2.03E+05	2.04E+05
S96T002522	143:5A	Upper ½	2.00E+05	1.95E+05	1.98E+05
S96T002673	143:5B	Upper ½	1.86E+05	1.84E+05	1.85E+05
S96T002674		Lower ½	1.68E+05	2.08E+05	1.88E+05[QC:e]
S96T002758	143:6	Upper ½	1.70E+05	1.69E+05	1.70E+05
S96T002650	144:1	Lower ½	1.64E+05	1.60E+05	1.62E+05[QC:d]
S96T002656	144:2	Upper ½	1.67E+05	1.64E+05	1.66E+05
S96T002651		Lower ½	1.81E+05	1.91E+05	1.86E+05[QC:d]
S96T002657	144:3	Upper ½	1.94E+05	2.13E+05	2.04E+05
S96T002658		Lower ½	2.03E+05	2.04E+05	2.04E+05
S96T002799	144:4	Upper ½	1.82E+05	1.84E+05	1.83E+05
S96T002800		Lower ½	1.85E+05	1.89E+05	1.87E+05[QC:c]
S96T002801	144:5	Upper ½	1.93E+05	2.01E+05	1.97E+05
S96T002802		Lower ½	1.77E+05	1.92E+05	1.84E+05
S96T002803	144:6	Upper ½	1.66E+05	1.68E+05	1.67E+05
S96T002804		Lower ½	1.88E+05	1.90E+05	1.89E+05[QC:d]
S96T003686	144:6A	Upper ½	2.07E+05	2.16E+05	2.12E+05[QC:b,d]
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	2.39E+05	2.41E+05	2.40E+05[QC:c]
S96T003675	144	n/a	2.74E+05	2.52E+05	2.63E+05
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	1.93E+05	1.88E+05	1.90E+05[QC:b,d]
S96T003676	144	n/a	1.96E+05	1.95E+05	1.96E+05
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143:1	DL	2.49E+05	2.53E+05	2.51E+05
S96T002549	144:1	DL	2.32E+05	2.39E+05	2.36E+05[QC:d]

Table B2-35. Tank 241-U-102 Analytical Results: Strontium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper½	< 186	< 191	< 188.5
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143:2	Upper ½	< 202	< 199	< 200.5
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143:3	Upper ½	< 175	< 174	< 174.5
S96T002447		Lower ½	< 203	< 200	< 201.5
S96T002448	143:4	Upper ½	< 211	< 214	< 212.5
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143:5	Whole	< 217	< 194	< 205.5
S96T002521	143:5A	Upper ½	< 218	< 233	< 225.5
S96T002671	143:5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143:6	Upper ½	< 187	< 202	< 194.5
S96T002648	144:1	Lower ½	< 198	< 202	< 200
S96T002654	144:2	Upper ½	< 189	< 184	< 186.5
S96T002649		Lower ½	< 200	< 193	< 196.5
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 184.5
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	< 199	< 194	< 196.5
S96T002794	144:5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144:6	Upper ½	< 203	< 198	< 200.5
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	< 4.630	< 4.47	< 4.55
S96T002469		Lower ½	< 4.660	< 4.87	< 4.765
S96T002470	143:2	Upper ½	< 4.440	< 4.62	< 4.53
S96T002471		Lower ½	< 4.580	< 4.52	< 4.55
S96T002472	143:3	Upper ½	< 4.900	< 4.70	< 4.80
S96T002473		Lower ½	< 4.340	< 4.91	< 4.625

Table B2-35. Tank 241-U-102 Analytical Results: Strontium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			μg/g	μg/g	μg/g
S96T002474	143:4	Upper ½	< 5.160	< 4.77	< 4.965
S96T002475		Lower ½	< 5.310	< 5.58	< 5.445
S96T002519	143:5	Whole	< 4.530	< 5.12	< 4.825
S96T002522	143:5A	Upper ½	< 4.840	< 4.35	< 4.595
S96T002673	143:5B	Upper ½	< 4.430	< 5.11	< 4.77
S96T002674		Lower ½	< 4.920	< 5.06	< 4.99
S96T002758	143:6	Upper ½	< 4.480	< 4.69	< 4.585
S96T002650	144:1	Lower ½	< 9.870	< 9.65	< 9.76
S96T002656	144:2	Upper ½	< 9.780	< 9.51	< 9.645
S96T002651		Lower ½	< 9.600	< 9.26	< 9.43
S96T002657	144:3	Upper ½	< 9.260	< 9.90	< 9.58
S96T002658		Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144:4	Upper ½	< 9.050	< 9.29	< 9.17
S96T002800		Lower ½	< 9.630	< 9.70	< 9.665
S96T002801	144:5	Upper ½	< 8.990	< 8.80	< 8.895
S96T002802		Lower ½	< 9.410	< 9.92	< 9.665
S96T002803	144:6	Upper ½	< 9.050	< 9.29	< 9.17
S96T002804		Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144:6A	Upper ½	< 4.360	4.46	4.41
Composites: fusion digest			μg/g	μg/g	μg/g
S96T003680	143	n/a	< 222	< 221	< 221.5
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			μg/g	μg/g	μg/g
S96T003682	143	n/a	< 5.150	< 4.61	< 4.88
S96T003676	144	n/a	< 4.800	< 4.84	< 4.82
Liquids: direct			μg/mL	μg/mL	μg/mL
S96T002323	143:1	DL	< 4.010	< 4.01	< 4.01
S96T002549	144:1	DL	< 4.010	< 4.01	< 4.01

Table B2-36. Tank 241-U-102 Analytical Results: Sulfur. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143:1	Upper ½	3,020	2,950	2,980
S96T002443		Lower ½	2,280	5,750	4,020
S96T002444	143:2	Upper ½	3,530	3,870	3,700
S96T002445		Lower ½	5,820	6,180	6,000
S96T002446	143:3	Upper ½	7,460	7,070	7,260
S96T002447		Lower ½	5,750	5,390	5,570
S96T002448	143:4	Upper ½	9,970	10,400	10,200
S96T002449		Lower ½	6,930	7,290	7,110
S96T002518	143:5	Whole	< 2,170	< 1,940	< 2,055
S96T002521	143:5A	Upper ½	< 2,180	< 2,330	< 2,255
S96T002671	143:5B	Upper ½	3,980	3,960	3,970
S96T002672		Lower ½	5,970	6,050	6,010
S96T002757	143:6	Upper ½	5,990	5,950	5,970
S96T002648	144:1	Lower ½	4,680	4,620	4,650
S96T002654	144:2	Upper ½	6,810	6,590	6,700
S96T002649		Lower ½	3,930	4,160	4,040
S96T002655	144:3	Upper ½	3,640	3,520	3,580
S96T002662		Lower ½	2,490	2,280	2,380
S96T002793	144:4	Upper ½	3,650	3,920	3,780
S96T002796		Lower ½	5,030	4,060	4,540[QC:e]
S96T002794	144:5	Upper ½	12,400	12,400	12,400
S96T002797		Lower ½	4,900	4,610	4,760
S96T002795	144:6	Upper ½	8,400	8,060	8,230
S96T002798		Lower ½	5,370	5,110	5,240
S96T003610	144:6A	Upper ½	2,430	2,420	2,420
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143:1	Upper ½	2,880	2,810	2,840
S96T002469		Lower ½	2,170	1,860	2,020[QC:d]
S96T002470	143:2	Upper ½	3,520	3,770	3,640
S96T002471		Lower ½	4,840	4,690	4,760[QC:c]
S96T002472	143:3	Upper ½	5,890	6,430	6,160
S96T002473		Lower ½	5,190	5,630	5,410

Table B2-36. Tank 241-U-102 Analytical Results: Sulfur. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	9,340	5,370	7,360[QC:d,e]
S96T002475		Lower ½	6,620	7,520	7,070
S96T002519	143:5	Whole	1,460	1,530	1,500[QC:c]
S96T002522	143:5A	Upper ½	1,230	1,160	1,200
S96T002673	143:5B	Upper ½	3,930	3,610	3,770
S96T002674		Lower ½	5,650	9,920	7,780[QC:e]
S96T002758	143:6	Upper ½	5,380	5,360	5,370
S96T002650	144:1	Lower ½	4,220	4,010	4,120
S96T002656	144:2	Upper ½	6,240	5,930	6,080
S96T002651		Lower ½	3,690	3,480	3,580
S96T002657	144:3	Upper ½	2,890	3,150	3,020
S96T002658		Lower ½	2,220	2,240	2,230
S96T002799	144:4	Upper ½	3,480	3,300	3,390
S96T002800		Lower ½	4,460	4,470	4,460[QC:c]
S96T002801	144:5	Upper ½	10,700	11,200	11,000
S96T002802		Lower ½	4,300	4,720	4,510
S96T002803	144:6	Upper ½	5,490	5,760	5,620
S96T002804		Lower ½	4,270	4,300	4,280[QC:c]
S96T003686	144:6A	Upper ½	2,640	2,340	2,490[QC:c]
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	5,770	6,010	5,890
S96T003675	144	n/a	6,330	5,820	6,080
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	5,970	6,150	6,060[QC:d]
S96T003676	144	n/a	5,800	5,540	5,670
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	3,510	3,540	3,520[QC:c]
S96T002549	144:1	DL	2,980	3,070	3,020

Table B2-37. Tank 241-U-102 Analytical Results: Thallium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper½	< 3,720	< 3,820	< 3,770
S96T002443		Lower ½	< 3,990	< 3,810	< 3,900
S96T002444	143:2	Upper ½	< 4,050	< 3,990	< 4,020
S96T002445		Lower ½	< 4,050	< 3,960	< 4,005
S96T002446	143:3	Upper ½	< 3,510	< 3,480	< 3,495
S96T002447		Lower ½	< 4,070	< 3,990	< 4,030
S96T002448	143:4	Upper ½	< 4,230	< 4,280	< 4,255
S96T002449		Lower ½	< 4,500	< 4,740	< 4,620
S96T002518	143:5	Whole	< 4,330	< 3,890	< 4,110
S96T002521	143:5A	Upper ½	< 4,360	< 4,650	< 4,505
S96T002671	143:5B	Upper ½	< 4,410	< 4,230	< 4,320
S96T002672		Lower ½	< 4,010	< 4,020	< 4,015
S96T002757	143:6	Upper ½	< 3,730	< 4,040	< 3,885
S96T002648	144:1	Lower ½	< 3,950	< 4,030	< 3,990
S96T002654	144:2	Upper ½	< 3,790	< 3,680	< 3,735
S96T002649		Lower ½	< 3,990	< 3,870	< 3,930
S96T002655	144:3	Upper ½	< 4,020	< 3,700	< 3,860
S96T002662		Lower ½	< 3,710	< 3,680	< 3,695
S96T002793	144:4	Upper ½	< 3,920	< 4,080	< 4,000
S96T002796		Lower ½	< 3,990	< 3,880	< 3,935
S96T002794	144:5	Upper ½	< 3,940	< 3,940	< 3,940
S96T002797		Lower ½	< 4,030	< 3,870	< 3,950
S96T002795	144:6	Upper ½	< 4,070	< 3,960	< 4,015
S96T002798		Lower ½	< 3,930	< 3,980	< 3,955
S96T003610	144:6A	Upper ½	< 4,030	< 4,100	< 4,065
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	< 92.60	< 89.3	< 90.95
S96T002469		Lower ½	< 93.20	< 97.3	< 95.25
S96T002470	143:2	Upper ½	< 88.70	< 92.5	< 90.60
S96T002471		Lower ½	< 91.60	< 90.3	< 90.95
S96T002472	143:3	Upper ½	< 98.10	< 94.1	< 96.10
S96T002473		Lower ½	< 86.80	< 98.2	< 92.50

Table B2-37. Tank 241-U-102 Analytical Results: Thallium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143:4	Upper ½	< 103	< 95.3	< 99.15
S96T002475		Lower ½	< 106	< 112	< 109
S96T002519	143:5	Whole	< 90.70	< 102	< 96.4
S96T002522	143:5A	Upper ½	< 96.80	< 87.0	< 91.90
S96T002673	143:5B	Upper ½	< 88.60	< 102	< 95.3
S96T002674		Lower ½	< 98.30	< 101	< 99.7
S96T002758	143:6	Upper ½	< 89.70	< 93.8	< 91.75
S96T002650	144:1	Lower ½	< 197	< 193	< 195
S96T002656	144:2	Upper ½	< 196	< 190	< 193
S96T002651		Lower ½	< 192	< 185	< 188.5
S96T002657	144:3	Upper ½	< 185	< 198	< 191.5
S96T002658		Lower ½	< 179	< 181	< 180
S96T002799	144:4	Upper ½	< 181	< 186	< 183.5
S96T002800		Lower ½	< 193	< 194	< 193.5
S96T002801	144:5	Upper ½	< 180	< 176	< 178
S96T002802		Lower ½	< 188	< 198	< 193
S96T002803	144:6	Upper ½	< 181	< 186	< 183.5
S96T002804		Lower ½	< 187	< 181	< 184
S96T003686	144:6A	Upper ½	< 87.30	89.1	88.2
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 4,430	< 4,420	< 4,425
S96T003675	144	n/a	< 4,410	< 4,130	< 4,270
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 103	< 92.2	< 97.6
S96T003676	144	n/a	< 96.10	< 96.9	< 96.5
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002323	143:1	DL	< 80.20	< 80.2	< 80.2
S96T002549	144:1	DL	< 80.20	< 80.2	< 80.2

Table B2-38. Tank 241-U-102 Analytical Results: Titanium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143:1	Upper ½	< 186	< 191	< 188.5
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143:2	Upper ½	< 202	< 199	< 200.5
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143:3	Upper ½	< 175	< 174	< 174.5
S96T002447		Lower ½	< 203	< 200	< 201.5
S96T002448	143:4	Upper ½	< 211	< 214	< 212.5
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143:5	Whole	< 217	< 194	< 205.5
S96T002521	143:5A	Upper ½	< 218	< 233	< 225.5
S96T002671	143:5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143:6	Upper ½	< 187	< 202	< 194.5
S96T002648	144:1	Lower ½	< 198	< 202	< 200
S96T002654	144:2	Upper ½	< 189	< 184	< 186.5
S96T002649		Lower ½	< 200	< 193	< 196.5
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 184.5
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	< 199	< 194	< 196.5
S96T002794	144:5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144:6	Upper ½	< 203	< 198	< 200.5
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143:1	Upper ½	< 4.630	< 4.47	< 4.55
S96T002469		Lower ½	< 4.660	< 4.87	< 4.77
S96T002470	143:2	Upper ½	< 4.440	< 4.62	< 4.53
S96T002471		Lower ½	< 4.580	< 4.52	< 4.55
S96T002472	143:3	Upper ½	< 4.900	< 4.70	< 4.80
S96T002473		Lower ½	< 4.340	< 4.91	< 4.63

Table B2-38. Tank 241-U-102 Analytical Results: Titanium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	< 5.160	< 4.77	< 4.97
S96T002475		Lower ½	< 5.310	< 5.58	< 5.44
S96T002519	143:5	Whole	< 4.530	< 5.12	< 4.83
S96T002522	143:5A	Upper ½	< 4.840	< 4.35	< 4.60
S96T002673	143:5B	Upper ½	< 4.430	< 5.11	< 4.77
S96T002674		Lower ½	< 4.920	< 5.06	< 4.99
S96T002758	143:6	Upper ½	< 4.480	< 4.69	< 4.59
S96T002650	144:1	Lower ½	< 9.870	< 9.65	< 9.76
S96T002656	144:2	Upper ½	< 9.780	< 9.51	< 9.65
S96T002651		Lower ½	< 9.600	< 9.26	< 9.43
S96T002657	144:3	Upper ½	< 9.260	< 9.90	< 9.58
S96T002658		Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144:4	Upper ½	< 9.050	< 9.29	< 9.17
S96T002800		Lower ½	< 9.630	< 9.70	< 9.67
S96T002801	144:5	Upper ½	< 8.990	< 8.80	< 8.89
S96T002802		Lower ½	< 9.410	< 9.92	< 9.67
S96T002803	144:6	Upper ½	< 9.050	< 9.29	< 9.17
S96T002804		Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144:6A	Upper ½	< 4.360	4.46	4.41
Composite: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 222	< 221	< 221.5
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 5.150	< 4.61	< 4.88
S96T003676	144	n/a	< 4.800	< 4.84	< 4.82
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	< 4.010	< 4.01	< 4.01
S96T002549	144:1	DL	< 4.010	< 4.01	< 4.01

Table B2-39. Tank 241-U-102 Analytical Results: Uranium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	< 9,300	< 9,540	< 9,420
S96T002443		Lower ½	< 9,990	< 9,520	< 9,755
S96T002444	143:2	Upper ½	< 10,100	< 9,970	< 10,035
S96T002445		Lower ½	< 10,100	< 9,890	< 9,995
S96T002446	143:3	Upper ½	< 8,760	< 8,710	< 8,735
S96T002447		Lower ½	< 10,200	< 9,980	< 10,090
S96T002448	143:4	Upper ½	< 10,600	< 10,700	< 10,650
S96T002449		Lower ½	< 11,200	< 11,800	< 11,500
S96T002518	143:5	Whole	< 10,800	< 9,720	< 10,260
S96T002521	143:5A	Upper ½	< 10,900	< 11,600	< 11,250
S96T002671	143:5B	Upper ½	< 11,000	< 10,600	< 10,800
S96T002672		Lower ½	< 10,000	< 10,000	< 10,000
S96T002757	143:6	Upper ½	< 9,330	< 10,100	< 9,715
S96T002648	144:1	Lower ½	< 9,880	< 10,100	< 9,990
S96T002654	144:2	Upper ½	< 9,470	< 9,200	< 9,335
S96T002649		Lower ½	< 9,990	< 9,670	< 9,830
S96T002655	144:3	Upper ½	< 10,100	< 9,240	< 9,670
S96T002662		Lower ½	< 9,270	< 9,210	< 9,240
S96T002793	144:4	Upper ½	< 9,810	< 10,200	< 10,005
S96T002796		Lower ½	< 9,970	< 9,700	< 9,835
S96T002794	144:5	Upper ½	< 9,850	< 9,840	< 9,845
S96T002797		Lower ½	< 10,100	< 9,660	< 9,880
S96T002795	144:6	Upper ½	< 10,200	< 9,910	< 10,055
S96T002798		Lower ½	< 9,830	< 9,950	< 9,890
S96T003610	144:6A	Upper ½	< 10,100	< 10,200	< 10,150
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper ½	< 231	< 223	< 227
S96T002469		Lower ½	< 233	< 243	< 238
S96T002470	143:2	Upper ½	< 222	< 231	< 226.5
S96T002471		Lower ½	< 229	< 226	< 227.5
S96T002472	143:3	Upper ½	< 245	< 235	< 240
S96T002473		Lower ½	< 217	< 246	< 231.5

Table B2-39. Tank 241-U-102 Analytical Results: Uranium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			µg/g	µg/g	µg/g
S96T002474	143:4	Upper ½	< 258	< 238	< 248
S96T002475		Lower ½	< 266	< 279	< 272.5
S96T002519	143:5	Whole	< 227	< 256	< 241.5
S96T002522	143:5A	Upper ½	< 242	< 218	< 230
S96T002673	143:5B	Upper ½	< 221	< 255	< 238
S96T002674		Lower ½	< 246	267	256.5
S96T002758	143:6	Upper ½	< 224	< 235	< 229.5
S96T002650	144:1	Lower ½	577	< 482	529.5[QC:a]
S96T002656	144:2	Upper ½	< 489	< 475	< 482[QC:a]
S96T002651		Lower ½	< 480	< 463	< 471.5[QC:a]
S96T002657	144:3	Upper ½	< 463	< 495	< 479[QC:a]
S96T002658		Lower ½	< 448	< 452	< 450[QC:a]
S96T002799	144:4	Upper ½	< 452	< 464	< 458[QC:a]
S96T002800		Lower ½	< 481	< 485	< 483
S96T002801	144:5	Upper ½	< 449	< 440	< 444.5
S96T002802		Lower ½	< 470	< 496	< 483
S96T002803	144:6	Upper ½	< 453	< 464	< 458.5
S96T002804		Lower ½	< 468	< 453	< 460.5
S96T003686	144:6A	Upper ½	< 218	223	220.5
Composites: fusion digest			µg/g	µg/g	µg/g
S96T003680	143	n/a	< 11,100	< 11,100	< 11,100
S96T003675	144	n/a	< 11,000	< 10,300	< 10,650
Composites: acid digest			µg/g	µg/g	µg/g
S96T003682	143	n/a	< 258	< 230	< 244
S96T003676	144	n/a	< 240	< 242	< 241
Composites: by Phosphorescence			µg/g	µg/g	µg/g
S96T003680	143	n/a	155	130.0	142.5
S96T003675	144	n/a	156	144.0	150.0
Liquids: direct			µg/g	µg/g	µg/g
S96T002323	143:1	DL	< 200	< 200	< 200
S96T002549	144:1	DL	< 200	< 200	< 200

Table B2-40. Tank 241-U-102 Analytical Results: Vanadium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T002438	143:1	Upper ½	< 930	< 954	< 942
S96T002443		Lower ½	< 999	< 952	< 975.5
S96T002444	143:2	Upper ½	< 1,100	< 997	< 1,003.5
S96T002445		Lower ½	< 1,010	< 989	< 999.5
S96T002446	143:3	Upper ½	< 876	< 871	< 873.5
S96T002447		Lower ½	< 1,020	< 998	< 1,009
S96T002448	143:4	Upper ½	< 1,060	< 1,070	< 1,065
S96T002449		Lower ½	< 1,120	< 1,180	< 1,150
S96T002518	143:5	Whole	< 1,080	< 972	< 1,026
S96T002521	143:5A	Upper ½	< 1,090	< 1,160	< 1,125
S96T002671	143:5B	Upper ½	< 1,100	< 1,060	< 1,080
S96T002672		Lower ½	< 1,000	< 1,000	< 1,000
S96T002757	143:6	Upper ½	< 933	< 1,010	< 971.5
S96T002648	144:1	Lower ½	< 988	< 1,010	< 999
S96T002654	144:2	Upper ½	< 947	< 920	< 933.5
S96T002649		Lower ½	< 999	< 967	< 983
S96T002655	144:3	Upper ½	< 1,010	< 924	< 967
S96T002662		Lower ½	< 927	< 921	< 924
S96T002793	144:4	Upper ½	< 981	< 1,020	< 1,000.5
S96T002796		Lower ½	< 997	< 970	< 983.5
S96T002794	144:5	Upper ½	< 985	< 984	< 984.5
S96T002797		Lower ½	< 1,010	< 966	< 988
S96T002795	144:6	Upper ½	< 1,020	< 991	< 1,005.5
S96T002798		Lower ½	< 983	< 995	< 989
S96T003610	144:6A	Upper ½	< 1,010	< 1,020	< 1,015
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002468	143:1	Upper ½	< 23.10	< 22.3	< 22.7
S96T002469		Lower ½	< 23.30	< 24.3	< 23.8
S96T002470	143:2	Upper ½	< 22.20	< 23.1	< 22.65
S96T002471		Lower ½	< 22.90	< 22.6	< 22.75
S96T002472	143:3	Upper ½	< 24.50	< 23.5	< 24.0
S96T002473		Lower ½	< 21.70	< 24.6	< 23.15

