

# ENGINEERING CHANGE NOTICE

Page 1 of 2

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ECN

<b>2. ECN Category (mark one)</b>  Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	<b>3. Originator's Name, Organization, MSIN, and Telephone No.</b> John M. Conner, Data Assessment and Interpretation, R2-12. 373-2711	<b>4. USQ Required?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<b>5. Date</b> 09/11/96
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# Tank Characterization Report for Double-Shell Tank 241-SY-103

John M. Conner

Westinghouse Hanford Company, Richland, WA 99352  
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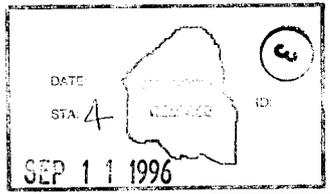
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Abstract: This document summarizes the information on the historical uses, present status, and the sampling and analysis results of waste stored in tank 241-SY-103. This report supports the requirements of Tri-Party Agreement Milestone M-44-09.

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# Tank Characterization Report for Double-Shell Tank 241-SY-103

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



**Westinghouse**  
**Hanford Company** Richland, Washington

Management and Operations Contractor for the  
U.S. Department of Energy under Contract DE-AC06-87RL10930

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# Tank Characterization Report for Double-Shell Tank 241-SY-103

D. R. Hansen  
S. G. Metcalf  
J. G. Douglas  
W. I. Winters  
Westinghouse Hanford Company

K. W. Johnson  
J. D. Franklin  
Los Alamos Technical Associates

Date Published  
September 1996

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



**Westinghouse  
Hanford Company**

P.O. Box 1970  
Richland, Washington

Management and Operations Contractor for the  
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## EXECUTIVE SUMMARY

This tank characterization report summarizes information on the historical uses, current status, and the sampling and analysis results of waste stored in double-shell underground storage tank 241-SY-103 at the Hanford Site. This report also supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1996), Milestone M-44-09.

Tank 241-SY-103 is located in the SY Tank Farm in the 200 West Area of the Hanford Site. The tank went into service in 1977 and received concentrated wastes from B Plant cesium and strontium recovery campaigns. In 1980, most of this waste was transferred out, and double-shell slurry was transferred into the tank. In 1985, uranium sludge from ion-exchange processing was added to the tank. No transfers from tank 241-SY-103 have occurred since January 1981. Small additions of waste water from many sources were made to the tank between 1981 and 1989. No waste has been added since 1990.

Table ES-1 and Figure ES-1 summarize the description and status of tank 241-SY-103. The tank is currently in service, but it is prohibited from receiving any waste because it is on the Flammable Gas Watch List. The tank, which has an operational capacity of 4,390 kL (1,160 kgal), is estimated to contain 2,824 kL (746 kgal) of waste in the form of supernate and solids (Hanlon 1996). The last sampling of the tank was a core sample taken in 1994. Based on that core sample, the tank is estimated to contain 1,440 kL (380 kgal) in an upper layer of supernate and 1,370 kL (362 kgal) in a lower layer of solids.

Table ES-1. Description and Status of Tank 241-SY-103.

<b>Tank Description</b>	
Type	Double-shell
Constructed	1977
In service	1977
Diameter	23 m (75 ft)
Maximum depth	10.7 m (35 ft)
Capacity	4,370 kL (1,160 kgal)
Bottom shape	Flat
Ventilation	Actively ventilated
<b>Tank Status</b>	
Waste classification	Complexant concentrate
Total waste volume (March 1995) <sup>1</sup>	2,824 kL (746 kgal)
Solids volume <sup>2</sup>	1,370 kL (362 kgal)
Supernatant volume <sup>2</sup>	1,440 kL (380 kgal)
ENRAF surface level (April 6, 1995)	690 cm (271 in.)
Temperature (1991 to present)	27°C (81°F) to 47.2°C (117°F)
Integrity	Sound
Watch List	Flammable gas
<b>Sampling Dates</b>	
Push-mode core sample	August and September, 1994
Auger sample	June 2 to 9, 1994
<b>Service Status</b>	
Restricted <sup>3</sup>	January 1991

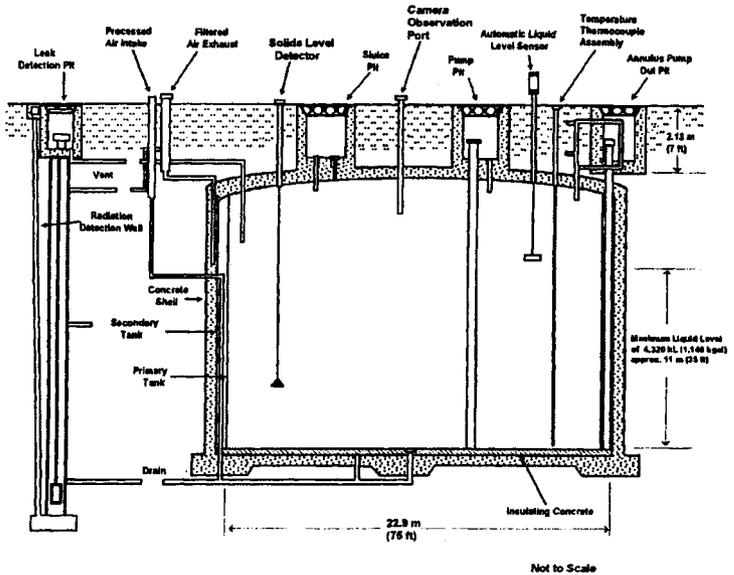
Notes:

<sup>1</sup>Hanlon (1996)

<sup>2</sup>Estimated from 1994 core sample.

<sup>3</sup>There has been no transfers of waste since 1990.

Figure ES-1. Basic Design of a Double-Shell Tank.



This report summarizes three sampling and analysis events.

- The solids and supernate compositions are based on the core sample taken in 1994.
- The crust was evaluated for safety concerns using auger solids in 1994.
- The physical properties of the solids presented were taken from 1986 and 1994 core segment samples.

An unreviewed safety question raised concern that the crust of the tank waste could become sufficiently hot during core sampling activities to initiate an exothermic reaction or ignite hydrogen gas, if present (Johnson 1994). General safety screening analyses were performed on the crust prior to core sampling in response to the unreviewed safety question. The differential scanning calorimetry (DSC) results did not exhibit exotherms, thus indicating that it was safe to obtain a push-mode core sample (Schreiber 1995).

Two data quality objectives (DQOs) were applicable to the 1994 core sampling event: the *Flammable Gas Tank Safety Programs: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objective Process* (McDuffie and Johnson 1994) and the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994). The flammable gas safety DQO requires one core, and the safety screening DQO requires two cores taken from two widely separated risers. Because of safety concerns, only one core was acquired; therefore, although the objectives were met for the flammable gas safety DQO, they were not met for the safety screening DQO. Safety screening analyses were performed on the one core obtained.

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Safety screening analyses were performed to evaluate the potential for exothermic reactions in the waste, criticality, and tank vapor flammability. The DSC results for one drainable liquid (segment 9, 559 J/g) and one lower semi-segment (segment 13, 630 J/g) exceeded the safety screening exothermic enthalpy criteria of 480 J/g based on the dry weight of the sample.<sup>1</sup> Most segments exhibited an exotherm, thus indicating that fuel is present throughout the tank. However, the weight percent water content of the waste is significantly above the 17 weight percent criteria and would prevent propagation of any potential reaction.

The exothermic behavior is most likely the result of the reaction of organic complexants with nitrates/nitrites at elevated temperatures. Total organic carbon (TOC) concentrations are relatively high in each segment. The samples with the larger exotherms had dry weight TOC concentrations near 2 weight percent, which is below the safety screening criteria of 3 weight percent. Energy estimates calculated from the TOC concentration, assuming that the TOC is acetate, were all greater than the observed exotherms from DSC analysis except for two samples. Only small amounts of cyanide were found in the waste and do not contribute significantly to the observed energetics.

The heat generated by radioactivity in the tank is estimated to be 5,880 W (20,100 Btu/hr), which is well below the criteria (11,720 W [40,000 Btu/hr]) distinguishing a high-heat tank

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<sup>1</sup>The safety screening criteria at the time of the analysis was 523 J/g, but it has been changed to 480 J/g in later DQOs.

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from a low-heat tank. In 1994, tank 241-SY-103 had maximum temperatures ranging from 36 to 39 °C (96 to 103 °F). The trend of the temperature data indicates the waste is cooling.

Total alpha results indicate that the tank is well below the criticality safety criterion of 41  $\mu\text{Ci/g}$ , but actinide levels in the solids exceed the transuranic classification of 100 nCi/g. Isotopic analyses indicates that most of the alpha activity is from  $^{241}\text{Am}$  and not  $^{239/240}\text{Pu}$ . The actinide levels in the supernate are well below the transuranic classification.

A standard hydrogen monitoring system was installed in June 1994. Headspace sampling indicates the presence and periodic buildup of hydrogen gas. The largest hydrogen concentration measured was 0.294 volume percent on May 2, 1995. This result is equivalent to 7.4 percent of the lower flammability limit (LFL) and does not exceed the tank safety DQO criterion of 25 percent of the LFL (Babad and Redus 1994).

Ammonia monitors on the SY tank farm indicate the highest ammonia concentration during a gas release event is about 486 ppmv or 0.3 percent of the LFL for ammonia. Additional waste characterization data were obtained to clarify mechanisms for gas generation, retention, and release. These data will be used in models of waste behavior to support evaluation of gas accumulation and development of any needed mitigation methods. Discussion of these mechanisms, models, and mitigation efforts is beyond the scope of this

report. The gas monitoring indicates the tank vapor is well below the flammability limits even during gas release events. However, the potential for these limits being exceeded in gases entrapped in the waste is still being evaluated.

Table ES-2 summarizes the tank inventories for the supernate and solids layers of the waste in tank 241-SY-103. The summary is based on the results from the 1994 core sample. The supernate layer contains large amounts of sodium, aluminum, chloride, hydroxide, nitrite, nitrate, and complexants. The solids layer contains large amounts of chloride, nitrite, nitrate, phosphate, sulfate, hydroxide, aluminum, chromium, sodium, and complexants (estimated from TOC).

Table ES-2. Tank 241-SY-103 Inventory. (2 Sheets)

Analyte	Supernate Layer (kg)	Solids Layer (kg)	Total (kg)
Formate <sup>-</sup>	6.12E+3	1.07E+4	1.68E+4
Oxalate <sup>2-</sup>	n/a	4.47E+4	4.47E+4
Cl <sup>-</sup>	1.64E+4	1.51E+4	3.15E+4
F <sup>-</sup>	n/a	3.35E+3	3.35E+3
NO <sub>2</sub>	2.01E+5	1.76E+5	3.77E+5
NO <sub>3</sub>	2.93E+5	2.11E+5	5.04E+5
PO <sub>4</sub> <sup>3-</sup>	6.99E+3	3.35E+4	4.05E+4
SO <sub>4</sub> <sup>2-</sup>	1.96E+2	1.68E+4	1.70E+4
OH <sup>-</sup>	4.01E+4	3.96E+4	7.97E+4
Al	5.99E+4	8.51E+4	1.47E+5
B	1.2E+2	n/a	1.2E+2
Ca	1.87E+2	7.52E+2	9.39E+2
Cr	4.9E+1	2.19E+4	2.19E+4
K	5.67E+3	7.18E+3	1.28E+4
Na	3.17E+5	4.02E+5	7.19E+5
Ni	7.1E+1	2.19E+2	2.9E+2
Si	1.07E+2	n/a	1.07E+2
Zn	5	4.9E+1	5.4E+1
Zr	n/a	1.23E+2	1.23E+2
Fe	7	5.80E+3	5.81E+3
U	4	1.67E+3	1.67E+3
TOC	2.89E+4 <sup>1</sup>	9.02E+3 <sup>1</sup>	3.79E+4 <sup>1</sup>
TIC	n/a	9.46E+4 <sup>2</sup>	9.46E+4 <sup>2</sup>

Table ES-2. Tank 241-SY-103 Inventory. (2 Sheets)

Analyte	Supernatant Layer Activity (Ci)	Solids Layer Activity (Ci)	Total Activity
<sup>241</sup> Am	2.36	1.44E+3	1.44E+3
<sup>137</sup> Cs	5.96E+5	5.38E+5	1.13E+6
<sup>60</sup> Co	n/a	1.05E+2	1.05E+2
<sup>154</sup> Eu	n/a	1.62E+3	1.62E+3
<sup>155</sup> Eu	n/a	1.41E+3	1.41E+3
<sup>129</sup> I	2.58E-1	n/a	2.58E-1
<sup>238</sup> Pu	5.75E-1	3.48E+1	3.54E+1
<sup>239/240</sup> Pu	n/a	1.34E+2	1.34E+2
<sup>90</sup> Sr	4.21E+3	7.48E+4	7.90E+4
<sup>99</sup> Tc	2.41E+2	5.25E+2	7.66E+2
Tritium	3.16	n/a	3.16
Total alpha	n/a	1.17E+3	1.17E+3
Total beta	5.97E+5	9.29E+5	1.53E+6

## Notes:

n/a = not available, all results were below detection limits

<sup>1</sup>As kg of acetate, corrected for formate and oxalate concentration.

<sup>2</sup>As kg of carbonate.

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**LIST OF TERMS**

Btu/hr	British thermal units per hour
CCPLX	complexant concentrate
Ci	curies
cm	centimeters
cm <sup>2</sup>	square centimeters
cm <sup>3</sup>	cubic centimeters
cP	centipoise
DSC	differential scanning calorimetry
DSS	double-shell slurry
DQO	data quality objective
ft	feet
g	grams
gal	gallons
HHF	hydrostatic head fluid
IC	ion chromatography
ICP	Inductively coupled plasma
in.	inches
kg	kilograms
kgal	kilogallons
kL	kiloliters
kW	kilowatts
J	joules
L	liters
LEL	low explosive limit
LFL	lower flammability limit
m	meters
mg	milligram
min	minute
mL	milliliter
M	molarity
nCi	nanocuries
Pa	Pascal
ppm	parts per million
ppmv	parts per million volume
RPD	relative percent difference
R/hr	roentgen per hour
TIC	total inorganic carbon
TOC	total organic carbon
W	Watts
wt%	weight percent
°C	degrees Celsius
°F	degrees Fahrenheit

**LIST OF TERMS (Continued)**

$\mu\text{Ci}$	microcuries
$\mu\text{g}$	micrograms
$\mu\text{mol/g}$	micromoles per gram
V/V	volume/volume dilution ratio

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## 1.0 INTRODUCTION

This tank characterization report provides an overview of the history and waste contents of double-shell tank 241-SY-103. It includes historical data and information about the tank and its contents and estimates of concentrations and inventories for waste components based on the most recent analytical data. The tank contents were sampled and analyzed in 1986 and in 1994. A comparison of the historical information with the 1994 analytical data is provided. The report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1996), Milestone M-44-09.

### 1.1 PURPOSE

The purpose of this report is to summarize historical information about tank use and to estimate its contents. When possible, the information will be used to assess issues associated with safety, operations, environmental issues, and process development activities. References to additional technical information about the tank and its contents are also provided.

### 1.2 SCOPE

Before core sampling tank 241-SY-103, auger sampling of the tanks crust was performed in support of the *Data Requirements Developed Through the Data Quality Objectives Process for the Crust Burn Issue Associated with Flammable Gas Tanks* (Johnson 1994).

The 1994 sampling centered on safety concerns and the need for data on fundamental chemical, radiological, and physical properties of the tank waste. Push-mode core samples were taken in August and September of 1994 for support of the *Tank Safety Screening Data Quality Objective (DQO)* (Babad and Redus 1994), and the *Flammable Gas Tank Safety Programs: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objective (DQO) Process* (McDuffie and Johnson 1994). The data gathered for the flammable gas DQO were intended to provide insight on the mechanisms of gas generation, retention, and release. In addition, gas behavior in the tank was to be modeled to support safety analysis and development of mitigation methods. Discussion of gas generation, retention, and release mechanisms and mitigation efforts is outside the scope of this report.

Many of the requirements for the safety screen DQO are similar to the flammable gas DQO. Data to support waste energetics, criticality, and tank vapor flammability were generated in the 1994 core sampling event. The measurements performed in the 1994 sampling event are described in Section 3.0.

The goal of the 1986 tank sampling was to determine the physical, rheological, chemical, and radiochemical properties of the tank waste before transferring it to tank 241-AP-107. This transfer did not take place. Pre-May 1989 data should not be used for decision making because adequate quality control information is not available for assessing data quality.

**2.0 HISTORICAL TANK INFORMATION**

Tank 241-SY-103 is in restricted service as a result of safety concerns related to hydrogen gas generation. The current tank status is available in routinely updated reports (Hanlon 1995). This section provides information about tank design, waste transfer history, waste temperature, and surface level.

**2.1 TANK STATUS**

According to Hanlon (1996), tank 241-SY-103 contains the volumes of waste shown in Table 2-1. As in tank 241-SY-101, three layers are expected: crust, convective, and nonconvective layers (Fox et al. 1993 and Schreiber 1994b). The tank integrity is sound, and it is in service. However, tank operations are restricted because the tank is on the Flammable Gas Watch List and has an associated unreviewed safety question.

Table 2-1. Estimated Tank Contents.

Waste Form	Estimated Volume <sup>1</sup>	
	Kiloliters	Kilogallons
Total waste	2,824	746
Supernatant liquid	640	160
DSS	2,169	573
Sludge	0	0
Saltcake	15	4
Drainable interstitial liquid	0	0
Drainable liquid remaining	640	169
Pumpable liquid remaining	640	169

Note:

<sup>1</sup>For definitions and calculation methods, refer to Appendix C (Hanlon 1996).

Tank 241-SY-103 is equipped with an automated liquid surface-level gauge and a manual tape. (The manual tape was out of service when the 1995 Hanlon report was compiled.)

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The waste depth is approximately 6.88 m (22.58 ft). Except for the manual tape, all monitoring systems are in compliance with established standards. For information about waste levels and temperatures, see Section 2.4.

Most tank 241-SY-103 waste is complexant concentrate (CCPLX) and double-shell slurry (DSS), concentrated process streams associated with waste tank flammable gas safety issues (WHC 1994 and McDuffie and Johnson 1994). Tank 241-SY-103 has been on the Flammable Gas Watch List since January 1991 (Hanlon 1995). A standard hydrogen monitoring system was installed in June 1994. Flammable gas is believed to be generated in the tank waste in quantities that may accumulate to levels approaching the LFL of hydrogen in air or hydrogen in nitrous oxide (Fox et al. 1993). An unreviewed safety question has been declared because a fuel (hydrogen) and an oxidizer (nitrous oxide) may coexist in the waste mass. A related safety issue is a concern that a chemical reaction could occur in the crust layer (crust burn) as a result of gas burn or intrusive activities (Schreiber 1994a).

## 2.2 TANK DESIGN

Tank 241-SY-103 is one of three double-shell tanks that comprise the SY Tank Farm. The SY Tank Farm contains the only double-shell tanks in the 200 West Area of the Hanford Site (see Figure 2-1). The tanks, which were designed to hold concentrated waste, were completed in 1977. For more information about the SY Tank Farm and double-shell tanks, refer to the *Tank Characterization Reference Guide* (De Lorenzo et al. 1994).

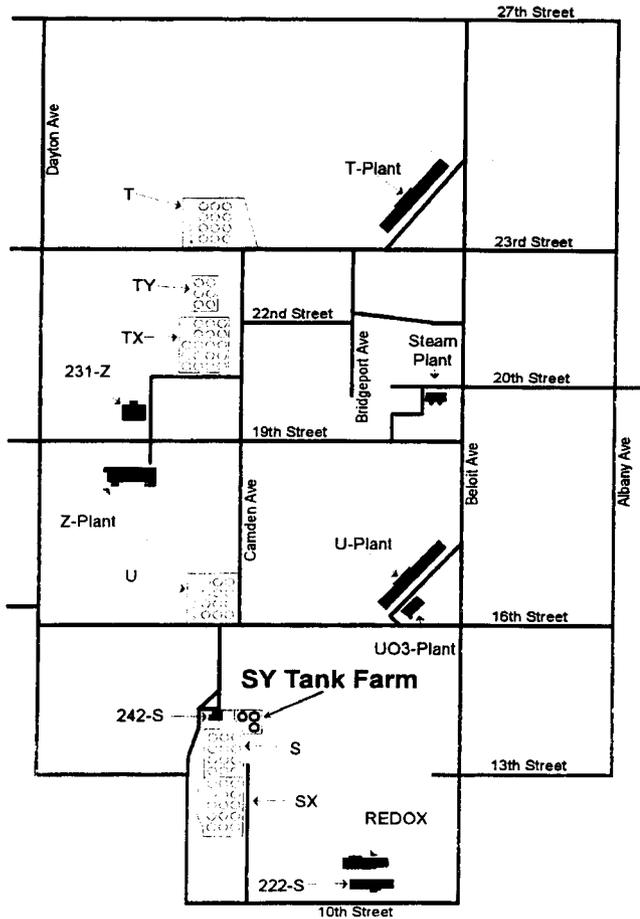
Like other double-shell tanks, tank 241-SY-103 was fabricated as three concentric tanks consisting of two steel liners within a protective concrete shell (see Figure ES-1). The protective shell is constructed of reinforced concrete designed to sustain soil loads and temperature gradients generated by the contained radioactive waste (WHC 1994). The inner wall of the concrete shell is lined with a carbon-steel liner called the secondary tank. The primary tank, also constructed of carbon steel, is completely enclosed within the secondary tank. The primary tank is freestanding. It sits on an insulating concrete pad that protects the structural concrete foundation from excessive temperatures during the annealing treatment, or stress relief, of the primary tank. The insulating pad is cast with air distribution and drain grids to provide leak detection, maintain a uniform tank bottom temperature, facilitate heat removal, and eliminate pockets of water condensation. An annular space, which separates the two steel liners, is a containment barrier to any primary tank leaks. The tanks are actively vented to the environment through high-efficiency particulate air filters. The primary ventilation system removes vapors from the primary tank and maintains negative pressure in relation to the atmosphere. The annulus ventilation system cools the primary tank, removes moisture from annular space, and helps detect radioactive leaks.