Table B2-40. Tank 241-U-102 Analytical Results: Vanadium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	< 25.80	< 23.8	< 24.8
S96T002475		Lower ½	< 26.60	< 27.9	< 27.25
S96T002519	143:5	Whole	< 22.70	< 25.6	< 24.15
S96T002522	143:5A	Upper ½	< 24.20	< 21.8	< 23.0
S96T002673	143:5B	Upper ½	< 22.10	< 25.5	< 23.8
S96T002674		Lower ½	< 24.60	< 25.3	< 24.95
S96T002758	143:6	Upper ½	< 22.40	< 23.5	< 22.95
S96T002650	144:1	Lower ½	< 49.30	< 48.2	< 48.75
S96T002656	144:2	Upper ½	< 48.90	< 47.5	< 48.2
S96T002651		Lower ½	< 48.00	< 46.3	< 47.15
S96T002657	144:3	Upper ½	< 46.30	< 49.5	< 47.9
S96T002658		Lower ½	< 44.80	< 45.2	< 45.0
S96T002799	144:4	Upper ½	< 45.20	< 46.4	< 45.8
S96T002800		Lower ½	< 48.10	< 48.5	< 48.3
S96T002801	144:5	Upper ½	< 44.90	< 44.0	< 44.45
S96T002802		Lower ½	< 47.00	< 49.6	< 48.3
S96T002803	144:6	Upper ½	< 45.30	< 46.4	< 45.85
S96T002804		Lower ½	< 46.80	< 45.3	< 46.05
S96T003686	144:6A	Upper ½	< 21.80	22.3	22.05
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 1,110	< 1,110	< 1,110
S96T003675	144	n/a	< 1,100	< 1,030	< 1,065
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	< 25.80	< 23.0	< 24.4
S96T003676	144	n/a	< 24.00	< 24.2	< 24.1
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	< 20.10	< 20.1	< 20.1
S96T002549	144:1	DL	< 20.10	< 20.1	< 20.1

Table B2-41. Tank 241-U-102 Analytical Results: Zinc. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	728	558	643
S96T002443		Lower ½	601	577	589
S96T002444	143:2	Upper ½	1,000	726	863
S96T002445		Lower ½	813	524	668.5
S96T002446	143:3	Upper ½	949	717	833
S96T002447		Lower ½	620	403	511.5
S96T002448	143:4	Upper ½	724	875	799.5
S96T002449		Lower ½	887	1,590	1,240
S96T002518	143:5	Whole	< 217	< 194	< 205.5
S96T002521	143:5A	Upper ½	861	1,050	955.5
S96T002671	143:5B	Upper ½	1,190	806	998
S96T002672		Lower ½	533	804	668.5
S96T002757	143:6	Upper ½	839	784	811.5
S96T002648	144:1	Lower ½	215	< 202	208.5
S96T002654	144:2	Upper ½	602	< 184	393
S96T002649		Lower ½	< 200	< 193	< 196.5
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 184.5
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	529	528	528.5
S96T002794	144:5	Upper ½	411	449	430
S96T002797		Lower ½	371	334	352.5
S96T002795	144:6	Upper ½	1,170	203	686.5
S96T002798		Lower ½	3,100	743	1,920
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	46.4	55.4	50.9
S96T002469		Lower ½	16.7	16.7	16.7
S96T002470	143:2	Upper ½	22.1	26.0	24.05
S96T002471		Lower ½	24.7	29.4	27.05
S96T002472	143:3	Upper ½	24.2	27.7	25.95
S96T002473		Lower ½	26.0	24.3	25.15

Table B2-41. Tank 241-U-102 Analytical Results: Zinc. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	35.3	24.1	29.7
S96T002475		Lower ½	26.6	19.1	22.85
S96T002519	143:5	Whole	18.0	20.1	19.05
S96T002522	143:5A	Upper ½	15.5	34.3	24.9
S96T002673	143:5B	Upper ½	17.0	24.0	20.5
S96T002674		Lower ½	20.9	33.8	27.35
S96T002758	143:6	Upper ½	21.0	20.2	20.6
S96T002650	144:1	Lower ½	135	29.6	82.3
S96T002656	144:2	Upper ½	26.5	23.6	25.05
S96T002651		Lower ½	22.2	26.6	24.4
S96T002657	144:3	Upper ½	17.4	17.4	17.4
S96T002658		Lower ½	40.4	13.6	27.0
S96T002799	144:4	Upper ½	30.0	32.0	31.0
S96T002800		Lower ½	32.5	28.3	30.4
S96T002801	144:5	Upper ½	18.4	15.5	16.95
S96T002802		Lower ½	31.6	25.9	28.75
S96T002803	144:6	Upper ½	16.7	19.6	18.15
S96T002804		Lower ½	29.7	13.8	21.75
S96T003686	144:6A	Upper ½	16.5	18.3	17.4
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 222	< 221	< 221.5
S96T003675	144	n/a	315	< 207	261
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	21.7	20.6	21.15
S96T003676	144	n/a	17.2	17.3	17.25
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	44	45	44.5
S96T002549	144:1	DL	23.4	24.5	23.95

Table B2-42. Tank 241-U-102 Analytical Results: Zirconium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µg/g	µg/g	µg/g
S96T002438	143:1	Upper ½	< 186	< 191	< 188.5
S96T002443		Lower ½	< 200	< 190	< 195
S96T002444	143:2	Upper ½	< 202	< 199	< 200.5
S96T002445		Lower ½	< 202	< 198	< 200
S96T002446	143:3	Upper ½	< 175	< 174	< 174.5
S96T002447		Lower ½	< 203	< 200	< 201.5
S96T002448	143:4	Upper ½	< 211	< 214	< 212.5
S96T002449		Lower ½	< 225	< 237	< 231
S96T002518	143:5	Whole	< 217	< 194	< 205.5
S96T002521	143:5A	Upper ½	< 218	< 233	< 225.5
S96T002671	143:5B	Upper ½	< 221	< 211	< 216
S96T002672		Lower ½	< 201	< 201	< 201
S96T002757	143:6	Upper ½	< 187	< 202	< 194.5
S96T002648	144:1	Lower ½	< 198	< 202	< 200
S96T002654	144:2	Upper ½	< 189	< 184	< 186.5
S96T002649		Lower ½	< 200	< 193	< 196.5
S96T002655	144:3	Upper ½	< 201	< 185	< 193
S96T002662		Lower ½	< 185	< 184	< 184.5
S96T002793	144:4	Upper ½	< 196	< 204	< 200
S96T002796		Lower ½	< 199	< 194	< 196.5
S96T002794	144:5	Upper ½	< 197	< 197	< 197
S96T002797		Lower ½	< 201	< 193	< 197
S96T002795	144:6	Upper ½	< 203	< 198	< 200.5
S96T002798		Lower ½	< 197	< 199	< 198
S96T003610	144:6A	Upper ½	< 201	< 205	< 203
Solids: acid digest			µg/g	µg/g	µg/g
S96T002468	143:1	Upper½	13.0	11.5	12.25
S96T002469		Lower ½	< 4.660	< 4.87	< 4.765
S96T002470	143:2	Upper ½	< 4.440	< 4.62	< 4.53
S96T002471		Lower ½	< 4.580	< 4.52	< 4.55
S96T002472	143:3	Upper ½	< 4.900	< 4.70	< 4.8
S96T002473		Lower ½	< 4.340	< 4.91	< 4.625

Table B2-42. Tank 241-U-102 Analytical Results: Zirconium. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T002474	143:4	Upper ½	15.6	< 4.77	10.185
S96T002475		Lower ½	5.95	6.96	6.455
S96T002519	143:5	Whole	< 4.530	< 5.12	< 4.805
S96T002522	143:5A	Upper ½	< 4.840	4.77	4.77
S96T002673	143:5B	Upper ½	< 4.430	< 5.11	< 11.76
S96T002674		Lower ½	< 4.920	18.6	7.13
S96T002758	143:6	Upper ½	6.00	8.26	7.13
S96T002650	144:1	Lower ½	28.5	21.4	24.95
S96T002656	144:2	Upper ½	< 9.780	< 9.51	< 9.645
S96T002651		Lower ½	< 9.600	< 9.26	< 9.43
S96T002657	144:3	Upper ½	< 9.260	< 9.90	< 9.58
S96T002658		Lower ½	< 8.970	< 9.03	< 9.00
S96T002799	144:4	Upper ½	33.3	20.9	27.1
S96T002800		Lower ½	14.5	10.7	12.6
S96T002801	144:5	Upper ½	12.7	12.5	12.6
S96T002802		Lower ½	10.2	10.4	10.3
S96T002803	144:6	Upper ½	< 9.050	< 9.29	< 9.17
S96T002804		Lower ½	< 9.360	< 9.06	< 9.21
S96T003686	144:6A	Upper ½	11.1	18.2	14.65
Composites: fusion digest			**µg/g**	**µg/g**	**µg/g**
S96T003680	143	n/a	< 222	< 221	< 221.5
S96T003675	144	n/a	< 221	< 207	< 214
Composites: acid digest			**µg/g**	**µg/g**	**µg/g**
S96T003682	143	n/a	7.86	7.96	7.91
S96T003676	144	n/a	8.39	8.66	8.525
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	< 4.010	< 4.01	< 4.01
S96T002549	144:1	DL	< 4.010	< 4.01	< 4.01

Table B2-43. Tank 241-U-102 Lithium Bromide Water Contamination Check: Bromide.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S96T002476	143:1	Upper ½	< 476	< 488	< 482
S96T002478	143:1	Lower ½	< 948	< 995	< 972
S96T002479	143:2	Upper ½	< 900	< 881	< 991
S96T002480	143:2	Lower ½	< 937	< 910	< 924
S96T002481	143:3	Upper ½	< 982	< 902	< 942
S96T002482	143:3	Lower ½	< 1,030	< 987	< 1,010
S96T002483	143:4	Upper ½	< 1,200	< 1,360	< 1,280
S96T002491	143:4	Lower ½	< 1,210	< 1,410	< 1,310
S96T002520	143:5	Whole	< 1,440	< 1,300	< 1,370
S96T002523	143:5A	Upper ½	< 1,300	< 1,350	< 1,330
S96T002675	143:5B	Upper ½	< 952	< 1,070	< 1,010
S96T002676	143:5B	Lower ½	< 909	< 991	< 950
S96T002759	143:6	Upper ½	< 1,440	< 1,230	< 1,340
S96T002652	144:1	Lower ½	< 1,220	< 1,240	< 1,230
S96T002659	144:2	Upper ½	< 1,220	< 1,230	< 1,230
S96T002653	144:2	Lower ½	< 928	< 933	< 931
S96T002660	144:3	Upper ½	< 922	< 918	< 920
S96T002661	144:3	Lower ½	< 1,180	< 1,250	< 1,220
S96T002805	144:4	Upper ½	< 1,150	< 1,140	< 1,150
S96T002806	144:4	Lower ½	< 1,240	< 1,240	< 1,240
S96T002807	144:5	Upper ½	< 1,170	< 1,210	< 1,190
S96T002808	144:5	Lower ½	< 1,170	< 1,190	< 1,180
S96T002809	144:6	Upper ½	< 1,170	< 1,140	< 1,160
S96T002810	144:6	Lower ½	< 1,150	< 1,170	< 1,160
S96T003612	144:6A	Upper ½	< 1,020	< 1,020	< 1,020
Composites: water digest			**µg/g**	**µg/g**	**µg/g**
S96T003684	143	n/a	< 538	< 553	< 546
S96T003677	144	n/a	< 506	< 528	< 517
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	< 1,280	< 1,290	< 1,290
S96T002549	144:1	DL	< 1,280	< 1,290	< 1,290
S96T002511	144: LiBr field blank		29,400	29,800	29,600

Table B2-44. Tank 241-U-102 Analytical Results: Chloride.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S96T002476	143:1	Upper ½	3,650	3,500	3,580
S96T002478		Lower ½	2,920	3,800	3,360[QC:e]
S96T002479	143:2	Upper ½	3,830	3,190	3,510
S96T002480		Lower ½	4,000	4,140	4,070
S96T002481	143:3	Upper ½	4,450	4,940	4,700
S96T002482		Lower ½	4,540	4,760	4,650
S96T002483	143:4	Upper ½	4,970	4,620	4,800
S96T002491		Lower ½	5,750	5,720	5,740
S96T002520	143:5	Whole	3,610	2,460	3,040[QC:e]
S96T002523	143:5A	Upper ½	2,620	2,620	2,620
S96T002675	143:5B	Upper ½	5,570	5,570	5,570
S96T002676		Lower ½	7,060	6,770	6,910
S96T002759	143:6	Upper ½	5,070	4,810	4,940
S96T002652	144:1	Lower ½	2,960	2,740	2,850
S96T002659	144:2	Upper ½	2,480	2,930	2,700
S96T002653		Lower ½	3,230	3,650	3,440
S96T002660	144:3	Upper ½	1,840	1,960	1,900
S96T002661		Lower ½	2,320	2,190	2,250
S96T002805	144:4	Upper ½	4,160	4,590	4,370
S96T002806		Lower ½	5,490	5,110	5,300
S96T002807	144:5	Upper ½	5,540	5,710	5,620
S96T002808		Lower ½	5,920	4,940	5,430
S96T002809	144:6	Upper ½	7,420	7,350	7,380
S96T002810		Lower ½	4,940	4,620	4,780
S96T003612	144:6A	Upper ½	3,330	3,480	3,410
Composites: water digest			**µg/g**	**µg/g**	**µg/g**
S96T003684	143	n/a	4,510	4,570	4,540
S96T003677	144	n/a	4,740	4,950	4,850
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	8,820	8,690	8,760
S96T002549	144:1	DL	8,840	8,910	8,880

Table B2-45. Tank 241-U-102 Analytical Results: Cyanide.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: EDTA addition			**µg/g**	**µg/g**	**µg/g**
S96T002332	143:2	Upper ½	20.4	29.7	25.05[QC:e]
S96T002335		Lower ½	35.6	34.7	35.15
Solids: water distillation			**µg/g**	**µg/g**	**µg/g**
S96T002332	143:2	Upper ½	17.7	18.0	17.85
S96T002335		Lower ½	22.7	25.5	24.1

Table B2-46. Tank 241-U-102 Analytical Results: Fluoride.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			μg/g	μg/g	μg/g
S96T002476	143:1	Upper ½	< 236	< 242	< 239
S96T002478		Lower ½	< 241	< 253	< 247
S96T002479	143:2	Upper ½	< 92.84	< 90.9	< 91.9
S96T002480		Lower ½	< 96.70	< 93.9	< 95.3
S96T002481	143:3	Upper ½	< 101	< 93.1	< 97.1
S96T002482		Lower ½	< 106	< 102	< 104[QC:d]
S96T002483	143:4	Upper ½	< 124	< 140	< 132[QC:d]
S96T002491		Lower ½	< 125	< 145	< 135
S96T002520	143:5	Whole	< 148	< 134	< 141
S96T002523	143:5A	Upper ½	< 134	< 139	< 137
S96T002675	143:5B	Upper ½	< 98.25	< 111	< 105[QC:d]
S96T002676		Lower ½	< 93.77	< 102	< 97.9
S96T002759	143:6	Upper ½	< 148	< 127	< 138
S96T002652	144:1	Lower ½	942	882	912.2
S96T002659	144:2	Upper ½	846	915	880.3
S96T002653		Lower ½	< 189	< 190	< 190
S96T002660	144:3	Upper ½	< 188	< 187	< 188
S96T002661		Lower ½	< 122	< 129	< 126
S96T002805	144:4	Upper ½	< 118	< 117	< 118
S96T002806		Lower ½	< 128	< 128	< 128[QC:d]
S96T002807	144:5	Upper ½	< 121	< 125	< 123
S96T002808		Lower ½	< 120	< 122	< 121
S96T002809	144:6	Upper ½	< 121	< 118	< 120
S96T002810		Lower ½	< 119	< 121	< 120
S96T003612	144:6A	Upper ½	< 105	< 106	< 106
Composites: water digest			μg/g	μg/g	μg/g
S96T003684	143	n/a	< 55.45	< 57.0	< 56.2
S96T003677	144	n/a	< 52.23	< 54.5	< 53.4
Liquids: direct			μg/mL	μg/mL	μg/mL
S96T002323	143:1	DL	< 133	< 133	< 133
S96T002549	144:1	DL	< 133	< 133	< 133

Table B2-47. Tank 241-U-102 Analytical Results: Hydroxide.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Liquids: direct			µg/mL	µg/mL	µg/mL
S96T002524	143:1	DL	22,400	20,400	21,400
S96T003622	144:1	DL	23,500	24,400	24,000

Table B2-48. Tank 241-U-102 Analytical Results: Nitrate. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			μg/g	μg/g	μg/g
S96T002476	143:1	Upper ½	2.36E+05	2.36E+05	2.36E+05
S96T002478		Lower ½	4.62E+05	5.04E+05	4.83E+05
S96T002479	143:2	Upper ½	2.60E+05	3.19E+05	2.89E+05[QC:e]
S96T002480		Lower ½	1.98E+05	1.89E+05	1.94E+05
S96T002481	143:3	Upper ½	2.04E+05	<1.97E+05	2.01E+05
S96T002482		Lower ½	2.48E+05	2.46E+05	2.47E+05
S96T002483	143:4	Upper ½	2.12E+05	2.27E+05	2.20E+05
S96T002491		Lower ½	1.99E+05	2.00E+05	2.00E+05
S96T002520	143:5	Whole	5.01E+05	4.95E+05	4.98E+05
S96T002523	143:5A	Upper ½	4.76E+05	4.75E+05	4.76E+05
S96T002675	143:5B	Upper ½	2.88E+05	3.01E+05	2.94E+05
S96T002676		Lower ½	1.42E+05	1.36E+05	1.39E+05
S96T002759	143:6	Upper ½	2.57E+05	2.71E+05	2.64E+05
S96T002652	144:1	Lower ½	1.99E+05	2.35E+05	2.17E+05
S96T002659	144:2	Upper ½	1.97E+05	1.77E+05	1.87E+05
S96T002653		Lower ½	4.03E+05	3.73E+05	3.88E+05
S96T002660	144:3	Upper ½	5.63E+05	5.05E+05	5.34E+05
S96T002661		Lower ½	5.45E+05	5.36E+05	5.40E+05
S96T002805	144:4	Upper ½	4.16E+05	3.97E+05	4.07E+05[QC:e]
S96T002806		Lower ½	2.84E+05	2.98E+05	2.91E+05
S96T002807	144:5	Upper ½	1.72E+05	1.36E+05	1.54E+05[QC:e]
S96T002808		Lower ½	3.32E+05	3.08E+05	3.20E+05[QC:e]
S96T002809	144:6	Upper ½	1.31E+05	1.43E+05	1.37E+05
S96T002810		Lower ½	3.28E+05	3.46E+05	3.37E+05
S96T003612	144:6A	Upper ½	4.07E+05	4.10E+05	4.08E+05
Composites: water digest			μg/g	μg/g	μg/g
S96T003684	143	n/a	1.94E+05	2.03E+05	1.98E+05
S96T003677	144	n/a	2.33E+05	2.32E+05	2.32E+05

Table B2-48. Tank 241-U-102 Analytical Results: Nitrate. (2 sheets)

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Liquids: direct			μg/mL	μg/mL	μg/mL
S96T002323	143:1	DL	2.40E+05	2.38E+05	2.39E+05
S96T002549	144:1	DL	2.52E+05	2.48E+05	2.50E+05

Table B2-49. Tank 241-U-102 Analytical Results: Nitrite.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			μg/g	μg/g	μg/g
S96T002476	143:1	Upper ½	35,900	37,800	36,900
S96T002478		Lower ½	30,600	29,400	30,000
S96T002479	143:2	Upper ½	42,600	36,000	39,300
S96T002480		Lower ½	44,000	44,900	44,400
S96T002481	143:3	Upper ½	47,400	55,200	51,300
S96T002482		Lower ½	48,300	51,600	50,000
S96T002483	143:4	Upper ½	54,500	47,800	51,100
S96T002491		Lower ½	63,200	63,100	63,100
S96T002520	143:5	Whole	31,500	29,100	30,300
S96T002523	143:5A	Upper ½	30,000	30,300	30,200
S96T002675	143:5B	Upper ½	64,600	61,700	63,100
S96T002676		Lower ½	82,400	78,300	80,300
S96T002759	143:6	Upper ½	56,100	53,700	54,900
S96T002652	144:1	Lower ½	34,300	33,900	34,100
S96T002659	144:2	Upper ½	31,300	36,300	33,800
S96T002653		Lower ½	33,900	38,100	36,000
S96T002660	144:3	Upper ½	20,900	21,200	21,100
S96T002661		Lower ½	24,400	22,700	23,600
S96T002805	144:4	Upper ½	45,700	50,700	48,200
S96T002806		Lower ½	59,600	56,600	58,100
S96T002807	144:5	Upper ½	62,700	63,900	63,300
S96T002808		Lower ½	63,200	55,200	59,200
S96T002809	144:6	Upper ½	86,500	83,100	84,800
S96T002810		Lower ½	55,400	51,500	53,400
S96T003612	144:6A	Upper ½	35,400	36,800	36,100
Composites: water digest			μg/g	μg/g	μg/g
S96T003684	143	n/a	54,600	57,200	55,900
S96T003677	144	n/a	55,900	59,100	57,500
Liquids: direct			μg/mL	μg/mL	μg/mL
S96T002323	143:1	DL	1.06E+05	1.02E+05	1.04E+05
S96T002549	144:1	DL	1.05E+05	1.05E+05	1.05E+05

Table B2-50. Tank 241-U-102 Analytical Results: Oxalate.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S96T002476	143:1	Upper ½	6,810	6,690	6,750
S96T002478		Lower ½	< 1,950	< 2,040	< 2,000
S96T002479	143:2	Upper ½	3,480	3,150	3,320
S96T002480		Lower ½	5,790	5,140	5,470
S96T002481	143:3	Upper ½	5,510	5,240	5,370
S96T002482		Lower ½	5,690	5,310	5,500
S96T002483	143:4	Upper ½	8,550	9,820	9,180
S96T002491		Lower ½	8,760	8,150	8,450
S96T002520	143:5	Whole	1,540	2,000	1,770
S96T002523	143:5A	Upper ½	1,650	1,430	1,540
S96T002675	143:5B	Upper ½	5,220	4,910	5,060
S96T002676		Lower ½	6,910	7,100	7,010
S96T002759	143:6	Upper ½	6,590	5,720	6,150
S96T002652	144:1	Lower ½	9,210	9,490	9,350
S96T002659	144:2	Upper ½	3,690	4,270	3,980
S96T002653		Lower ½	2,730	2,840	2,780
S96T002660	144:3	Upper ½	1,760	2,510	2,140
S96T002661		Lower ½	2,050	1,530	1,790
S96T002805	144:4	Upper ½	4,590	4,740	4,660
S96T002806		Lower ½	6,480	6,600	6,540
S96T002807	144:5	Upper ½	9,420	10,500	9,960
S96T002808		Lower ½	6,480	5,100	5,790
S96T002809	144:6	Upper ½	7,540	7,160	7,350
S96T002810		Lower ½	4,030	4,430	4,230
S96T003612	144:6A	Upper ½	2,650	2,530	2,590
Composites: water digest			**µg/g**	**µg/g**	**µg/g**
S96T003684	143	n/a	5,060	5,580	5,320
S96T003677	144	n/a	5,800	6,140	5,970
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	< 1,070	< 1,070	< 1,070
S96T002549	144:1	DL	< 1,070	< 1,070	< 1,070

Table B2-51. Tank 241-U-102 Analytical Results: Phosphate.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S96T002476	143:1	Upper ½	49,800	52,800	51,300
S96T002478		Lower ½	8,520	13,400	11,000[QC:e]
S96T002479	143:2	Upper ½	11,500	9,970	10,700
S96T002480		Lower ½	14,500	15,500	15,000
S96T002481	143:3	Upper ½	12,300	8,470	10,400[QC:e]
S96T002482		Lower ½	6,570	6,910	6,740
S96T002483	143:4	Upper ½	2,600	6,360	4,480[QC:e]
S96T002491		Lower ½	3,740	5,000	4,370[QC:e]
S96T002520	143:5	Whole	< 1,360	< 1,230	< 1,300
S96T002523	143:5A	Upper ½	2,320	2,340	2,330
S96T002675	143:5B	Upper ½	2,700	3,130	2,920
S96T002676		Lower ½	2,800	2,650	2,720
S96T002759	143:6	Upper ½	4,030	3,290	3,660[QC:e]
S96T002652	144:1	Lower ½	49,700	48,700	49,200
S96T002659	144:2	Upper ½	15,100	22,200	18,700[QC:e]
S96T002653		Lower ½	15,100	15,300	15,200
S96T002660	144:3	Upper ½	7,040	18,900	13,000[QC:e]
S96T002661		Lower ½	4,390	10,300	7,350[QC:e]
S96T002805	144:4	Upper ½	2,460	4,260	3,360[QC:e]
S96T002806		Lower ½	4,850	3,590	4,220[QC:e]
S96T002807	144:5	Upper ½	3,870	3,740	3,810
S96T002808		Lower ½	3,810	3,450	3,630
S96T002809	144:6	Upper ½	3,760	11,800	7,780[QC:e]
S96T002810		Lower ½	3,840	6,550	5,190[QC:e]
S96T003612	144:6A	Upper ½	3,370	3,220	3,300
Composites: water digest			**µg/g**	**µg/g**	**µg/g**
S96T003684	143	n/a	7,560	8,990	8,270
S96T003677	144	n/a	8,340	5,790	7,070
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	3,760	3,760	3,760
S96T002549	144:1	DL	3,620	4,080	3,850

Table B2-52. Tank 241-U-102 Analytical Results: Sulfate.

Sample Number	Sample Location	Segment Portion	Result	Duplicate	Sample Mean
Solids: water digest			**µg/g**	**µg/g**	**µg/g**
S96T002476	143:1	Upper ½	8,270	9,260	8,760
S96T002478		Lower ½	6,430	6,610	6,520
S96T002479	143:2	Upper ½	12,500	10,100	11,300[QC:e]
S96T002480		Lower ½	18,000	18,200	18,100
S96T002481	143:3	Upper ½	18,600	18,900	18,700
S96T002482		Lower ½	16,300	15,300	15,800
S96T002483	143:4	Upper ½	30,000	29,600	29,800
S96T002491		Lower ½	23,000	22,200	22,600
S96T002520	143:5	Whole	4,130	3,530	3,830
S96T002523	143:5A	Upper ½	2,880	2,930	2,900
S96T002675	143:5B	Upper ½	11,600	11,600	11,600
S96T002676		Lower ½	17,500	17,800	17,700
S96T002759	143:6	Upper ½	20,200	18,100	19,100
S96T002652	144:1	Lower ½	13,600	12,700	13,200
S96T002659	144:2	Upper ½	14,200	16,200	15,200
S96T002653		Lower ½	12,700	12,000	12,300
S96T002660	144:3	Upper ½	10,600	11,700	11,200
S96T002661		Lower ½	7,650	7,640	7,640
S96T002805	144:4	Upper ½	11,400	11,300	11,300
S96T002806		Lower ½	15,400	15,200	15,300
S96T002807	144:5	Upper ½	35,400	38,600	37,000
S96T002808		Lower ½	14,100	12,800	13,500
S96T002809	144:6	Upper ½	22,400	21,900	22,200
S96T002810		Lower ½	13,600	14,200	13,900
S96T003612	144:6A	Upper ½	6,080	5,960	6,020
Composites: water digest			**µg/g**	**µg/g**	**µg/g**
S96T003684	143	n/a	15,100	16,700	15,900
S96T003677	144	n/a	16,800	17,400	17,100
Liquids: direct			**µg/mL**	**µg/mL**	**µg/mL**
S96T002323	143:1	DL	7,450	7,460	7,450
S96T002549	144:1	DL	6,700	6,610	6,660

Table B2-53. Tank 241-U-102 Analytical Results: Total Organic Carbon.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: direct			**µg C/g**	**µg C/g**	**µg C/g**
S96T002326	143:1	Upper ½	6,960	7,900	7,430
S96T002329		Lower ½	4,380	4,030	4,200
S96T002332	143:2	Upper ½	7,120	7,760	7,440
S96T002335		Lower ½	7,710	8,670	8,190[QC:d]
S96T002338	143:3	Upper ½	10,100	10,300	10,200
S96T002341		Lower ½	9,520	9,410	9,460[QC:d]
S96T002344	143:4	Upper ½	9,440	9,650	9,540
S96T002347		Lower ½	10,300	11,100	10,700
S96T002500	143:5	Whole	4,360	4,420	4,390
S96T002501	143:5A	Upper ½	4,090	4,200	4,140
S96T002665	143:5B	Upper ½	9,180	9,240	9,210
S96T002666		Lower ½	10,200	11,600	10,900
S96T002755	143:6	Upper ½	8,650	9,130	8,890
S96T002632	144:1	Lower ½	5,930	5,990	5,960
S96T002646	144:2	Upper ½	7,110	7,190	7,150
S96T002633		Lower ½	5,730	5,390	5,560
S96T002647	144:3	Upper ½	4,030	3,930	3,980
S96T002636		Lower ½	3,890	3,610	3,750
S96T002775	144:4	Upper ½	6,780	7,020	6,900[QC:d]
S96T002776		Lower ½	9,860	8,920	9,390
S96T002777	144:5	Upper ½	11,600	11,900	11,800
S96T002778		Lower ½	9,130	8,570	8,850
S96T002779	144:6	Upper ½	11,100	11,200	11,200
S96T002780		Lower ½	7,920	7,430	7,680
S96T003609	144:6A	Upper ½	5,700	5,440	5,570[QC:c]
Composites: direct			**µg C/g**	**µg C/g**	**µg C/g**
S96T003678	143	n/a	8,390	9,110	8,750
S96T003670	144	n/a	9,390	9,050	9,220
Liquids: direct			**µg C/mL**	**µg C/mL**	**µg C/mL**
S96T002524	143:1	DL	12,300	12,500	12,400
S96T003622	144:1	DL	17,700	17,900	17,800

Table B2-54. Tank 241-U-102 Analytical Results: Total Inorganic Carbon.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: direct			µg C/g	µg C/g	µg C/g
S96T002326	143:1	Upper ½	7,960	8,920	8,440
S96T002329		Lower ½	6,620	5,940	6,280
S96T002332	143:2	Upper ½	8,870	10,100	9,480
S96T002335		Lower ½	9,540	9,090	9,320[QC:d]
S96T002338	143:3	Upper ½	12,800	11,300	12,000
S96T002341		Lower ½	9,410	11,200	10,300
S96T002344	143:4	Upper ½	17,700	18,600	18,200
S96T002347		Lower ½	13,100	14,100	13,600
S96T002500	143:5	Whole	3,420	3,290	3,360
S96T002501	143:5A	Upper ½	3,300	3,050	3,180
S96T002665	143:5B	Upper ½	7,760	8,200	7,980
S96T002666		Lower ½	11,000	11,100	11,000
S96T002755	143:6	Upper ½	9,530	10,100	9,820
S96T002632	144:1	Lower ½	8,090	7,020	7,560
S96T002646	144:2	Upper ½	12,800	13,300	13,000
S96T002633		Lower ½	7,720	7,750	7,740
S96T002647	144:3	Upper ½	7,000	6,810	6,900
S96T002636		Lower ½	5,000	4,740	4,870
S96T002775	144:4	Upper ½	7,550	7,700	7,620[QC:d]
S96T002776		Lower ½	9,920	10,100	10,000
S96T002777	144:5	Upper ½	21,100	22,200	21,600
S96T002778		Lower ½	8,820	8,830	8,820
S96T002779	144:6	Upper ½	12,900	12,300	12,600
S96T002780		Lower ½	8,270	7,570	7,920
S96T003609	144:6A	Upper ½	4,680	4,190	4,440
Composites: direct			µg C/g	µg C/g	µg C/g
S96T003678	143	n/a	9,830	10,600	10,200
S96T003670	144	n/a	10,300	10,100	10,200
Liquids: direct			µg C/mL	µg C/mL	µg C/mL
S96T002524	143:1	DL	10,100	9,740	9,920
S96T003622	144:1	DL	8,770	8,810	8,790

Table B2-55. Tank 241-U-102 Analytical Results: Total Alpha Activity.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002443	143:1	Lower ½	0.0556	0.0591	0.0573
S96T002445	143:2	Lower ½	0.133	0.148	0.141
S96T002447	143:3	Lower ½	0.147	0.154	0.15
S96T002449	143:4	Lower ½	0.213	0.236	0.224
S96T002518	143:5	Whole	0.0831	0.0654	0.0742[QC:e]
S96T002672	143:5B	Lower ½	0.106	0.121	0.113
S96T002648	144:1	Lower ½	0.624	0.644	0.634
S96T002649	144:2	Lower ½	0.163	0.158	0.161
S96T002662	144:3	Lower ½	0.121	0.129	0.125
S96T002796	144:4	Lower ½	0.345	0.347	0.346
S96T002797	144:5	Lower ½	0.166	0.167	0.167
S96T002798	144:6	Lower ½	0.0849	0.0818	0.0834
S96T003610	144:6A	Upper ½	0.0653	0.0703	0.0678
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	0.190	0.174	0.182
S96T003675	144	n/a	0.178	0.162	0.170
Liquids: direct			µCi/mL	µCi/mL	µCi/mL
S96T002323	143:1	DL	0.0272	0.0260	0.0266
S96T002549	144:1	DL	0.0293	0.0424	0.0358[QC:d,e]

Table B2-56. Tank 241-U-102 Analytical Results: Total Beta Activity.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Composites: fusion digest			μCi/g	μCi/g	μCi/g
S96T003680	143	n/a	285	275	280
S96T003675	144	n/a	291	254	272.5

Table B2-57. Tank 241-U-102 Analytical Results: Americium-241.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002438	143:1	Upper ½	< 0.214	< 0.236	< 0.225
S96T002443		Lower ½	< 0.144	< 0.134	< 0.139
S96T002444	143:2	Upper ½	< 0.159	< 0.163	< 0.161
S96T002445		Lower ½	< 1.101	< 1.17	< 1.14
S96T002446	143:3	Upper ½	< 1.111	< 1.03	< 1.07
S96T002447		Lower ½	< 1.217	< 1.30	< 1.26
S96T002448	143:4	Upper ½	< 450	< 365	< 408
S96T002449		Lower ½	< 0.324	< 0.330	< 0.327
S96T002518	143:5	Whole	< 0.152	< 0.144	< 0.148
S96T002521	143:5A	Upper ½	< 0.973	< 1.00	< 0.987
S96T002671	143:5B	Upper ½	< 1.308	< 1.27	< 1.29
S96T002672		Lower ½	< 2.022	< 2.07	< 2.05
S96T002757	143:6	Upper ½	< 1.692	< 1.74	< 1.72
S96T002648	144:1	Lower ½	< 583	< 624	< 604
S96T002654	144:2	Upper ½	< 0.437	< 0.435	< 0.436
S96T002649		Lower ½	< 0.438	< 0.446	< 0.442
S96T002655	144:3	Upper ½	< 1.187	< 1.20	< 1.19
S96T002662		Lower ½	< 1.130	< 1.12	< 1.13
S96T002793	144:4	Upper ½	< 1.754	< 1.80	< 1.78
S96T002796		Lower ½	< 2.761	< 2.68	< 2.72
S96T002794	144:5	Upper ½	< 2.910	< 2.94	< 2.93
S96T002797		Lower ½	< 2.789	< 2.71	< 2.75
S96T002795	144:6	Upper ½	< 0.563	< 0.547	< 0.555
S96T002798		Lower ½	< 0.478	< 0.492	< 0.485
S96T003610	144:6A	Upper ½	< 0.155	< 0.157	< 0.156
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	< 1.898	< 1.89	< 1.89
S96T003675	144	n/a	< 2.073	< 1.93	< 2.00
Liquids: extraction			µCi/mL	µCi/mL	µCi/mL
S96T002524	143:1	DL	0.0193	0.0194	0.0193
S96T003622	144:1	DL	0.0169	0.0176	0.0173

Table B2-58. Tank 241-U-102 Analytical Results: Cesium-137.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002438	143:1	Upper ½	123	121	122
S96T002443		Lower ½	103	96.1	99.45
S96T002444	143:2	Upper ½	130	140	134.9
S96T002445		Lower ½	154	177	165.8
S96T002446	143:3	Upper ½	189	163	176.2
S96T002447		Lower ½	188	221	204.7
S96T002448	143:4	Upper ½	172	173	172.3
S96T002449		Lower ½	214	214	213.9
S96T002518	143:5	Whole	104	106	104.8
S96T002521	143:5A	Upper ½	112	109	110.3
S96T002671	143:5B	Upper ½	200	203	201.6
S96T002672		Lower ½	266	266	266.2
S96T002757	143:6	Upper ½	195	191	193.1
S96T002648	144:1	Lower ½	115	111	113
S96T002654	144:2	Upper ½	138	138	138.1
S96T002649		Lower ½	120	113	116.4
S96T002655	144:3	Upper ½	61.83	67.6	64.72
S96T002662		Lower ½	63.31	62.4	62.86
S96T002793	144:4	Upper ½	141	149	144.8
S96T002796		Lower ½	184	178	181.1
S96T002794	144:5	Upper ½	205	211	208.1
S96T002797		Lower ½	191	176	183.3
S96T002795	144:6	Upper ½	271	249	259.9
S96T002798		Lower ½	188	191	189.2
S96T003610	144:6A	Upper ½	124	125	124.7
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	204	192	197.9
S96T003675	144	n/a	198	172	184.8
Liquids: direct			µCi/mL	µCi/mL	µCi/mL
S96T002524	143:1	DL	373	371	372
S96T003622	144:1	DL	308	306	307

Table B2-59. Tank 241-U-102 Analytical Results: Cobalt-60.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002438	143:1	Upper ½	< 0.0932	< 0.110	< 0.102
S96T002443		Lower ½	< 0.0535	< 0.0549	< 0.0542
S96T002444	143:2	Upper ½	< 0.0469	< 0.0418	< 0.0444
S96T002445		Lower ½	< 0.0336	< 0.0373	< 0.0355
S96T002446	143:3	Upper ½	< 0.0355	< 0.0337	< 0.0346
S96T002447		Lower ½	< 0.0318	< 0.0345	< 0.0332
S96T002448	143:4	Upper ½	< 0.121	< 0.100	< 0.111
S96T002449		Lower ½	< 0.125	< 0.101	< 0.113
S96T002518	143:5	Whole	< 0.0507	< 0.0484	< 0.0496
S96T002521	143:5A	Upper ½	< 0.0447	< 0.0401	< 0.0424
S96T002671	143:5B	Upper ½	< 0.0357	< 0.0368	< 0.0363
S96T002672		Lower ½	< 0.0501	< 0.0648	< 0.0575
S96T002757	143:6	Upper ½	< 0.0765	< 0.0595	< 0.0680
S96T002648	144:1	Lower ½	< 0.247	< 0.259	< 0.253
S96T002654	144:2	Upper ½	< 0.185	< 0.196	< 0.191
S96T002649		Lower ½	< 0.185	< 0.210	< 0.198
S96T002655	144:3	Upper ½	< 0.0873	< 0.0721	< 0.0797
S96T002662		Lower ½	< 0.0760	< 0.0787	< 0.0774
S96T002793	144:4	Upper ½	< 0.0938	< 0.0988	< 0.0963
S96T002796		Lower ½	< 0.141	< 0.138	< 0.140
S96T002794	144:5	Upper ½	< 0.147	< 0.144	< 0.146
S96T002797		Lower ½	< 0.129	< 0.153	< 0.141
S96T002795	144:6	Upper ½	< 0.212	< 0.212	< 0.212
S96T002798		Lower ½	< 0.206	< 0.225	< 0.216
S96T003610	144:6A	Upper ½	< 0.0526	< 0.0504	< 0.0515
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	< 0.0671	< 0.0900	< 0.0786
S96T003675	144	n/a	< 0.0982	< 0.0739	< 0.0861
Liquids: direct			µCi/mL	µCi/mL	µCi/mL
S96T002524	143:1	DL	0.0302	< 0.0247	0.0275
S96T003622	144:1	DL	0.0338	0.0255	0.0296

Table B2-60. Tank 241-U-102 Analytical Results: Europium-154.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002438	143:1	Upper ½	< 0.383	< 0.396	< 0.390
S96T002443		Lower ½	< 0.163	< 0.170	< 0.167
S96T002444	143:2	Upper ½	< 0.187	< 0.183	< 0.185
S96T002445		Lower ½	< 0.142	< 0.152	< 0.147
S96T002446	143:3	Upper ½	< 0.111	< 0.139	< 0.125
S96T002447		Lower ½	< 0.143	< 0.170	< 0.157
S96T002448	143:4	Upper ½	< 0.426	< 0.435	< 0.431
S96T002449		Lower ½	< 0.437	< 0.445	< 0.441
S96T002518	143:5	Whole	< 0.210	< 0.180	< 0.195
S96T002521	143:5A	Upper ½	< 0.109	< 0.127	< 0.118
S96T002671	143:5B	Upper ½	< 0.104	< 0.130	< 0.117
S96T002672		Lower ½	< 0.248	< 0.231	< 0.240
S96T002757	143:6	Upper ½	< 0.194	< 0.210	< 0.202
S96T002648	144:1	Lower ½	< 0.865	< 0.838	< 0.852
S96T002654	144:2	Upper ½	< 0.727	< 0.698	< 0.713
S96T002649		Lower ½	< 0.804	< 0.705	< 0.755
S96T002655	144:3	Upper ½	< 0.330	< 0.302	< 0.316
S96T002662		Lower ½	< 0.231	< 0.274	< 0.253
S96T002793	144:4	Upper ½	< 0.288	< 0.368	< 0.328
S96T002796		Lower ½	< 0.502	< 0.472	< 0.487
S96T002794	144:5	Upper ½	< 0.532	< 0.456	< 0.494
S96T002797		Lower ½	< 0.343	< 0.494	< 0.419
S96T002795	144:6	Upper ½	< 0.819	< 0.770	< 0.795
S96T002798		Lower ½	< 0.716	< 0.837	< 0.777
S96T003610	144:6A	Upper ½	< 0.157	< 0.183	< 0.170
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	< 0.307	< 0.282	< 0.295
S96T003675	144	n/a	< 0.391	< 0.350	< 0.371

Table B2-61. Tank 241-U-102 Analytical Results: Europium-155.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Solids: fusion digest			µCi/g	µCi/g	µCi/g
S96T002438	143:1	Upper ½	< 0.430	< 0.428	< 0.429
S96T002443		Lower ½	< 0.260	< 0.245	< 0.253
S96T002444	143:2	Upper ½	< 0.292	< 0.292	< 0.292
S96T002445		Lower ½	< 0.420	< 0.454	< 0.437
S96T002446	143:3	Upper ½	< 0.435	< 0.408	< 0.422
S96T002447		Lower ½	< 0.472	< 0.507	< 0.490
S96T002448	143:4	Upper ½	< 0.525	< 0.524	< 0.525
S96T002449		Lower ½	< 0.584	< 0.590	< 0.587
S96T002518	143:5	Whole	< 0.281	< 0.260	< 0.271
S96T002521	143:5A	Upper ½	< 0.375	< 0.379	< 0.377
S96T002671	143:5B	Upper ½	< 0.494	< 0.486	< 0.490
S96T002672		Lower ½	< 0.783	< 0.784	< 0.784
S96T002757	143:6	Upper ½	< 0.639	< 0.664	< 0.652
S96T002648	144:1	Lower ½	< 0.866	< 0.851	< 0.859
S96T002654	144:2	Upper ½	< 0.834	< 0.782	< 0.808
S96T002649		Lower ½	< 0.840	< 0.794	< 0.817
S96T002655	144:3	Upper ½	< 0.590	< 0.557	< 0.574
S96T002662		Lower ½	< 0.556	< 0.561	< 0.559
S96T002793	144:4	Upper ½	< 0.829	< 0.886	< 0.858
S96T002796		Lower ½	< 1.066	< 1.05	< 1.06
S96T002794	144:5	Upper ½	< 1.133	< 1.15	< 1.14
S96T002797		Lower ½	< 1.064	< 1.05	< 1.06
S96T002795	144:6	Upper ½	< 1.035	< 1.01	< 1.02
S96T002798		Lower ½	< 0.908	< 0.916	< 0.912
S96T003610	144:6A	Upper ½	< 0.280	< 0.288	< 0.284
Composites: fusion digest			µCi/g	µCi/g	µCi/g
S96T003680	143	n/a	< 0.929	< 0.922	< 0.926
S96T003675	144	n/a	< 1.058	< 0.921	< 0.990

Table B2-62. Tank 241-U-102 Analytical Results: Plutonium-239/240.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Liquids: extraction			μCi/mL	μCi/mL	μCi/mL
S96T002524	143:1	DL	7.99E-04	8.06E-04	8.03E-04
S96T003622	144:1	DL	7.88E-04	8.78E-04	8.33E-04

Table B2-63. Tank 241-U-102 Analytical Results: Strontium-89/90.