Tank 241-SY-103 has a maximum storage capacity of 4,390 kL (1,160 kgal) and a nominal capacity of 4,370 kL (1,150 kgal) (WHC 1994). It has an inside diameter of 22.9 m (75 ft), and it is 14.2 m (46 ft 9 in.) high at the crown.

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Figure 2-1. Location of the SY Tank Farm.



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Tank 241-SY-103 has 24 risers that penetrate the primary tank dome and provide access for waste transfers, sampling, tank monitoring, and ventilation. Additional risers access the annulus (DOE 1994). Instruments monitor the pressure, temperature, liquid level, sludge level, and other bulk tank characteristics. Waste has been added and removed through risers that enter tank 241-SY-103 through the central pump pit. Riser locations are shown in Figure 2-2. For additional riser information, see Anderson (1992).

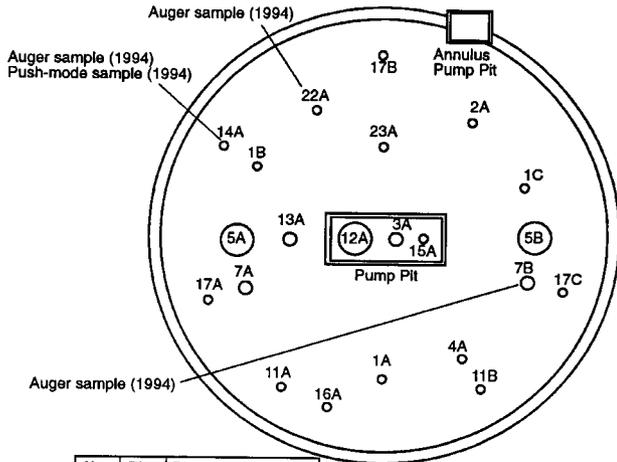
### 2.3 PROCESS KNOWLEDGE

Tank 241-SY-103 began operating in 1977 and received concentrated wastes. Two years later the tank contained more than 3,600 kL (950 kgal) of CCPLX waste. During 1980, the tank was pumped down to a waste heel of about 466 kL (123 kgal), then received DSS. During 1985, the tank received small transfers of uranium ion exchange sludge. The uranium sludge was generated from groundwater pumped from beneath a crib near U-Plant, then processed through ion-exchange resins. During 1988 and 1989, the tank received saltwell liquid and waste water from the 200 West Area. For additional information on the waste transfer history of the tank, see Section 2.3.1.

Since 1979, waste level fluctuations in tank 241-SY-103 have been observed at times when waste was not added or removed from the tank (Welty 1988). The fluctuations are attributed to the accumulation and release of gases, mainly hydrogen (gas release events). Tank 241-SY-103 contains waste forms that are similar to the constituents in tank 241-SY-101. Both tanks generate and house accumulated gases. This phenomenon is shown by rising surface levels followed by periodic gas releases and subsequent surface level drops. From January 1989 to July 1993, 12 gas release events were observed in tank 241-SY-103 with an average period between events of 135 days (Fox et al. 1993). During these events, surface level decreases were measured ranging from 1.8 cm (0.7 in.) to 5.8 cm (2.3 in.). Unlike tank 241-SY-101, which has experienced much larger releases historically, the pressure in the headspace of tank 241-SY-103 remained below atmospheric pressure for each event. Since 1990, the period between gas release events appears to be increasing with the longest period being 302 days. This may be the result of cooling temperatures in the tank. Prior to 1985, waste level fluctuations in tank 241-SY-103 were random (Harmon 1993). In the latter half of 1985, after uranium ion-exchange wastes were pumped into the tank, the magnitude of the surface level fluctuations appeared to increase.

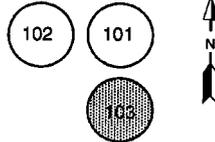
Figure 2-3 shows the fill history of the tank based on information from Agnew et al. (1995), Anderson (1990), Fox et al. (1993), and Harmon (1993). The estimated amount of each major waste type added to the tank during its process history is shown in Table 2-2.

Figure 2-2. Riser Configuration for Tank 241-SY-103.



No.	Dia.	Description
1A	4 in.	Spare
1B	4 in.	Sludge Weight
1C	4 in.	Spare
2A	4 in.	ENRAF Gauge
3A	12 in.	Supernate Pump
4A	4 in.	Thermocouple Probe
5A	42 in.	Spare
5B	42 in.	Video Camera
7A	12 in.	Exhaust Port
7B	12 in.	Spare
11A	4 in.	Spare
11B	4 in.	Pressure Transmitter
12A	42 in.	Supernate Addition
13A	12 in.	Observation Port
14A	4 in.	Spare
15A	4 in.	Droplag Nozzle
16A	4 in.	Spare
17A	4 in.	Manual Tape
17B	4 in.	MIT
17C	4 in.	Sludge Weight
22A	4 in.	Spare
23A	4 in.	Sludge Weight

241-SY Tank Farm



2G95100626.1

Figure 2-3. Tank 241-SY-103 Fill History.

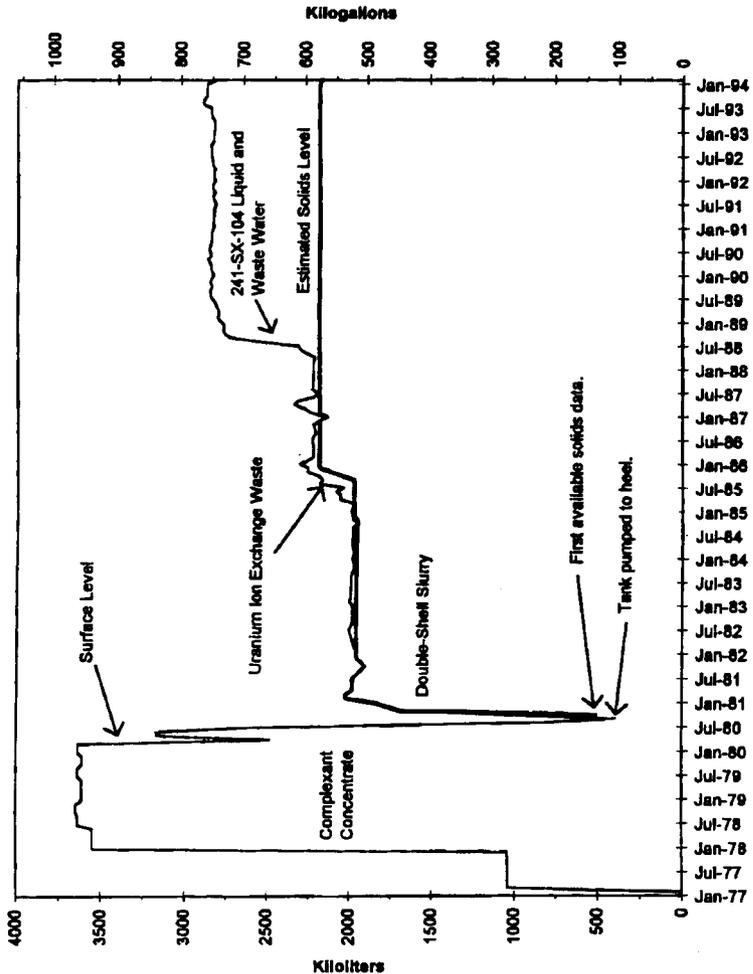


Table 2-2. Summary of Major Waste Transfers<sup>1</sup>.

Waste Type	Period Received	Estimated Volume
Complexant concentrate <sup>2</sup>	1977 to 1980	466 <sup>3</sup> kL (123 kgal)
Double-shell slurry	1980	1,590 kL (420 kgal)
Uranium ion exchange eluate	1985	121 kL (32 kgal)
Tank 241-SX-104 supernate	1981 to 1989	496 kL (131 kgal)

## Notes:

<sup>1</sup>Volumes are from Fox et al. (1993).

<sup>2</sup>CCPLX also includes B Plant high strontium waste and evaporator residual liquor.

<sup>3</sup>The estimated CCPLX volume represents the heel remaining in the tank after most CCPLX was removed.

### 2.3.1 Waste Transfer History

During 1977 to 1979, tank 241-SY-103 received concentrated wastes from B Plant cesium and strontium recovery campaigns (Anderson 1990 and Agnew et al. 1995). This waste, CCPLX and residual evaporator liquid, is rich in complexing agents such as sodium salts of ethylenediaminetetraacetate (EDTA) and glycolic acid (Agnew 1995).

Most of the CCPLX waste was transferred from the tank in 1980 leaving a heel of about 466 kL (123 kgal) (Agnew et al. 1995). During 1980, about 1,590 kL (420 kgal) of DSS was received from the 242-S Evaporator (Fox et al. 1993). The DSS is the most concentrated product produced by Hanford Site evaporators (Strode et al. 1988). This waste was concentrated beyond the aluminate solubility boundary. It is highly viscous and has high concentrations of hydroxide, nitrate, carbonate, and aluminate (Agnew 1995).

Other than small amounts of water, no other transfers involving this tank occurred until 1985. From June to November of 1985, approximately 121 kL (32 kgal) of uranium sludge from ion-exchange processing were placed on top of the DSS. This waste consisted of a solution of sodium nitrate and sodium hydroxide that contained about 690 kg of uranium (Fox et al. 1993).

There have been no transfers from tank 241-SY-103 since January 1981. However, between 1981 and 1989, small additions of waste water were made from catch tanks, sumps, and evaporator flushes as well as saltwell liquid from single-shell tanks (Agnew et al. 1995 and Fox et al. 1993). The most significant waste addition after the 1985 uranium sludge transfer

was approximately 496 kL (131 kgal) of liquid waste from the saltwell pumping of tank 241-SX-104 from 1988 to 1989 (Fox et al. 1993). Tank 241-SX-104 was storing DSS feed at the time of the pumping. No waste has been added since 1990 (Koreski 1995).

### 2.3.2 Historical Estimate of Contents

Tank inventory estimates based on the tank layer model, waste status and transaction record summary, and Hanford defined waste types, have been developed for tank 241-SY-103 by the Los Alamos National Laboratory (Brevick 1995). Table 2-3 shows the historical tank content estimate based on the supernatant mixing model (Brevick 1995). Table 2-3 data are shown as model predictions only and are not intended to be used for decision-making for the waste in tank 241-SY-103.

Waste, which was added to the tank at various times, has settled into layers that vary from sludge (lower depths) to liquid (toward the top). From the bottom up, the solids in the lowest region are expected to consist of the following: a heel of CCPLX from the early process history, DSS, and uranium ion-exchange sludge. A less dense layer of supernate is on top of the solids layer; it consists of waste water and other liquid waste transfers. Sampling confirms the existence of a crust layer at the waste surface (Schreiber 1994b). Similar to tank 241-SY-101 waste, the solid layers of waste on the tank 241-SY-103 bottom appear to be nonconvective, and the supernate region farther up appears to be convective so that the waste appears to circulate naturally (Fox et al. 1993).

Based on the process history of tank 241-SY-103, the following assumptions can be made about its major waste constituents. The lower regions of waste are expected to contain large amounts of organic complexants from the CCPLX heel left in the tank in 1980. Large concentrations of aluminate are expected from the DSS, the predominant waste type in the tank.

Table 2-3. Historical Tank Content Estimate Total Inventory.<sup>1,2</sup> (2 sheets)

Physical Properties			
Total waste	4.21E+6 kg (758 kgal)		
Heat load	5.36 kW (1.83E+4 Btu/hr)		
Bulk density <sup>3</sup>	1.47 g/cm <sup>3</sup>		
Water wt% <sup>3</sup>	45.7 wt%		
TOC wt% carbon (wet) <sup>3</sup>	1.08 wt% carbon		
Chemical Constituents	mole/L	ppm (µg/g)	kg
Na <sup>+</sup>	9.94	1.56E+5	6.56E+5
Al <sup>3+</sup>	1.40	2.56E+4	1.08E+5
Fe <sup>3+</sup> (total Fe)	2.74E-3	1.04E+2	4.40E+2
Cr <sup>3+</sup>	3.21E-2	1.14E+3	4.79E+3
Bi <sup>3+</sup>	1.61E-3	2.29E+2	9.64E+2
La <sup>3+</sup>	1.48E-5	1.40	5.91
Hg <sup>2+</sup>	9.81E-6	1.34	5.65
Zr [as ZrO(OH) <sub>2</sub> ]	9.84E-4	6.11E+1	2.58E+2
Pb <sup>2+</sup>	4.85E-5	6.84	2.88E+1
Ni <sup>2+</sup>	2.39E-3	9.54E+1	4.02E+2
Sr <sup>2+</sup>	1.57E-5	9.36E-1	3.94
Mn <sup>4+</sup>	8.08E-3	3.02E+2	1.27E+3
Ca <sup>2+</sup>	1.92E-2	5.24E+2	2.21E+3
K <sup>+</sup>	2.40E-2	6.39E+2	2.69E+3
OH <sup>-</sup>	6.06	7.01E+4	2.95E+5
NO <sub>3</sub>	3.00	1.27E+5	5.34E+5
NO <sub>2</sub>	2.84	8.90E+4	3.75E+5
CO <sub>3</sub> <sup>2-</sup>	3.69E-1	1.51E+4	6.36E+4
PO <sub>4</sub> <sup>3-</sup>	1.34E-1	8.66E+3	3.65E+4
SO <sub>4</sub> <sup>2-</sup>	2.81E-1	1.84E+4	7.76E+4
Si (as SiO <sub>3</sub> <sup>2-</sup> )	4.06E-2	7.77E+2	3.27E+3
F <sup>-</sup>	9.67E-2	1.25E+3	5.27E+3
Cl <sup>-</sup>	1.70E-1	4.11E+3	1.73E+4
citrate <sup>3-</sup>	3.45E-2	4.45E+3	1.87E+4
EDTA <sup>4-</sup>	2.15E-2	4.22E+3	1.78E+4
HEDTA <sup>3-</sup>	3.84E-2	7.17E+3	3.02E+4

Table 2-3. Historical Tank Content Estimate Total Inventory.<sup>1,2</sup> (2 sheets)

Chemical Constituents	mole/L	ppm ( $\mu\text{g/g}$ )	kg
glycolate <sup>-</sup>	1.04E-1	5.31E+3	2.24E+4
acetate <sup>-</sup>	1.48E-2	5.95E+2	2.51E+3
oxalate <sup>2-</sup>	5.60E-5	3.36	1.41E+1
DBP	1.64E-2	1.80E+3	7.57E+3
butanol	1.64E-2	8.27E+2	3.48E+3
NH <sub>3</sub>	4.69E-2	5.43E+2	2.29E+3
Fe(CN) <sub>6</sub> <sup>4-</sup>	0	0	0
Radiological Constituents			
Pu <sup>(4)</sup>	2.52E-2 ( $\mu\text{Ci/g}$ )	--	1.77 (kg)
U <sup>(4)</sup>	5.20E-3 (M)	843 ( $\mu\text{g/g}$ )	3.55E+3 (kg)
<sup>137</sup> Cs	0.386 (Ci/L)	263 ( $\mu\text{Ci/g}$ )	1.11E+6 (Ci)
<sup>90</sup> Sr	8.76E-3 (Ci/L)	5.97 ( $\mu\text{Ci/g}$ )	2.51E+4 (Ci)

## Notes:

<sup>1</sup>From Brevick (1995); the table data are shown as model predictions only and are not intended to be used for decision-making about the waste in tank 241-SY-103.

<sup>2</sup>Unknowns in tank solids inventory are assigned by the tank layer model (Agnew et al. 1995).

<sup>3</sup>Density was computed on a volume average; water weight percent and TOC weight percent carbon were computed on a mass average.

<sup>4</sup>Brevick (1995) does not indicate isotopic composition for plutonium or uranium. However, <sup>239/240</sup>Pu and <sup>238</sup>U are the predominate isotopes based on process knowledge.

## 2.4 SURVEILLANCE DATA

### 2.4.1 Surface Level Readings

The waste surface level in tank 241-SY-103 is measured with an automated ENRAF gauge and a manual tape (currently out of service) (Hanlon 1995). Surface level measurements are recorded daily. The ENRAF gauge went into service in July 1994 to replace a Food Instrument Corporation gauge (De Lorenzo et al. 1994). The ENRAF gauge determines the waste surface level by detecting variations in the weight of a displacer (a small disk) suspended in the tank through a riser (Hanlon 1995). The displacer, which is suspended on the end of wire wound onto a precision measuring drum, is lowered until a force transducer detects a change in the weight of the displacer, indicating contact with the waste surface has

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been made. The manual tape uses a conductivity electrode that is lowered until contact is established with the waste surface, indicated by the completion of an electrical circuit.

According to data from the Surveillance Analysis Computer System, the ENRAF gauge measured a surface level of 6.88 m (22.58 ft) on April 6, 1995. Surface levels were measured by the Food Instrument Corporation and ENRAF gauges from 1981 through 1994 (see Figure 2-4). A closer examination of data from 1989 through 1993 shows a distinct saw-toothed pattern of gas accumulation and release (see Figure 2-5). The current surface level is not expected to be equal to the sum of all the major and minor waste additions over the process history of the tank because of the cycles of slurry growth and subsequent gas releases. In addition, the surface level is also affected by evaporation and condensation processes (Fox et al. 1993).

#### 2.4.2 Internal Tank Temperatures

Temperatures in tank 241-SY-103 are measured by thermocouple probes assembled in a tree that enters the tank at riser 4A located 6.1 m (20 ft) from the tank's center (see Figure 2-2). The lowest-elevation operational thermocouple (thermocouple 2) is 23 cm (9 in.) above the tank bottom; other thermocouples are spaced at 61-cm (24-in.) intervals (Tran 1993). The thermocouples are iron-constantan type J with an average error of  $\pm 2.5$  °C (4.5 °F) (Scaief 1991). The maximum in-tank temperature on April 6, 1995 was 34.4 °C (94 °F) measured at thermocouple 3. Waste temperatures recorded by thermocouples 2, 4, and 6 indicate the waste is cooling (Fox et al. 1993). A least squares linear fit of average temperatures from these three thermocouples indicates a cooling rate of 2.7 °C (4.86 °F) per year. The highest temperature ever recorded in the tank was 47.2 °C (117 °F) at thermocouple 2 in May 1991. In-tank temperatures have remained within operating and design specifications (WHC 1994).

Figure 2-6 shows temperatures recorded from thermocouples 2, 6, and 12 from January 1991 to December 1994. The tank waste regions measured by the thermocouples are not well defined. However, examination of data from previous core sampling and temperature histories indicates thermocouple 2 is probably within the nonconvective region, thermocouple 6 may be within the lower part of the convective layer, and thermocouple 12 is probably within the crust layer (Fox et al. 1993). The relationship of the temperature readings from thermocouples 6 and 12 in recent years suggests both are near the temperature of the convective region, which was not the case prior to 1991. The crust layer may have been thicker at that time, providing additional heat flow resistance for heat traveling to the dome air. After the last date (October 1994) on Figure 2-6, thermocouple 12 acts like a vapor space temperature and doesn't follow thermocouple 6 as closely. Thermocouple 12 elevation is about the same as the waste level.

A Multifunctional Instrument Tree in riser 17B measures temperatures (with type K thermocouples). The peak temperature measured is approximately 100 °F. The convective layer is approximately 90 °F. This is comparable to those measured in riser 4A (98 °F

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Figure 2-4. Tank 241-SY-103 Surface Levels 1981 to 1994.

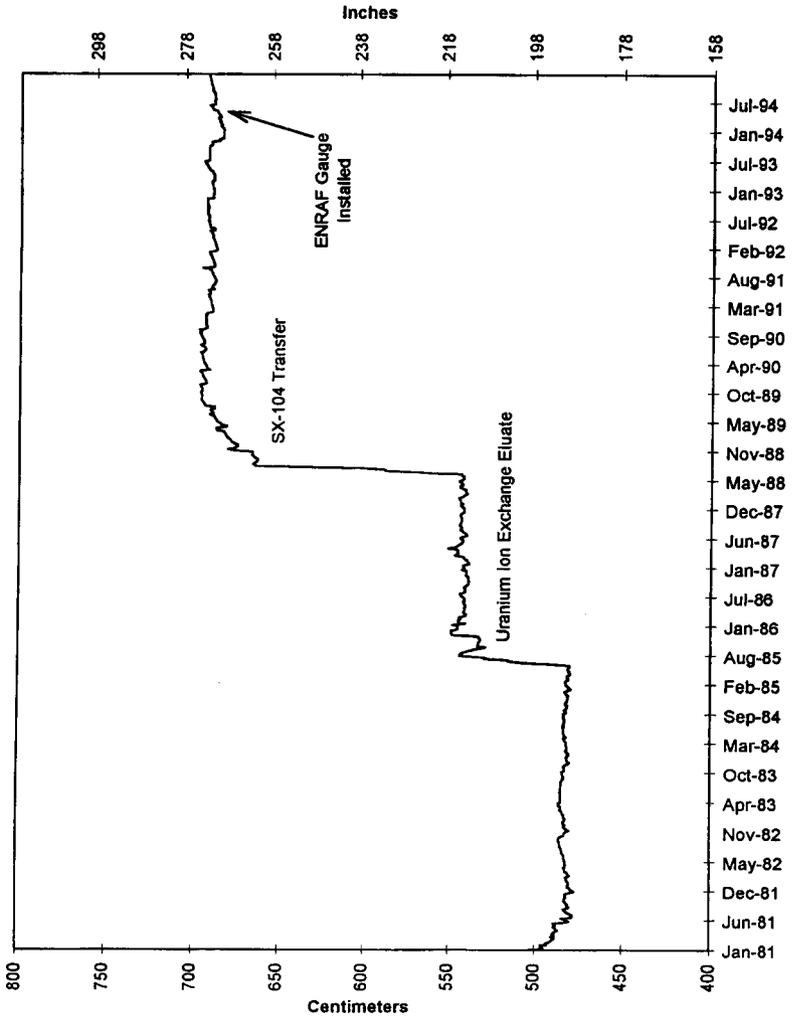


Figure 2-5. Tank 241-SY-103 Surface Levels June 1989 to June 1993.