Sample Number	Core: Segment	Segment Portion	Result	Duplicate	Sample Mean
Composites: fusion digest			μCi/g	μCi/g	μCi/g
S96T003680	143	n/a	40.4	37.4	38.9
S96T003675	144	n/a	44.6	40.1	42.35
Liquids: direct			μCi/mL	μCi/mL	μCi/mL
S96T002524	143:1	DL	9.28	9.19	9.235
S96T003622	144:1	DL	8.39	8.46	8.425

B2.2 TANK HEADSPACE FLAMMABILITY SCREENING RESULTS

As requested in the TSAP (Hu 1996b), the flammability of the tank 241-U-102 headspace was monitored with a combustible gas meter prior to and during the sampling event. The safety screening DQO limit for headspace flammability is 25 percent of the lower flammability limit (LFL) (Dukelow et al. 1995). The combustible gas meter reports results as a percentage of the lower explosive limit (LEL). Because the National Fire Protection Association defines the terms LEL and LFL identically, the two terms may be used interchangeably (NFPA 1995). The reported LFL of 0 percent was well below the limit. The results of the flammability measurement, as well as those for oxygen, ammonia, and TOC vapor, are presented in Table B2-64.

Table B2-64. Headspace Flammability and Vapor Concentrations of Tank 241-U-102. (Hu and Steen 1996)

Vapor Characteristic Measured	Results	
	Riser 9	
	20 ft below	20 ft below
Flammability vapor concentration as percent of LFL	0 %	0 %
Volume percent oxygen gas	21.1 %	20.7 %
Concentration of ammonia gas	500 ppm	400 ppm
Concentration of TOC vapor	18 ppm	21 ppm

B2.3 HISTORICAL ANALYTICAL RESULTS

Information from three historical sampling events was available for tank 241-U-102. Appendix C presents the analytical results of these sampling events. The events occurred in 1976, 1977, and 1993. Because the tank was active at the time of the 1976 and 1977 samplings and the solids volume increased substantially after these events, the results from these two samplings are likely no longer representative of the tank's contents, and have been included here for informational purposes only. The 1993 supernatant sampling event results should be representative of the current liquid inventory.

B2.3.1 Description of the 1976 Sampling Event

A sample was received on March 1, 1976, and reported on April 12, 1976 (Horton 1976). The sample was a slurry with a few large chunks. A description of the technique or procedure used to obtain the sample, and information concerning the sample riser or sample depth was unavailable. The sample was centrifuged into liquid and solid phases. The chunks were grayish white and the fines were dark brown. The fines represented about 85 to 90 percent of the solids received. Analyses were made by fusing the fines and chunks separately with KOH and dissolving the melt with HCl. Analytical results are presented in Table B2-65.

B2.3.2 Description of the 1977 Sampling Event

Results of a sampling event were reported October 24, 1977 (Lane 1977). Neither the date of sample retrieval nor the date of analysis was given. A description of the technique or procedure used to obtain the sample, information concerning the sampled riser or sample depth, and how the sample was handled once received for analysis were unavailable. Analytical results are presented in Table B2-66.

B2.3.3 Description of 1993 Sampling Event

In approximately July 1993, three samples of the supernatant in tank 241-U-102 were taken. The sampling method is unknown, although the samples most likely were grab samples. The samples were labeled top, middle, and bottom. The samples were received by the laboratory on July 29, 1993. No information concerning sample description or sample handling was given. Selected metals, anions, and radionuclides were analyzed in the samples, along with specific gravity, percent water, pH, energetics, TIC, and TOC. Results from this sampling event are presented in Table B2-67. Comparisons between this sampling event and the drainable liquid results from the 1996 core sampling event have been made in Appendix D.

Table B2-65. Tank 241-U-102 1976 Historical Results. (Horton 1976) (2 sheets)

Analysis of Tank 241-U-102 Supernatant Liquid		
Physical Data		
Component	**Lab Value**	**Lab Unit**
Density	1.27	g/cc
Water content	63.6	Weight percent
Chemical Analysis		
Component	**Molarity**	**Weight percent**
$NaAlO_2$	0.02	0.1
$NaNO_2$	0.3	1.6
$NaNO_3$	3.48	23.3
Na_2CO_3	0.17	1.4
Fe	9.15E-04	<1.0
Si	0.00275	<1.0
Ni	0.00515	0.02
Cr	<1.08E-04	<1.0
Radiological Analysis		
Component	**Lab Value**	**Lab Unit**
Pu	2.10E-04	g/L
$^{89/90}Sr$	25,800	μCi/L
^{137}Cs	137,000	μCi/L
^{60}Co	2,100	μCi/L
$^{106}RuRh$	3,180	μCi/L
^{144}Ce	10,400	μCi/L
^{154}Eu	2,890	μCi/L
Analysis of Tank 241-U-102 Fine Solids		
Physical Data		
Component	**Lab Value**	**Lab Unit**
Bulk density	1.60	g/mL
Particle density	2.50	g/mL
Water content	34.6	Weight percent
Chemical Analysis		
Component	**Lab Value**	**Lab Unit**
Al	4.2	M
Ca	0.1	M
Fe	0.3	M
NO_3	3.9	M
Na	5.4	M

Table B2-65. Tank 241-U-102 1976 Historical Results. (Horton 1976) (2 sheets)

Analysis of Tank 241-U-102 Fine Solids		
Chemical Analysis		
Component	**Lab Value**	**Lab Unit**
Mn	0.4	M
Ni	0.1	M
PO_4	0.1	M
Si	0.3	M
Radiological Analysis		
Component	**Lab Value**	**Lab Unit**
Pu	0.0064	g/L
$^{89/90}Sr$	3.46E+05	μCi/L
^{137}Cs	1.05E+05	μCi/L
^{144}Ce	47,100	μCi/L
Analysis of Chunk Solids from Tank 241-U-102		
Physical Data		
Component	**Lab Value**	**Lab Unit**
Bulk density	1.38	g/mL
Particle density	3.37	g/mL
Water content	3.6	Weight percent
Chemical Analysis		
Component	**Lab Value**	**Lab Unit**
Al	7.4	M
Fe	0.2	M
Mn	0.003	M
Na	9.2	M
Ni	0.4	M
NO_3	8.9	M
PO_4	0.2	M
Si	0.3	M
Radiological Analysis		
Component	**Lab Value**	**Lab Unit**
Pu	3.87E-04	g/L
$^{89/90}Sr$	50,500	μCi/L
^{137}Cs	876	μCi/L
^{125}Sb	128	μCi/L

Note:

Because of the lack of proper QC procedures, historical data may not be reliable and should be used with caution.

Table B2-66. Historical Results of 1977 Sample from Tank 241-U-102. (Lane 1977)

Chemical Analysis		
Component	**Lab Value**	**Lab Unit**
Al	1.65	Not given
OH	2.53	Not given
NO_2	5.26	Not given
NO_3	3.09	Not given
CO_3	1.33	Not given
EDTA	0.1	Not given
HEDTA	0.2	Not given
Aluminum to caustic ratio	0.65	Not given

Table B2-67. 1993 Historical Grab Sample Data. (Sutey 1994) (2 sheets)

Analyte	Top	Middle	Bottom
METALS	µg/mL	µg/mL	µg/mL
Aluminum	5.63	16,100	17,400
Boron	5.47	63.1	64.1
Cadmium	---	5.27	5.28
Calcium	68.7	250	240
Cobalt	---	1.58	0.977
Chromium	---	256	271
Copper	---	3.84	3.44
Iron	69.5	10.5	12.9
Potassium	34.3	2,890	3,230
Magnesium	8.86	2.32	0.782
Manganese	0.686	0.711	0.587
Molybdenum	---	78.3	82.8
Sodium	850	1.99E+05	2.20E+05
Nickel	850	104	108
Phosphorus	---	1,310	1,320
Selenium	11.7	14.5	23.3
Silicon	25.1	68.5	58.4
Strontium	1.67	0.624	0.570
Sulfur	---	---	2,550
Zirconium	0.826	---	---
IONS	µg/mL	µg/mL	µg/mL
Ammonia	3,260	186	< 160
Chloride	73.3	6,570	6,880
Cyanide	4.37	38.8	39.9
Fluoride	< 1.1	---	---
Hydroxide	---	15,100	19,700
Nitrate	1,140	97,300	99,700
Nitrite	690	86,800	89,300
Phosphate	< 11.0	4,740	4,470
Sulfate	25.8	6,300	6,290

Table B2-67. 1993 Historical Grab Sample Data. (Sutey 1994) (2 sheets)

Analyte	Top	Middle	Bottom
RADIONUCLIDES	**μCi/mL**	**μCi/mL**	**μCi/mL**
^{241}Am	< 0.00129	0.0193	0.0231
^{137}Cs	2.90	250	308
^{237}Np	5.48E-05	< 1.30E-05	4.04E-05
$^{239/240}Pu$	< 0.00135	< 8.65E-04	< 8.66E-04
^{90}Sr	2.94E-04	6.88	8.08
Total alpha	< 0.00459	0.298	0.362
Total beta	2.48	386	459
TOTAL CARBON	**μg C/mL**	**μg C/mL**	**μg C/mL**
TIC	146	5,580	7,570
TOC	---	11,000	8,590
PHYSICAL PROPERTIES			
Weight percent water (TGA)	98.4 wt%	51.9 wt%	50.7 wt%
Weight percent water (Gravimetric)	65.3 wt%	56.5 wt%	51.8 wt%
pH	6.87	13.7	13.7
Specific gravity	---	1.34	1.38
Exotherm	379.1 J/g	65.5 J/g	162.3 J/g

Note:

Because of the lack of proper QC procedures, data may not be reliable and should be used with caution.

B3.0 ASSESSMENT OF CHARACTERIZATION RESULTS

The purpose of this section is to discuss the overall quality and consistency of the current sampling results for tank 241-U-102. This section also evaluates sampling and analysis factors that may impact interpretation of the data. These factors are used to assess the overall quality and consistency of the data and to identify any limitations in the use of the data.

B3.1 FIELD OBSERVATIONS

The safety screening DQO (Dukelow et al. 1995) requirement that vertical profiles from at least two widely spaced risers be obtained was not fulfilled. Hard waste prevented collection of samples from the bottom portion of the tank using this push-mode core sampling. It is estimated that approximately 74 cm (29 in.) of waste below riser 19 and 112 cm (44 in.) of waste below riser 9 were not sampled. According to the historical waste transaction record (Agnew et al. 1996b) and the Hanford defined waste (HDW) model (Agnew et al. 1996), the bottom 28 cm (11 in.) may be metal waste and the rest of the uncollectible waste will be similar to the waste that has been sampled. In addition, because of waste hardness, full segments could not be pushed after segment 4 for core 143 and segment 5 for core 144. Partial segments were collected and labeled as segments 5, 5A, 5B and 6 of core 143 and segment 6A of core 144. Water with a lithium bromide tracer was used to acquire the samples from core 143, segment 5B and core 144, segments 3 and 6A.

B3.2 LITHIUM BROMIDE WATER CONTAMINATION CHECK

Water with a lithium bromide tracer was used in the acquisition of three segments from tank 241-U-102: core 143, segment 5B, and core 144, segments 3 and 6A. The water was used to soften the waste to facilitate core sampling. All the segments were subjected to a lithium analysis by ICP and a bromide analysis by IC to check for possible external water intrusion. The lithium results for the fusion digest preparation samples were all below the detection limit. Most of the lithium results in acid digest preparation samples were less than the detection limit, except for segments 5A and 6 from core 143 and segment 6A from core 144. The highest lithium concentration was 44.1 μg/g, which is well below the LiBr field blank's 2,610 μg/g. From the observed moisture content of this sample (24 wt%), it was calculated that only 7 percent of the water was contaminated by the external LiBr water. The bromide results were all below the detection limit (less than 1,500 μg/g), which is less than 5 percent of the LiBr water field blank concentration of 29,600 μg/g. Because all the samples and all the water were contaminated less than 10 percent by the LiBr-softened water, no correction was necessary (Kristofzski 1996).

B3.3 QUALITY CONTROL ASSESSMENT

The usual quality control (QC) assessment includes an evaluation of the appropriate standard recoveries, matrix spike recoveries, duplicate analyses, and blanks that are performed in conjunction with the chemical analyses. All the pertinent QC tests were conducted on the 1996 core samples, allowing a full assessment regarding the accuracy and precision of the data. The SAP (Hu 1996a) established the specific criteria for all QC checks. Only the primary and secondary analytes required by the applicable DQOs were reviewed for adherence to the QC parameters. All analytes obtained on an opportunistic basis were not investigated for QC compliance (Hu 1996a). Quality control results outside their respective criteria are identified by superscripts in the Appendix A tables. A summary of the QC results is presented below.

The standard and matrix spike recovery results provide an estimate of the accuracy of the analysis. If a standard or spike recovery is above or below the given criterion, then the analytical results may be biased high or low. Standard recoveries for all analytes were within the defined criteria with the exception of sodium, silicon, and uranium. Only one standard was outside the criteria for both sodium and uranium, and three were outside the standard for silicon. Because sodium is an ubiquitous contaminant, the high standard recovery was not unusual. The uranium standard that exceeded the criterion was only slightly below the desired range. Deviations for two of the three silicon standards from the SAP QC range were relatively minor. The third had a standard recovery of 258 percent. Aluminum, chromium, iron, phosphorus, potassium, sodium, sulfur, fluoride, nitrate, and total alpha all had spikes outside of the QC criteria. Spike results for analytes present in large concentrations can be unreliable. Unless the spike concentration is at least 25 percent of the analyte concentration (difficult to achieve when the analyte concentration is large), the spiked amount may be masked by the analyte concentration. The deviations should not impact data quality.

Analytical 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 one hundred. Ten out of the 24 DSC samples had RPDs above the desired 30 percent criterion (20 percent for drainable liquid). The high RPDs are attributed to the heterogeneous nature of the samples (Steen 1996a and 1996b). Two of the DSC analyses were rerun because of the high RPDs and the differences in appearance between the thermograms of the primary and duplicate samples. The RPDs improved for both rerun samples. Four TGA samples had RPDs outside the QC criteria. Reruns were performed for two of these, and the resulting RPDs were below the QC limits (Steen 1996a and 1996b). Nine metals and four anions displayed minor RPD deviations. These deviations were credited to sample heterogeneity; reruns were not performed because they would not significantly improve the results (Steen 1996a and 1996b). Total alpha activity had two samples with RPDs outside of the QC criteria.

Finally, occasional preparation blanks showed results above the detection limit for several metals, chloride, nitrate, TIC, TOC, and ^{90}Sr. The levels of these analytes in the preparation blanks were inconsequential when compared to the analytical results and should not impact the quality of the data (Steen 1996a and 1996b).

In summary, practically all of the QC results were within the boundaries specified in the SAP (Hu 1996a). The few discrepancies should not impact either the validity or the use of the data.

B3.4 DATA CONSISTENCY CHECKS

Comparing different analytical methods can help in assessing data consistency and quality. Several correlations were possible with the data set provided with the two core samples; these are presented in the following subsections. They include the comparison of phosphorus and sulfur by ICP with phosphate and sulfate as analyzed by IC, the comparison of total alpha and total beta with the sum of alpha and beta emitters, and mass and charge balances. Consistency checks were performed primarily for the solids analytical data, because solids comprise 95 percent of the tank waste.

B3.4.1 Comparison of Results from Different Analytical Methods

The following data consistency check compares the results from two different analytical methods. A close comparison between the two methods strengthens the credibility of both results, whereas a poor comparison brings the reliability of the data into question. All analytical mean results were taken from Table B3-7. The phosphorus acid digestion mean was used in the consistency check instead of the fusion digestion mean because the fusion digestion mean was nondetected with a relatively high detection limit.

The analytical phosphorus mean was 3,880 μg/g by ICP acid digest, which represents total phosphorus. This amount of phosphorus converts to 11,900 μg/g of phosphate. The IC phosphate result for the solids was 12,100 μg/g. The IC phosphate:equivalent phosphate ratio was 1.02, which is evidence that most of the phosphate exists in a water soluble form.

The ICP sulfur value of 5,190 μg/g by fusion digest, which represents total sulfur, is equivalent to 15,500 μg/g of sulfate. The IC result for sulfate was 14,600 μg/g. The IC sulfate:equivalent sulfate ratio was 0.94, which indicates that most of the sulfate exists in a water soluble form.

A comparison was made between the total alpha activity and the sums of the activities of the individual radionuclides that emit alpha particles. The data for the alpha comparison were taken from the supernatant analyses, because both ^{241}Am and $^{239/240}$Pu and the total alpha analysis exhibited activities in the supernatant above the detection limit. The activities of the individual alpha emitters was summed according to the following:

$$\text{Sum of alpha emitters} = {}^{241}Am + {}^{239/240}Pu.$$

Table B3-1 presents the comparison of the alpha analyses. The comparison is reasonable. The difference between the sum of the individual alpha emitters and the total alpha activity may be because not all alpha emitters were measured; for example, uranium was not measured. In addition, the low alpha activity has a large standard deviation of 30 percent.

Table B3-1. Comparison of Total Alpha Activity with the Sum of the Individual Alpha Emitters in the Supernatant.

Analyte	Half-Life (years)	Overall Mean (µCi/mL)
^{241}Am	432.2	0.0183
$^{239/240}Pu$	24,100 (^{239}Pu)	8.18E-04
Sum of alpha emitters		0.0191
Gross alpha activity		0.0312

Total beta activity and the sum of the ^{137}Cs and ^{90}Sr activities were compared. Because the total beta analysis was performed on the composite samples, the ^{137}Cs and the ^{90}Sr activities from the analysis of the composite samples were used for the comparison. The activities of the individual beta emitters were summed according to the following equation. The ^{90}Sr activity was multiplied by two in order to compensate for the activity of ^{90}Y, which is in secular equilibrium with the ^{90}Sr. Table B3-2 presents the comparison of the beta analysis. The comparison is reasonable as evidenced by the ratio of 0.84. The difference between the total beta activity and the sum of the individual emitters is probably caused by the presence of non-measured beta emitters in the sample.

$$\text{Sum of beta emitters} = (2 * {}^{90}Sr) + {}^{137}Cs.$$

Table B3-2. Comparison of Total Beta with the Sum of the Individual Beta Emitters.

Analyte	Half-Life (years)	Overall Mean (µCi/g)
^{137}Cs	30.17	191
^{90}Sr	28.6	40.6
Sum of beta emitters		232
Total beta activity		276

B3.4.2 Mass and Charge Balances

The principal objective in performing mass and charge balances is to determine if the measurements were self-consistent. In calculating the balances, only analytes listed in Table B3-7 detected at a concentration of 3,000 μg/g or greater in the solids were considered.

Table B3-3 presents the cation mass and charge data. All sodium was assumed to be soluble. Because precipitates are neutral species, all positive charge was attributed to sodium. The anionic analytes listed in Table B3-4 were assumed to be present as sodium salts and were expected to balance the positive charge. All aluminum was assumed to be present as aluminate ions AlO_2^-. Phosphorus and sulfur are assumed to be present as soluble phosphate and sulfate ions. The concentrations of cationic species in Table B3-3, the anionic species in Table B3-4, and the percent water were ultimately used to calculate the mass balance. The uncertainty estimates (relative standard deviations [RSDs]) associated with each analyte are also given in the tables. The uncertainty estimates for the cation and anion totals, as well as the overall uncertainty given in Table B3-5, were computed using propagation of errors techniques (Nuclear Regulatory Commission 1988).

The mass balance was calculated from the formula below. The factor 0.0001 is the conversion factor from μg/g to weight percent.

$$\text{Mass balance} = \text{Percent water} + 0.0001 \times \{\text{Total Analyte Concentration}\}$$
$$= \text{Percent water} + 0.0001 \times \{Na^+ + AlO_2^- + Cl^- + NO_3^- + NO_2^- + OH^- + CO_3^{2-} + C_2O_4^{2-} + C_2H_3O_2^- + PO_4^{3-} + SO_4^{2-}\}.$$

The total analyte concentration calculated from the above equation is 763,70 μg/g. The mean weight percent water obtained from thermogravimetric analysis reported in Table B3-7 is 35.0 percent, or 350,000 μg/g. The mass balance resulting from adding the percent water to the total analyte concentration is 110 percent (Table B3-5).

The following equations demonstrate the derivation of total cations and total anions, and the charge balance is the ratio of these two values.

$$\text{Total cations } (\mu eq/g) = [Na^+]/23.0 = 11{,}100\ \mu eq/g$$
$$\text{Total anions } (\mu eq/g) = [AlO_2^-]/59.0 + [Cl^-]/35.5 + [CO_3^{2-}]/30.0 + [C_2O_4^{2-}]/44.0 + [OH\text{-}]/17.0 + [C_2H_3O_2^-]/59.0 + [NO_3^-]/62.0 + [NO_2^-]/46.0 + [PO_4^{3-}]/31.7 + [SO_4^{2-}]/48.0 = 10{,}600\ \mu eq/g.$$

Table B3-3. Cation Mass and Charge Data.

Analyte	Concentration µg/g	Assumed Species	Concentration of Assumed Species µg/g	RSD (Mean) %	Charge µeq/g
Sodium	256,000	Na^+	256,000	2.4	11,100
Total			256,000	2.4	11,100

Table B3-4. Anion Mass and Charge Data.

Analyte	Concentration µg/g	Assumed Species	Concentration of Assumed Species µg/g	RSD (Mean) %	Charge µeq/g
Aluminum	15,000	AlO_2^-	32,800	9.1	556
Chloride	4,100	Cl^-	4,100	8.3	115
Hydroxide[1]	22,700	OH^-	22,700	5.6	1335
Nitrate	304,000	NO_3^-	304,000	9.2	4,900
Nitrite	45,000	NO_2^-	45,000	8.8	978
Oxalate	5,390	$C_2O_4^{2-}$	5,390	12.1	123
Phosphate	12,600	PO_4^{3-}	12,600	30.4	398
Sulfate	14,900	SO_4^{2-}	14,900	12.3	310
TIC	9,520	CO_3^{2-}	47,600	10.2	1,590
TOC	7,570	$C_2H_3O_2^-$	18,600	8.1	315
Total			507,700	5.7	10,600

Notes:

[1]No solids data were available; the value is from the drainable liquid overall mean.

Table B3-5. Mass Balance Totals.

Totals	Concentrations µg/g	RSD (Mean) %
Total from Table B3-3	256,000	2.4
Total from Table B3-4	507,700	5.7
Water	350,000	9.2
Grand total	1,113,700	3.9

The charge balance obtained by dividing the sum of the positive charge by the sum of the negative charge was 1.04. Overall, the above calculations yielded a reasonable mass balance value (close to 100 percent) and a good agreement in charge balance.

B3.5 MEAN CONCENTRATIONS AND CONFIDENCE INTERVALS

The statistics in this section were based on analytical data from the most recent sampling event of tank 241-U-102. Analysis of variance (ANOVA) techniques were used to estimate the mean, and calculate confidence limits on the mean, for all analytes that had at least 50 percent of reported values above the detection limit. If at least 50 percent of the reported values were above the detection limit, all of the data were used in the computations. The detection limit was used as the value for nondetected results. No ANOVA estimates were computed for analytes with less than 50 percent detected values.

The results given below are ANOVA estimates based on core composite data from core 143 and core 144 of tank 241-U-102. Estimates of the mean concentration, and confidence interval on the mean concentration, are given in Table B3-6. The lower limit, LL, to a 95 percent confidence interval can be negative. Because an actual concentration of less than zero is not possible, the lower limit is reported as zero whenever this occurred.

In addition to core composite data, segment level data from tank 241-U-102 was also available. The supernatant sample data and solid sample data were analyzed separately. Supernatant samples were present only in segment 1 of both cores. Mean concentration estimates, along with 95 percent confidence intervals on the mean, are given in Table B3-7 for the solid segment sample data and in Table B3-8 for the supernatant segment sample data.

Table B3-6. 95% Two-Sided Confidence Interval for the Mean Concentration for Composite Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
Al-acid	µg/g	1.66E+04	3.75E+02	1	1.18E+04	2.13E+04
Al-fusion	µg/g	1.82E+04	6.04E+02	1	1.05E+04	2.59E+04
Alpha	µCi/g	1.76E-01	6.00E-03	1	9.98E-02	2.52E-01
Beta	µCi/g	2.76E+02	8.12E+00	1	1.73E+02	3.79E+02
B-acid	µg/g	7.98E+01	7.07E+00	1	0.00E+00	1.70E+02
CN-EDTA-add	µCi/g	3.01E+01	5.05E+00	1	0.00E+00	9.43E+01
CN-water-dist	µCi/g	2.10E+01	3.12E+00	1	0.00E+00	6.07E+01
Ca-acid	µg/g	2.13E+02	1.65E+01	1	3.85E+00	4.23E+02
Cd-acid	µg/g	7.64E+00	2.77E-01	1	4.12E+00	1.12E+01
Cs-137	µCi/g	1.92E+02	6.95E+00	1	1.03E+02	2.80E+02
Cl	µg/g	4.69E+03	1.53E+02	1	2.75E+03	6.63E+03
Co-60	µCi/g	2.85E-02	2.13E-03	1	1.49E-03	5.56E-02
Cr-acid	µg/g	2.43E+03	3.40E+02	1	0.00E+00	6.75E+03
Cr-fusion	µg/g	2.51E+03	2.95E+02	1	0.00E+00	6.25E+03
Cu-acid	µg/g	7.79E+00	5.07E-01	1	1.34E+00	1.42E+01
Fe-acid	µg/g	3.87E+02	1.48E+01	1	2.00E+02	5.75E+02
K-acid	µg/g	1.97E+03	8.50E+01	1	8.90E+02	3.05E+03
Pb-acid	µg/g	6.84E+01	2.30E+00	1	3.92E+01	9.77E+01
Mn-acid	µg/g	1.24E+02	3.00E+00	1	8.59E+01	1.62E+02
Mo-acid	µg/g	4.92E+01	9.26E-01	1	3.74E+01	6.09E+01
Na-acid	µg/g	1.93E+05	2.50E+03	1	1.61E+05	2.25E+05
Na-fusion	µg/g	2.52E+05	1.15E+04	1	1.05E+05	3.98E+05
Ni-acid	µg/g	1.07E+02	4.25E+00	1	5.32E+01	1.61E+02
Ni-fusion	µg/g	7.50E+02	1.59E+02	1	0.00E+00	2.77E+03
Nitrate	µg/g	2.16E+05	1.70E+04	1	0.00E+00	4.32E+05
Nitrite	µg/g	5.67E+04	9.60E+02	1	4.45E+04	6.89E+04

Table B3-6. 95% Two-Sided Confidence Interval for the Mean Concentration for Composite Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
Oxalate	μg/g	5.64E+03	3.25E+02	1	1.52E+03	9.77E+03
P-acid	μg/g	2.73E+03	8.18E+02	1	0.00E+00	1.31E+04
Phosphate	μg/g	7.67E+03	6.91E+02	1	0.00E+00	1.65E+04
Si-acid	μg/g	1.52E+02	5.96E+00	1	7.63E+01	2.28E+02
Ag-acid	μg/g	1.47E+01	2.00E-01	1	1.22E+01	1.72E+01
Sr-90	μCi/g	4.06E+01	1.73E+00	1	1.87E+01	6.25E+01
Sulfate	μg/g	1.65E+04	6.00E+02	1	8.88E+03	2.41E+04
S-acid	μg/g	5.86E+03	1.95E+02	1	3.39E+03	8.34E+03
S-fusion	μg/g	5.98E+03	1.27E+02	1	4.37E+03	7.59E+03
TIC	μg/g	1.02E+04	1.62E+02	1	8.14E+03	1.23E+04
TOC	μg/g	8.98E+03	2.35E+02	1	6.00E+03	1.20E+04
Water	%	3.91E+01	2.91E+00	1	2.07E+00	7.61E+01
Zn-acid	μg/g	1.92E+01	1.95E+00	1	0.00E+00	4.40E+01
Zr-acid	μg/g	8.22E+00	3.07E-01	1	4.31E+00	1.21E+01

Table B3-7. 95% Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
Al-acid	µg/g	1.27E+04	1.11E+03	1	0.00E+00	2.69E+04
Al-fusion	µg/g	1.51E+04	1.38E+03	1	0.00E+00	3.27E+04
Alpha	µCi/g	1.96E-01	5.88E-02	1	0.00E+00	9.42E-01
B-acid	µg/g	7.68E+01	2.52E+01	1	0.00E+00	3.97E+02
Bulk Density	---	1.68E+00	1.58E-02	1	1.48E+00	1.88E+00
Ca-acid	µg/g	2.95E+02	1.41E+01	1	1.16E+02	4.74E+02
Cd-acid	µg/g	5.94E+00	4.52E-01	1	2.04E-01	1.17E+01
Chloride	µg/g	4.16E+03	3.46E+02	1	0.00E+00	8.56E+03
Cu-acid	µg/g	1.03E+01	9.87E-01	1	0.00E+00	2.28E+01
Cr-acid	µg/g	2.10E+03	2.76E+02	1	0.00E+00	5.61E+03
Cr-fusion	µg/g	2.72E+03	4.05E+02	1	0.00E+00	7.86E+03
Cs-137	µCi/g	1.54E+02	1.31E+01	1	0.00E+00	3.21E+02
Fe-acid	µg/g	4.99E+02	1.74E+02	1	0.00E+00	2.71E+03
K-acid	µg/g	1.52E+03	1.01E+02	1	2.43E+02	2.80E+03
Mn-acid	µg/g	1.33E+02	3.47E+01	1	0.00E+00	5.74E+02
Mo-acid	µg/g	4.26E+01	4.81E+00	1	0.00E+00	1.04E+02
Na-acid	µg/g	1.86E+05	3.11E+03	1	1.47E+05	2.26E+05
Na-fusion	µg/g	2.59E+05	6.26E+03	1	1.79E+05	3.38E+05
Ni-acid	µg/g	8.24E+01	6.41E+00	1	9.88E-01	1.64E+02
Ni-fusion	µg/g	3.07E+03	8.90E+02	1	0.00E+00	1.44E+04
Nitrate	µg/g	3.10E+05	2.85E+04	1	0.00E+00	6.73E+05
Nitrite	µg/g	4.58E+04	4.03E+03	1	0.00E+00	9.70E+04
Oxalate	µg/g	5.12E+03	6.17E+02	1	0.00E+00	1.30E+04
P-acid	µg/g	3.88E+03	1.11E+03	1	0.00E+00	1.80E+04
Phosphate	µg/g	1.21E+04	3.68E+03	1	0.00E+00	5.88E+04
S-acid	µg/g	4.45E+03	4.96E+02	1	0.00E+00	1.08E+04

Table B3-7. 95% Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
S-fusion	μg/g	5.19E+03	5.56E+02	1	0.00E+00	1.23E+04
Si-acid	μg/g	1.70E+02	2.59E+01	1	0.00E+00	4.99E+02
Ag-acid	μg/g	1.20E+01	1.78E+00	1	0.00E+00	3.47E+01
Sulfate	μg/g	1.46E+04	1.80E+03	1	0.00E+00	3.75E+04
TIC	μg/g	9.52E+03	9.67E+02	1	0.00E+00	2.18E+04
TOC	μg/g	7.48E+03	6.04E+02	1	0.00E+00	1.52E+04
Water	%	3.40E+01	3.13E+00	1	0.00E+00	7.37E+01
Zinc-acid	μg/g	2.87E+01	3.99E+00	1	0.00E+00	7.93E+01
Zinc-fusion	μg/g	5.98E+02	1.50E+02	1	0.00E+00	2.51E+03

Table B3-8. 95% Two-Sided Confidence Interval for the Mean Concentration for Supernatant Segment Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
Al	μg/mL	1.80E+04	6.75E+02	1	9.40E+03	2.66E+04
Alpha	μCi/mL	3.12E-02	4.62E-03	1	0.00E+00	9.00E-02
Am-241	μCi/mL	1.83E-02	1.05E-03	1	4.96E-03	3.16E-02
B	μg/mL	8.10E+01	4.93E+00	1	1.84E+01	1.44E+02
Ca	μg/mL	2.53E+02	1.58E+01	1	5.31E+01	4.53E+02
Cd	μg/mL	5.49E+00	1.82E-01	1	3.17E+00	7.80E+00
Cs-137	μCi/mL	3.40E+02	3.25E+01	1	0.00E+00	7.52E+02
Cl	μg/mL	8.81E+03	6.00E+01	1	8.05E+03	9.58E+03
Cr	μg/mL	2.79E+02	2.10E+01	1	1.22E+01	5.46E+02
Cu	μg/mL	5.26E+00	5.05E-01	1	0.00E+00	1.17E+01
K	μg/mL	3.77E+03	8.25E+01	1	2.72E+03	4.82E+03
Mo	μg/mL	9.47E+01	2.95E+00	1	5.72E+01	1.32E+02
Na	μg/mL	2.43E+05	7.75E+03	1	1.45E+05	3.42E+05
Ni	μg/mL	1.26E+02	2.75E+00	1	9.13E+01	1.61E+02
Nitrate	μg/mL	2.44E+05	5.50E+03	1	1.75E+05	3.14E+05
Nitrite	μg/mL	1.04E+05	8.66E+02	1	9.35E+04	1.16E+05
OH	μg/mL	2.27E+04	1.27E+03	1	6.47E+03	3.89E+04
P	μg/mL	1.72E+03	6.50E+01	1	8.99E+02	2.55E+03
Phosphate	μg/mL	3.80E+03	9.74E+01	1	2.57E+03	5.04E+03
Pu	μCi/mL	8.18E-04	2.04E-05	1	5.58E-04	1.08E-03
Se	μg/mL	4.07E+01	5.00E-01	1	3.43E+01	4.71E+01
Si	μg/mL	1.09E+02	1.44E+01	1	0.00E+00	2.92E+02
Ag	μg/mL	1.73E+01	6.00E-01	1	9.63E+00	2.49E+01
SpG	---	1.38E+00	2.37E-02	1	1.07E+00	1.68E+00
Sr-90	μCi/mL	8.83E+00	4.05E-01	1	3.68E+00	1.40E+01
Sulfate	μg/mL	7.05E+03	4.00E+02	1	1.97E+03	1.21E+04

Table B3-8. 95% Two-Sided Confidence Interval for the Mean Concentration for Supernatant Segment Sample Data of Tank 241-U-102. (2 sheets)

Analyte	Units	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	df	95% LL	95% UL
S	µg/mL	3.27E+03	2.50E+02	1	9.84E+01	6.45E+03
TIC	µg/mL	9.36E+03	5.65E+02	1	2.18E+03	1.65E+04
TOC	µg/mL	1.51E+04	2.70E+03	1	0.00E+00	4.94E+04
Water	%	4.84E+01	2.77E+00	1	1.33E+01	8.36E+01
Zn	µg/mL	3.42E+01	1.03E+01	1	0.00E+00	1.65E+02
pH	pH	1.32E+01	1.10E-01	1	1.18E+01	1.46E+01

The statistical model fit to the composite sample data and supernatant segment sample data is

$$Y_{ij} = \mu + C_i + A_{ij},$$

$$i=1,\ldots,a,\ j= 1,\ldots,n_i,$$

where

Y_{ij} = laboratory results from the j^{th} duplicate from the i^{th} core in the tank,

μ = the grand mean

C_i = the effect of the i^{th} core

A_{ij} = the effect of the j^{th} analytical result from the i^{th} core

a = the number of cores

n_i = the number of analytical results from the i^{th} location.

The variable C_i is assumed to be a random effect. This variable and A_{ij} are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(C)$ and $\sigma^2(A)$, respectively. Estimates of $\sigma^2(C)$ and $\sigma^2(A)$ were obtained using restricted maximum likelihood estimation (REML) techniques. The statistical results were obtained using the statistical analysis package S-PLUS (Statistical Science 1993).

The statistical model fit to the solid segment sample data is

$$Y_{ijkmn} = \mu + C_i + S_{ij} + R_{ijk} + L_{ijkm} + A_{ijkmn},$$

$$i=1,\ldots,a,\ j=1,\ldots,b_i,\ k=1,\ldots,c_{ij},\ m=1,\ldots,d_{ijk},\ n=1,\ldots n_{ijkm},$$

where

Y_{ijkmn}	=	laboratory results from the n^{th} duplicate from the m^{th} location from the k^{th} segment replicate in the j^{th} segment in the i^{th} core in the tank,
μ	=	the grand mean
C_i	=	the effect of the i^{th} core
S_{ij}	=	the effect of the j^{th} segment from the i^{th} core
R_{ijk}	=	the effect of the k^{th} segment replicate from the j^{th} segment in the i^{th} core
L_{ijkm}	=	the effect of the m^{th} location from the k^{th} segment replicate in the j^{th} segment in the i^{th} core
A_{ijkmn}	=	the effect of the n^{th} analytical result from the m^{th} location from the k^{th} segment replicate in the j^{th} segment in the i^{th} core
a	=	the number of cores
b_i	=	the number of segments in the i^{th} core
c_{ij}	=	the number of segment replicates from the j^{th} segment in the i^{th} core
d_{ijk}	=	the number of locations from the k^{th} segment replicate in j^{th} segment in the i^{th} core
n_{ijkm}	=	the number of analytical results from the m^{th} location from the k^{th} segment replicate in j^{th} segment in the i^{th} core.

The variable C_i, S_{ij}, R_{ijk}, and, L_{ijkm} are assumed to be random effects. These variables and A_{ijkmn} are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(C)$, $\sigma^2(S)$, $\sigma^2(R)$, $\sigma^2(L)$, and $\sigma^2(A)$, respectively. Estimates of $\sigma^2(C)$, $\sigma^2(S)$, $\sigma^2(R)$, $\sigma^2(L)$, and $\sigma^2(A)$ were obtained using REML techniques. The statistical results were obtained using statistical analysis package S-PLUS (Statistical Science 1993).

The upper and lower limits (UL and LL) to a two-sided 95 percent confidence interval for the mean are

$$\hat{\mu} \pm t_{(df,0.025)} \times \hat{\sigma}_{\hat{\mu}}.$$

In this equation, $\hat{\mu}$ is the estimate of the mean concentration, $\hat{\sigma}_{\hat{\mu}}$ is the estimate of the standard deviation of the mean concentration, and $t_{(df,0.025)}$ is the quantile from Student's t distribution with *df* degrees of freedom for a two-sided 95 percent confidence interval.

The mean, $\hat{\mu}$, and the standard deviation, $\hat{\sigma}_{\hat{\mu}}$, were estimated using restricted maximum likelihood estimation (REML) methods. The degrees of freedom (*df*), for tank 241-U-102, is one the number of cores sampled minus one.

B4.0 APPENDIX B REFERENCES

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. Fitzpatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1996a, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 3*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. A. Corbin, T. B. Duran, and K. A. Jurgensen, 1996b, *Waste Status and Transaction Record Summary for the Southwest Quadrant*, WHC-SD-WM-TI-614, Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

Bechtold, D. B., 1996, *RSST Adiabatic Calorimetry of U-102 Sludge Sample* (internal memorandum 75764-PCS96-092 to F. H. Steen, September 16), Westinghouse Hanford Company, Richland, Washington.

DeLorenzo, 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-TI-648, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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.

Fowler, K. D., 1995, *Data Quality Objectives for the Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Horton, J. E., 1976, *Analysis of Solids and Liquid Samples from Tank 102-U*, (internal letter to W.R. Christensen, April 12), Atlantic Richfield Hanford Company, Richland, Washington.

Hu, T. A., 1996b, *Compatibility Grab Sampling and Analysis Plan*, WHC-SD-WM-TSAP-037, Rev. 1-E, Westinghouse Hanford Company, Richland, Washington.

Hu, T. A., 1996a, *Tank 241-U-102 Push Mode Core Sampling and Analysis Plan*, WHC-SD-WM-TSAP-082, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hu, T. A., and F. H. Steen, 1996, *45-Day Safety Screening Report for Tank 241-U-102, Push Mode Cores 143 and 144*, WHC-SD-WM-DP-189, Rev. 0-A, Westinghouse Hanford Company, Richland, Washington.

Kristofzski, J. G., 1996, *Directions for Opportunistic Analyses* (internal memorandum 79400-96-108 to J. H. Baldwin, September 11), Westinghouse Hanford Company, Richland, Washington.

Lane, T. A., 1977, *Double-Shell Slurry Processing*, (internal letter to J. O. Honeyman, dated October 24), Rockwell Hanford Operations, Richland, Washington.

NFPA, 1995, *National Fire Codes*, Vol. 10, Section 115, "Laser Fire Protection," National Fire Protection Association, Quincy, Massachusetts.

Nuclear Regulatory Commission, 1988, *Statistical Methods for Nuclear Materials Management*, NUREG-CR-4604, PNL-5849, (C. A. Bennett and W. M. Bowen eds.), U.S. Government Printing Office, Washington, D.C.

Simpson, B. C., and D. J. McCain, 1996, *Historical Model Evaluation Data Requirements*, WHC-SD-WM-DQO-018, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Statistical Sciences, Inc. *S-PLUS Reference Manual, Version 3.2*, Seattle: StatSci, a division of MathSoft, Inc., 1993.

Steen, F. H., 1996a, *45-Day Safety Screening Results for Tank 241-U-102, Push Mode Cores 143 and 144*, WHC-SD-WM-DP-189, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Steen, F. H., 1996b, *Tank 241-U-102, Cores 143 and 144, Analytical Results for the Final Report*, WHC-SD-WM-DP-189, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Sutey, M. J., 1994, Sample Status Reports for Samples R-4090, R-4091, and R-4092, TCRC-6, Tank 241-U-102, Tank Characterization Resource Center, Westinghouse Hanford Company, Richland, Washington.

Turner, D. A., H. Babad, L. L. Buckley, and J. E. Meacham, 1995, *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue*, WHC-SD-WM-DQO-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

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APPENDIX C

STATISTICAL ANALYSIS FOR ISSUE RESOLUTION

In Appendix C, the analyses required for the applicable data quality objective (DQO) reports for tank 241-U-102 are performed. Specifically, statistical and other numerical manipulations required in the DQO reports are performed and documented in this appendix. The two analyses required for tank 241-U-102 are documented in the following sections:

- **Section C1**: Statistical analysis supporting the safety screening DQO (Dukelow et al. 1995). Specifically, confidence intervals were needed to support the plutonium (criticality) and energetic threshold limit.

- **Section C2**: Statistical analysis supporting the organic complexant safety DQO (Turner et al. 1995). Specifically, confidence intervals were needed to total organic carbon (fuel content) threshold limit.

- **Section C3**: References for Appendix C.

C1.0 STATISTICS FOR SAFETY SCREENING DQO

The safety screening DQO (Dukelow et al. 1995) defines acceptable decision confidence limits in terms of one-sided 95 percent confidence intervals. In this appendix, one-sided confidence limits supporting the safety screening DQO are calculated for tank 241-U-102. All data in this section are from the final laboratory data package for the 1996 core sampling event for tank 241-U-102 (Steen 1996).

Confidence intervals were computed for each sample number from tank 241-U-102 analytical data. The sample numbers and confidence intervals are provided in Table C1-1 for DSC and Table C1-2 for total alpha.

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 for a one-sided 95 percent confidence interval.

For the tank 241-U-102 data (per sample number), *df* equals the number of observations minus one, and $t_{(1,0.05)} = 6.314$.

The upper limit of the 95 percent confidence interval for each sample number based on total alpha data is listed in Table C1-1. Each confidence interval can be used to make the following statement. If the upper limit is less than 41 μCi/g, then one would reject the null hypothesis that the total alpha is greater than or equal to 41 μCi/g at the 0.05 level of significance.

The upper limit of the 95 percent confidence interval for each sample number based on DSC data is listed in Table C1-2. Each confidence interval can be used to make the following statement. If the upper limit is less than -480 J/g, then one would reject the null hypothesis that DSC is greater than or equal to -480 J/g at the 0.05 level of significance.

Table C1-1. 95% Confidence Interval Upper Limits for Total Alpha for Tank 241-U-102 (Units are μCi/g or μCi/mL).

Sample Number	Sample Description	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	95% UL
S96T002323	Core 143, Segment 1, Drainable Liquid	0.027	0.001	0.030
S96T002443	Core 143, Segment 1, Lower Half	0.057	0.002	0.068
S96T002445	Core 143, Segment 2, Lower Half	0.141	0.008	0.188
S96T002447	Core 143, Segment 3, Lower Half	0.151	0.004	0.173
S96T002449	Core 143, Segment 4, Lower Half	0.225	0.012	0.297
S96T002518	Core 143, Segment 5, Whole Segment	0.074	0.009	0.130
S96T002549	Core 144, Segment 1, Drainable Liquid	0.036	0.007	0.077
S96T002648	Core 144, Segment 1, Lower Half	0.634	0.010	0.697
S96T002649	Core 144, Segment 2, Lower Half	0.161	0.003	0.176
S96T002662	Core 144, Segment 3, Lower Half	0.125	0.004	0.150
S96T002672	Core 143, Segment 5B, Lower Half	0.114	0.008	0.161
S96T002796	Core 144, Segment 4, Lower Half	0.346	0.001	0.352
S96T002797	Core 144, Segment 5, Lower Half	0.167	0.001	0.170
S96T002798	Core 144, Segment 6, Lower Half	0.083	0.002	0.093
S96T003610	Core 144, Segment 6A, Upper Half	0.068	0.003	0.084

Table C1-2. 95% Confidence Interval Upper Limits for DSC for Tank 241-U-102. (Units are Joules/g-Dry).