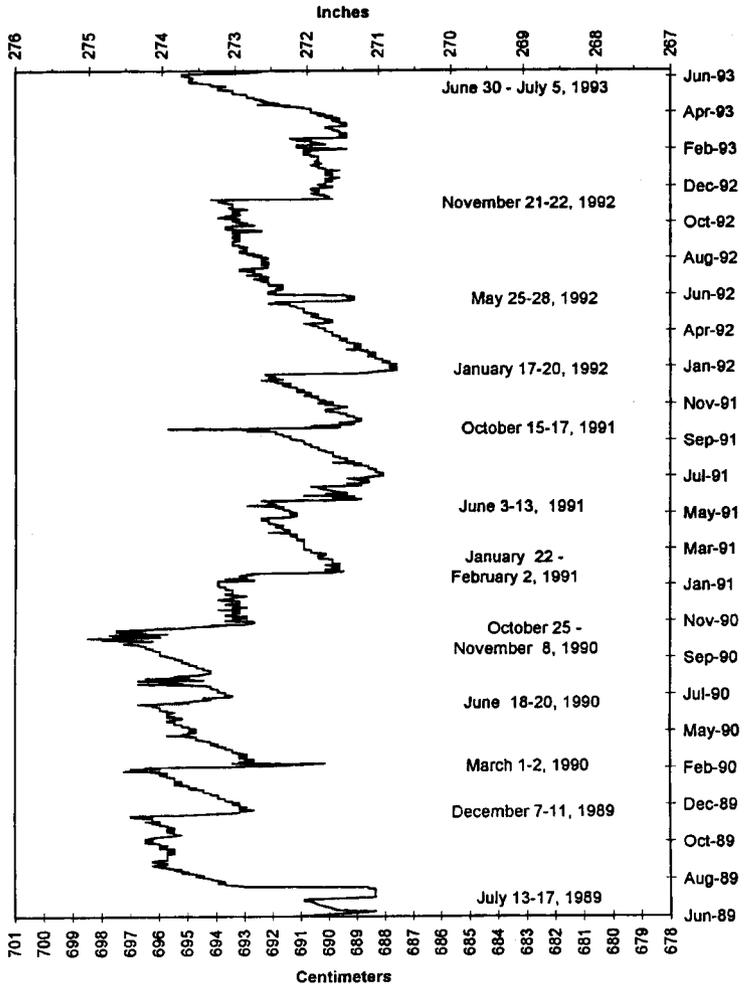
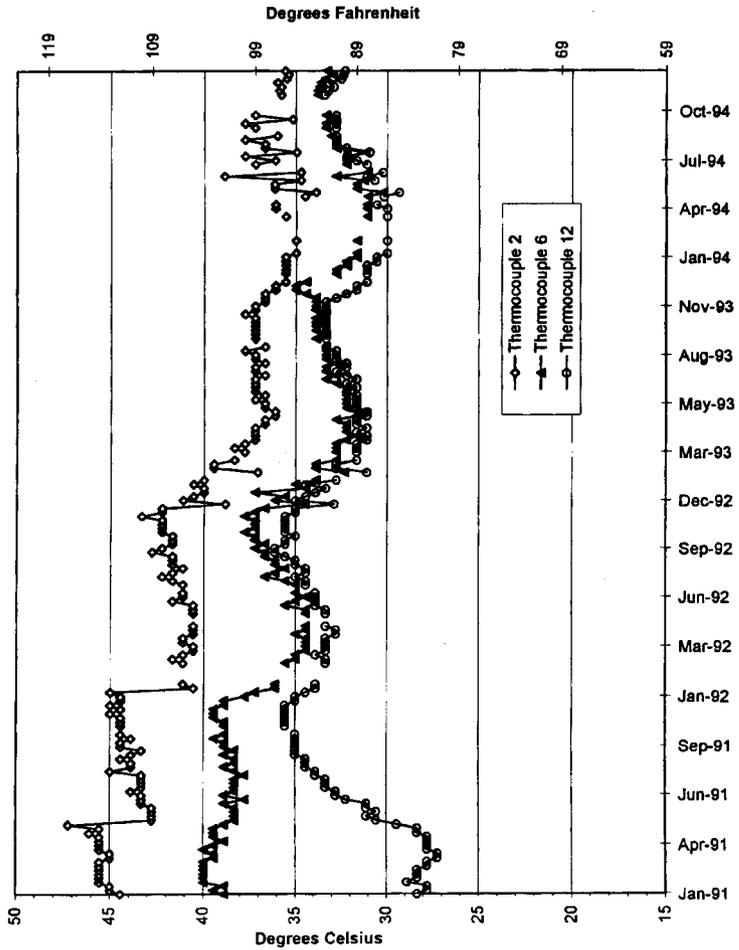


Figure 2-6. Tank 241-SY-103 In-Tank Temperature History.



and 93 °F). Data from the Multifunctional Instrument Tree can help establish the boundary between convective and nonconvective layers. Figure 2-7 shows the axial temperature profile along with the core segment location (Wilkins 1995b).

### 2.4.3 Gas Monitoring

Hydrogen gas is measured in the exhaust gas using a standard hydrogen monitoring system. The system consists of two Whittaker cells. One cell has a range of 0 to 1 percent; the other has a range of 0 to 10 percent. For a description of the standard hydrogen monitoring system and gas monitoring results, see Wilkins (1995a).

Grab samples indicate that the baseline hydrogen concentration is below 100 ppm (0.01 percent). Gas release events have occurred approximately every two to four months since December 1994. The highest hydrogen concentration measured during these events was 0.294 volume percent on May 2, 1995, which is equivalent to 7.4 percent of the LFL for hydrogen.

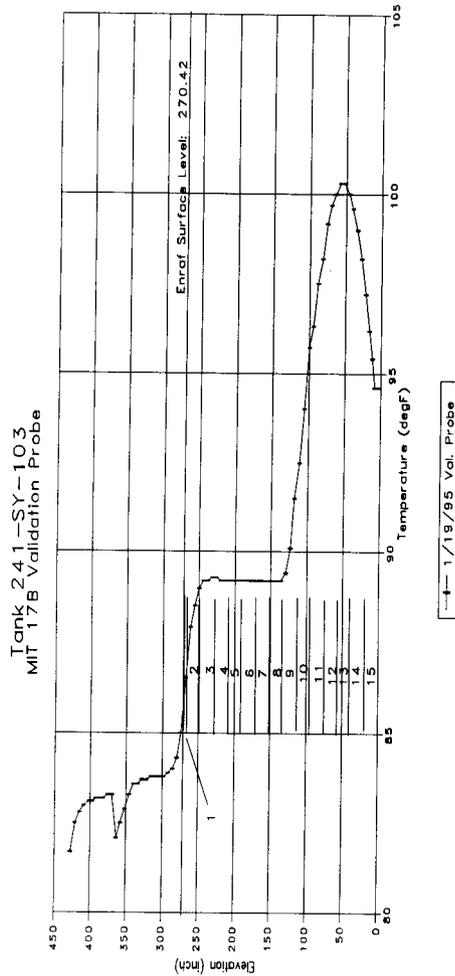
Nitrous oxide, ammonia, and methane have been measured in addition to hydrogen. Nitrous oxide concentrations ranged from 4 to 39 ppm in grab samples taken in August and September of 1994. Two grab samples taken during the March 2, 1995 gas release had N<sub>2</sub>O results of 630 and 900 ppm. Grab samples taken in August 1995 detected methane at 12 and 15 ppm.

Ammonia was measured in the vent header from mid-December to mid-January (1994 to 1995). Concentrations ranged from 40 to 180 ppm. Ammonia is also measured at the SY Tank Farm stack exhaust to detect any ammonia from the three SY tanks. The estimated contribution of ammonia from tank 241-SY-103 at the time of the peak concentration at the SY Tank Farm stack during the May 2, 1995, gas release from tank 241-SY-103 was 486 ppm, which is equivalent to about 0.3 percent of the LFL for ammonia.

### 2.4.4 In-Tank Photographs

The interior of tank 241-SY-103 was most recently photographed in October 1985. Approximately 492 kL (130 kgal) of waste was added to the tank since the photographs were taken; therefore, the photographs no longer reflect current conditions in the tank and are not included in this report. A TV camera, that permits viewing of the waste surface, is installed in the tank headspace.

Figure 2-7. Tank 241-SY-103 MIT 17B Validation Probe Results.



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### 3.0 TANK SAMPLING OVERVIEW

This section describes three sampling events associated with tank 241-SY-103. A push-mode core was acquired in August and September of 1994 in support of the *Tank Safety Screening Data Quality Objective (DQO)* (Babad and Redus 1994), the *Flammable Gas Tank Safety Program: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objective Process* (McDuffie and Johnson 1994), and *Tank 241-SY-103 Tank Characterization Plan* (Schreiber 1994b and 1995). In June 1994, auger sampling and analysis of the tank's crust material were completed to ensure that further core sampling could be carried out in a safe manner. In 1986, core samples were taken from tank 241-SY-103 in support of retrieval, transport, and pretreatment characterization activities.

Results for the 1994 push-mode core sampling event may be found in *45-Day Safety Screen Results for Tank 241-SY-103, Core 62* and *216-Day Final Report for Tank 241-SY-103 Push Mode, Core 62* reports (Rice 1994 and 1995). The results for the auger sampling event are given in the *45-Day Deliverable for Tank 241-SY-103* (Kocher 1994) and the *136-Day Deliverable for Tank 241-SY-103 Auger Samples, Risers 7A, 14B, and 22A* (Bell 1994). The results for the 1986 sampling event are reported in *Tank 103-SY Dissolution Study - Results of Physical Measurements* (Prignano 1988a), *Tank 103-SY Dissolution Study - Results of Chemical Analyses* (Prignano 1988b), and *Characterization of Waste from Double-Shell Tank 103-SY, A Letter Report for Rockwell Hanford Operations* (Fow et al. 1986). Pre-May 1989 data may not be acceptable for waste decisions because adequate quality control information for the data is not available to assess data quality and enable confident decisions.

#### 3.1 DESCRIPTION OF THE 1994 CORE SAMPLING EVENT

During August and September of 1994, one push-mode core was obtained from riser 14A of tank 241-SY-103. The core consisted of 15 segments and was numbered core 62. A solution of 0.3 molar (*M*) lithium bromide was used for the hydrostatic head fluid (HHF). Originally, a second core sample was planned, but it was not acquired because of safety concerns related to sample pressurization of the last core segment. Because the second core has not been acquired, the duplicate sampler requirements of the tank safety screening DQO have not been met for this tank (Babad and Redus 1994).

Table 3-1 summarizes the sampling information for this event. The third column lists the approximate elevation of the top of each segment as measured from the bottom of the tank, using the solids level measurement of 6.86 m (22.5 ft) taken by manual tape in July 1994 (Schreiber 1994b). It should be noted that the first segment was only to a depth of 10 cm (4 in.). The depth information is given as a guide and is not precise. Table 3-1 also

Table 3-1. Tank 241-SY-103 Core 62 Sampling Information<sup>1</sup>.

Segment Number	Customer Sample Number	Sample Elevation <sup>2</sup> (cm)	Sample Date <sup>3</sup>	Date Received by 222-S Laboratory <sup>3</sup>	Extrusion Date <sup>3</sup>	Drill String Dose Rate (R/hr)
<b>Riser 14A</b>						
1	94-005	714	8/19/94	8/22/94	8/24/94	2
2	94-006	666	8/19/94	8/22/94	8/24/94	2.2
3	94-007	617	8/23/94	8/25/94	8/26/94	2.2
4	94-008	569	8/23/94	8/25/94	8/26/94	2
5	94-009	521	9/8/94	9/9/94	9/12/94	2.2
6	94-010	473	9/13/94	9/15/94	9/16/94	2.5
7	94-011	425	9/13/94	9/15/94	9/16/94	2
8	94-012	376	9/13/94	9/15/94	9/19/94	2
9	94-013	328	9/13/94	9/15/94	9/19/94	1.9
10	94-014	280	9/13/94	9/15/94	9/20/94	1.7
11	94-015	232	9/16/94	9/19/94	9/21/94	1.9
12	94-016	183	9/16/94	9/19/94	9/22/94	1.7
13	94-017	135	9/16/94	9/19/94	9/23/94	1.8
14	94-018	87	9/19/94	9/21/94	9/23/94	1.8
15	94-019	39	9/19/94	9/21/94	9/26/94	1.5
field blank <sup>4</sup>	n/a	n/a	n/a	n/a	n/a	n/a
HHF		n/a			n/a	n/a

## Notes:

n/a = not available

<sup>1</sup>Rice (1994)<sup>2</sup>As measured from the bottom of the tank to the top of the core segment; values are approximate.<sup>3</sup>Dates are listed in the mm/dd/yy format.<sup>4</sup>The 222-S Laboratory has no record of receipt or analysis of a field blank.

provides the sample date, the date the sample was received by the laboratory, the date the sample was extruded, and the drill string dose rate as reported in chain-of-custody documentation.

The 241-SY-103 tank characterization plan for the push-mode sampling and analysis required the collection of an HHF sample and a field blank of deionized water (Schreiber 1995). The HHF sample, which was taken from the HHF batch used during push-mode sampling, was used to determine the original lithium and bromide concentrations in the HHF. These concentrations may then be used to subsequently correct for HHF water contamination of the samples should the lithium and bromide analyses of the core samples reveal that such contamination occurred. The HHF sample was collected and sent to the 222-S Laboratory as directed by the tank characterization plan. However, Rice (1995) contains no record of the receipt or analysis of a deionized water field blank; therefore, the field blank requirement of Schreiber (1995) was not satisfied.

### **3.1.1 1994 Core Sample Handling**

The samples were extruded and subsampled in the 222-S Laboratory hot cell. Table 3-2 lists the segment number, the percent of sample recovered, the liquid volume of the segment, the solid mass of the segment, and a description of the sample. A flow chart of the sample breakdown is described in the sample and analysis plan (Schreiber 1994a).

The only problems noted were during the extrusion of segments 3 and 15. When the valve for segment 3 was first opened, no liquid sample appeared. Apparently a solid plug had formed. Once the extrusion began, this solid plug was pushed onto the tray followed rapidly by the drainable liquid. Some liquid was lost out the back of the sample tray, and much of the solid was carried into the drainable liquid jar with the liquid. When segment 15 of core 62 was extruded in the 222-S Laboratory hot cell, internal pressure in the sampler caused approximately 20 mL of sample material to be sprayed on the wall of the hot cell. This pressurization was not anticipated. No injuries or imminent safety hazards resulted from the release (Rice 1994).

After extrusion, each segment of core 62 was divided into two subsamples: segments 1 through 9 and segment 15 were divided into drainable liquids and solids, segments 10 through 14 did not contain any drainable liquid and were divided into upper and lower segment halves. The drainable liquid subsamples were analyzed by DSC and thermogravimetric analysis (TGA); DSC, TGA, and total alpha activity determinations were performed on the solids from segments 1 through 9 and segment 15 and the upper and lower segment halves from segments 10 through 14. Each subsample underwent safety screening analysis according to Schreiber (1994b). In addition, an HHF sample used during sampling was analyzed for lithium and bromide.

Table 3-2. Tank 241-SY-103 Core 62 Subsampling Information<sup>1</sup>. (2 sheets)

Segment Number	Sampler Recovery (percent)	Drainable Liquid (mL)	Solid (g)	Sample Description
1	91	262	22	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
2	91	272	9.6	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
3	91	~ 262 (±10)	5.8	When the valve was first opened, no liquid sample appeared. When the extrusion began, the solid material was pushed onto the tray followed rapidly by the drainable liquid. Some liquid was lost out the back of the sample tray and much of the solid was carried into the drainable liquid jar with the liquid. The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
4	100	295	33	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
5	95	270	36	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
6	92	260	34	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
7	88	262	22	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
8	98	295	22	The liquid was turbid and medium brown in color. The solids resembled dirty ice crystals, much like "snow cone" ice.
9	92	35	369	The drainable liquid was dark brown and opaque. The solid sample did not retain its shape following extrusion but spread slowly across the sample tray. The dark brown solids appeared homogeneous, with the consistency of thin, wet mud.

Table 3-2. Tank 241-SY-103 Core 62 Subsampling Information<sup>1</sup>. (2 sheets)

Segment Number	Sampler Recovery (percent)	Drainable Liquid (mL)	Solid (g)	Sample Description
10	85	0	381	This segment contained no drainable liquid. The lower half segment was dark brown and retained the shape of the sampler after extrusion. The upper half was more wet and did not retain its shape, with the upper quarter being similar in appearance to segment 9.
11	95	0	431	This segment contained no drainable liquid. The solid material was slightly different in color from segment 10, having a gray vs. a red cast to the otherwise homogeneous brown color. This change occurred gradually, without a layering effect. The sample retained its shape following extrusion and was slightly pitted at the surface.
12	95	0	382	This segment contained no drainable liquid. The solid material was gray brown in color, soft and damp in texture, much like segment 11. The sample retained its shape following extrusion and was slightly pitted at the surface.
13	95	0	429	This segment contained no drainable liquid. The solid material was gray brown in color, soft and damp in texture, much like segments 11 and 12. The sample retained its shape following extrusion and was slightly pitted at the surface.
14	80	0	352	This segment contained no drainable liquid. About 25 cm (10 in.) of solid were extruded, followed by a 10-cm (4-in.) air gap, then 10 to 13 cm (4 to 5 in.) of solids. The solid material was gray brown in color, soft and damp in texture, and was slightly pitted at the surface.
15	52	125	n/a	This segment was composed primarily of drainable liquid. When the sampler valve was opened, an estimated 20 mL of liquid sprayed onto the hot cell wall. The amount of solids was difficult to determine due to the runny texture.

Note:

n/a = not available

<sup>1</sup>Rice (1994)

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After the safety screening subsamples had been removed, the segments were visually evaluated for facies and strata. The drainable liquid was separated into the following subsamples: segments 1, 8, 9 and 15 (individual samples); and segments 2 through 7 (subsamples combined into a drainable liquid composite). The solids in segment 1, which were left behind after the liquid drained away, were identified as stratum 1 because they may contain crust material. Solids from segments 4 through 8 were combined into a stratum B composite (segments 2 and 3 contained insufficient solids to include in the composite). Segment 9 represented the liquid-solid interface, and the solids in it were treated as their own stratum (stratum C). Subsamples in segments 10 through 14 were collected into a composite labeled stratum D. Apparent sampling problems in segment 15 caused it to be analyzed separately.

Table 3-3 summarizes the subsampling and compositing of the extruded core segments. The table also includes the laboratory sample numbers and the analyses performed on each sample.

### 3.1.2 1994 Core Sample Analysis

This section provides information about the analysis of the 1994 core. Table 3-3 summarizes the core segment subsampling and compositing scheme and the analyses performed on each subsample and composite. Table 3-4 lists the sample preparation and analytical procedures used to perform the analyses.

Safety screening analyses were performed on the subsamples of core 62 according to the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994), the *Flammable Gas Tank Safety Program: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objective Process* (McDuffie and Johnson 1994), and the tank 241-SY-103 TCP (Schreiber 1994b and 1995). The safety screening DQO required that the safety screening analyses be performed on half segments. However, the flammable gas DQO required that analyses be performed on composite samples made from discrete core strata. To meet both requirements, the tank characterization plan instructed that sample aliquots for the safety screening analyses be taken without dividing the segment into half segments or disturbing the stratification of the segment. Aliquots were to be removed from both halves of the segment without homogenization, as if the segment had been divided into half segments.

The safety screening aliquots from core 62 were analyzed for energetics by DSC, percent water by TGA, and total alpha activity. The results from the safety screening analyses are reported in the *45-Day Safety Screen Results for Tank 241-SY-103, Core 62* (Rice 1994) and the *216-Day Safety Screen Results for Tank 241-SY-103 Push Mode, Core 62* (Rice 1995), and are included in Appendix A. For results from these reports, see Section 4.0.