Sample No.	Sample Description	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	95% UL
S96T002323	Core 143, Segment 1, Drainable Liquid	249.05	2.25	263.26
S96T002326	Core 143, Segment 1, Upper Half	115.40	2.70	132.45
S96T002329	Core 143, Segment 1, Lower Half	108.20	1.40	117.04
S96T002332	Core 143, Segment 2, Upper Half	534.35	53.55	872.46
S96T002335	Core 143, Segment 2, Lower Half	617.65	6.45	658.38
S96T002338	Core 143, Segment 3, Upper Half	110.85	3.35	132.00
S96T002341	Core 143, Segment 3, Lower Half	112.54	15.37	209.55
S96T002344	Core 143, Segment 4, Upper Half	8.69	4.56	22.02
S96T002347	Core 143, Segment 4, Lower Half	52.00	52.00	380.33
S96T002500	Core 143, Segment 5, Whole Segment	19.13	0.66	23.30
S96T002501	Core 143, Segment 5A, Upper Half	20.82	2.11	34.14
S96T002549	Core 144, Segment 1, Drainable Liquid	240.15	32.65	446.30
S96T002632	Core 144, Segment 1, Lower Half	74.70	5.46	109.14
S96T002633	Core 144, Segment 2, Lower Half	103.60	0.80	108.65
S96T002636	Core 144, Segment 3, Lower Half	26.72	2.65	43.42
S96T002646	Core 144, Segment 2, Upper Half	51.76	17.51	92.96
S96T002647	Core 144, Segment 3, Upper Half	26.34	6.21	65.55
S96T002665	Core 143, Segment 5B, Upper Half	252.23	19.51	298.13
S96T002666	Core 143, Segment 5B, Lower Half	188.80	13.00	270.88
S96T002755	Core 143, Segment 6, Upper Half	112.60	6.80	155.54
S96T002775	Core 144, Segment 4, Upper Half	45.75	0.58	49.38
S96T002776	Core 144, Segment 4, Lower Half	51.07	8.50	104.74
S96T002777	Core 144, Segment 5, Upper Half	143.10	8.70	198.03
S96T002778	Core 144, Segment 5, Lower Half	147.75	28.54	214.91
S96T002779	Core 144, Segment 6, Upper Half	148.00	14.20	237.66
S96T002780	Core 144, Segment 6, Lower Half	30.81	4.87	61.52
S96T003609	Core 144, Segment 6A, Upper Half	20.21	0.66	24.38

C2.0 STATISTICS FOR THE ORGANIC COMPLEXANT SAFETY DQO

The organic complexant safety DQO (Turner et al. 1995) defines acceptable decision confidence limits in terms of one-sided 95 percent confidence intervals. In this appendix, one-sided confidence limits supporting the organic DQO are calculated for tank 241-U-102. All data considered in this section are taken from the final laboratory data package for the 1996 core sampling event for tank 241-U-102 (Steen 1996).

Confidence intervals were computed for each sample number from tank 241-U-102 analytical data. The sample numbers and confidence intervals are provided in Table C1-3 for percent water and table C1-4 for TOC.

For percent water, the lower limit (LL) of a one-sided 95 percent confidence interval for the mean is

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

and for TOC, the upper limit (UL) of a one-sided 95 percent confidence interval for the mean is

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

For these equations, $\hat{\mu}$ is the arithmetic mean of the data, $\hat{\sigma}_{\hat{\mu}}$ is the estimate of the variance of the mean, and $t_{(df,0.05)}$ is the quantile from Student's t distribution with *df* degrees of freedom for a one-sided 95% confidence interval.

For the tank 241-U-102 data (per sample number), *df* equals the number of observations minus one, and $t_{(1,0.05)} = 6.314$.

The lower limit of the 95 percent confidence interval for each sample number based on percent water data is listed in Table C1-3. Each confidence interval can be used to make the following statement. If the lower limit is greater than 17 percent, then one would reject the null hypothesis that the percent water is less than or equal to 17 percent at the 0.05 level of significance.

The upper limit of the 95 percent confidence interval for each sample number based on TOC data is listed in Table C1-4. Each confidence interval can be used to make the following statement. If the upper limit is less than 30,000 μg/g, then one would reject the null hypothesis that TOC is greater than or equal to 30,000 μg/g at the 0.05 level of significance.

Table C1-3. 95% Confidence Interval Lower Limits for Percent Water for Tank 241-U-102 (Units are in %).

Sample No.	Sample Description	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	95% LL
S96T002323	Core 143, Segment 1, Drainable Liquid	50.61	0.33	48.55
S96T002326	Core 143, Segment 1, Upper Half	40.90	0.60	37.11
S96T002329	Core 143, Segment 1, Lower Half	51.57	0.22	50.18
S96T002332	Core 143, Segment 2, Upper Half	50.86	0.56	47.35
S96T002335	Core 143, Segment 2, Lower Half	49.72	0.80	44.67
S96T002338	Core 143, Segment 3, Upper Half	43.27	0.33	41.19
S96T002341	Core 143, Segment 3, Lower Half	32.39	0.78	27.47
S96T002344	Core 143, Segment 4, Upper Half	24.28	3.71	15.56
S96T002347	Core 143, Segment 4, Lower Half	45.01	1.81	33.58
S96T002500	Core 143, Segment 5, Whole Segment	16.10	0.38	13.70
S96T002501	Core 143, Segment 5A, Upper Half	17.15	0.04	16.90
S96T002549	Core 144, Segment 1, Drainable Liquid	46.26	6.03	8.19
S96T002632	Core 144, Segment 1, Lower Half	39.49	1.29	31.37
S96T002633	Core 144, Segment 2, Lower Half	33.73	0.12	32.97
S96T002636	Core 144, Segment 3, Lower Half	18.52	6.18	3.97
S96T002646	Core 144, Segment 2, Upper Half	29.56	5.83	15.83
S96T002647	Core 144, Segment 3, Upper Half	10.00	0.83	8.05
S96T002665	Core 143, Segment 5B, Upper Half	36.45	3.79	12.52
S96T002666	Core 143, Segment 5B, Lower Half	44.61	1.65	34.19
S96T002755	Core 143, Segment 6, Upper Half	41.19	0.49	38.10
S96T002775	Core 144, Segment 4, Upper Half	22.29	2.19	8.49
S96T002776	Core 144, Segment 4, Lower Half	30.00	0.10	29.37
S96T002777	Core 144, Segment 5, Upper Half	34.80	1.10	27.85
S96T002778	Core 144, Segment 5, Lower Half	38.54	1.50	29.07
S96T002779	Core 144, Segment 6, Upper Half	52.78	2.68	35.86
S96T002780	Core 144, Segment 6, Lower Half	44.49	0.41	41.90
S96T003609	Core 144, Segment 6A, Upper Half	24.30	3.80	0.33

Table C1-4. 95% Confidence Interval Upper Limits for TOC for Tank 241-U-102 (Units are in μg/g dry).

Sample No.	Sample Description	$\hat{\mu}$	$\hat{\sigma}_{\hat{\mu}}$	95% UL
S96T002326	Core 143, Segment 1, Upper Half	12,572	795	17,593
S96T002329	Core 143, Segment 1, Lower Half	8,683	361	10,964
S96T002332	Core 143, Segment 2, Upper Half	15,139	651	19,250
S96T002335	Core 143, Segment 2, Lower Half	16,289	955	22,316
S96T002338	Core 143, Segment 3, Upper Half	17,980	176	19,093
S96T002341	Core 143, Segment 3, Lower Half	13,999	81	14,513
S96T002344	Core 143, Segment 4, Upper Half	12,606	139	13,482
S96T002347	Core 143, Segment 4, Lower Half	19,458	727	24,051
S96T002500	Core 143, Segment 5, Whole Segment	5,232	36	5,458
S96T002501	Core 143, Segment 5A, Upper Half	5,003	66	5,422
S96T002632	Core 144, Segment 1, Lower Half	9,849	50	10,162
S96T002633	Core 144, Segment 2, Lower Half	8,390	257	10,010
S96T002636	Core 144, Segment 3, Lower Half	4,602	172	5,687
S96T002646	Core 144, Segment 2, Upper Half	10,150	57	10,508
S96T002647	Core 144, Segment 3, Upper Half	4,422	56	4,773
S96T002665	Core 143, Segment 5B, Upper Half	14,493	47	14,791
S96T002666	Core 143, Segment 5B, Lower Half	19,679	1264	27,658
S96T002755	Core 143, Segment 6, Upper Half	15,116	408	17,693
S96T002775	Core 144, Segment 4, Upper Half	8,879	154	9,854
S96T002776	Core 144, Segment 4, Lower Half	13,414	671	17,654
S96T002777	Core 144, Segment 5, Upper Half	18,021	230	19,474
S96T002778	Core 144, Segment 5, Lower Half	14,400	456	17,276
S96T002779	Core 144, Segment 6, Upper Half	23,613	106	24,281
S96T002780	Core 144, Segment 6, Lower Half	13,826	441	16,613
S96T003609	Core 144, Segment 6A, Upper Half	7,358	172	8,442

C3.0 APPENDIX C REFERENCES

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.

Steen, F. H., 1996, *Tank 241-U-102, Cores 143 and 144, Analytical Results for the Final Report*, WHC-SD-WM-DP-189, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Turner, D. A., H. Babad, L. L. Buckley, and J. E. Meacham, 1995, *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue*, WHC-SD-WM-DQO-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR TANK 241-U-102

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR TANK 241-U-102

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various tank waste management activities (Hodgson and LeClair 1996). As part of this effort, the following evaluation provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-U-102.

D1.0 TANK WASTE INFORMATION SOURCES ASSESSMENT

Available tank waste information for tank 241-U-102 included:

- Data from two push-mode cores samples that were collected in 1996 (see Appendix B, Section B2.0 for data). The core samples provided incomplete core recovery. Only the top 80 percent (about 267 cm [105 in.]) of waste was sampled.

- The inventory estimate for this tank was generated from the Hanford Defined Waste (HDW) model (Agnew et al. 1996). See Appendix A, Section A3.2, for the model estimate.

- The analytical data from tanks 241-S-101 (Kruger et al. 1996), 241-S-104 (DiCenso et al. 1994) and 241-S-107 (Simpson et al. 1996) were used for the composition estimates of reduction and oxidation (REDOX) process waste.

A list of references used in this evaluation is provided in Section D4.0.

D1.1 Waste Transaction Record

Based on process knowledge and the waste transaction record, as discussed in Section A3.2, expected waste types for tank 241-U-102 are metal waste (MW) sludge and SMMT2 and SMMS2 evaporator concentrates saltcake as reported in Agnew et al. (1996). However, a second interpretation of the same waste transfer records (Hill et al. 1995) suggests that the sludge in tank 241-U-102 is REDOX waste and not MW.

Further investigation of the waste transfer record (Agnew et al. 1995) indicates that the MW stored in the tank since 1948 was sluiced out in 1957. The record stated that the total waste volume of the tank was zero by the first quarter of 1957. This event was also documented in Rodenhizer (1987), where it is stated that by February 1957 tank 241-U-102 had been sluiced of MW and was empty. After the tank was emptied, the transfer record shows that over 1,515 kL (400 kgal) of REDOX high-level waste supernatant were transferred in from tanks 241-SX-102 and 241-SX-111. This waste remained in the tank until the first quarter of 1974. During the period 1957 to 1974, the first non-zero measurement of the solid volume was 155 kL (41 kgal) in the fourth quarter of 1969; the solid volume then changed to 162 kL (43 kgal) in the third quarter of 1971 and remained the same until the evaporator bottom concentrate waste was added to the tank in 1975.

This waste transaction assessment suggests that the bottom 162 kL (43 kgal) of sludge in tank 241-U-102 is REDOX high-level waste generated from 1952 to 1966. For purposes of interpreting the tank data and deriving an overall tank inventory, the bottom 163 kL (43 kgal) of waste are assumed to be REDOX sludge. Future sampling from the sludge layer will help verify this assumption.

D1.2 Analytical Results

Several analytical results, as discussed in Appendix B2, are available for tank 241-U-102. The most interesting results for the inventory construction are those from the 1996 core sampling event, which provide comprehensive analytical results at the half-segment level (about every 24 cm [9 in.] in depth). Unfortunately, because of the hardness of the waste, the vertical core sample was only partially collected because it did not reach the bottom 20 percent of the waste.

The analytical results from the 1996 core sampling represent the top 80 percent of the waste in the tank. Based on the transaction record, these wastes are believed to be evaporator concentrates (saltcake) added on top of the tank's bottom sludge layer from 1976 to the present. The analytical data shows no obvious stratification. The visual record of the sample extrusion results also show no distinguishable layers based on sample appearance. Analytical results from Appendix B data tables were summarized in Table D1-1 for later use in constructing the saltcake inventory. In preparing Table D1-1, analytical results were selected so that bias results, such as those arising from sample preparation in the analysis, were avoided.

Table D1-1. Analytical Results From 1996 Core Sampling in Tank 241-U-102. (2 sheets)

Analyte	Solid Segment Mean	Liquid Segment Mean
METALS	μg/g	μg/mL
Aluminum (Al)	15,100 (fusion)	18,000
Boron (B)	76.8 (acid)	81.0
Cadmium (Cd)	5.94 (acid)	5.49
Calcium (Ca)	295 (acid)	253
Chromium (Cr)	2,720 (fusion)	279

Table D1-1. Analytical Results From 1996 Core Sampling in Tank 241-U-102. (2 sheets)

Analyte	Solid Segment Mean	Liquid Segment Mean
METALS	**µg/g**	**µg/mL**
Copper (Cu)	10.3 (acid)	5.26
Iron (Fe)	499 (acid)	< 20.1
Lead[1] (Pb)	68.4 (acid)	< 40.1
Manganese (Mn)	133 (acid)	< 4.0
Molybdenum (Mo)	42.6 (acid)	94.7
Nickel (Ni)	82.4 (acid)	126
Phosphorus (P)	3,880 (acid)	1,720
Potassium (K)	1,520 (acid)	3,770
Silicon (Si)	170 (acid)	109
Silver (Ag)	120 (acid)	17.3
Sodium (Na)	259,000 (fusion)	243,000
Sulfur (S)	5,190 (fusion)	3,270
Zinc (Zn)	28.7 (acid)	34.2
Zirconium (Zr)[1]	8.22 (acid)	< 4.0
ANIONS	**µg/g**	**µg/mL**
Chloride (Cl^-)	4,160	8,810
Nitrate (NO_3^-)	310,000	244,000
Nitrite (NO_2^-)	45,800	104,000
Oxalate	5,120	< 1,070
Phosphate (PO_4^-)	12,100	3,800
Sulfate (SO_4^-)	14,600	7,050
RADIONUCLIDES	**µCi/g**	**µCi/mL**
Cesium (^{137}Cs)	154	340
Strontium ($^{90}Sr^2$)	40.6	8.83
CARBON	**µg C/g**	**µg C/mL**
Total inorganic carbon (TIC)	9,520	9,360
Total organic carbon (TOC)	7,480	15,100
PHYSICAL PROPERTIES		
Density (g/mL)	1.68	1.38
Weight percent water	34.0	48.4

Note:

[1]Composite samples average.

D1.3 Tank Waste Volume

In the waste tank summary report for the period ending August 31, 1996 (Hanlon 1996), the total tank volume was reported as 1,415 kL (374 kgal) of waste, including 68 kL (18 kgal) of supernatant, 1,184 kL (313 kgal) of saltcake and 162 kL (43 kgal) of sludge. An assessment on the waste level and volume was conducted. For the 1996 April core sampling event, the waste levels under risers 7, 9 and 19 were measured using sludge weight, and was reported in riser preparation work package WS-96-00027. Additional measurements to date were taken from the SACS database measurement. All measurements are summarized in Table D1-2.

Table D1-2. Tank 241-U-102 Waste Level Measurement.

	Sludge Weight	Sludge Weight	Sludge Weight	Manual ENRAF™	Neutron Probe	Manual FIC	FIC
Riser location	7	9	19	8	2	8	8
Measurement date	4/12/96	4/12/96	4/12/96	12/9/96	12/8/96	10/01/95	3/25/96
Waste, cm (in.)	337.8 (133.0)	334.0 (131.5)	334.7 (131.8)	337.3 (132.8)	321.0 (126.4)	332.4 (130.9)	334.2 (131.6)
Supernatant, cm (in.)	7.6 (3)	25.4 (10)	25.4 (10)	n/a	n/a	n/a	n/a

Notes:

The waste level reference is the top of the tank's dished bottom (191 m [628 ft] mean sea level).

FIC = Food Instrument Corporation

Because of the consistency of the measurements between methods and across the tanks, average waste level was derived from these data. The average waste level in the tank is 335 cm (132 in.). The neutron probe measurement is primarily for interstitial liquid level information, and was left out of this average. At an average waste level of 335 cm (132 in.), the volume of waste is 1,419 kL (375 kgal).

The 1989 in-tank photo shows that one third of the waste surface toward the southern side is covered by dry crust, and the rest of the surface is supernatant. As shown in Table D1-2, riser 7 (located over the dry crust area) has 8 cm (3 in.) of supernatant beneath it, and riser 9 and 19 (located over the wet area) has 25 cm (10 in.) of supernatant beneath it. A good estimate of supernatant volume is 68 kL (18 kgal) assuming a linear fall of the supernatant depth from 8 cm (3 in.) to 25 cm (10 in.) symmetrically.

This assessment indicates that the waste levels are consistent throughout the tank. The estimated total waste amount of 1,419 kL (375 kgal), with 70 kL (18 kgal) of supernatant on top of 1,351 kL (357 kgal) of solids, is in agreement with Hanlon (1996).

D2.0 EVALUATION OF COMPONENT INVENTORY VALUES

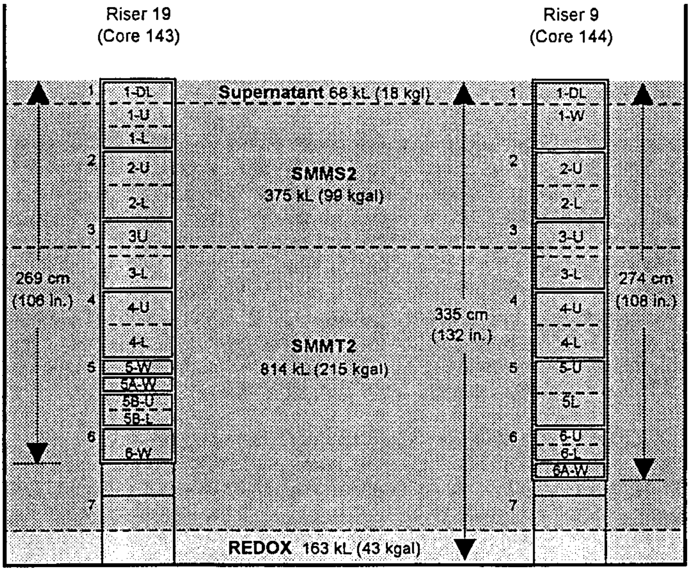
This section will develop an inventory model, evaluate Agnew's model (Agnew et al. 1996) using process knowledge and analytical results, and provide a basis for a best-basis inventory.

D2.1 Tank Inventory Model

Based on above assessment, a conceptual tank inventory model was established from which to construct an inventory. As shown in Figure D2-1, the total waste volume is 1,419 kL (375 kgal), consisting of 70 kL (18 kgal) of supernatant and 1,351 kL (357 kgal) of solids. In terms of waste types in HDW, Rev. 3 (Agnew et. al. 1996), there are 163 kL (43 kgal) of REDOX sludge in the bottom of the tank, and a total of 1,257 kL (332 kgal) of evaporator concentrates (70 kL [18 kgal] of supernatant and 1,189 kL [314 kgal] of solids) above the REDOX sludge layer. In the SMM model (Agnew et. al 1996), this evaporator concentrates solid layer was further divided into SMMS2 saltcake (374 kL [99 kgal]) on the top and SMMT2 (814 kL [215 kgal]) saltcake on the bottom. The SMMS2 saltcake waste was generated from the 242 Evaporator from 1977 until 1980, and the SMMT2 saltcake waste was generated from the 242 T Evaporator from 1955 until 1965.

As shown in Figure D2-1, the 1996 core sampling results represent 88 percent (1,113 out of 1,257 kL [294 kgal out of 332 kgal]) of the evaporator concentrates saltcake waste layer and 80 percent (averaged 272 cm [107 in.] collected samples out of expected 335 cm [132 in.]) of the total waste in a vertical profile. The missing 20 percent of waste sample is assumed to include part of the saltcake information and all information from the bottom 28 cm (11 in.) of the REDOX sludge layer. The mean densities for the saltcake layer are 1.68 g/mL in solids and 1.38 g/mL in liquid (from the 1996 core sampling event). The saltcake layer inventory will be constructed by using the analytical results from tank 241-U-102. These analytical results will be evaluated against process knowledge and the transaction record to see if any bias or possible error is present in these measurements. The sludge layer inventory will be constructed based on the developed analytical results of REDOX waste from tanks 241-S-101 (Kruger et. al. 1996), 241-S-104 (DiCenso et. al. 1994) and 241-S-107 (Simpson et al. 1996).

Figure D2-1. Tank 241-U-102 Inventory Profile.



Note: 1. Every full segment is 48 cm (19 in.). Due to waste hardness, partial segments were collected starting from the location of segment 5 on core 143 and the location of segment 6 on core 144.

2. HDW model's SMMS2 and SMMT2 layers cannot be differentiated using analytical data.

HDW Model (Agnew et al. 1996)

- Evaporator Concentrates 1257 kL (332 kgal) (89%)
- REDOX Sludge 163 kL (43 kgal) (11%)

Extrusion Results

- Obtained sample segment from 1996 core sampling
- Segment not available
- 1-DL: Segment 1, drainable liquid sample
- 1-W: Segment 1, whole solid sample
- 5B-U: Segment 5B, upper half solid sample
- 6-L: Segment 6, lower half solid sample

D2.2 Component Inventory in Saltcake Layer

The transaction record shows that the saltcake layer primarily consists of the evaporator concentrate waste from the 242-S Evaporator and the 242-T Evaporator campaign. These wastes consist of all kinds of wastes from different waste streams. According to the SMM, the primary HDWs in this saltcake layer are the supernatant fractions of CSR (20.4%), R1 (11.3%), CWP1 and CWP2 (8.8%), DW (8.5%), BL (7.9%), T1SltCk (5.9%), CWR1 and CWR2 (4.6%), and P1 and P2 (4.4%). The remaining 28 percent of the total waste is contributed from 26 other types of HDWs. With a linear combination of these pure supernatant waste types, Agnew's SMM model can be used to generate a tank component prediction for the evaporator concentrates.