Table 3-3. Tank 241-SY-103 Core 62 Summary of Subsamples and Analyses. (4 sheets)

Segment	Segment Portion	Labcore Number	Analyses
<b>Riser 14A</b>			
1	drainable liquid	S94T000008 S94T000009 S95T000281 S95T000323	DSC, TGA ICP DSC, TGA, pH, TOC ICP
	solids (Stratum A)	S94T000004 S94T000005 S94T000006 S94T000265 S94T000266 S94T000267 S94T000268	DSC, TGA AT, ICP, uranium, radionuclides density pH, TIC, TOC ICP IC, hydroxide, chromium(VI), tritium GEA, radionuclides
2	drainable liquid	S94T000015 S94T000016	DSC, TGA ICP
	solids	S94T000011 S94T000012	DSC, TGA AT, ICP
3	drainable liquid	S94T000025 S94T000026	DSC, TGA ICP
	solids	S94T000020 S94T000021	DSC, TGA AT, ICP
4	drainable liquid	S94T000032 S94T000033	DSC, TGA ICP
	solids	S94T000028 S94T000029	DSC, TGA, TOC AT, ICP
5	drainable liquid	S94T000040 S94T000041	DSC, TGA ICP
	solids	S94T000036 S94T000037	DSC, TGA AT, ICP
6	drainable liquid	S94T000105 S94T000109	DSC, TGA ICP
	solids	S94T000055 S94T000064	DSC, TGA AT, ICP
7	drainable liquid	S94T000106 S94T000110	DSC, TGA ICP
	solids	S94T000056 S94T000065	DSC, TGA AT, ICP

Table 3-3. Tank 241-SY-103 Core 62 Summary of Subsamples and Analyses. (4 sheets)

Segment	Segment Portion	Labcore Number	Analyses
8	drainable liquid	S94T000082 S94T000107 S94T000111 S95T000283 S95T000325 S95T000329 S95T000333	density DSC, TGA ICP DSC, pH, TGA, TOC ICP AT, total beta, uranium, radionuclides IC, hydroxide, chromium(VI), <sup>129</sup> I
	solids	S94T000057 S94T000066	DSC, TGA AT, ICP
9	drainable liquid	S94T000108 S94T000112	DSC, TGA ICP
	solids (Stratum C)	S94T000058 S94T000067  S94T000077 S94T000274 S94T000277 S94T000280 S94T000283 S95T000295	DSC, TGA AT, ICP, total beta, radionuclides, uranium density pH, TIC, TOC ICP IC, hydroxide, chromium(VI), tritium GEA, radionuclides <sup>99</sup> Tc
10	upper ½ aliquot	S94T000063 S94T000069	DSC, TGA AT, ICP
	lower ½ aliquot	S94T000070 S94T000068	DSC, TGA AT, ICP
11	upper ½ aliquot	S94T000072 S94T000119	DSC, TGA AT, ICP
	lower ½ aliquot	S94T000071 S94T000094	DSC, TGA AT, ICP
12	upper ½ aliquot	S94T000085 S94T000120	DSC, TGA AT, ICP
	lower ½ aliquot	S94T000090 S94T000095	DSC, TGA AT, ICP

Table 3-3. Tank 241-SY-103 Core 62 Summary of Subsamples and Analyses. (4 sheets)

Segment	Segment Portion	Labcore Number	Analyses
13	liner liquid	S95T000284 S95T000326 S95T000330 S95T000334	DSC, pH, TGA, TOC ICP AT, total beta, uranium, radionuclides IC, hydroxide, chromium(VI), <sup>129</sup> I
	upper ½ aliquot	S94T000088 S94T000121	DSC, TGA AT, ICP
	lower ½ aliquot	S94T000091 S94T000096	DSC, TGA, cyanide, TOC AT, ICP
14	upper ½ aliquot	S94T000089 S94T000122	DSC, TGA AT, ICP
	lower ½ aliquot	S94T000092 S94T000097	DSC, TGA, cyanide, TOC AT, ICP
15	liner liquid	S95T000262 S95T000285 S95T000327 S95T000331 S95T000335	density DSC, pH, TGA, TOC ICP AT, total beta, uranium, radionuclides IC, hydroxide, chromium(VI), <sup>129</sup> I
	drainable liquid	S94T000104 S94T000113	DSC, TGA ICP
	solids	S94T000093 S94T000098	DSC, TGA AT, ICP
Stratum A	see segment 1, solids		
Stratum B	composite of segments 4 to 8 solids	S94T000273 S94T000276 S94T000279 S94T000282 S94T000299  S95T000739	DSC, TGA, pH, TIC, TOC ICP IC, hydroxide, chromium(VI), tritium GEA, radionuclides ICP, AT, total beta, GEA, uranium, radionuclides density
Stratum C	see segment 9, solids		

Table 3-3. Tank 241-SY-103 Core 62 Summary of Subsamples and Analyses. (4 sheets)

Segment	Segment Portion	Labore Number	Analyses
Stratum D	composite of segments 10 to 14 solids	S94T000271 S94T000275 S94T000278 S94T000281 S94T000284 S94T000300  S95T000291 S95T000296	density DSC, TGA, pH, TIC, TOC ICP IC, hydroxide, chromium(VI), tritium GEA, radionuclides ICP, AT, total beta, GEA, uranium, radionuclides <sup>129</sup> I <sup>99</sup> Tc
Field Blank <sup>1</sup>	n/a	n/a	n/a
HHF	n/a	S94T000127	ICP, IC

Notes:

n/a = not applicable

<sup>1</sup>The 222-S Laboratory has no record of the receipt of a field blank.

Table 3-4. Core 62 Analytical Procedures. (2 sheets)

Analysis	Instrument or Method	Preparation Procedure <sup>1,2</sup>	Analytical Procedure <sup>1</sup>
DSC: energetics	Mettler™	n/a	LA-514-113, B-1
TGA: percent water	Mettler™ Perkin-Elmer™	n/a	LA-560-112, A-2 LA-514-114, B-0
AT/total beta: total alpha/beta activity	proportional counter	LA-505-158, A-4 LA-549-141, C-1	LA-508-101, D-2
Density: Solids	n/a	n/a	LO-160-103, A-7
Density: Liquids	n/a	n/a	LA-560-101
ICP: Lithium/metals	inductively coupled plasma spectrometer	LA-505-158, A-4 LA-505-159, B-2 LA-549-141, C-1	LA-505-151, D-1 LA-505-161, A-1
IC: Bromide/anions	ion chromatograph	LA-504-101, C-0	LA-533-105, C-2
GEA: Radionuclides	gamma detector spectrometer	LA-505-158, A-4 LA-549-141, C-1	LA-548-121, D-1
<sup>129</sup> Iodine	solvent extraction/GEA	n/a	LA-378-103, B-3 & B-4
<sup>90</sup> Strontium	precipitation/beta count	LA-505-158, A-4 LA-549-141, C-1	LA-220-101, D-1
<sup>99</sup> Technetium	solvent extraction/liquid scintillation count	LA-505-158, A-4 LA-549-141, C-1	LA-438-101, D-2
<sup>237</sup> Neptunium	solvent extraction/alpha count	LA-505-158, A-4 LA-549-141, C-1	LA-933-141, H-0 & H-1
<sup>241</sup> Am, <sup>243/244</sup> Cm	ion exchange/alpha energy analysis	LA-505-158, A-4 LA-549-141, C-1	LA-953-103, A-1 & A-2
<sup>238/239/240</sup> Pu	ion exchange/alpha energy analysis	LA-505-158, A-4 LA-549-141, C-1	LA-503-156, D-1
Uranium	laser phosphorescence	LA-505-158, A-4 LA-549-141, C-1	LA-925-009, A-0
Tritium	microdistillation/liquid scintillation count	LA-504-101, C-0	LA-218-114, A-3 & A-4

Table 3-4. Core 62 Analytical Procedures. (2 sheets)

Analysis	Instrument or Method	Preparation Procedure <sup>1,2</sup>	Analytical Procedure <sup>1</sup>
TIC/TOC: total inorganic/organic carbon	persulfate oxidation/coulometric detection	n/a	LA-342-100, A-0 LA-344-105, B-3
Chromium(VI)	spectrophotometry	LA-504-101, C-0	LA-265-101, A-2
Cyanide	microdistillation/spectrophotometry	n/a	LA-695-102, B-2
pH	glass electrode	n/a	LA-212-103, B-3
Hydroxide ion	potentiometric titration	LA-504-101, C-0	LA-211-102, B-1

Notes:

n/a = not applicable

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.

<sup>1</sup>Procedures refer to 222-S procedure numbers; procedure numbers (Lx-xxx-xxx) are followed by the revision code (X-X).

<sup>2</sup>LA-504-101 = solid-sample water digest, LA-505-158 = liquid-sample acid dilution, LA-505-159 = solid-sample acid digest, LA-549-141 = solid-sample, alkali-metal fusion

The TGA and DSC analyses were done on 5- to 20-mg specimens of the waste material under a nitrogen atmosphere; however, DSC samples S95T000085 and S95T000105 were inadvertently run in air. Duplicate samples of S95T000085 and S95T000105 were run under nitrogen; the DSC behavior under nitrogen and air appeared to be identical. Therefore, the results obtained under air were considered acceptable and are included in this report. The total alpha activity specimens were prepared by fusing a solid aliquot (0.2 to 0.5 grams) of the waste material in potassium hydroxide and dissolving, or digesting, the resultant fluxed material in hydrochloric acid. Total alpha activity was then determined on a liquid aliquot of the dissolved waste material.

Laboratory control standards and duplicate analysis quality control checks were applied to TGA, DSC, and total alpha activity analyses. Analysis of laboratory blanks and spikes was also applied to the total alpha activity analysis. For assessment of the quality control data, see Section 5.0 and Table A-1.

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The tank characterization plan required the analysis of all subsamples for lithium and bromide to determine the extent of HHF contamination (Schreiber 1995). Lithium was determined by inductively coupled plasma (ICP) and bromide by ion chromatography. These results are provided in Appendix A. Only segment 15 and the liquid in the cask liner showed large amounts of HHF.

Concentrations of HHF in segment 15 were too large to make accurate data corrections. Because of the HHF contamination in the sample, segment 15 results do not represent accurate estimates of the tank contents and should not be used. Segment 15 sample material was not included in the solids composite. Lithium and bromide concentrations were so low in other samples that data corrections were not necessary.

In addition to the safety screening analyses, the flammable gas DQO (McDuffie and Johnson 1994) and the tank characterization plan (Schreiber 1995) call out a number of additional assays to be performed. Selected subsamples and strata were analyzed for a variety of analytes including ICP metals, IC anions, radionuclides, TIC, TOC, hydroxide, cyanide, chromium IV, pH, and density. Physical characterization, that is, the determination of density, solids settling rate, viscosity, shear strength, and volume percent solids, was also performed on composited segments 10 through 14 (stratum D).

All reported analyses were completed using approved laboratory procedures (see Table 3-4). No deviations or modifications to the procedures were noted by the laboratory, except for DSC samples S95T000085 and S95T000105 which were inadvertently run in air.

### **3.2 DESCRIPTION OF JUNE 1994 AUGER SAMPLING EVENT**

The auger samples were obtained from June 2, 1994, through June 9, 1994, using risers 7B, 14A, and 22A (Bell 1994). The samples were taken to address "crust burn," the possibility of the waste crust in the tank becoming hot enough during intrusive (core) sampling activities to initiate an exothermic reaction or to ignite the radiolytically produced hydrogen gas (Schreiber 1994a). An auger sample was considered a satisfactory and safe way to evaluate the waste crust.

No problems with the sampling event were noted, except for a kinked bounding spring in the auger sampler for riser 22A which made it difficult to remove the auger from the sleeve.

Table 3-5 lists the sample date, extrusion date, sample mass, and a description of the sample. Table 3-6 provides additional information about the auger sampling event.

Table 3-5. Description of June 1994 Auger Samples<sup>1</sup>.

Riser	Sample Date <sup>2</sup>	Extrusion Date <sup>2</sup>	Sample Mass (g)	Sample Description
7B	6/8/94	6/9/94	10.7	Hard, dry brittle crust on flutes 1 to 4 and 6, white to light gray color. Different texture than subsequent samples.
14A	6/6/94	6/7/94	9.05	95 percent of material on flute 2, white to light brown color. Smaller amounts on flutes 1 and 3.
22A	6/2/94	6/7/94	20.5	4 to 5 mL liquid in liner not recovered. White, crusty material recovered from flutes 1 to 3; white and dark brown material from flute 4; dark brown material from flutes 5 to 8.

Notes:

<sup>1</sup>Bell (1994)

<sup>2</sup>Dates are in the mm/dd/yy format.

Table 3-6. Tank 241-SY-103 June 1994 Auger Sampling Information<sup>1</sup>.

Riser	Sample Number	Shipment Number	Cask Number	Cask Seal Number	Drill String Dose Rate (mR/hr)
22A	94-AUG-001	33783	C-1046	2297	160
14A	94-AUG-002	43663	C-1043	3756	60
7B	94-AUG-003	n/a	C-1054	n/a	n/a

Notes:

n/a = information not available

<sup>1</sup>Kocher (1994)

### 3.2.1 1994 Auger Sample Handling

After extrusion, the auger samples were subsampled for DSC, TGA, TIC, and TOC. Two subsamples were taken from each auger sample. The auger samples from risers 7B and 14A were subsampled by taking one subsample from the auger itself and the second subsample

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from the extrusion tray. The auger sample from riser 22A was subsampled by taking both subsamples from the auger only. These six subsamples were used for the DSC and TGA analyses. Composite samples were obtained for the TIC and TOC analyses for risers 7B and 14A by combining material remaining on the auger and the tray after the DSC and TGA subsamples were obtained. In the case of the auger obtained from riser 22A, two composites were taken. Composite 1 was composed of the white crust material on flutes 1 to 3, and composite 2 was composed of the dark brown material from flutes 4 to 8.

### 3.2.2 1994 Auger Sample Analysis

Schreiber (1994a) dictated the analyses to be performed on the auger samples, and the analyses were performed according to approved 222-S Laboratory analytical procedures (Bell 1994). The TGA was performed in duplicate directly on the subsamples to determine water content. The DSC analyses were performed in duplicate directly on the samples to screen for exothermic behavior. The TIC and TOC determinations were performed directly on the composite auger samples primarily to gather additional information about the waste. Appendix B tabulates the results for these samples.

## 3.3 DESCRIPTION OF THE 1986 CORE SAMPLING EVENT

In 1986, tank 241-SY-103 was sampled by Rockwell Hanford Operations. The samples were taken to evaluate the suitability of the waste to be transported by pipeline and treated in vitrification and grouting facilities. The information from that sampling event is in this report for comparison. Pre-May 1989 data should not be used for decision-making because adequate quality control information is not available. Using push-mode core sampling, one core with 12 segments was obtained (Fow et al. 1986). Core segments 2, 7, and 12 were chosen to characterize the tank waste.

Segment 2, suspected to contain uranium sludge, was a brown slurry containing solid particles approximately 0.16 cm (0.06 in.) in diameter. It was taken from a depth of 4.83 to 5.31 m (15.83 to 17.42 ft) from the tank bottom.

Segment 7, thought to consist of DSS, was also brown and grainy, with larger particles and less fluid than segment 2. This segment was taken at a depth of 2.41 to 2.9 m (7.92 to 9.5 ft) from the tank bottom. A large, rock-like particle about 0.64 cm (0.25 in.) in diameter and 0.25 cm (0.10 in.) thick was found in segment 7. Segment 12 had the appearance of dark brown chunky peanut butter mixed with sand but without the adhesive properties of peanut butter. This sample was taken from the tank bottom and was suspected to contain complexant concentrate waste.

### 3.3.1 1986 Core Sample Handling

Pacific Northwest National Laboratory (PNNL) personnel combined the two samples from each core segment into one container (three total) prior to characterization. Sample preparation was performed as required for each analysis. In general, chemical and radiochemical analyses were preceded by dissolution in acid or by dilution in water. Physical analyses were preceded by dilution or by oven drying.

### 3.3.2 1986 Core Sample Analysis

Chemical and radiochemical analyses were preceded by dissolution in concentrated nitric acid and heated until the sample was dissolved or by adding water until the water-to-waste ratio was approximately 10:1 (V/V). The acid-digested samples were used for the ICP analysis and for radiochemical analyses. The 10:1 (V/V) water slurry solutions were used for ion chromatography, carbonate, and hydroxide analyses.

Physical properties measured for tank 241-SY-103 wastes were density and settling rates. Preparation for the physical tests (see Section 4.3.1) consisted of placing 5 mL of each of three segment samples in a 10-mL graduated cylinder. This procedure was repeated. Three of the resulting six cylinders were dried, and the remaining three were placed in a 10 °C (50 °F) water bath. Settling rate data were gathered over the next three days, then the samples were weighed, and the density was calculated.

The results of the chemical and radiochemical analyses of the 1986 samples are tabulated in Appendix C (Fow et al. 1986). Section 4.3 discusses physical properties.

## 3.4 GAS MONITORING

In addition to the online standard hydrogen monitoring system described in Section 2.4.3, a series of grab samples were taken between August and October. This information, together with the explosivity test meter measurements before sampling, are used to satisfy the flammable gas requirements for the safety screen DQO. Gas compositions (hydrogen, ammonia, and organics) are converted to a percent of the LFL for comparison to the safety screening flammable gas criteria (< 25 percent LFL). For results from the gas monitoring, see Table 4-8 and Section 4.4.

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## 4.0 ANALYTICAL RESULTS AND WASTE INVENTORY ESTIMATES

### 4.1 OVERVIEW

This section summarizes the sampling and analytical results from the 1994 core sample and the June 1994 auger samples. It provides an overall estimate of each analyte concentration and the total amount of the analyte in the tank (inventory) based on the volumes of solid and liquid layers in the tank as estimated from the 1994 core sample (Rice 1995). This section also provides results from the 1994 and 1995 vapor sampling and analysis.

The convective (mixing) and nonconvective (nonmixing) layer compositions are based on the analyses of the 1994 core sampling event and are reported in Appendix A. Physical measurements were also taken on the 1994 core sample.

In deriving inventory estimates, if all values were below the detection limit, the inventory result was designated not available (n/a). If at least one value was above the detection limit, that value was used to calculate an inventory amount. The remaining inventory estimates were based on the average of two results generated from duplicate samples. No attempt was made to derive an overall estimate of variability because only one core sample was obtained from the tank. For the derivation of the tank inventory estimates, see Section 4.2.

### 4.2 DATA PRESENTATION

Tables 4-1, 4-2, and 4-3 summarize the data obtained from the analyses of the composite samples obtained from the 1994 core sample from tank 241-SY-103. Tables 4-1 and 4-2 summarize the convective and nonconvective layers. Table 4-3 estimates the inventory based on the sum of Tables 4-1 and 4-2. The "analyte method" column is the method used to determine the analyte concentration. For many metals, two methods were used to prepare the samples. The higher of the fusion (F) or acid digest (A) results was used to calculate tank inventories. Strata B and D composites were used to calculate the solids values in the convective and nonconvective layers, respectively. The drainable liquid composite sample for segments 2 to 7 was used to calculate the liquid values in the convective layer. Each segment is 48 cm (19 in.) long.

The projected tank inventory was based on the height of the waste at the time of the inventory (6.86 m [22.5 ft]), which is approximately 2,820 kL (745 kgal) of waste (Schreiber 1995). The historical estimate of the tank contents on January 1994 was 2,870 kL (758 kgal) of waste, of which 2,184 kL (577 kgal) was expected to be solids (Hanlon 1995). The results of the extrusion of core 62 from tank 241-SY-103 indicate that the surveillance-based estimates of the liquid and solid layers in the tank are not very reliable. The liquid-solid interface was found in segment 9, out of 15 segments, indicating that about half of the tank contents are supernatant.

Table 4-1. Convective Layer Summary for Core 62. (2 Sheets)

Method/ Analyte	Drainable Liquid Composite		Stratum B Composite		Convective Layer Est. wt (kg)
	Average Concentration ( $\mu\text{g/mL}$ )	Est. wt (kg)	Average Concentration ( $\mu\text{g/g}$ )	Est. wt (kg)	
IC. Formate	4.24E+3	5.72E+3	2.75E+3	3.96E+2	6.12E+3
IC. Oxalate	<2.55E+3	n/a	<96.8	n/a	n/a
IC. Cl <sup>-</sup>	1.16E+4	1.57E+4	4.52E+3	6.51E+2	1.64E+4
IC. F <sup>-</sup>	<3.06E+2	n/a	n/a	n/a	n/a
IC. NO <sub>2</sub> <sup>-</sup>	1.43E+5	1.93E+5	5.56E+4	8.01E+3	2.01E+5
IC. NO <sub>3</sub> <sup>-</sup>	1.79E+5	2.42E+5	3.56E+5	5.13E+4	2.93E+5
IC. PO <sub>4</sub> <sup>3-</sup>	3.12E+3	4.21E+3	1.93E+4	2.78E+3	6.99E+3
IC. SO <sub>4</sub> <sup>2-</sup>	<4.08E+3	n/a	1.36E+3	1.96E+2	1.96E+2
OH <sup>-</sup>	2.86E+4	3.86E+4	1.05E+4	1.51E+3	4.01E+4
ICP. Al	4.14E+4	5.59E+4	2.75E+4 (A)	3.96E+3	5.99E+4
ICP. B	8.9E+1	1.2E+2	n/a	n/a	1.2E+2
ICP. Ca	1.18E+2	1.59E+2	1.94E+2 (A)	2.8E+1	1.87E+2
ICP. Cr	3.3E+1	4.5E+1	3.1E+1 (A)	4	4.9E+1
ICP. K	3.91E+3	5.28E+3	2.72E+3 (A)	3.92E+2	5.67E+3
ICP. Na	2.12E+5	2.86E+5	2.12E+5 (F)	3.05E+4	3.17E+5
ICP. Ni	4.9E+1	6.6E+1	3.4E+1 (A)	5	7.1+1
ICP. Si	7.9E+1	1.07E+2	n/a	n/a	1.07E+2
ICP. Zn	<4.2	n/a	3.6E+1 (A)	5	5
ICP. Zr	<4.2	n/a	<1.93 (A)	n/a	n/a
ICP. Fe	<2.1E+1	n/a	4.8E+1 (A)	7	7
ICP. Bi	<4.2E+1	n/a	n/a	n/a	n/a
ICP. Ba	<2.1E+1	n/a	n/a	n/a	n/a
U	2.82	4	<2.12E-2	n/a	4
TOC	9.64E+3	2.82E+4 <sup>1</sup>	2.66E+3	6.83E+2 <sup>1</sup>	2.89E+4
H <sub>2</sub> O (%)	48.43 %	9.59E+5	46.68%	6.72E+4	1.03E+6

Table 4-1. Convective Layer Summary for Core 62. (2 Sheets)

Analyte	Drainable liquid composite		Stratum B composite		Convective Layer Act. (Ci)
	Average Activity (µCi/mL)	Est. act. (Ci)	Average Activity (µCi/g)	Est. act. (Ci)	
<sup>241</sup> Am	1.75E-3 (D)	2.36	<2.50E-3 (R) <1.47E-2 (F)	n/a	2.36
<sup>137</sup> Cs	4.23E+2 (D)	5.71E+5	1.76E+2 (R) 1.34E+2 (F)	2.53E+4 (R)	5.96E+5
<sup>60</sup> Co	<1.69E-2 (D)	n/a	<6.26E-3 (R) <2.27E-2 (F)	n/a	n/a
<sup>243/244</sup> Cm	<7.77E-4 (D)	n/a	<2.50E-3 (R) <1.47E-2 (F)	n/a	n/a
<sup>154</sup> Eu	<8.02E-2 (D)	n/a	<2.67E-2 (R) <5.98E-2 (F)	n/a	n/a
<sup>155</sup> Eu	<2.58E-1 (D)	n/a	<1.32E-1 (R) <3.08E-1 (F)	n/a	n/a
<sup>129</sup> I	1.91E-4 (V)	2.58E-1	<1.68E-1 (F)	n/a	2.58E-1
<sup>237</sup> Np	<5.93E-4 (D)	n/a	<2.42E-3 (R) <1.45E-2 (F)	n/a	n/a
<sup>238</sup> Pu	<6.12E-5 (D)	n/a	<3.13E-4 (R) 3.99E-3 (F)	5.75E-1	5.75E-1
<sup>239/240</sup> Pu	<6.12E-5 (D)	n/a	<3.13E-4 (R) <2.42E-3 (F)	n/a	n/a
<sup>90</sup> Sr	2.98 (D)	4.02E+3	1.30 (R) 1.12 (F)	1.87E+2 (R)	4.21E+3
<sup>99</sup> Tc	1.63E-1 (D)	2.20E+2	1.47E-1 (F)	2.12E+1 (F)	2.41E+2
Tritium	2.34E-3 (D)	3.16	<4.73E-4 (W)	n/a	3.16
Total alpha	<2.52E-2 (D)	n/a	<4.51E-3 (F)	n/a	n/a
Total beta	4.24E+2 (D)	5.72E+5	1.71E+2 (F)	2.46E+4	5.97E+5

Notes:

- |                              |                                    |
|------------------------------|------------------------------------|
| (A) = acid digest            | (R) = acidified water digest       |
| (D) = diluted with acid      | (V) = water dilution-no acid added |
| (F) = fusion in Ni crucible  | (W) = water digested-no acid added |
| (R) = acidified water digest | n/a = not available                |

<sup>1</sup>As kg of acetate, corrected for formate contribution

Table 4-2. Nonconvective Layer Summary for Core 62. (2 Sheets)

Method/analyte	Stratum D composite	
	Average concentration ( $\mu\text{g/g}$ )	Estimated weight (kg)
IC. Formate	4.960E+3	1.07E+4
IC. Oxalate	2.08E+4	4.47E+4
IC. $\text{Cl}^-$	7.03E+3	1.51E+4
IC. $\text{F}^-$	1.56E+3	3.35E+3
IC. $\text{NO}_2^-$	8.19E+4	1.76E+5
IC. $\text{NO}_3^-$	9.81E+4	2.11E+5
IC. $\text{PO}_4^{3-}$	1.56E+4	3.35E+4
IC. $\text{SO}_4^{2-}$	7.82E+3	1.68E+4
$\text{OH}^-$	1.84E+4	3.96E+4
ICP. Al (F)	3.96E+4	8.51E+4
ICP. Ca (A)	3.5E+2	7.52E+2
ICP. Cr (F)	1.02E+4	2.19E+4
ICP. K (A)	3.34E+3	7.18E+3
ICP. Na (A)	1.87E+5	4.02E+5
ICP. Ni (A)	1.02E+2	2.19E+2
ICP. Fe (F)	2.70E+3	5.80E+3
ICP. Zn (A)	2.3E+1	4.9E+1
ICP. Zr (A)	5.7E+1	1.23E+2
U	7.76E+2	1.67E+3
TOC	1.06E+4	1.94E+4 <sup>1</sup>
TIC	8.80E+3	9.46E+4 <sup>2</sup>
$\text{H}_2\text{O}$ (%)	32.99%	7.09E+5

Table 4-2. Nonconvective Layer Summary for Core 62. (2 Sheets)

Analyte	Stratum D composite	
	Average activity ( $\mu\text{Ci/g}$ )	Est. Activity (CI)
<sup>241</sup> Am	6.68E-1 (F)	1.44E+3 (F)
<sup>137</sup> Cs	2.50E+2 (R) 2.32E+2 (F)	5.38E+5 (R)
<sup>60</sup> Co	2.28E-2 (R) 4.90E-2 (F)	1.05E+2 (F)
<sup>243/244</sup> Cm	< 2.37E-3 (F)	n/a
<sup>154</sup> Eu	< 5.37E-2 (R) 7.54E-1 (F)	1.62E+3 (F)
<sup>155</sup> Eu	< 1.81E-1 (R) 6.55E-1 (F)	1.41E+3 (F)
<sup>129</sup> I	< 5.25E-2 (F) < 2.23E-2 (W)	n/a
<sup>237</sup> Np	< 2.60E-3 (R) < 1.20E-2 (F)	n/a
<sup>238</sup> Pu	5.07E-4 (R) 1.62E-2 (F)	3.48E+1 (F)
<sup>239/240</sup> Pu	9.41E-4 (R) 6.23E-2 (F)	1.34E+2 (F)
<sup>90</sup> Sr	2.16 (R) 3.48E+1 (F)	7.48E+4 (F)
<sup>99</sup> Tc	2.44E-1 (F) 1.35E-1 (R)	5.25E+2 (F)
Tritium	n/a	n/a
Total alpha	5.68E-1 (F)	1.22E+3 (F)
Total beta	4.32E+2 (F)	9.29E+5

Notes:

- (A) = acid digest
- (F) = fusion in a Ni crucible
- (R) = water digest acidified for radchem
- (W) = water digest - no acid added
- n/a = not available-all results below the detection limit

<sup>1</sup>As kg of acetate, corrected for formate and oxalate contribution

<sup>2</sup>As kg of carbonate

Table 4-3. Tank 241-SY-103 Inventory Based on Core 62. (2 Sheets)

Analyte	Convective layer (kg)	Nonconvective Layer (kg)	Total (kg)
Formate	6.12E+3	1.07E+4	1.68E+4
Oxalate	n/a	4.47E+4	4.47E+4
Cl <sup>-</sup>	1.64E+4	1.51E+4	3.15E+4
F <sup>-</sup>	n/a	3.35E+3	3.35E+3
NO <sub>2</sub> <sup>-</sup>	2.01E+5	1.76E+5	3.77E+5
NO <sub>3</sub> <sup>-</sup>	2.93E+5	2.11E+5	5.04E+5
PO <sub>4</sub> <sup>3-</sup>	6.99E+3	3.35E+4	4.05E+4
SO <sub>4</sub> <sup>2-</sup>	1.96E+2	1.68E+4	1.70E+4
OH <sup>-</sup>	4.01E+4	3.96E+4	7.97E+4
Al	5.99E+4	8.51E+4	1.47E+5
B	1.2E+2	n/a	1.2E+2
Ca	1.87E+2	7.52E+2	9.39E+2
Cr	4.9E+1	2.19E+4	2.19E+4
K	5.67E+3	7.18E+3	1.28E+4
Na	3.17E+5	4.02E+5	7.19E+5
Ni	7.1E+1	2.19E+2	2.9E+2
Si	1.07E+2	n/a	1.07E+2
Zn	5	4.9E+1	5.4E+1
Zr	n/a	1.23E+2	1.23E+2
Fe	7	5.80E+3	5.81E+3
U	4	1.67E+3	1.67E+3
TOC	2.89E+4 <sup>1</sup>	9.02E+3 <sup>1</sup>	3.79E+4 <sup>1</sup>
TIC	n/a	9.46E+4 <sup>2</sup>	9.46E+4 <sup>2</sup>

Table 4-3. Tank 241-SY-103 Inventory Based on Core 62. (2 Sheets)

Analyte	Convective Layer Activity (Ci)	Nonconvective Layer Activity (Ci)	Total Activity
<sup>241</sup> Am	2.36	1.44E+3	1.44E+3
<sup>137</sup> Cs	5.96E+5	5.38E+5	1.13E+6
<sup>60</sup> Co	n/a	1.05E+2	1.05E+2
<sup>154</sup> Eu	n/a	1.62E+3	1.62E+3
<sup>155</sup> Eu	n/a	1.41E+3	1.41E+3
<sup>129</sup> I	2.58E-1	n/a	2.58E-1
<sup>238</sup> Pu	5.75E-1	3.48E+1	3.54E+1
<sup>239/240</sup> Pu	n/a	1.34E+2	1.34E+2
<sup>90</sup> Sr	4.21E+3	7.48E+4	7.90E+4
<sup>99</sup> Tc	2.41E+2	5.25E+2	7.66E+2
Tritium	3.16	n/a	3.16
Total alpha	n/a	1.17E+3	1.17E+3
Total beta	5.97E+5	9.29E+5	1.53E+6

Notes:

n/a = not available

<sup>1</sup>As kg of acetate, corrected for formate and oxalate concentration

<sup>2</sup>As kg of carbonate

At the time of the 1994 core sampling, the depth of the waste was estimated to be 6.86 m (22.5 ft). To estimate the tank inventory, an estimate of the liquid (convective) layer and solid (nonconvective) layer was made from the extrusion data shown (see Table 3-2). Based on the length of each segment (19 in.) and the estimated height of the liquid-solid interface in segment 9, the height of the liquid layer (in segments) can be converted to a volume.

The density of the drainable liquid and the solids from segment 9 was approximately equal (1.47 g/mL vs. 1.51 g/mL); therefore, the volume of the liquid and solid (obtained from the hot cell extrusion data sheets) was used to estimate the fraction of segment 9 that was attributable to the liquid layer. In any case, the exact point of the liquid/solid interface is

difficult to determine accurately because of solids settling and suspension variables. The tank also has cyclic height changes that may affect this interface. The following formula was used to calculate the fraction of segment 9 that is liquid. The volumes used were obtained from hot cell data sheets.

$$\text{vol. liquid}/(\text{vol. liquid} + \text{vol. solid}) = 35/(35 + 250) = 0.12 \text{ segment.}$$

The first segment was only sampled to a depth of 10 cm (4 in.). The height of the convective layer, including the crust, can be estimated at 7.12 segments plus the 10 cm (3.94 in.) of the first segment. Each segment is 48 cm (19 in.) long. This calculates to a height of 3.54 m (1.58 ft). A height of 3.54 m is approximately 1,450 kL (384 kgal). No data have been collected on the thickness of the crust layer or its composition. The historical estimate for the crust is about 15 kL (4 kgal), which is used in the following formula to help estimate the volume of the nonconvective layer.

$$\text{nonconvective vol.} = \text{total vol.} - (\text{crust vol.} + \text{convective vol.}).$$

The nonconvective volume has been estimated to be 1,370 kL (362 kgal) by this method.

The convective layer consisted mainly of liquids with some solids present. Based on the stratum B composite, the solids represent approximately 7 percent by weight in the convective layer. Because of the small amount of solids present and the closeness in densities of the solids and liquids, the density of the convective layer can be approximated as 1.47 g/mL, which is the drainable liquid composite sample density. The solids would then represent approximately 1.44E+05 kg and the liquids about 1.98E+06 kg (1,350 kL) (356 kgal) in the convective layer. This solids-corrected convective layer volume is used to calculate inventory from the drainable liquid composite sample analyses. The solids weight is used to calculate inventory contributions from stratum B composite sample analyses. The calculated volumes and masses used in determining the convective and nonconvective inventories are summarized in Table 4-4. No attempt was made to derive an estimate of variability in Table 4-3 and 4-4.

Table 4-4. Calculated Tank Volumes and Masses.

	Convective Layer		Nonconvective Layer
	Drainable Liquid	Solids	
Density (g/mL)	1.47	1.51	1.57
Volume (kL)	1.35E+3	9.6E+1	1.37E+3
Mass (kg)	1.98E+6	1.44E+5	2.15E+6

Solids in the convective layer were analyzed with a polarizeable light microscope and were identified as trisodium phosphate with a large amount of interstitial liquid (Rice 1995). It is possible that cooling the sample from tank temperature (approximately 34 °C [94 °F]) to room temperature caused the solid to precipitate because trisodium phosphate is relatively insoluble at room temperature. The convective layer solids were later centrifuged to remove supernate and reanalyzed. The aluminum concentration was lower in the centrifuged solids, and sodium and phosphate were higher.

The nonconvective layer was made up of solids that varied in consistency from a thin wet mud to a damp solid that retained its shape after extrusion.

### 4.3 PHYSICAL MEASUREMENTS

Physical analyses performed on the 1994 core sample included density, viscosity, shear strength, volume percent solids, and solids settling rate (Schreiber 1995). Segments 10 through 14, the segments containing solids, were combined into a composite (stratum D) before physical measurements were made.

#### 4.3.1 Density, Percent Solids, and Settling Behavior

Table 4-5 shows the bulk densities for the 1994 core composite samples. The stratum D sample density does not include any sample from the last segment because of an apparent sampling failure.

The volume-percent centrifuged solids decreased with caustic strength at a dilution ratio of 3.0:1 (V/V) from 11 percent for deionized water to 4 percent for 2 M NaOH. The decrease in volume percent settled solids at 60 and 80 °C was nearly linear, decreasing from 100 percent to about 40 percent between the dilution ratios of 0:1 (no dilution) and 1.0:1 (V/V). At 30 °C, the decrease in volume percent settled solids showed a near linear decrease from 100 percent to 40 percent between 0.15:1 and 1.0:1 (V/V). The volume percent settled solids was about 20 percent for all diluents at 30, 60, and 80 °C (Bredt et al. 1995).

Table 4-5. Densities of Waste Samples for Core 62, Tank 241-SY-103.

Sample	Density (g/mL)
Drainable liquid composite (segment 2 to 7)	1.47
Drainable liquid (segment 8)	1.47
Stratum A (segment 1)	1.59
Stratum B (segment 4 to 8)	1.51
Stratum C (segment 9)	1.51
Stratum D (segment 10 to 14)	1.57

#### 4.3.2 Thermodynamic Analyses

The TGA and DSC safety screening results of individual segments were reported in Rice (1994). The results are summarized in Table 4-6. The average of one solid sample had a weight percent water result below the safety screen notification limit of 17 percent water (segment 8). It did not, however, contain an exotherm, and it is in a segment that was greater than 90 percent water. One solid sample (lower half of segment 13) and one drainable liquid (segment 9) had a result above the safety screen notification limit of 523 J/g (dry). This criteria has been changed to 480 J/g in a later DQO. The lower half of segment 14 also had a result above the safety screen notification limit, but the duplicate did not, and the average was below the limit. Because no endothermic data are presented and only three of the samples did not have exotherms, the normal "-" sign (convention for exothermic enthalpy) was not used in Table 4-6 or Appendix A for DSC data.

#### 4.3.3 Shear Strength

Shear strength was measured on two sets of samples from the 1994 core sampling event. The shear strength of the undisturbed samples was approximately 10,000 dyne/cm<sup>2</sup>, while the highest yield stress observed for the gently hand-stirred composite was only 63 dyne/cm<sup>2</sup> (Bredt et al. 1995).

#### 4.3.4 Shear Stress Versus Shear Rate for Tank 241-SY-103

The apparent viscosity of the samples, taken from the nonconvective layer composite sample obtained in 1994, decreased with temperature and dilution. The effect of temperature is most pronounced between and 30 and 60 °C, decreasing from 320 to 120 cP for the undiluted sample at 400 s<sup>-1</sup>. With dilution, the decrease is most pronounced between the undiluted and 0.15:1 (V/V) sample, decreasing from 320 to 110 cP at 400 s<sup>-1</sup>. The apparent viscosity of the composite and diluted samples decreased with increasing shear rate above a yield point. Foam formation in the samples caused an increase in apparent viscosity with increasing shear rate for the 0.50:1, 1.0:1, and 3.0:1 (V/V) diluted samples. The increase in apparent viscosity resulting from foam formation was seen above 300 s<sup>-1</sup> for the 0.51 and 1.0:1 (V/V) diluted samples and above 50 s<sup>-1</sup> for the 3.0:1 (V/V) diluted samples.

Table 4-6. Safety Screen Results for Core 62, Tank 241-SY-103.

Segment	Location	Average TGA (percent water)	Average DSC <sup>2</sup> J/g (dry)	Average Alpha ( $\mu$ Cl/g)
1	Drainable liquid	48.81	173 (338)	nr
	Solid	39.18	118 (193)	< 2.29E-1
2	Drainable liquid	48.71	206 (402)	nr
	Solid	34.30	No exotherm	< 1.26E-1
3	Drainable liquid	47.62	162 (309)	nr
	Solid	19.52	43 (53)	< 1.03E-1
4	Drainable liquid	48.52	200 (388)	nr
	Solid	35.24	57 (82)	< 1.02E-1
5	Drainable liquid	48.34	216 (418)	nr
	Solid	19.69	No exotherm	< 2.57E-1
6	Drainable liquid	49.22	158 (311)	nr
	Solid	29.57	193 (276)	< 2.50E-1
7	Drainable liquid	49.79	144 (287)	nr
	Solid	26.93	147 (224)	< 1.95E-1
8	Drainable liquid	48.89	227 (444)	nr
	Solid	15.59 <sup>1</sup>	No exotherm	< 1.38E-1
9	Drainable liquid	48.83	286 (559) <sup>2</sup>	nr
	Solid	45.34	174 (319)	7.3E-1
10	Upper	43.72	202 (358)	5.6E-1
	Lower	40.42	160 (268)	8.9E-1
11	Upper	45.74	227 (419)	8.1E-1
	Lower	38.34	109 (246)	9.1E-1
12	Upper	41.49	113 (193)	9.8E-1
	Lower	42.45	201 (349)	< 7.53E-1
13	Upper	39.81	196 (326)	1.13
	Lower	40.22	377 (630) <sup>2</sup>	9.1E-1
14	Upper	38.80	149 (245)	9.9E-1
	Lower	41.10	273 (464)	1.54
15	Drainable liquid	75.06	181	nr
	Solid	68.75	No exotherm	< 4.88E-1

Notes:

nr = not requested

<sup>1</sup>Below the notification limit of 17 percent water

<sup>2</sup>Above the notification limit of 523 J/g (dry). This value has been changed to 480 J/g (dry) in more recent DQOs (Dukelow et al. 1995).

<sup>3</sup>All DSC results are for exotherms. The normal (-) sign used for designating exothermic enthalpy is not shown.

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The Yield Power Law equation is as follows:

$$\sigma = \alpha + \beta \gamma^n$$

where

$\sigma$  = shear stress in Pa (lb<sub>f</sub>/ft<sup>2</sup>)

$\gamma$  = shear rate

$\alpha$  = yield stress (not a fit parameter)

$\beta$  and  $n$  are fit parameters

Results from the power law model are shown in Table 4-7 (Bredt et al. 1995).

The rheological parameters for diluted and undiluted 1986 samples are in Table C-7. The data indicate that segment 12 is yield-pseudoplastic, whereas the remaining samples do not exhibit a yield stress. The diluted samples number 2(1:1)<sup>1</sup> and number 12(1:2)<sup>1</sup> at 10 and 46 °C (50 and 115 °F), and number 12(1:1)<sup>1</sup> at 10 °C were found to be dilatant fluids, which means the fluids became more viscous at higher shear rates. The remaining diluted samples became less viscous as the shear rates increased. They are identified as pseudoplastic fluids. Apparent viscosities were calculated based on the 1986 core data for various samples and dilutions using flows of 189 and 284 L/min (50 and 75 gal/min), which yields a shear rate of 70 and 104 sec<sup>-1</sup> for schedule 40 pipe. The results are summarized in Table C-8.

A ball rheometer was deployed in risers 17C and 22A in July and August of 1995. The rheological properties of the convective layer were uniform and characterized by a viscosity of approximately 45 cP and a yield strength of less than 2 Pa. The nonconvective layer had a yield strength of less than 210 Pa and an apparent viscosity of 10<sup>4</sup> to 10<sup>5</sup> cP. The rheology of the nonconvective layer varied widely with depth and was very sensitive to shear history, more so in riser 22A than 17C. The ball rheometer was not able to penetrate a heel layer about 12 m thick on the tank bottom (Shepard et al. 1995).

#### 4.4 GAS MONITORING

Waste tank 241-SY-103 is on the Flammable Gas Watch List. Gas release events occur in this tank every two or three months. Hydrogen and ammonia online gas monitors have been installed. Figure 4-1 shows the results from the hydrogen monitor for December, 1994 through September, 1995. Figure 4-2 shows the results from the ammonia monitor in the SY Farm exhaust stack for August 23, 1995, through September 13, 1995.

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<sup>1</sup>The values inside the parentheses indicate the size of the sample dilution by volume.