No obvious stratification structure was observed from the sample appearance or analytical results; thus the SMMS2 and SMMT2 layers are very similar. A comparison of the analyte concentration of SMMS2 saltcake between tank 241-U-102 and tanks 241-S-101, 241-S-102, 241-U-107, and 241-U-109 is presented in Table D2-1. The mean analyte concentrations were derived by averaging the analytical results for the sample segments corresponding to the volume of the SMMS2 saltcake assigned in Agnew's SMM. An average concentration for the analytes from these five tanks is given in the seventh column of the table.

As shown in Table D2-1, the concentrations of most bulk analytes (Al, Na, NO_2, NO_3, PO4) are within a factor of 2, although several analyte concentrations have quite wide ranges. These wide-ranging characteristics may indicate mixing between SMM saltcake layers; they may also be a property of the waste, because the evaporator concentrates are a mixture of several different waste streams and will vary from tank to tank. Overall, the analytical results of SMMS2 from tank 241-U-102 are in the same order of magnitude as other tanks, and are comparable to the mean concentrations of these five tanks.

Because the SMM model is a linear combination of HDWs, there is no direct comparison between analytical results of SMMS2 and individual HDWs. However, SMMS2 analytical results can be compared with the analyte prediction of the tank, which contains only pure SMMS2 waste. The waste in tanks 241-SY-103 and 241-SY-101 was assigned as pure SMMS2 waste (Agnew et.al. 1996). The analyte prediction of these tanks is listed in the last two columns. Table D2-1 shows that the bulk analytes except TOC (Na, Al, NO_3, NO_2, PO_4, SO_4) are quite comparable between the sample average and SY farm tanks.

Another effort was made to evaluate the analytical results of whole saltcake layer with the model generated from the process knowledge. A direct comparison between Agnew's model prediction and 1996 core sampling analytical results was made for the chemical components in this saltcake layer. With the saltcake layer volume and density from the tank inventory model section, a component inventory of saltcake layer derived from core sample results (Table D1-1) and Agnew's prediction (Agnew 1996) are listed in Table D2-2. For the core sample, the mass and volume basis used in the calculation are 1.994E+09 g for solid and 6.804E+07 mL for liquid. For Agnew's prediction, total mass basis of 1.98E+09 g is used in the calculation.

Table D2-1. Comparison of SMMS2 Saltcake Concentrations ($\mu g/g$).

Analyte	S-101[1]	S-102[2]	U-102[3]	U-107[4]	U-109[5]	Sample Average	Agnew's SY-103	Agnew's SY-101
Al	16,925	7,450	10,505	10,612	9,487	10,996	2,7200	31,400
Ag	12	17	13	16		14	NR	NR
B	111	58	67	89		82	NR	NR
Ca	274	233	310			272	853	1,050
Cl	4,607	2,981	4,550	2,515		3,663	4,680	5,550
Cd	8	4	6	8		7	NR	NR
Cr	8,163	1,577	2,417	2,570	2,570	3,459	1,870	2,240
Cu	7		12	10		10	NR	NR
F	638	267	896	501		576	920	1,100
Fe	453	65	565	767	1,630	696	262	322
K	1,225	748	1,360	914		1,062	1400	1,660
Mn	541	26	137	330		258	143	166
Mo	43	63	35	39		45	NR	NR
Na	153,000	207,000	176,000	205,667	237,333	195,800	171,000	203,000
Ni	115	19	77	56		676	234	288
NO2	58,150	28,939	36,250	27,600		37,735	68,800	79,400
NO3	218,500	514,000	293,000	455,333	407,333	377,633	201,000	242,000
Pb	66	47		149		87	138	155
PO4	9,230	15,589	19,950	13,509		14,570	5,620	6,760
P	2,333	2,860	6,187	2,580	7,780	4,348	NR	NR
S	4,713	1,325	4,037	1,090		2,791	NR	NR
Si		219	148	194	1,220	445	1,420	1,720
SO4	21,185	8,553	12,785	4,112		11,659	15,500	18,200
TOC			6,417	2,414		4,415	42,552	80,600
U	1,497			430		964	NR	NR
Zn	33	21	33	29		29	NR	NR
Zr	13			13		13	51	65
Oxalate	12,808	3,329	4,883	3,794		6,203	2	3

Note: [1]Kruger et. al. (1996)
[2]Eggers et. al. (1996)
[3]See appendix B
[4]Jo et. al. (1996)
[5]Baldwin and Stephens (1996)

Table D2-2. Comparison of Saltcake Layer Inventory Between Analytical Results From 1996 Core Sampling and Agnew's SMM Prediction for the Tank 241-U-102. (2 sheets)

Analyte	Analytical Results From 1996 Core Sampling			Agnew's SMM Model	Model/ Sampling
METALS	Solid	Liquid	Total	Total	Ratio
	kg	kg	kg	kg	
Aluminum	3.01E+04	1.22E+03	3.13E+04	5.49E+04	1.75
Born	1.53E+02	5.51E+00	1.59E+02	NR	NA
Cadmium	1.18E+01	3.74E-01	1.22E+01	NR	NA
Calcium	5.88E+02	1.72E+01	6.05E+02	1.89E+03	3.12
Chromium	5.42E+03	1.90E+01	5.44E+03	3.83E+03	0.70
Copper	2.05E+01	3.58E-01	2.09E+01	NR	NA
Iron	9.95E+02	1.37E+00	9.96E+02	5.79E+02	0.58
Lead[2]	1.36E+02	2.73E+00	1.39E+02	2.89E+02	2.08
Manganese	2.65E+02	2.72E-01	2.65E+02	2.79E+02	1.05
Molybdenum (Mo)	8.49E+01	6.44E+00	9.14E+01	NR	NA
Nickel	1.64E+02	8.57E+00	1.73E+02	5.19E+02	3.00
Phosphorus	7.74E+03	1.17E+02	7.85E+03	NR	NA
Potassium	3.03E+03	2.57E+02	3.29E+03	2.98E+03	0.91
Silicon	3.39E+02	7.42E+00	3.46E+02	2.99E+03	8.63
Silver	2.39E+02	1.18E+00	2.40E+02	NR	NA
Sodium	5.16E+05	1.65E+04	5.33E+05	3.58E+05	0.67
Sulfur	1.03E+04	2.22E+02	1.06E+04	NR	NA
Zinc	5.72E+01	2.33E+00	5.96E+01	NR	NA
Zirconium (Zr)[2]	1.64E+01	2.72E-01	1.67E+01	1.30E+02	7.80
ANIONS	kg	kg	kg	kg	
Chloride	8.30E+03	5.99E+02	8.89E+03	9.83E+03	1.11
Nitrate	6.18E+05	1.66E+04	6.35E+05	4.30E+05	0.68
Nitrite	9.13E+04	7.08E+03	9.84E+04	1.37E+05	1.39
Oxalate	1.02E+04	7.28E+01	1.03E+04	5.41	0.00
Phosphate (PO_4^-)-	2.41E+04	2.59E+02	2.44E+04	1.26E+04	0.52
Sulfate	2.91E+04	4.80E+02	2.96E+04	3.24E+04	1.09
RADIONUCLIDE	µCi/g	µCi/mL	µCi	µCi	
Cesium-137	3.07E+05	2.31E+01	3.07E+05	3.32E+05	1.08
Strontium-90	8.10E+04	6.01E-01	8.10E+04	1.59E+05	1.96

Table D2-2. Comparison of Saltcake Layer Inventory Between Analytical Results From 1996 Core Sampling and Agnew's SMM Prediction for the Tank 241-U-102. (2 sheets)

Analyte	Analytical Results From 1996 Core Sampling			Agnew's SMM Model	Model/ Sampling
CARBON	kg C	kg C	kg C	kg C	
TOC	1.49E+04	1.03E+03	1.59E+04	1.88E+04	1.18
TIC	1.90E+04	6.37E+02	1.96E+04	7.46E+03	NA
PHYSICAL					
Density (g/mL)	1.68	1.38	1.66	1.58	0.95
Water (wt%)	34.0	48.4	35.0	34.8	0.99
Volume (kgal)	314	18	332	331	NA

The ratio of model prediction over analytical results was used as a comparison indicator and listed in the last column of Table D2-1. Results for several analytes (Mn, K, Cl, SO4, Cs-137, TOC, density, and weight percent water) have agreement within 10 percent. Results for other analytes (Al, Cr, Fe, Na, Pb, NO_3, NO_2, PO_4, Sr-90, TOC) agree with each other within a factor of 2, and in most of these predictions are within the 95 percent confidence interval of the analytical results. Results for the remaining analytes (Ca, Ni, Si, Zr, oxalate) have ratios greater than 2 and are outside the 95 percent confidence interval.

For calcium, nickel, silicon and zirconium, Agnew's predictions (Agnew et al. 1996) are all greater than the analytical results. These four analytical results are all measured using an acid digest sample preparation on ICP. They could be biased because the acid method may only partially dissolve these metals in the waste sample. For example, the observed fusion data of calcium were all less than the detection limit 2,000 μg/g because of the high dilution. Therefore, the calcium concentration could be between 295 μg/g (acid data) to 2,000 μg/g (fusion detection limit). This concentration range gives a calcium inventory ranging from 605 kg to 3,600 kg, while the HDW predicted value is 1,890 kg. Similar means are observed for the other analytes.

According to the HDW model, the major source of oxalate is 224 waste. Most of the other HDW wastes do not have oxalate; only a couple of then have oxalate concentrations in the order of 1 ppm. In the SMM model, tank 241-U-102 has a very small percentage of waste from 224 waste or other oxalate-containing waste. Its predicted value is 3 μg/g of oxalate versus an observed 5,120 μg/g. Similar predictions were given on the evaporator concentrate waste in other U Farm tanks; the model predicted 2.5 μg/g and 2.3 μg/g for tank 241-U-105 (1,461 kL [386 kgal] saltcake) and tank 241-U-107 (757 kL [200 kgal] saltcake), and the observed concentrations are 9,900 μg/g and 3,120 μg/g, which is in the same order as observed in tank 241-U-102.

These observed discrepancies between measured and modeled concentrations of oxalate in these U Farm tanks are similar and consistent. If the model-predicted oxalate concentration is correct, then this observation is a good example of organic degradation with the oxalate being the end product of the degradation. This organic degradation process has been observed in the waste simulants experiment (Camaioni et al. 1996). Camaioni reported that the starting organic compounds, EDTA, HEDTA, and glycolate, exhibit exponential decay functions and the products (oxalate, formate, and carbonate) all increase linearly as the radiation dose increases. An organic speciation effort (Reynolds 1996) is underway to examine organic degradation processes on real waste samples. The other possible contributor for this discrepancy is that the HDW model assumption regarding oxalate concentration is incomplete, which would lead to poor agreement with the analytical results. In the B Farm 200 series tanks (pure 224 waste), for example, the observed oxalate concentrations (Sasaki et al. 1996) were much smaller than the model predicted values. This suggests that the oxalate source term may be misused in the model.

For TIC comparison, there is no direct comparison because the model only calculates CO^3 concentration. To make the two values comparable, the HDW values will be converted to the same basis as the analytical value (CO_3 concentration divided by 5; the ratio of the molecular weight of carbon to carbonate). It is noted that the observed TIC is two times higher than the model estimate, within the typical ratio observed in several other analytes.

Overall, the inventory of the evaporator concentrate waste layer has reasonable agreement between analytical results and HDW model prediction. The bulk analytes Na, Al, NO_3, NO_2, PO_4, SO_4 and water, which account for more than 90 percent of the inventory, agree with each other quite well.

D2.3 Basis for Sludge Layer Calculations

According to the waste transaction record, the bottom sludge layer of REDOX waste was generated from 1952 to 1966. The primary components in this waste stream are aluminum, calcium, chromium, sodium, uranium, nitrate, nitrite, and sulfate. Because no bottom sludge layer samples are available for tank 241-U-102, the analytical results of REDOX waste from other tanks will be used to derive a composition for this 163-kL (43-kgal) REDOX sludge layer.

The available analytical results of REDOX waste from tanks 241-S-101, 241-S-104 and 241-S-107 are listed in Table D2-3. Tank 241-S-104 has mixture of 37 percent R1 waste, 8 percent CWR1 waste, and 55 percent RSltCk. The concentrations quoted for tank 241-S-104 in Table D2-3 are the means from all available core sample segments. Tanks 241-S-101 and 241-S-107 have two and three segments of R1, respectively. The concentrations quoted in table D2-3 for these two tanks are the averages from these REDOX waste segments. The average concentrations from these three tanks are given in the fifth column. Also listed in the table are the ratios of the concentration between each tank and the average value. Most of the ratios are close to 1; within 20 percent. This degree of agreement suggest the assumption that the concentrations come from the same type of waste. The projected

REDOX sludge layer inventory for tank 241-U-102 is derived from the average concentration and is given in the last column. The mass basis used in the sludge layer inventory is 2.7794 E+08 g with a density of 1.71 g/mL, and a waste volume of 163 kL (43 kgal).

The REDOX waste composition from the average of analytical results was evaluated using Agnew's model. A comparison between the averaged sample results and several of Agnew's REDOX wastes (R1, CWR1 and RSltCk) is given in Table D2-4. Poor agreement is shown between the analytical data and model-predicted values. This discrepancy can be attributed to poor source terms, incomplete transfer records, or a wrong assumption on the solubility in Agnew's model.

Table D2-3. The Projected Sludge Inventory for Tank 241-U-102 from the Average of Tanks 241-S-101, 241-S-104 and 241-S-107.

Analyte	Analyte Concentration (μg/g)				Ratio Between Tanks and Average Value			U-102 Sludge Inventory
	S-104[1]	S-107[2]	S-101[3]	Average	S-104	S-107	S-101	Kg
Al	1.17E+05	5.64E+04	1.27E+05	1.00E+05	1.17	0.56	1.27	2.79E+04
B			6.31E+01	6.31E+01				1.75E+01
Ca	2.47E+02	2.34E+02	3.22E+02	2.68E+02	0.92	0.87	1.20	7.44E+01
Cr	2.35E+03	1.18E+03	2.23E+03	1.92E+03	1.22	0.61	1.16	5.34E+02
Fe	1.72E+03	1.16E+03	1.96E+03	1.61E+03	1.07	0.72	1.21	4.48E+02
Pb	2.96E+01	3.30E+01	3.70E+01	3.32E+01	0.89	0.99	1.11	9.23E+00
Mn	1.15E+03		2.75E+03	1.95E+03	0.59		1.41	5.42E+02
Ni	5.60E+01		9.07E+01	7.33E+01	0.76		1.24	2.04E+01
P	9.32E+01		2.78E+02	1.86E+02	0.50		1.50	5.17E+01
K	3.00E+02	4.57E+02	5.39E+02	4.32E+02	0.69	1.06	1.25	1.20E+02
Si	1.33E+03	1.06E+03	1.36E+03	1.25E+03	1.06	0.85	1.09	3.48E+02
Ag			9.71E+00	9.71E+00			1.00	2.70E+00
Na	1.21E+05	6.04E+04	1.23E+05	1.01E+05	1.19	0.60	1.21	2.82E+04
Sr	4.24E+02		4.56E+02	4.40E+02	0.96		1.04	1.22E+02
S	4.72E+02		3.43E+02	4.07E+02	1.16		0.84	1.13E+02
U	6.69E+03		8.48E+03	7.59E+03	0.88		1.12	2.11E+03
Zn			2.51E+01	2.51E+01			1.00	6.96E+00
Zr	3.36E+01		3.60E+01	3.48E+01	0.97		1.03	9.67E+00
CO_3	4.14E+03			4.14E+03				1.15E+03
Cl	3.20E+03	1.86E+03	2.05E+03	2.37E+03	1.35	0.78	0.87	6.59E+02
F	1.45E+02	1.50E+02		1.48E+02	0.98	1.02		4.10E+01
NO_3	1.19E+05	5.76E+04	1.02E+05	9.30E+04	1.28	0.62	1.10	2.58E+04
NO_2	2.59E+04	3.43E+04	3.11E+04	3.04E+04	0.85	1.13	1.02	8.46E+03
PO_4	2.19E+03	1.63E+03		1.91E+03		0.85		5.31E+02
SO_4	2.27E+03	1.30E+03	8.97E+02	1.49E+03	1.52	0.87	0.60	4.14E+02
TOC	1.73E+03			1.73E+03				4.81E+02
Density	1.64E+00		1.77E+00	1.71+00				

Notes:

[1]DiCenso et al. (1994)
[2]Simpson et al. (1996)
[3]Kruger et al. (1996)

Table D2-4. Comparison Between REDOX Waste Analytical Results From Tanks 241-S-101, 241-S-104, 241-S-107 and HDW Prediction.

		Concentration ($\mu g/g$)			Ratio (HDW's/Sample Ave)		
Analyte	[1]Sample Ave.	[2]RI	[2]CWRI	[2]RSltCk	RI	CWRI	RSltCk
Al	1.22E+05	7.54E+04	1.71E+05	2.47E+04	0.62	1.40	0.20
B	6.31E+01	NR	NR	NR	NA	NA	NA
Ca	1.60E+03	5.80E+03	2.73E+03	2.06E+03	3.63	1.71	1.29
Cr	1.92E+03	3.06E+04	5.98E+02	7.94E+03	15.96	0.31	4.13
Fe	1.61E+03	3.81E+04	5.20E+03	6.39E+02	23.66	3.22	0.40
Pb	3.32E+01	NR	NR	NR	NA	NA	NA
Mn	1.95E+03	0.00E+00	0.00E+00	2.00E+00	0.00	0.00	0.00
Ni	7.33E+01	2.01E+03	3.37E+01	5.95E+02	27.35	0.46	8.11
P	1.86E+02	NR	NR	NR	NA	NA	NA
K	4.32E+02	2.24E+02	3.24E+01	6.68E+02	0.52	0.08	1.55
Si	1.25E+03	2.25E+02	3.19E+02	2.43E+03	0.18	0.26	1.94
Ag	9.71E+00	NR	NR	NR	NA	NA	NA
Na	1.01E+05	3.68E+04	1.02E+05	1.37E+05	0.36	1.00	1.35
Sr	4.40E+02	0.00E+00	0.00E+00	5.20E-06	0.00	0.00	0.00
S	4.07E+02	NR	NR	NR	NA	NA	NA
U	7.59E+03	NR	NR	NR	NA	NA	NA
Zn	2.51E+01	NR	NR	NR	NA	NA	NA
Zr	3.48E+01	0.00E+00	0.00E+00	2.24E-01	0.00	0.00	0.01
CO3	4.14E+03	8.68E+03	4.09E+03	3.31E+03	2.10	0.99	0.80
Cl	2.37E+03	9.34E+02	1.35E+02	2.77E+03	0.39	0.06	1.17
F	1.48E+02	0.00E+00	0.00E+00	5.50E+00	0.00	0.00	0.04
NO_3	1.17E+05	1.47E+03	2.00E+04	2.20E+03	0.01	0.17	0.02
NO_2	3.04E+04	6.06E+04	2.49E+04	5.72E+04	1.99	0.82	1.88
PO_4	1.91E+03	0.00E+00	0.00E+00	3.10E+01	0.00	0.00	0.02
SO_4	1.49E+03	9.92E+02	4.55E+02	2.85E+03	0.67	0.31	1.91
TOC	1.73E+03	0.00E+00	0.00E+00	6.63E+01	0.00	0.00	0.04
TIC	8.28E+02	1.74E+03	8.18E+02	6.62E+02	2.10	0.99	0.80
Cs-137	8.57E+01	5.34E+01	1.47E+00	1.95E+02	0.62	0.02	2.27
Sr-90	3.50E+02	7.03E+02	1.19E+00	1.76E+02	2.00	0.00	0.50
Wt% water	3.33E+01	5.20E+01	2.45E+01	5.02E+01	1.56	0.74	1.51
density	1.71E+00	1.48E+00	1.77E+00	1.49E+00	0.87	1.04	0.87

Notes: NR = Not reported
[1]Sample ave. is the average sample data of REDOX waste from tanks 241-S-101, 241-S-104 and 241-S-107 listed in Table D2-3.
[2]The data of R1, CWR1 and RSltCk wastes are HDW predictions (Agnew et al. 1996)

D3.0 BEST-BASIS INVENTORY ESTIMATE

To derive a best-basis inventory for tank 241-U-102, an evaluation of tank waste information for the tank was performed that included the following:

- The waste transaction was reviewed. Analysis suggests that the waste type comprising the bottom sludge layer is REDOX instead of MW as reported in Agnew's model.

- The analytical data from two 1996 push-mode core samples of tank 241-U-102 (see Appendix B, Section B2.0) were evaluated. This partial core sample (80 percent of the full core profile) provides analytical results. These sample data correspond to the SMMS2 and SMMT2 saltcake layers described in Agnew's HDW model. No stratification was observed, either in terms of sample appearance or assessment of the analytical results at the subsegment level.

- The tank waste volume was determined by examining the waste level measurements from several risers, the waste transfer history, and the in-tank photos. The data suggested that the waste volume was consistent with the number stated in Hanlon (1996). This assessment indicates that the waste level does not significantly vary throughout the tank.

- Establish a model to calculate a standard inventory (see Figure 3-1). It contains the top 1,257 kL (331 kgal) of evaporator concentrated saltcake waste with a mass basis of 1.98E+09 g for solid and 1.7E+07 mL for liquid, and the bottom 164 kL (43 kgal) of REDOX waste with a mass basis of 1.7E+09 g for the sludge. In the HDW model this saltcake layer was separated into SMMS2 and SMMT2 layers.

- Analytical results and the HDW model were reviewed to derive a saltcake layer composition and inventory. An evaluation of analytical results against SMM model predictions was performed, and a comparison of the SMMS2 layer with tank 241-U-102 and the other four tanks was performed.

- Comparisons with the R sludge concentrations from tank 241-S-101, 241-S-104, 241-S-107 were made to derive a sludge layer composition and inventory. These results were also evaluated against the HDW composition for REDOX waste (R, CWR1 and RSltCk). The average of the analytical results of REDOX waste from these tanks was used to construct the bottom sludge layer composition.

Based on this evaluation, a best-basis total inventory of tank 241-U-102 was developed by adding the evaporator concentrates saltcake inventory (in Table D2-2) and REDOX sludge inventory (in Table D2-3). The non-radioactive component inventory is shown in Table D3-1, and Table D3-2 contains the radioactive component inventory.

In summary, this evaluation shows that the tank 241-U-102 analytical results for evaporator concentrates (saltcake) are similar to the saltcake wastes sampled and analyzed from other tanks with similar process histories. It also shows the analytical results are in reasonable agreement with the SMM model (Agnew et al. 1996) prediction. When the data are compared, the saltcakes (SMMS2 and SMMT2) in the HDW model resemble each other. For the REDOX sludge layer, the projected inventory was derived from the analytical results of tanks 241-S-101, 241-S-104 and 241-S-107. The analytical results of REDOX waste in these tank are consistent and close to one another. However, the REDOX analytical results do not agree with the HDW model's REDOX waste composition.