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Table 4-7. Tank 241-SY-103 Core 62 Rheological Data. (2 sheets)

Dilution	Temperature (°C)	Viscosity 100-400 $\mu^2$ (cP)	Yield Point (Pa)	Consistency Parameter (Pa sec)	Flow Index Behavior	Comments
0:1	30	560-340	4.3	2.32	0.677	
0:1 Dup	30	370-290	3.7	0.659	0.859	
0:1	60	180-110	6.3	0.289	0.814	
0:1 Dup	60	220-130	4.8	1.05	0.628	
0:1	90	240-120	0.33	5.98	0.327	
0:1 Dup	90	250-120	1.3	4.78	0.373	
0:15:1	30	140-110	1.1	0.241	0.873	
0:15:1 Dup	30	130-110	0.84	0.196	0.896	
0:15:1	60	82-50	1.6	0.322	0.670	
0:15:1 Dup	60	100-60	2.1	0.450	0.635	
0:15:1	90	90-42	4.5	0.274	0.634	
0:15:1 Dup	90	110-52	4.7	0.362	0.631	
0:30:1	30	58-50	0.53	0.0745	0.927	
0:30:1 Dup	30	60-51	0.52	0.0902	0.900	
0:30:1	60	77-43	1.0	0.481	0.584	
0:30:1	90	69-32	4.2	0.110	0.731	
0:30:1 Dup	90	73-34	0.66	0.948	0.435	
0:50:1	30	1.5-4.3				a
0:50:1 Dup	30	9-7	0.085	0.0166	0.848	b
0:50:1	60	15-10	0.32	0.0380	0.752	b
0:50:1 Dup	60	15-10	0.27	0.0348	0.778	b
0:50:1	90	20-12	0.85	0.0240	0.845	b
0:50:1 Dup	90	21-12	0.84	0.0438	0.748	b
1.0:1	30	16-13	0.17	0.0266	0.873	b
1.0:1 Dup	30	17-13	0.16	0.0408	0.802	b
1.0:1	60	11-8	0.24	0.0265	0.777	b
1.0:1 Dup	60	13-9	0.22	0.0358	0.749	b
1.0:1	90	13-9	0.31	0.0438	0.696	b
1.0:1 Dup	90	15-9	0.36	0.0527	0.683	b

Table 4-7. Tank 241-SY-103 Core 62 Rheological Data. (2 sheets)

Dilution	Temperature (°C)	Viscosity 100-400 s <sup>-1</sup> (cP)	Yield Point (Pa)	Consistency Parameter (Pa sec)	Flow Index Behavior	Comments
1:3	30	4-6				a,c
1:3 Dup	30	4-6				a,c
1:3	60	6-7				a,c
1:3 Dup	60	7-7				a,c
1:3	90	7-6				a,c
1:3 Dup	90	5-6				a,c

Notes:

\*Foam formation prevents modeling using yield power law.

<sup>b</sup>Model fit fails above 300 s<sup>-1</sup>, apparent dilatant behavior observed above 300 s<sup>-1</sup>.

<sup>c</sup>Apparent dilatant behavior observed above 50 s<sup>-1</sup>.

Figure 4-1. Tank 241-SY-103 Hydrogen Results.

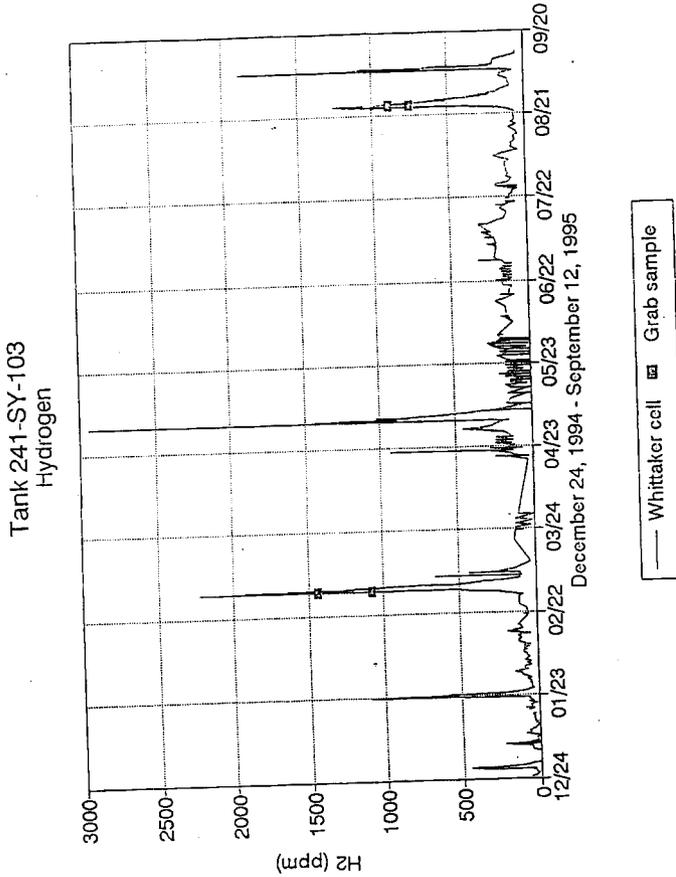
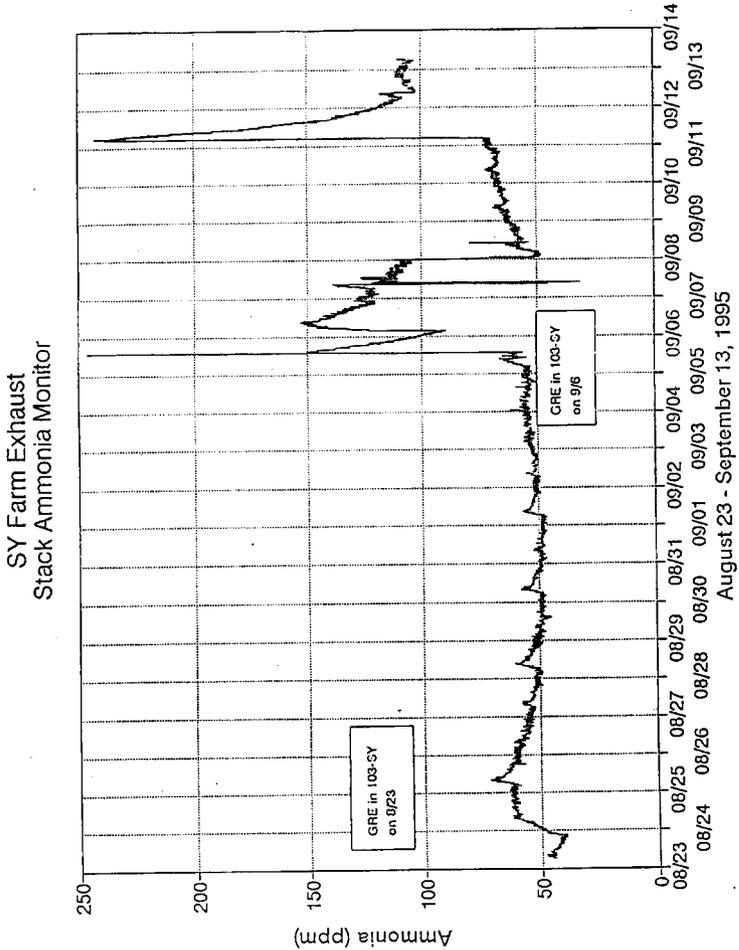


Figure 4-2. SY Farm Exhaust Stack Ammonia Monitor.



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Table 4-8 shows the results of vapor grab samples taken between August and October 1994 and analyzed by mass spectrometry (Wilkins 1995a). These grab sample results were consistent with the standard hydrogen monitoring system results for that period and are < 1 percent of the LFL.

The LFL for hydrogen is 40,000 ppmv; therefore, the 25 percent LFL limit is 10,000 ppmv. The LFL for ammonia is 150,000 ppmv, and the 25 percent limit is 37,500 ppmv. The observed concentrations of hydrogen and ammonia on the monitors are well below these limits even during gas release events.

Several important physical properties of the sludge in flammable gas tanks, including the viscosity, surface tension, and gas permeability and solubility, may be strongly affected by characteristics of the solid phases in the sludge. It has been suggested that an aluminum hydroxide gel may play an important role in gas generation and retention properties of these tanks. The crystallinity, morphology, chemical composition, and crystalline phases of several solid samples from tanks 241-SY-101 and 241-SY-103 were studied by transmission electron microscope, electron energy dispersive spectroscopy, and electron diffraction (Liu 1995). Aluminum hydroxide was found in the solids of 241-SY-103 but not in 241-SY-101. This difference was explained by the different hydroxide to aluminum ratios (OH/Al) found in the two tank samples. The lower OH/Al of 241-SY-103 waste favors the formation of aluminum hydroxide based on aluminum solubility studies (Barney 1976).

In July and August of 1995, a void fraction instrument was operated in risers 17C and 22A. The results indicate that the nonconvective layer contains up to 12 percent void. The average void fraction was  $0.047 \pm 0.015$  at riser 17C and  $0.091 \pm 0.015$  at riser 22A. The stored gas volume based on these void fraction measurements is  $210 \pm 60 \text{ M}^3$  at 1 atmosphere. This is consistent with the volume estimated from the observed response of waste level to atmospheric pressure (Shepard et al. 1995). The uncertainty in the measurements is expressed as one standard deviation.

Table 4-8. 1994 Tank 241-SY-103 Grab Samples.

Date	H <sub>2</sub> , ppm	N <sub>2</sub> O, ppm	Other, ppm
August 18	19	< 10	
August 18	19	< 10	
August 25	16	< 10	
August 25	38	18	
September 1	63	39	CH <sub>4</sub> = 11 <sup>1</sup>
September 1	3	< 10	
September 7	< 40	< 10	
September 7	38	32	
September 15	27	23	
September 15	15	< 10	
September 23	28	12	
September 23	48	23	
October 6	16	< 5	
October 6	22	5	
October 19	22	4	
October 19	28	6	

Note:

<sup>1</sup>Methane was normally reported as being less than 10 ppm.

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## 5.0 INTERPRETATION OF CHARACTERIZATION RESULTS

### 5.1 ASSESSMENT OF SAMPLING AND ANALYTICAL RESULTS

This section evaluates sampling and analysis factors that may impact data interpretation. The factors are used to assess the overall quality and consistency of the data and to identify limitations in its use.

#### 5.1.1 Field/Laboratory Observations

During the extrusion of the 1994 core segments, several observations were made that could impact the data interpretation (Rice 1995). During the subsampling of the drainable liquid from segment 1, the sample jar was inadvertently cracked at the base by the manipulator fingers. This caused most of the drainable liquid sample to be lost. The remaining drainable liquid sample had the following analyses performed on it: DSC, TGA, and ICP using an acid digest. Insufficient sample remained to do radiochemical or other water preparation analyses.

During the extrusion of segment 3, no liquid appeared when the valve was opened. A solid plug apparently had formed. As the extrusion began, this plug was pushed onto the tray and was followed rapidly by the drainable liquid. Some of the liquid was lost out the back of the sample tray, and much of the solid was carried into the drainable liquid jar with the liquid. During the extrusion of segment 14, an air gap of 10 to 13 cm (4 to 5 in.) was observed after approximately 25 cm (10 in.) of solids.

When segment 15 was extruded, internal pressure in the sampler caused approximately 20 mL of sample material to be sprayed on the hot cell wall. This pressurization had not been expected and was not observed during the extrusion of the 1986 core segment of the same depth. The remaining sample from segment 15 was inconsistent with the previous segment. The analysis indicated that the liquid was mostly HHF, signifying a sampling failure. Because of the pressurization of segment 15, an operational hold was placed on the nonsafety screening analyses of the segment, and the second core has not yet been obtained.

Segment 13 had sufficient liner liquids (34 g) to require analysis. The analyses indicate that it is a mixture of the HHF and some fraction of the core sample material, showing the valve had a small leak. The concentration of bromine in the segment 13 liner liquid (0.2 M) indicates that most of the liner liquid is HHF.

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### 5.1.2 Quality Control Assessment of Analytical Data

No quality control data are available for evaluating samples analyzed at the Pacific Northwest Laboratory for the 1986 sampling event. The quality control requirements for the 1994 sampling event are defined in the tank characterization plan for tank 241-SY-103. The results are summarized in the report defined in the tank characterization plan by the method of analysis (Schreiber 1995 and Rice 1995). The 1994 raw data contain different amounts of blank, duplicate, spike, and standards data, depending on the method used to generate the results (see Appendix A and Rice [1995]). The source documents should be examined to further evaluate the quality of a given analysis. With few exceptions, the quality control objectives were met overall. The sample results with the quality control results outside the desired criteria are identified by flags in Appendix A tables.

Appendix B has quality control information for the auger sampling event. No standards for any tests were outside their limits, but the relative percent difference (RPD) for several tests on the samples exceeded 20 percent. The poor reproducibility for TGA and TOC did not affect the data use because no exotherm was observed by the DSC.

The tank characterization plan required blind standard checks for three analyses: TOC, IC, and ICP. The results are in Tables D-1, D-2, and D-3. Problems passing the TOC consistently may mean TOC results are not reliable (2 of 4 results were unacceptable). The water pollution blind standard results are comparable only to the liquid samples. The solid samples are prepared by a different method.

In general, the quality control data for the 1994 sampling event are consistent and show acceptable precision, especially considering the associated problems with sampling and the complex chemical and radiochemical nature of the samples. The total alpha count rates were very low in all samples and below detection limits in most, potentially impacting the inventory calculations and data interpretation. In the same samples, the beta-gamma activity was high and was predominately associated with two isotopes:  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$  accounted for approximately 98 percent of the beta-gamma activity. Although some data are judged unreliable, all data are included in the report. Case-by-case decisions can be made on data use based on the users needs and assessment of data quality.

Several analyses suffered from poor spike recovery and/or precision. Tritium spike recoveries for solid samples showed a matrix incompatibility with the analytical method and are of little value. Although several total beta measurements gave marginal precision (approximately 20 percent or higher), most total beta data are useful in meeting the programmatic needs. Values for  $^{129}\text{I}$  were all below or near detection limits. Occasional low precision (RPD of 20 percent or more) in  $^{90}\text{Sr}$  determinations do not preclude data use. One  $^{99}\text{Tc}$  duplicate gave poor precision (RPD of 28 percent), but most duplicates are adequate.

Analyses for alpha emitting isotopes were severely hampered by count rates near the detection limit and by high beta activities. Nevertheless, most alpha emitting isotope data are acceptable. The  $^{237}\text{Np}$  standards and spikes recoveries were not high (approximately 70 to

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80 percent); however, the data are within the expected range for the method and sample matrix. The plutonium activity for most samples was near the detection limits which results in large counting errors and differences in the results.

**5.1.3 Data Consistency Checks**

The ability to assess the overall consistency of the data between segment and composite samples is limited because not all analytes were performed on every segment. Checks can be made on some analytes when the same aliquot of sample is analyzed by two comparable analyses, or when two methods were used to prepare the sample before analysis. Comparisons between methods may also provide information about waste chemistry. Some comparisons are provided below.

**5.1.3.1 Comparison Between ICP and IC Phosphate Analyses.** Table 5-1 compares the calculated phosphate concentration based on the ICP phosphorus result with phosphate data obtained from the IC for liquid samples. Phosphorus by ICP was not requested on the solid samples. The calculated ICP results, which were analyzed using an acid digest, may be greater than IC data because of small quantities of suspended insoluble phosphates or because of other phosphorus species not measured by IC. The results in Table 5-1 agree within normal analytical precision and indicate good consistency between methods.

Table 5-1. Average Phosphate Concentration ( $\mu\text{g/mL}$ ).

	Drainable Liquid Segments 2 to 7	Drainable Liquid Segment 8
$\text{PO}_4^{3-}$ (calculated from ICP data)	3530	3570
$\text{PO}_4^{3-}$ (from IC)	3120	3180
% Relative Percent Difference ( $100 \times (\text{calc} - \text{IC}) \times 2 / (\text{calc} + \text{IC})$ )	12	12

**5.1.3.2 Comparison of ICP Acid Digest and Fusion Methods.** Table 5-2 summarizes results for the most abundant elements in each stratum. Although each stratum was mixed at the time the composite sample was created, variation in the aluminum results for the stratum B composite sample could be explained by the heterogeneous behavior of the samples. Most of the stratum C composite sample acid digestion results are lower than the fusion preparation.

The metals in question should be made soluble during acid digest preparation and during fusion preparation. Duplicate results for acid and fusion in the stratum C sample agree with the original result. There is no compelling reason why the fusion preparation would be more appropriate for these metals, as demonstrated by stratum D sample results. Stratum C and stratum D are similar in composition, being primarily or exclusively solid material. The stratum C sample contained more liquid, however, and the sample would tend to stratify in storage. These results could be explained if the sample was not mixed thoroughly each time an aliquot was removed.

Table 5-2. Average Concentration Stratum Samples Selected Elements ( $\mu\text{g/g}$ ).

	Stratum A	Stratum B	Stratum C	Stratum D
Al (F)	22200	12400	37500	39600
Al (A)	29200	27500	25300	35000
Cr (F)	59	< 93	5650	10200
Cr (A)	27	31	252	6550
Fe (F)	30	< 274	1460	2700
Fe (A)	< 18	48	78	2120
Na (F)	141000	212000	172000	140000
Na (A)	150000	161000	147000	187000

Notes:

- (A) = acid digest
- (F) = fusion in a Ni crucible

**5.1.3.3 Comparison of Acid Digest and Fusion Methods for Radiochemical Analysis.** In all cases, the activities found for actinide elements were higher for samples prepared by fusion rather than acid digest. This was expected from past experience and consideration of the chemistries involved.

The  $^{90}\text{Sr}$  values produced by fusion of solid samples from the stratum B composite sample were 14 percent lower than values yielded by acid digest. Part of this difference may be caused by subsampling errors arising from sample heterogeneity; however, this difference is also within the analytical variance expected for the method. Stratum D solid samples prepared by fusion yield higher values than those subjected to acid digest. Consideration of strontium chemistry shows this is to be expected. Fusions may provide higher results if the radionuclide is present as an insoluble compound (sulfate, fluoride etc.) which will convert to acid soluble hydroxides in the KOH fusion flux.

The <sup>137</sup>Cs values for acid digested samples were slightly higher than for fused samples. This may be caused by cesium volatility.

**5.1.3.4 Comparison of Total Alpha with the Sum of the Isotopes.** The only significant alpha activity was associated with solids in stratum D. The sum of the individual alpha emitting isotopes exceeded the total alpha activity by 32 percent. This does not preclude using the data because the very low total alpha activities that led to high counting errors. Total alpha results may also be biased low from absorption by solids on the mount. The alpha activity for <sup>241</sup>Am in stratum D is 10 times greater than for <sup>239/240</sup>Pu.

Table 5-3. Total Alpha/Specific Isotope Sums (μCi/mL).

Matrix	Total Alpha Activity μCi/mL	Sum of Isotope Alpha Activity μCi/mL	Isotope Sum Total Alpha (100%)
Stratum D solids composite	5.68E-1	7.50E-1	132 %

**5.1.3.5 Comparison of Total Beta with the Sum of the Isotopes.** Beta activity is associated with all samples and strata. As shown in Table 5-4, the sum of individual beta emitting isotopes and total beta are in excellent agreement for drainable liquid and solids in the stratum B composite sample. In the stratum D composite sample, the sum of the individual isotopes is only 66 percent of the total beta activity. A satisfactory explanation is not apparent at this time. One difficulty is that the precision of the total beta results for that composite is poor (RPD of 30 percent). In addition, the <sup>90</sup>Sr RPD is 15.2 percent for the sample prepared by fusion, which was used for inventory and this calculation. The <sup>137</sup>Cs RPD for the sample prepared by acid dilution, which was used for this calculation and the inventory calculation, is low (0.4 percent). It is interesting, however, that the RPD for the fused sample is 31 percent. Because most beta activity is from <sup>137</sup>Cs and the <sup>137</sup>Cs results agree reasonably well for acid and fusion, it appears that the total beta result is high and possibly in error. Generally, the agreement between acid-diluted samples and fused samples is expected to be much better.

Table 5-4. Total Beta/Specific Isotope Sums (μCi/mL).

Matrix	Total Beta Activity μCi/mL	Sum of Isotope Beta Activity μCi/mL	Isotope Sum Total Beta (100%)
Drainable liquid composite	4.24E+2	4.26E+2	101 %
Stratum B solids composite	1.71E+2	1.77E+2	104 %
Stratum D solids composite	4.32E+2	2.85E+2	66 %

**5.1.3.6 Mass and Charge Balance.** The objective in performing a mass and charge balance on the 1994 core data was to determine whether the measurements were consistent. To facilitate calculation, only the sludge phase was considered in calculating balances. Only analytes at a concentration of 1,500  $\mu\text{g/g}$  or greater were considered.

Except for sodium and potassium, all cations listed in Table 5-5 were assumed present in their most common hydroxide or oxide form, and the concentrations of the assumed species were calculated stoichiometrically. There is some uncertainty as to whether a specific species were hydroxides or oxides, but the difference in molecular weight had a minimal effect on the overall mass balance. Smaller concentrations of other forms of the species are probably also present in the waste, but they are not included in order to keep the mass-charge balance calculations simple and consistent.

Table 5-5. Cation Mass and Charge Data (Stratum D).

Analyte	Concentration ( $\mu\text{g/g}$ )	Assumed Species	Concentration of Assumed Species ( $\mu\text{g/g}$ )	Charge ( $\mu\text{mol/g}$ )
Aluminum	3.96E+4	$\text{Al}(\text{OH})_3$	1.14E+5	0
Chromium	1.02E+4	$\text{Cr}(\text{OH})_3$	2.02E+4	0
Potassium	3.34E+3	$\text{K}^+$	3.34E+3	85
Iron	2.70E+3	$\text{Fe}(\text{O})(\text{OH})$	1.70E+3	0
Sodium	1.87E+5	$\text{Na}^+$	1.87E+5	8134
Total			3.27E+3	8219

Because precipitants are neutral species, all positive charge was attributed to sodium and potassium cations. The anionic analytes listed in Table 5-6 were assumed present as sodium or potassium salts and were expected to balance the positive charge. For comparison, the TOC and TIC results were converted to acetate and carbonate, respectively. In the TOC result, the data for formate and oxalate were converted to the appropriate TOC units, then subtracted prior to the TOC result being converted to acetate. The percent water was obtained from the TGA result of the solids composite in stratum D.

The ratio of microequivalents of total cations to microequivalents of total anions is 1.08. A perfect charge balance would yield a ratio of 1.00. The charge balance, along with the mass balance result of 0.966 g/g in Table 5-7, demonstrates agreement among the analyses when considering the uncertainty in the assumptions and numerous measurements that were used to arrive at the values. These results indicate that large data inconsistencies or errors are not present, and that major components have been determined and evaluated properly.

Table 5-6. Anion Mass and Charge Data (Stratum D).

Analyte	Concentration ( $\mu\text{g/g}$ )	Charge ( $\mu\text{mol/g}$ )
TOC (acetate)	$9.02\text{E}+3^1$	$1.53\text{E}+2$
TIC (carbonate)	$4.40\text{E}+4^2$	$1.467\text{E}+3$
Formate	$4.96\text{E}+3$	$1.1\text{E}+2$
Oxalate	$2.08\text{E}+4$	$4.73\text{E}+2$
Chloride	$7.03\text{E}+3$	$1.98\text{E}+2$
Fluoride	$1.56\text{E}+3$	$8.2\text{E}+1$
Nitrite	$8.19\text{E}+4$	$1.78\text{E}+3$
Nitrate	$9.81\text{E}+4$	$1.582\text{E}+3$
Phosphate	$1.56\text{E}+4$	$4.93\text{E}+2$
Sulfate	$7.82\text{E}+3$	$1.63\text{E}+2$
Hydroxide	$1.84\text{E}+4$	$1.082\text{E}+3$
Total	$3.09\text{E}+5$	$7.583\text{E}+3$

Notes:

<sup>1</sup>Estimated as acetate, corrected for formate and oxalate

<sup>2</sup>Estimated as carbonate

Table 5-7. Mass Balance Totals.

Totals	Concentrations (grams per gram)
Total from Table 5-5	0.327
Total from Table 5-6	0.309
Water (33%)	0.330
Grand Total	0.966

**5.2 COMPARISON OF SAMPLING EVENTS**

The use of composite samples in the 1994 sample event makes it difficult to compare results in the solids to the individual segments analyzed from the 1986 sampling event. Table 5-8 compares the two solids results. For the chemical and radiochemical results for the 1986 core sampling event, see Appendix C.

Comparing the radiochemistry data for the 1986 event to that for stratum D of the 1994 event shows that the 1994 activities are somewhat lower than the 1986 activities. Part of this is attributable to the decay of the isotopes. Because of the uncertainties in compositing in 1994 and uncertainties in 1986 results, no rigorous comparison of the events is possible. However, no major inconsistencies appear.

Table 5-8. 1986 and 1994 Core Comparison.<sup>1</sup>

Analyte	1986 (µg/g)			1994 (µg/g)	
	Segment 2	Segment 7	Segment 12	Stratum C	Stratum D
Al	4.45E+4	4.15E+4	4.77E+4	3.75E+4	3.96E+4
Cr	3.0E+3	5.9E+3	5.8E+3	5.65E+3	1.02E+4
Fe	9.4E+2	1.6E+3	2.0E+3	1.46E+3	2.70E+3
K	3.8E+3	3.4E+3	2.6E+3	3.04E+3	3.34E+3
Na	2.17E+5	2.07E+5	2.97E+5	1.60E+5	1.87E+5
Ni	8.0E+1	1.30E+2	1.20E+2	2.9E+1	1.02E+2
Cl <sup>-</sup>	7.3E+3	6.8E+3	5.3E+3	7.4E+3	7.0E+3
NO <sub>2</sub> <sup>-</sup>	8.35E+4	7.91E+4	7.31E+4	7.99E+4	8.19E+4
NO <sub>3</sub> <sup>-</sup>	1.0E+5	1.0E+5	2.5E+5	9.64E+4	9.81E+4
PO <sub>4</sub> <sup>3-</sup>	3.1E+3	3.8E+3	4.2E+3	8.44E+3	1.56E+4
SO <sub>4</sub> <sup>2-</sup>	2.4E+3	4.6E+3	3.8E+3	6.38E+3	7.82E+3
OH <sup>-</sup>	2.10 M	2.06 M	1.55 M	1.79 M	1.63 M

Note:

<sup>1</sup>1986 data should be used with caution because the level of quality is uncertain and because of later waste additions.

### 5.3 TANK WASTE PROFILE

The tank waste profile for tank 241-SY-103, for which approximately half the contents is contained in a nonconvective layer, is difficult to estimate. The ability to evaluate the horizontal distribution of waste components is limited by the number of risers sampled (14A and 17A), while the vertical stratification depends on the number of segments or subsegments analyzed. Because supernatant has been added to the tank since 1986, estimates using the 1986 data are not informative.

The 1986 segment samples (2, 7, and 12) may give a better estimate of the solids stratification because the segments were chosen to sample the three suspected solids layers (see Section 3.3) The 1994 core solids were composited into two samples: one from the interface (stratum C); the other containing solids from the remaining segments (stratum D), except for the bottom segment.

The total waste composition has been estimated in Table 2-2 based on process knowledge. The uranium ion exchange sludge has not been estimated. The CCPLX layer is expected to be on the bottom and the DSS layer above it. The main features of the CCPLX waste estimate are the lack of aluminum, the presence of organics, and lower levels of nitrite and hydroxide, when compared to the DSS. Table 5-8 shows no significant difference for these analytes among segments 2, 7, and 12. This indicates that substantial mixing has occurred between the solids layers.

Organics were not measured in the 1986 core sample, but they were part of the composite samples in the 1994 core. The safety screen analyses did include DSC, which gives a relative idea of organics stratification in the solids layer. The DSC analyses were done on each half segment, and the results are in Table 4-6. Only the lower halves of segments 13 and 14 indicate increased organics. Unfortunately, segment 15 data, expected to have the most organics, is suspect because of sampling problems associated with it. The alpha results show no trends, but they are higher in the solids layer (segments 9 to 14) than in the supernate.

Uranium was not measured in the 1986 core sample. Table 5-9 lists the average uranium results of the 1994 strata solids. There appears to be no difference between the stratum C sample, which is expected to contain the uranium resin sludge, and the stratum D sample.

Data indicate that two relatively homogenous phases (convective and nonconvective) are present in the tank. The nonconvective layer does not show signs of stratification, which may be caused by the mechanical mixing action experienced during gas releases.

Table 5-9. Average Concentration ( $\mu\text{g/g}$ ) Solids.

	Stratum A	Stratum B	Stratum C	Stratum D
Uranium	7.05	< .02	626	776

**5.4 COMPARISON OF ANALYTICAL AND TRANSFER HISTORY INFORMATION**

Table 5-10 compares the supernatant mixing model and the analytical composite sample results from the 1994 core (Brevick 1995). Most major constituents compare reasonably well with the computer model, except hydroxide. Among the lesser constituents, Cr<sup>3+</sup> and K<sup>+</sup> were found at much higher levels than predicted; SO<sub>4</sub><sup>2-</sup> was much lower. The model contains several organic constituents including citrate, EDTA, HEDTA, glycolate, and dibutyl phosphate, which were not analyzed on the 1994 core sample. Some organic results (Campbell et al. 1995) were compared to the historical model. A TOC analysis compared well with the model's prediction.

Table 5-10. Tank 241-SY-103 Inventory Comparison.<sup>1</sup>

Constituent	Supernatant Mixing Model Composite (kg)	1994 Core Total Inventory	
		(kg)	Ratio Predicted/Found
Na <sup>+</sup>	6.56E+5	7.19E+5	0.91
Al <sup>3+</sup>	1.08E+5	1.45E+5	0.74
Cr <sup>3+</sup>	4.79E+3	2.19E+4	0.22
Ni <sup>2+</sup>	4.02E+2	2.9E+2	1.37
K <sup>+</sup>	2.69E+3	1.28E+4	0.21
OH <sup>-</sup>	2.95E+5	8.06E+4	3.66
NO <sub>3</sub> <sup>-</sup>	5.34E+5	5.04E+5	1.06
NO <sub>2</sub> <sup>-</sup>	3.75E+5	3.77E+5	0.99
PO <sub>4</sub> <sup>3-</sup>	3.65E+4	4.05E+4	0.90
SO <sub>4</sub> <sup>2-</sup>	7.76E+4	1.70E+4	4.56
F <sup>-</sup>	5.27E+3	3.35E+3	1.57
Cl <sup>-</sup>	1.73E+4	3.15E+4	0.55
TOC	1.08 wt% C	0.89 wt% C	1.21
C <sub>6</sub> H <sub>5</sub> O <sub>7</sub> <sup>3-</sup>	1.87E+4	5.50E+3 <sup>1</sup>	3.40
EDTA <sup>4-</sup>	1.78E+4	6.15E+3 <sup>1</sup>	2.89
HEDTA <sup>3-</sup>	3.02E+4	1.46E+2 <sup>1</sup>	207
Oxlate	1.41E+1	4.73E+4 <sup>1</sup>	0.0003
Acetate	2.51E+3	6.83E+3 <sup>1</sup>	0.37
U	3.55E+3	1.67E+3	2.13
Pu	1.77 kg	2.16 kg	0.82
Cs	1.11E+6 Ci	1.13E+6 Ci	0.98
Sr	2.51E+4 Ci	7.90 E+4 Ci	0.32

Note:

<sup>1</sup>Campbell et al. (1995)

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## 5.5 EVALUATION OF PROGRAM REQUIREMENTS

The 1994 auger sampling event was performed based on the crust burn issue DQO (Johnson 1994). The 1994 core sampling event was guided by the safety screening DQO (Babad and Redus 1994) and the flammability DQO (McDuffie and Johnson 1994). Implementation of the DQOs through tank characterization plans are summarized in Schreiber (1994a, 1994b, and 1995).

### 5.5.1 Safety Evaluation

Data criteria identified in the safety screening and flammability DQOs are used to assess the waste safety in tank 241-SY-103. The safety screening DQO requires data from two widely spaced risers, and the flammability DQO requires data from one riser. Because of the pressurization observed in the bottom segment for core 62, it was decided not to obtain a second core from the tank; therefore, the sampling requirements of the safety screening DQO were not met. Safety screening results for the vertical subsegments for the one core indicate the two major waste layers are relatively homogeneous. Because of the large amount of water in the tank and the gas evolution events, the waste may be mixed. It is possible that the horizontal variations that would be observed by taking and analyzing a second core would be small.

Although some of the auger samples of the crust had low moisture (< 17 weight percent) content and relatively high (1 weight percent) TOC concentrations, no exothermic reactions were observed. This indicates the potential for a crust burn is low.

Table 5-11 summarizes the results for the safety screening analyses. Most samples exhibited exothermic behavior. The mean enthalpy observed for a dried sample was approximately the same (350 to 400 J/g) for the supernate and solid phases of the waste. One drainable liquid and one solid semi-segment sample exceeded the present 480 J/g safety screening criteria. However, the weight percent water for the waste is significantly above 17 weight percent and would prevent propagation of any potential reaction.

The exothermic behavior is most likely the result of the reaction of organic complexants with nitrates/nitrites at elevated temperatures. Table 5-12 shows the TOC is relatively high throughout the tank. The samples with larger exotherms had dry weight TOC concentrations near 2 weight percent. All of the energy estimates (except two) calculated from the TOC, assuming that the TOC is acetate, were greater than the observed exotherms by DSC. These calculated enthalpy values are based on an estimate of 1,200 J/g energy for 4.5 weight percent TOC as acetate (Turner et al. 1995). Only small amounts of cyanide were found in the waste and do not contribute significantly to the observed exotherms.

Ion chromatography results for formate, acetate, and oxalate can account for 20 to 30 percent of the TOC in the supernate and 70 to 80 percent of the TOC in the solid phase. The solid phase contains significant quantities of oxalate, and the supernate contains none. This

indicates that insoluble oxalates may be present in the solid waste. The oxalates and formates are degradation products of complexants such as HEDTA and EDTA and will not react as energetically with nitrate as the original complexants.

Radiolysis of water and organic degradation in the tank generate hydrogen and other gases (NH<sub>3</sub>, NO<sub>2</sub>) in the headspace of the tank. Combustible gas meter testing of the tank vapors before sampling measured 0 percent LFL. The safety screening DQO notification limit for flammable gas concentration is 25 percent of the LFL (Dukelow et al. 1995). The combustible gas meter used to measure gases in the tank vapor reports results as a percent of the lower explosive limit (LEL). Because the National Fire Protection Association defines the term LFL and LEL identically, the two terms are used interchangeably (NFPA 1995).

Table 5-11. Comparison of Analytical Results with Decision Criteria for the Safety Screening Data Quality Objective.

Decision Variable	Decision Criteria Threshold	Analytical Values	
		Supernate Segment 1 to 9	Solids Segment 9 to 14
Total Fuel	-480 J/g <sup>1</sup>	mean = 384 + 53 J/g <sup>2</sup>	mean = 347 + 67 J/g <sup>2</sup>
		high = 559 J/g	high = 630 J/g
Percent Moisture	17 wt%	Av = 48.7 - 0.4 wt% <sup>2</sup>	Av = 41.6 - 1.4 wt% <sup>2</sup>
Total Alpha	1 g/L 61.5 μCi/mL Liquid 41.0 μCi/mL Solid	< 0.08 μCi/mL <sup>3</sup>	Av = 0.95 + 0.15 μCi/mL <sup>2</sup>
Flammable Gas	< 25% LFL	Explosivity meter = 0% LFL	
		Highest standard hydrogen monitoring system H <sub>2</sub> = 7.35% LFL	
		Highest NH <sub>3</sub> = 0.32% LFL	
TOC	30,000 μg/g	9,640 μg/mL (18,680) <sup>4</sup>	10,600 μg/g (15,820) <sup>4</sup>

Notes:

<sup>1</sup>Negative values denote exothermic reaction. The 480 J/g is based on the most recent version of the safety screening DQO (Dukelow et al 1995). A threshold of 523 J/g was applicable at the time of the sampling event.

<sup>2</sup>Upper or lower limit to a one-sided 95 percent confidence interval on the mean.

<sup>3</sup>Total alpha on the drainable liquid composite.

<sup>4</sup>Values in parentheses are based on dry weight.

Table 5-12. Evaluation of Organic Fuel Content in Tank 241-SY-103.

Sample	TOC	Oxalate	Formate	DSC Energy	Calc. Energy <sup>1</sup>
Strata/Segment	µg/g or mL	µg/g or mL	µg/g or mL	J/g Wet	J/g Wet
Strata A Segment 1-solids	4,770 (7,845)	< 95.8	2,920 (3,993)	118	127
Drainable liquid Comp. Segments 2 to 7	9,640 (18,680)	< 2,550 1,350 Acetate	4,240 (7,579)	85	257
Strata B Segments 4 to 8 solids	2,660 (4,990)	< 97.1	2,750 (5,159)	165	71
Segment 4 Lower solids	3,200 (4,526)	n/a	n/a	57	85
Segment 8 Drainable liquid	10,000 (19,157)	< 2,550 1330 Acetate	4,280 (7700)	227	267
Strata C Segment 9 solids	9,580 (17,514)	23,200 (42,413) 368 Acetate	3,440 (6289)	175	255
Segment 13 Lower solids	10,800 (18,060)	n/a	n/a	377	288
Segment 14 Lower solids	10,300 (17,487)	n/a	n/a	273	275
Strata D solids Comp.	10,600 (15,820)	20,800 (31,044) 3,130 Acetate	4,960 (7,420)	159	283

Notes:

( ) = Are dry weight values.

$$^1 \text{Calculated Energy (J/g)} = \text{wt\% TOC in sample} \times \frac{1,200 \text{ J/g}}{4.5 \text{ wt\% TOC}}$$

A standard hydrogen monitoring system was installed on the tank in June 1994. An ammonia monitoring system also was installed on the stack exhaust for all SY tanks. For monitoring results, see Section 4.4. The highest recorded hydrogen concentration was 0.294 volume percent. This represents 7.35 percent of the LFL for hydrogen.

The estimated ammonia concentration from tank 241-SY-103 at the peak of the May 2, 1995 gas release was 486 ppmv. This represents only 0.32 percent of the LFL for ammonia. The standard hydrogen monitoring system hydrogen results have been verified by occasional grab samples. Small quantities of methane (10 to 15 ppmv) have also been detected in grab samples but do not contribute significantly to the LFL. This monitoring indicates the flammability of the tank vapors are well below the 25 percent LFL limit even during the short duration gas release events. Rheology, void fraction, and other physical measurements on the waste will be used to assess the potential for gas build-up in the liquid and solid phases of the wastes.

Another factor in assessing the tank waste safety is the heat generation and temperature of the wastes. Heat is generated in the tanks primarily from radioactive decay. The primary contributors for heat generation in the tank are  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$ . The estimated heat generated from the isotopes in the tank is 5,880 W (20,100 Btu/hr) as shown in Table 5-13. This is well below the 11,723 W (40,000 Btu/hr) criteria for distinguishing a high heat tank from a low heat tank. Temperature monitoring indicates the waste temperature is decreasing as expected from decay of the isotopes.

Table 5-13. Heat Generation (W).

Matrix	$^{90}\text{Sr}/\text{Y}$	$^{137}\text{Cs}/\text{Ba}$	Total W
Drainable liquids	2.69E+1	2.70E+3	2.72E+3
Convective solids (stratum B)	1.25	1.19E+2	1.21E+2
Nonconvective solids (stratum D)	5.00E+2	2.54E+3	3.04E+3
			5.88E+3

The potential for criticality is assessed from total alpha and  $^{239/240}\text{Pu}$  analyses. As expected, the highest total alpha results (0.5 to 1.5 uCi/g) were found in the solids layer. These results are well below the 41 uCi/g notification limit for safety screening. In addition, the  $^{239/240}\text{Pu}$  activity in the solids is approximately 0.06 uCi/g. This and  $^{241}\text{Am}$  analyses indicate that most total alpha activity is from  $^{241}\text{Am}$ .

### 5.5.2 Operational Evaluations

The 1986 sampling was performed to characterize the waste for retrieval and processing to create immobile waste forms suitable for disposal. The 1994 core sampling was performed to screen the tank for general safety considerations, flammable gas issues, and further process development purposes. However, the process development core (core 2) has not been sampled yet. Metal and anion analyses will support operating decisions for this tank.

The 1994 analysis results indicate the total organic carbon content of the tank is near the 10-g/L TOC complexant waste classification limit, and the actinide levels in the sludge exceed the transuranics limit of 100 nCi/g.

### **5.5.3 Environmental Evaluation**

Tank 241-SY-103 was not characterized to designate waste or to evaluate environmental compliance issues. The tank has been characterized to meet regulatory requirements that the waste is safely stored and managed. No specific organic (volatile or semivolatile) analyses have been performed on the tank; therefore, no assessment can be made of these compounds.

The 1994 analyses indicate the tank meets the hydroxide specification ( $12 < \text{pH} > 14$ ), with the lowest pH measured at 12.85. Chromium, mostly as  $\text{Cr}^{3+}$ , is present in relatively high concentrations in the sludge. No analysis was made for metals such as lead, mercury, cadmium, and silver.

### **5.5.4 Process Development Evaluation**

The metal and anion analyses will be important in evaluating the glass disposal waste formulations and identifying potential components that may affect the treatment and disposal process. Because waste sludges may be blended, washed, and treated before disposal, there are no specific criteria. Solids samples have been taken for physical testing (Bredt et al. 1995) and to evaluate sludge washing (Lumetta and Rapko 1995).

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## 6.0 CONCLUSION AND RECOMMENDATIONS

The crust, supernate, and solids in tank 241-SY-103 were sampled and analyzed. Because no exotherms were observed in any auger crust sample, the potential for a crust burn was considered low, and full core sampling was performed. Only one core sample was taken in 1994 because sampling was stopped after a segment showed pressurization when extruded in the hot cells. The one core satisfied the flammability DQO but did not meet the requirements of the safety screening DQO which requires two cores from widely spaced risers. However, results for different segments of the one core indicate the waste may be reasonably homogeneous, and large differences may not exist between risers.

The DSC analyses for one drainable liquid and one semi-segment solid exceeded the safety screening criteria of 480 J/g (dry weight). All segments in the core exhibited exotherms. TOC levels were relatively high throughout the tank but less than 3 weight percent. The weight percent water concentration for samples was well above the 17 weight percent criteria; therefore, although a fuel source is present in the waste, the water content is too high for an exothermic reaction to propagate. The thermal history of the waste does not indicate excessive temperatures, and the tank temperature is decreasing.

Flammability testing of the tank vapor using a combustible gas meter before sampling indicated 0 percent of the LFL. Hydrogen gas monitors for tank 241-SY-103 have recorded hydrogen gas concentrations in the headspace as high as 7.35 percent of the LFL. Ammonia monitors on the SY Tank Farm stack exhaust have estimated ammonia concentrations of about 0.3 percent of the LFL during a gas release event. These values are consistent with results obtained from grab samples and are well below the 25 percent LFL vapor safety criteria. Based on these results, ignition of the tank vapors is not possible.

Physical measurements on samples from the 1994 sampling event and in-tank rheology and void space measurements have been made and will be used to evaluate gas accumulation in the tank waste. Analysis of metals, TOC, and anions further support the flammability DQO.

The total alpha results and the isotopic plutonium results show that the fissile content of the waste is well below the criticality criteria for the waste. The <sup>241</sup>Am concentration in the solids is about 10 times higher than the plutonium concentration and together they exceed the transuranic waste criteria of 100 nCi/g.

The data from the 1994 sampling event is sufficient to establish that the waste in its present condition does not present an immediate safety problem. Although the safety screening sample requirement of two cores was not met, the consistency of the results indicate that the waste is homogeneous for critical analytes; therefore resampling for this purpose may not be necessary. If the tank is resampled for other purposes in the future, it should be done from a second riser if possible, and the safety screening analyses should be included to verify these conclusions.

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**APPENDIX A**  
**1994 CORE SAMPLING DATA**

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## A.0 1994 CORE SAMPLING DATA

### A.1 INTRODUCTION

Table A-1 presents the detailed results for the analysis of each sample including applicable quality control information.

### A.2 COLUMN HEADINGS

The column headings for Table A-1 are discussed below. Segment numbers and portions are identified in rows preceding each data set.