Table D3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
Al	65,200	E	More than half of Al comes from REDOX sludge
B	176	E	
Ca	680	E	
Cl	9,550	E	
TIC	98,380	E	
Cr	5,980	E	
Fe	1,440	E	
K	3,410	E	
Mn	808	E	
Na	5.61E+05	E	
Ni	193	E	
P	7,910	E	
Pb	148	E	
S	10,700	E	

Table D3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
NO_2	1.07E+05	E	
NO_3	6.61+05	E	
Pb	148	E	
PO_4	24,900	E	
Si	694	E	
SO_4	30,000	E	
TOC	17,100	E	
TIC	98,380	E	
Zn	66.5	E	
Zr	26.3	E	

Notes:

[1]E = Engineering assessment-based

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

Table D3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102.

Analyte	Total inventory (Ci)	Basis[1]	Comment
^{90}Sr	1.6E+05	E	
^{137}Cs	3.18E+05	E	

Notes:

[1]E = Engineering assessment-based

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

D4.0 APPENDIX D REFERENCES

Agnew, S. F., P. Baca, R. A. Corbin, T. B. Duran, and K. A. Jurgensen, 1995, *Waste Status and Transaction Record Summary for the Southwest Quadrant*, WHC-SD-WM-TI-614, Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., J. Boyer, R. Corbin, T. Duran, J. FitzPatrick, K. Jurgensen, T. Ortiz, and B. Young, 1996, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 3*, 1996, Los Alamos National Laboratory, Los Alamos, New Mexico.

Baldwin, J. H., and R. H. Stephens, 1996, *Tank Characterization Report for Single-Shell Tank 241-U-109*, WHC-SD-WM-ER-609, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Camaioni, D. M., A. K. Sharma, W. D. Samuels, K. L. Wahl, J. C. Linehan, J. A. Campbell, and S. A. Clauss, 1996, *Organic Tanks Safety Program FY96 Waste Aging Studies*, PNNL-11312, Pacific Northwest National Laboratory, Richland, Washington.

DiCenso, A. T., L. C. Amato, J. D. Franklin, G. L. Nuttall, K. W. Johnson, P. Sathyanarayana, and B. C. Simpson, 1994, *Tank Characterization Report for Single-Shell Tank 241-S-104,* WHC-SD-WM-ER-370, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Eggers, R. F., R. H. Stephens and T. T. Tran, 1996, *Tank Characterization Report for Single-Shell Tank 241-S-102*, WHC-SD-WM-ER-609, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. M., 1996, *Waste Tank Summary Report for Month Ending August 31, 1996*, WHC-EP-0182-101, Westinghouse Hanford Company, Richland, Washington.

Hill, J. G., G. S. Anderson, and B. C. Simpson, 1995, *The Sort On Radioactive Waste Type Model: A Method to Sort Single-Shell Tanks into Characteristic Groups,* PNL-9814, Rev. 2, Pacific Northwest Laboratory, Richland, Washington.

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. 1, Lockheed Martin Hanford Corporation, Richland, Washington.

Jo, J., B. J. Morris and T. T. Tran, 1996, *Tank Characterization Report for Single-Shell Tank 241-U-107*, WHC-SD-WM-ER-614, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Kruger, A. A., B. J. Morris, and F. J. Fergestrom, 1996, *Tank Characterization Report for Single-Shell Tank 241-S-101*, WHC-SD-WM-ER-613, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Reynolds, D. A., 1996, *Samples to Ship to PNNL for Organic Speciation* (internal letter 74A30-96-047 to K. M. Hall, October 28), Lockheed Martin Hanford Corporation, Richland, Washington.

Rodenhizer, D. G., 1987, *Hanford Waste Tank Sluicing History,* WHC-SD-WM-TI-302, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Simpson, B. C., J. G. Field, D. W. Engel and D. S. Daly, 1996, *Tank Characterization Report for Single-Shell Tank 241-S-107*, WHC-SD-WM-ER-589, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Sasaki, L. M., J. G. Douglas, R. H. Stephens, L. C. Amato and T. T. Tran, 1996, *Tank Characterization Report for Single-Shell Tank 241-B-204*, WHC-SD-WM-ER-581, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX E

BIBLIOGRAPHY FOR TANK 241-U-102

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APPENDIX E

BIBLIOGRAPHY FOR TANK 241-U-102

Appendix E provides a bibliography of information that supports the characterization of tank 241-U-102. This bibliography represents 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-U-102 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-U-102
- IIb. Sampling of 242-S Evaporator Streams
- IIc. Sampling of REDOX waste

III. COMBINED ANALYTICAL/NON-ANALYTICAL DATA

- IIIa. Inventories using both 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. A majority of the information listed below may be found in the Lockheed Martin Hanford Corporation Tank Characterization Resource Center.

I. NON-ANALYTICAL DATA

Ia. Models/Waste Type Inventories/Campaign Information

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

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

Boldt, A.L., 1966, *Redox Chemical Flowsheet HW No. 9,* ISO-335, Isochem, Inc., Richland, Washington.

- Document contains compositions of material balance for REDOX process as well as a separations plan denoting process stream waste before transfer to 200 Area waste tanks.

Crawley, D.T., 1960, *Redox Chemical Flowsheet HW-No. 6,* HW-66203, Hanford Atomic Products Operation, General Electric Company, Richland, Washington.

- Document contains composition of material balance for REDOX process as well as a separations plan denoting process stream waste before transfer to 200 Area waste tanks.

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.

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

Merrill, E. T., and R. L. Stevenson, 1955, *REDOX Chemical Flowsheet HW No. 5*, HW-38684, Hanford Atomic Products Operation, Richland, Washington.

- Document contains compositions of material balance for REDOX process as well as a separations plan denoting process stream waste before transfer to 200 Area waste tanks.

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

- Document contains compositions of first concentration cycle waste before 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, 1994, *Waste Status and Transaction Record Summary for the Southwest Quadrant of the Hanford 200 East Area*, WHC-SD-WM-TI-614, Rev. 2, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Document contains spreadsheets depicting all available data on tank additions/transfers.

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

- Document 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.

- Document shows tank riser locations in relation to a tank aerial view, as well as a description of each riser and its contents.

Lipnicki, J., 1996, *Waste Tank Risers Available for Sampling*, WHC-SD-WM-TI-710, Rev. 3, Westinghouse Hanford Company, Richland, Washington.

- Document gives an assessment of riser locations for each tank; however, not all tanks are included/completed. Also included is an estimate of what risers are available for sampling.

Id. Sample Planning/Tank Prioritization

Brown, T. M., T. J. Kunthara, and J. W. Hunt, 1995, *Tank Waste Characterization Basis*, WHC-SD-WM-TA-164, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Document that summarizes the technical basis for characterizing the waste in the tanks and assigns a priority number to each tank.

Hu, T. A. and W. D. Winkleman 1996, *Tank 241-U-102 Tank Characterization Plan*, WHC-SD-WM-TP-451, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

- Document discusses any and all relevant DQOs and how they will be met for tank 241-U-102.

Hu, T. A., 1996, *Compatibility Grab Sampling and Analysis Plan*, WHC-SD-WM-TSAP-037, Rev. 1E, Westinghouse Hanford Company, Richland, Washington.

- Document contains detailed sampling and analysis procedure information for tank 241-U-102 based on waste compatibility DQO.

Hu, T. A., 1996, *Tank 241-U-102 Push Mode Core Sampling and Analysis Plan*, WHC-SD-WM-TSAP-082, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains detailed sampling and analysis procedure information for tank 241-U-102 based on applicable DQOs.

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.

Winkelman, W. D., J. W. Hunt and L. Fergestrom, 1996, *FY 1996 Tank Waste Analysis Plan*, WHC-SD-WM-PLN-120, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains Tri-Party Agreement (see Ecology et al. 1994 listing in Section 5.0) requirement-driven TWRS Characterization Program information and a list of tanks addressed in fiscal year 1996.

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.

Womack, J. C., 1975, *Impact of Current 242-T Operation on Plans and Goals*, (internal memorandum MEM-092675 to R. L. Walser and Distribution, September 26), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses the impact of evaporator process changes on tank farms A, C, TX, and U.

Womack, J. C., 1975, *Disposition of High Strontium Liquid Wastes*, (internal memorandum MEM-112075 to G. T. Dukleow and Distribution, November 20), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo outlines plans for disposition of liquid waste currently stored in A, C, and U Farms which are high in ionic strontium.

Ie. Data Quality Objectives (DQO) 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.

- DQO used to determine if tanks are under safe operating conditions.

Fowler, K.D., 1995, *Data Quality Objectives for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains waste transfer compatibility program data needs, list of tanks to be evaluated, decision thresholds, and decision logic flow diagram.

Simpson, B. C., and D. J. McCain, 1996, *Historical Model Evaluation Data Requirements*, WHC-SD-WM-DQO-018, Rev. 1, Westinghouse, Hanford Company, Richland, Washington.

- Document provides data needs for evaluating the LANL model for estimating tank waste compositions.

Turner, D.A., *Data Quality Objectives for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains waste transfer compatibility program data needs, list of tanks to be evaluated, decision thresholds, and decision logic flow diagram.

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

IIa. Sampling of tank 241-U-102

Christensen, W. R., 1977, *Waste Tank Solids Samples*, (internal memorandum 77-15 to J. L. Starr, November 30), Rockwell International, Richland, Washington.

- Memo contains confirmation of previous requests for analysis of samples from waste tank U-241-U-102.

Horton, J. E., 1976, *Analysis of Solids and Liquid Samples from Tank 102-U*, (internal letter to W. R. Christensen, April 12), Atlantic Richfield Hanford Company, Richland, Washington.

- Document contains sample analyses results of 1976 sampling event.

Horton, J. E., 1976, *Concentration Laboratory Assistance*, (internal letter CTL-122 to D. C. Lini, April [no day]), Atlantic Richfield Hanford Company, Richland, Washington.

- Document contains sample analyses results for supernatant liquid, fine top solids, bottom chunks, and tank sludge.

Hu, T. A., *Immediate Notification: Violation of Limits for Exothermic Reaction for Samples from Tank 241-U-102*, (internal memorandum 79400-96-149 to H. Babad and Distribution, June 20), Westinghouse Hanford Company, Richland, Washington.

- Memo provides sample analysis results that fall outside of acceptable range (Notification limit: > -480 Joules/g DSC moisture) for tank 241-U-102.

Lane, T. A., 1977, *Double-Shell Slurry Processing*, (internal letter to J. O. Honeyman, October 24), Rockwell Hanford Operations, Richland, Washington.

- Document contains sample analyses results of 1977 sampling event.

Sant, W. H., 1973, *242-S Feed Samples, T-209, 102-U*, (internal memorandum to R. L. Walker, December 12), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo provides sample analysis results.

Sant, W. H., 1974, *242-S Feed Samples, T-1968, 102-U*, (internal memorandum to R. L. Walser, February 26), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo provides sample analysis results.

Starr, J. L., 1977, *241-102-U Sample #9844*, (internal letter 77-126 to W. R. Christensen, December 28), Rockwell International, Richland, Washington.

- Memo describes waste sample #9844 and its chemical analysis.

Steen, F. H., 1996, *Tank 241-U-102, Cores 143 and 144, Analytical Results for the Final Report*, WHC-SD-WM-DP-189, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

- Document contains sample analyses results from 1996 April tank 241-U-102 push-mode core sampling event.

Supervisor, Analytical Services, 1978, *Analyses of Tank Farm Samples, Serial No. 3664, Tank 102-Y (242-S FDN), Received 12/18/77*, (internal letter to W. R. Christensen, January 31), Rockwell International, Richland, Washington.

- Letter provides sample analysis results.

Sutey, M. J., 1994, Sample Status Reports for Samples R-4090, R-4091, and R-4092, TCRC-6, Tank 241-U-102, Tank Characterization Resource Center, Westinghouse Hanford Company, Richland, Washington.

- Internal letter provides analyses of supernatant sample of 1993 June grab sampling.

Wheeler, R. E., 1975, *Analysis of Tank Farm Samples, Sample: T-7796, Tank 102-U, Received: September 8, 1975*, (internal memorandum to R. L. Walser, October 20), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo provides sample analysis results.

Wheeler, R. E., 1975, *Analysis of Tank Farm Samples, Sample: T-7444, Tank 102-U, Received: August 26, 1975*, (internal memorandum to R. L. Walser, October 20), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo provides sample analysis results.

IIb. Sampling of 242-T Evaporator Waste Streams

- All the information in this section is documented in Process Aids 1970 - 1993. Process Aids is a consecutive compilation of laboratory memos, letters, etc. indexed by year then by subject and/or tank. The following analyses may provide insight as to the composition of SltCk waste type expected to be in tank 241-U-102.

Buckingham, J. S., 1972, *Interim Report III: Nitric Acid Neutralization and Concentration of Caustic Waste Solutions - 242-T Evaporator Feed*, ARH-2529, Atlantic Richfield Hanford Company, Richland, Washington.

Buckingham, J. S., 1972, *Nitric Acid Neutralization and Concentration of 242-T Evaporator Recycle Feed*, (internal letter, Process Aids #00256, to W. P. Metz, May 12), Atlantic Richfield Hanford Company, Richland Washington.

Buckingham, J. S., 1971, *Interim Processing of Z Plant Wastes*, (internal letter, Process Aids #00394, to O. D. Erlandson, November 2), Atlantic Richfield Hanford Company, Richland, Washington.

Buckingham, J. S. and D. A. Dodd, 1972, *Nitric Acid Neutralization and Concentration of Synthetic Recycle Waste Solution*, (internal letter, Process Aids #00263, to D. J. Larkin, July 17), Atlantic Richfield Hanford Company, Richland, Washington.

Puryear, D. A., 1970, *Solubility of 242-T Evaporator Process Feed and Concentrate*, (internal letter, Process Aids #00088, to M. C. Fraser, December 9), Atlantic Richfield Hanford Company, Richland, Washington.

Puryear, D. A. and J. S. Buckingham, 1971, *Status Report on Waste Solidification Studies and Separations Chemistry Laboratory*, (internal letter, Process Aids #00362, to M. H. Campbell, July 23), Atlantic Richfield Hanford Company, Richland, Washington.

IIc. 242-S Evaporator Waste Streams

Bratzel, D. R., 1981, *Analysis of Routine Evaporator Samples*, (internal letter, Process Aids #00828, to W. H. Sant, October 30), Rockwell International, Richland, Washington.

- Letter addresses a sample breakdown and analysis program.

Brown, G. E., 1978, *Aging Waste Crystallization*, (internal letter, Process Aids #00065, to J. O. Honeyman, August 21), Rockwell International, Richland, Washington.

- Letter summarizes results of laboratory boildown of synthetic citrate complexed B-Plant waste.

Brown, G. E., 1978, *Boiling Point Elevation in the 242-S Evaporator*, (internal letter, Process Aids #00101, to K. G. Carothers, December 28), Rockwell International, Richland, Washington.

- Letter discusses two possible causes of boiling point elevation in forced circulation evaporators.

Brown, G. E., 1978, *Complexed Waste Evaporation Studies*, (internal letter, Process Aids #00122, to K. G. Carothers, June 20), Rockwell International, Richland, Washington.

- Letter reports results of experiments undertaken to determine the effects of HEDTA/EDTA (complexant) concentrations on the evaporation of liquid waste to salt cake.

Brown, G. E., 1978, *Operating Parameters for Evaporator Crystallizers*, (internal letter, Process Aids #00188, to K. G. Carothers, July 5), Rockwell International, Richland, Washington.

- Letter summarizes planned experiments that will define the operating parameters for concentration of complexed waste in the 242-S and 242-A evaporator-crystallizers.

Buckingham, J. S., 1974, *Analysis of Supernatant Liquids from 242-S Slurry Receiving Tanks*, (internal memorandum, Process Aids #00093, to W. R. Christensen, July 8), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo reports results on tests which were initiated because of some concern that the waste being evaporated in 242-S Evaporator-Crystallizer may be approaching terminal concentration.

Lane, T. A., 1977, *Complexed Waste Batch Evaporator Runs*, (internal letter 77-96 to J. O. Honeyman, October 4), Rockwell International, Richland, Washington.

- Memo describes experimental conditions and viscosity measurements used to analyze samples.

Lane, T. A., 1977, *Complexed Waste Batch Evaporator Runs*, (internal letter 77-102 to J. O. Honeyman, October 17), Rockwell International, Richland, Washington.

- Memo describes a series of three additional experiments to measure viscosity.

Puryear, D. A., 1971, *Characterization of S, U, and SX Waste Tanks*, (internal memorandum 00347 to J. P. Skolrud, September 21), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo describes sampling and analysis of S, U, and SX waste tanks to identify feed material for 242-S vacuum evaporator.

Puryear, D. A., 1974, *Percent Solids in 242-S Feeds After 30 and 50 Volume Percent Reduction*, (internal memorandum, Process Aids #00079, to R. L. Walser, January 30), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo compares two methods of sample testing. Comparison was done to determine if the present method of atmospheric evaporation was accurately reporting conditions that could be expected in the vacuum crystallizer.

Puryear, D. A., 1974, *Vacuum Boildown of Tank 102-S Sample*, (internal memorandum, Process Aids #00091, to N. L. Harms, April 4), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses a process upset in the 242-S Evaporator. Samples were rerun to aid in identifying the cause. It was determined that the macro-evaporation boiled so evenly throughout the entire experiment, it would appear that the cause of the blurp could not be associated with the physical or chemical properties of the feed.

Puryear, D. A., 1974, *Continuous Flow Laboratory Vacuum Evaporator*, (internal memorandum, Process Aids #00115, to N. L. Harms, April 17), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses the possibility of development and operation of a laboratory with laboratory scale capabilities of continuous flow vacuum evaporation.

Puryear, D. A., 1974, *Partial Neutralization of Near Terminal Liquor with Nitric Acid: General Observations and Physical Data Percent Reduction*, (internal memorandum, Process Aids #00186, to N. L. Harms, April 17), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses methods of disposal for thousands of gallons of near terminal liquor which will remain in the 242-S vacuum crystallizer after repeated processing of Hanford Site wastes.

Puryear, D. A., 1974, *Partial Neutralization of Near Terminal Liquor with Nitric Acid: Analytical Data and Material Balance Percent Reduction*, (internal memorandum, Process Aids #00191, to N. L. Harms, May 31), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses tests to study the feasibility of reprocessing near terminal liquor.

Puryear, D. A., 1974, *Pilot Plant Support - HNO_3 Partial Neutralization,* (internal memorandum, Process Aids #00200, to R. I. Donovan, June 17), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo is a response to requests for laboratory support of the pilot plant evaporator with emphasis on partial neutralization of recycle liquid using nitric acid.

Puryear, D. A., 1974, *Evaporative Characteristics of the System - $NaNO_3{\cdot}NaOH{\cdot}H_2O$,* (internal memorandum, Process Aids #00202, to R. I. Donovan, July 3), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo references studies done that indicate only $NaNO_3$, NaOH, and H_2O influence the evaporator operation and solids product. By studying the simpler three component system, parameters of operation and suitable feed adjustments can be selected for pilot plant studies on partial neutralization of caustic waste with nitric acid.

Puryear, D. A., 1974, *Analytical Support of Pilot Evaporator Runs 3A,* (internal memorandum, Process Aids #00211, to R. I. Donovan, August 30), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo delivers analytical results. Results show the run temperature controls the product formation.

Puryear, D. A., 1974, *Evaporative Characteristics of the Fire Component System - $NaNO_2{\cdot}NaNO_3{\cdot}NaA10_2{\cdot}NaOH{\cdot}H_2O$,* (internal memorandum, Process Aids #00213, to R. I. Donovan, September 9), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses the feasibility of reducing the hydroxide concentration of the 242-S Evaporator recycle liquor.

Puryear, D. A., 1974, *Aluminum Behavior in Partial HNO3 Neutralization of S-Farm Liquors,* (internal memorandum, Process Aids #00219, to W. E. Ogren, November 15), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses the importance of defining the solubility of sodium aluminate in the caustic waste system and establishing partial neutralization limits based on these solubility data.

Puryear, D. A., 1974, *Aluminum Removal from Caustic Radioactive Waste Using Diatomite During Partial Neutralization,* (internal memorandum, Process Aids #00229, to W. E. Ogren, December 5), Atlantic Richfield Hanford Company, Richland, Washington.

- Memo discusses employing partial neutralization of caustic with nitric acid.

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, 1995, *Hanford Tank Chemical and Radionuclide Inventories: HDW Rev. 3*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

- Document contains waste type summaries as well as 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.

- Document contains major components for waste types, and some assumptions. Purchase record 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.

- Document contains major components for waste types, and some assumptions

Brevick, C. H., L. A. Gaddis, and E. D. Johnson, 1995, *Historical Tank Content Estimate for the Southwest Quadrant of the Hanford 200 Areas*, WHC-SD-MW-ER-352, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

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

IIIb. Compendium of data from other sources physical and chemical

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

- Document 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, 1995, *Tank Waste Source Term Inventory Validation, Vol I & II.*, WHC-SD-WM-ER-400, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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

Brevick, C. H., L. A. Gaddis, and W. W. Pickett, 1995, *Supporting Document for the Historical Tank Content Estimate for U Tank Farm*, WHC-SD-WM-ER-325, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

- Document contains summary tank farm and tank write-ups on historical data and solid inventory estimates as well as appendices for the data. The appendices contain the following information: Appendix C - Level History AutoCAD sketch; Appendix D - Temperature Graphs; Appendix E - Surface Level Graph; Appendix F, pg F-1 - Cascade/ Drywell Chart; Appendix G - Riser Configuration Drawing and Table; Appendix I - In-Tank Photos; and Appendix K - Tank Layer Model Bar Chart and Spreadsheet.

Hanlon, B. M., 1996, *Waste Tank Summary Report for Month Ending August 31, 1996*, WHC-EP-0182-101, Westinghouse Hanford Company, Richland, Washington.

- This document contain a monthly summary of: 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.

- This document compares historical data to sample-based estimates.

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

- Document contains in-tank photos as well as 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.

- Document gives assessment of relative dryness between tanks.

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

- Document is a multivariate statistical study categorizing tanks into groups based on analytical data.

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

- Memo contains a tank inventory estimate based on analytical information.

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

- Memo contains a tank inventory estimate based on analytical information.

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<u>Tank Advisory Panel</u> 102 Windham Road Oak Ridge, TN 37830					
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Distribution	Data Assessment and Interpretation	Date 01/23/97
Project Title/Work Order		EDT No. EDT-613495
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