Sample #	Identifies the 222-S Laboratory Labcore sample number.
"Q"	Identifies the quality qualifiers for the data. These qualifiers are as follows:  "a" - indicates the standard recovery was below the quality control limit  "b" - indicates the standard recovery was above the quality control limit  "c" - indicates the spike recovery was below the quality control limit  "d" - indicates the spike recovery was above the quality control limit  "e" - indicates the RPD was outside the quality control limit  "f" - indicates there was blank contamination > 10 percent of the result

The quality control limits are based on the tank characterization plan (Schreiber 1995). Standard recoveries may be outside the plan limits but still within the laboratory control limits for that procedure. Analytes near the detection limit for a method may produce RPDs that exceed the limits in the plan. Spike recoveries may not be valid indicators of accuracy when the concentration of the analyte in the sample is so large that accurate spike measurements are not possible. These conditions must be considered when evaluating data with these quality control flags.

"A#" data-bbox="134 104 174 118">	This identifies the aliquot class or how the sample aliquot was treated before analysis. The following codes are used:
	"A" - solid sample was prepared by acid digestion
	"B" - liquid sample was prepared by acid digestion
	"D" - sample was prepared by acid dilution
	"F" - sample was prepared by KOH fusion and acid dissolution
	"R" - sample was digested in water then acidified for radiochemical analysis
	"V" - sample was diluted in water
	"W" - sample was leached or digested in water but no acid was added.
"Analyte" data-bbox="134 418 214 432">	Identifies the analyte/test performed and the analytical method used. DSC exothermic data do not have the normal "-" sign convention.
"Unit" data-bbox="134 473 184 487">	This is the unit for the results.
"Standard %" data-bbox="134 508 244 522">	This is the percent recovery for the standard run with the batch.
"Blank" data-bbox="134 543 194 557">	This is the result for the preparation blank prepared for the batch.
"Result" data-bbox="134 578 199 592">	This is the test result for the sample.
"Duplicate" data-bbox="134 613 224 627">	This is the duplicate result for the sample.
"Average" data-bbox="134 648 214 662">	This is the average of the sample and duplicate result.
"RPD" data-bbox="134 683 189 697">	This is the RPD between the sample and duplicate results.
"Spk Rec %" data-bbox="134 718 241 732">	This is the recovery for a spike added to the sample. Spikes may be added before or after sample preparation depending on the method.
"Det. Limit" data-bbox="134 773 234 787">	This is the estimated detection limit for the prepared sample. This detection limit is a function of the instrument detection limit and the sample size used for analysis.
"Count Err%" data-bbox="134 840 244 854">	This is the error in radiochemical analysis that is derived from counting statistics. When this error is large, it indicates the sample analyzed was near its minimum detectable activity.

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Sp. Rec. %	Det. Limit	Count Err. %
Segment #1													
Drainable Liquid													
SEGMENT PORTION													
S94T00008			% Water by TGA using Mettler	%	98.26	n/a	49.45	48.18	4.88E+01	2.6	n/a	1.00E-02	n/a
S94T00008	e		DSC Exotherm using Mettler	Joules/g	97.7	n/a	1.36E+02	210.6	1.73E+02	43.3	n/a	n/a	n/a
S94T00009			Lithium-ICP-Acid Dil.	ug/mL	99.8	1.00E-03	LDL	LDL	n/a	n/a	n/a	11	n/a
S95T000281			Tot. Organic Carbon by Coul.	ug/mL	99.67	<5.000	n/a	n/a	n/a	n/a	n/a	5	n/a
S95T000281			% Water by TGA using Mettler	%	99.32	n/a	47.4	46.04	4.67E+01	2.91	n/a	n/a	n/a
S95T000281			pH Direct	pH	99.46	n/a	n/a	n/a	n/a	n/a	n/a	1.00E-02	n/a
S95T000281			DSC Exotherm using Mettler	Joules/g	103.7	n/a	32.9	31.7	3.23E+01	3.72	n/a	n/a	n/a
S95T000323	B		Aluminium -ICP-Acid Digest-Liq	ug/mL	96.4	1.50E-02	2.42E+04	24100	2.42E+04	0.41	n/a	21	n/a
S95T000323	B		Boron -ICP-Acid Digest-Liquid	ug/mL	94.6	1.00E-03	56.8	52.6	5.47E+01	7.68	n/a	21	n/a
S95T000323	B		Barium -ICP-Acid Digest-Liquid	ug/mL	94.2	0.00E+00	< 21.00	<21	n/a	n/a	n/a	21	n/a
S95T000323	B		Bismuth -ICP-Acid Digest/Liq	ug/mL	92.8	-2.30E-02	< 42.00	<42	n/a	n/a	n/a	42	n/a
S95T000323	B		Calcium -ICP-Acid Digest-Liq	ug/mL	96	1.70E-02	82.7	74.9	7.88E+01	9.9	n/a	42	n/a
S95T000323	B		Chromium -ICP-Acid Digest-Liq	ug/mL	96.8	0.00E+00	1.62E+02	161	1.62E+02	0.62	n/a	4.2	n/a
S95T000323	B		Iron -ICP-Acid Digest-Liquid	ug/mL	95.2	5.00E-03	49.8	50.1	5.00E+01	0.6	n/a	21	n/a
S95T000323	B		Potassium -ICP-Acid Digest-Liq	ug/mL	100.2	7.40E-02	2.37E+03	2310	2.32E+03	0.43	n/a	210	n/a
S95T000323	B		Lithium -ICP-Acid Digest-Liq	ug/mL	94.2	0.00E+00	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RSD, %	Spk. Conc. #	Det. Limit	Conc. Exp. #
S95T000323	B		Sodium -ICP-Acid Digest-Liquid	ug/mL	94.4	-3.00E-03	1.27E+05	126000	1.26E+05	0.79	n/a	42	n/a
S95T000323	B		Nickel -ICP-Acid Digest-Liquid	ug/mL	96.4	-7.00E-03	30.7	27.9	2.93E+01	9.56	n/a	8.4	n/a
S95T000323	B		Phosphorus-ICP-Acid Adjust-Liq	ug/mL	95.2	3.00E-03	8.60E+02	866	8.63E+02	0.7	n/a	84	n/a
S95T000323	a		Silicon -ICP-Acid Digest-Liq	ug/mL	88.2	1.20E-02	67.8	66.9	6.74E+01	1.34	n/a	21	n/a
S95T000323	b		Uranium -ICP-Acid Digest-Liq	ug/mL	192.2	-1.40E-02	<2.10E+02	<210	n/a	n/a	n/a	210	n/a
S95T000323	B		Zinc -ICP-Acid Digest-Liquid	ug/mL	94.6	1.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000323	B		Zirconium -ICP-Acid Digest-Liq	ug/mL	95.6	0.00E+00	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
SEGMENT PORTION													
Stratum "A" Solids Composite (Segment 1)													
S94T000004			% Water by TGA using Mettler	%	100.2	n/a	40.92	37.44	3.92E+01	8.88	n/a	1.00E-02	n/a
S94T000004			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	1.75E+02	211.6	1.93E+02	19	n/a	1.00E-03	n/a
S94T000004			DSC Exotherm using Mettler	Joules/g	102.3	n/a	1.03E+02	132.4	1.18E+02	24.7	n/a	n/a	n/a
S94T000005	c, f		Uranium by Phosphorescence	ug/g	99.24	1.37	7.83	6.27	7.06E+00	22.1	104	1.31	n/a
S94T000005	b		Alpha of Digested Solid	uCi/g	110.2	<2.290E-1	<2.29E-01	<2.29E-1	n/a	n/a	108.2	5.48E-01	500
S94T000005	F		Am-241 by Extraction	uCi/g	107.1	<2.480E-2	<2.87E-02	<2.81E-2	n/a	n/a	n/a	2.90E-02	23
S94T000005	F		Cm-243/244 by Extraction	uCi/g	n/a	<2.480E-2	<2.87E-02	<2.81E-2	n/a	n/a	n/a	2.90E-02	65.4
S94T000005	F		Beta of Solid Sample	uCi/g	91.36	<1.050	3.08E+02	285	2.97E+02	7.76	89.8	1.88	1.7
S94T000005	F		Cesium-137 by GEA	uCi/g	98.4	3.28E-01	2.39E+02	242	2.41E+02	1.25	n/a	3.28E-01	1.05
S94T000005	F		Iodine-129 Waste Tank Samples	uCi/g	100	<8.030E-2	<5.02E-02	<4.71E-2	n/a	n/a	n/a	5.00E-02	n/a
S94T000005	F		Aluminium -ICP-Fusion	ug/g	98.6	3.20E-01	2.23E+04	22200	2.22E+04	0.45	n/a	226	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Rec. %	Det Limit	Crust Brk %
S94T000005	F		Calcium -ICP-Fusion	ug/g	101.4	2.97E-01	<4.57e+02	177	n/a	n/a	n/a	452	n/a
S94T000005	e		Chromium -ICP-Fusion	ug/g	102.2	6.00E-03	64.5	54.2	5.94E+01	17.4	n/a	45.2	n/a
S94T000005	F		Iron -ICP-Fusion	ug/g	101.2	3.02E-01	<2.26e+02	30.2	n/a	n/a	n/a	226	n/a
S94T000005	F		Potassium -ICP-Fusion (2)	ug/g	96.6	-1.40E-02	n/a	n/a	n/a	n/a	n/a	1.36E+03	n/a
S94T000005	F		Sodium -ICP-Fusion	ug/g	97.4	3.88	1.41E+05	141000	1.41E+05	0	n/a	452	n/a
S94T000005	F		Nickel -ICP-Fusion (2)	ug/g	101.8	6.66	n/a	n/a	n/a	n/a	n/a	90.5	n/a
S94T000005	F		Zinc -ICP-Fusion	ug/g	103.6	1.50E-02	< 45.20	4.28	n/a	n/a	n/a	45.2	n/a
S94T000005	F		Zirconium -ICP-Fusion	ug/g	99.8	1.00E-01	< 45.20	2.59	n/a	n/a	n/a	45.2	n/a
S94T000005	a	F	Lithium -ICP-Fusion	ug/g	96	<1.00E-2	LDL	LDL	n/a	n/a	n/a	95.1	n/a
S94T000005	c	F	Np237 by TTA Extraction	uCi/g	73.28	<9.370e-3	<1.17e-02	<9.29e-3	n/a	n/a	63.7	2.00E-02	490.6
S94T000005	F		Pu-238 by Ion Exchange	uCi/g	n/a	1.00E-02	<4.23e-03	<3.67e-3	n/a	n/a	n/a	4.00E-03	12.5
S94T000005	F		Pu-239/240 by TRU-SPEC Resin	uCi/g	97.89	<9.050e-3	<4.23e-03	<3.67e-3	n/a	n/a	n/a	4.00E-03	13.2
S94T000005	F		Strontium-89/90 High Level	uCi/g	99.11	2.90E-02	1.68	1.94	1.81E+00	14.4	n/a	1.00E-03	1
S94T000005	F		Tetradium-99 Liq. Scint.	uCi/g	85.06	<2.480e-2	1.91E-01	0.175	1.83E-01	8.74	85	2.50E-02	4.14
S94T000006			Bulk Density of Sample	g/mL	n/a	n/a	1.59	n/a	n/a	n/a	n/a	5.00E-01	n/a
S94T000265			pH on SST Samples	pH	100.2	n/a	13.01	13.04	1.50E+01	0.23	n/a	1.00E-02	n/a
S94T000265			TOC by Persulfate/Coulometry	ug/g	90.67	32.5	4.92E+03	4620	4.77E+03	6.29	n/a	80	n/a
S94T000265			TIC by Acid/Coulometry	ug/g	97.83	2.200	2.68e+03	2.68e+03	2.68e+03	0.00	n/a	5.000	n/a
S94T000266	A		Aluminium -ICP-Acid Digest	ug/g	97.6	2.60E-02	2.89E+04	29400	2.92E+04	1.72	n/a	17.6	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Result	Drinking	Average	RDP %	Sp. Res #	Det. Limit	Compl. Exp #
S94T000266	A		Calcium -ICP-Acid Digest	ug/g	101.2	2.10E-02	1.09E+02	108	1.09E+02	0.92	n/a	35.1	n/a
S94T000266	A		Chromium -ICP-Acid Digest	ug/g	95.8	1.10E-02	27	27.9	2.75E+01	3.28	n/a	3.51	n/a
S94T000266	A		Iron -ICP-Acid Digest	ug/g	96.6	4.40E-02	< 17.60	< 17.60	n/a	n/a	n/a	17.6	n/a
S94T000266	b		Potassium -ICP-Acid Digest	ug/g	121	2.15	2.89E+03	2930	2.91E+03	1.37	n/a	105	n/a
S94T000266	A		Sodium -ICP-Acid Digest	ug/g	99.2	1.14E-01	1.50E+05	149000	1.50E+05	0.67	n/a	70.2	n/a
S94T000266	A		Nickel -ICP-Acid Digest	ug/g	94.6	7.00E-03	33.4	35.5	3.43E+01	6.1	n/a	7.02	n/a
S94T000266	A		Zinc -ICP-Acid Digest	ug/g	91.2	6.00E-03	19.4	19.1	1.93E+01	1.56	n/a	3.51	n/a
S94T000266	A		Zirconium -ICP-Acid Digest	ug/g	96.4	7.00E-03	< 3.510	< 3.51	n/a	n/a	n/a	3.51	n/a
S94T000267	e		OH <sup>-</sup> by Pot. Titration	ug/g	99.36	< 50300.0	1.40E+04	15900	1.50E+04	12.7	n/a	5.99E+03	n/a
S94T000267	W		Chromium (VI) by Spec.	ug/g	100.6	< 2.290E-1	< 21.90	< 21.9	n/a	n/a	107.9	21.9	n/a
S94T000267	W		Tritium By Lachat	uCi/g	92.36	< 4.210E-4	< 4.15E-04	< 4.21E-4	n/a	n/a	88.8	4.21E-04	5.49
S94T000267	W		Bromide by Ion Chromatograph	ug/g	97.38	< 1.000	< 95.80	< 95.8	n/a	n/a	94.4	95.8	n/a
S94T000267	e		Chloride-IC-Dioxex 4000/4500	ug/g	95.73	1.188	5.79E+03	7050	6.42E+03	19.6	72.7	19.2	n/a
S94T000267	e		Fluoride-IC-Dioxex 4000/4500	ug/g	94.82	< 1.000E-1	3.00E+02	366	3.33E+02	19.8	65.8	9.59	n/a
S94T000267	e		Nitrate-IC - Dioxex 4000/4500	ug/g	96.21	< 1.000	6.80E+04	84400	7.65E+04	20.7	102.1	95.8	n/a
S94T000267	e		Nitrate by IC-Dioxex4000/4500	ug/g	96.19	< 1.000	1.61E+05	105900	1.33E+05	42.1	103.5	95.8	n/a
S94T000267	W		Oxalate by IC - Dioxex 4000i	ug/g	94.81	< 1.000	< 95.80	< 95.8	n/a	n/a	101.4	95.8	n/a
S94T000267	s, e		Phosphate-IC-Dioxex 4000i/4500	ug/g	97.09	< 1.000	6.03E-04	31900	4.61E+04	61.6	65.9	95.8	n/a
S94T000267	W		Sulfate by IC-Dioxex4000i/4500	ug/g	95.83	< 1.000	1.58E+03	1840	1.71E+03	15.2	95.6	95.8	n/a
S94T000267	W		Acetate by IC - Dioxex 4000i	ug/g	n/a	< 1.000	n/a	n/a	n/a	n/a	n/a	1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

SampleID	Q	AF	Analyte	Unit	Standard %	Blank	Premit	Duplicate	Average	RFD %	Spk Res. %	Det Limit	Count Err %
S94T000267	W		Formate by IC - Dionex 4000	ug/g	n/a	<1.000	2.83E+03	3000	2.92E+03	5.83	108.3	96	n/a
S94T000268	R		Am-241 by Extraction	uCi/g	99.58	<2.670e-3	3.19E-03	0.00298	3.09E-03	6.81	n/a	3.00E-03	13.2
S94T000268	R		Cm-244/244 by Extraction	uCi/g	n/a	<2.670e-3	<2.58e-03	<2.45e-3	n/a	n/a	n/a	3.00E-03	42.9
S94T000268	R		Cobalt-60 by GEA	uCi/g	97.06	<2.990e-3	<1.07e-02	<9.75e-3	n/a	n/a	n/a	3.00E-03	n/a
S94T000268	R		Cesium-137 by GEA	uCi/g	94.64	<6.900e-3	2.41E+02	210	2.26E+02	13.7	n/a	7.00E-03	0.16
S94T000268	R		Europium-154 by GEA	uCi/g	n/a	<6.390e-3	<5.03e-02	<4.33e-2	n/a	n/a	n/a	6.00E-03	n/a
S94T000268	R		Europium-155 by GEA	uCi/g	n/a	<7.000e-3	<1.78e-01	<1.67e-1	n/a	n/a	n/a	7.00E-03	n/a
S94T000268	R		Np237 by TTA Extraction	uCi/g	72.18	<2.220e-3	<2.22e-03	<2.22E-3	n/a	n/a	87.1	5.00E-03	101
S94T000268	R		Pu-238 by Ion Exchange	uCi/g	n/a	<3.510e-4	<3.33e-04	<3.00e-4	n/a	n/a	n/a	3.33E-04	11.4
S94T000268	R		Pu-239/240 by TRU-SPEC Resin	uCi/g	98.59	<3.510e-4	<3.33e-04	<3.00e-4	n/a	n/a	n/a	3.33E-04	10.1
S94T000268	R		Strontium-89/90 High Level	uCi/g	91.89	2.10E-02	1.84	1.68	1.76E+00	9.09	n/a	2.10E-02	4.7
SEGMENT # 2-7													
Drainable Liquid Composite													
SEGMENT PORTION													
S95T000282			Tot. Organic Carbon by Cool.	ug/mL	99.67	<5.000	9.68E+03	9610	9.64E+03	0.73	n/a	105	n/a
S95T000282			% Water by TGA using Mettler	%	99.32	n/a	48.52	48.34	4.84E+01	0.37	n/a	n/a	n/a
S95T000282			pH Direct	pH	99.32	n/a	13.99	14.02	1.40E+01	0.21	n/a	1.00E-02	n/a
S95T000282			DSC Exotherm using Mettler	Joules/g	103.7	n/a	86.6	83.5	8.51E+01	3.64	n/a	n/a	n/a
S95T000324	B		Aluminum -ICP-Acid Digest-Liq	ug/mL	96.4	1.50E-02	4.05E+04	47200	4.14E+04	4.11	n/a	21	n/a
S95T000324	B		Boron -ICP-Acid Digest-Liquid	ug/mL	94.6	1.00E-03	86.5	90.8	8.87E+01	4.85	n/a	21	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	M	Analyte	Unit	Standard %	Blank	Result	Duplicates	Average	RFD, %	Std. Dev. %	Test Limit	Client Dev. %
S95T000324	B		Barium -ICP-Acid Digest-Liquid	ug/mL	94.2	0.00E+00	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000324	B		Bismuth -ICP-Acid Digest/Liq	ug/mL	92.8	-2.30E-02	< 42.00	<42.0	n/a	n/a	n/a	42	n/a
S95T000324	B		Calcium -ICP-Acid Digest-Liq	ug/mL	98	1.70E-02	1.19E+02	117	1.18E+02	1.69	n/a	42	n/a
S95T000324	B		Chromium -ICP-Acid Digest-Liq	ug/mL	96.8	0.00E+00	32.6	33.9	3.33E+01	3.91	n/a	1.00E-02	n/a
S95T000324	B		Iron -ICP-Acid Digest-Liquid	ug/mL	95.2	5.00E-03	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000324	B		Potassium -ICP-Acid Digest-Liq	ug/mL	100.2	7.40E-02	3.82E+03	4000	3.91E+03	4.6	n/a	210	n/a
S95T000324	B		Lithium -ICP-Acid Digest-Liq	ug/mL	94.2	0.00E+00	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000324	B		Sodium -ICP-Acid Digest-Liquid	ug/mL	94.4	-3.00E-03	2.08E+05	215000	2.12E+05	3.31	n/a	42	n/a
S95T000324	B		Nickel -ICP-Acid Digest-Liquid	ug/mL	96.4	-7.00E-03	50.1	47.6	4.89E+01	5.12	n/a	8.4	n/a
S95T000324	B		Phosphorus -ICP-Acid Adjust-Liq	ug/mL	95.2	3.00E-03	1.12E+03	1170	1.14E+03	4.37	n/a	84	n/a
S95T000324	B		Silicon -ICP-Acid Digest-Liq	ug/mL	88.2	1.20E-02	77.9	81	7.95E+01	3.9	n/a	21	n/a
S95T000324	b		Uranium -ICP-Acid Digest-Liq	ug/mL	192.2	-1.40E-02	<2.10E+02	<210	n/a	n/a	n/a	210	n/a
S95T000324	B		Zinc -ICP-Acid Digest-Liquid	ug/mL	94.6	1.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000324	B		Zirconium -ICP-Acid Digest-Liq	ug/mL	95.6	0.00E+00	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000328	e	D	Uranium by Phosphorescence	ug/mL	93.03	1.98E-01	2.4	3.24	2.82E+00	29.8	98.2	3.00E-02	n/a
S95T000328	D		Alpha in Liquid Samples	nCi/mL	91.76	<2.52E-02	<2.52E-2	<2.52E-2	n/a	n/a	93.00	5.74E-02	72.3
S95T000328	D		Beta in Liquid Samples	nCi/mL	103.5	<1.090E-1	4.19E+02	429	4.24E+02	2.36	107.3	1.20E-01	0.4
S95T000328	D		Am-241 by Extraction	nCi/mL	88.27	<1.590E-3	1.67E-03	0.00182	1.75E-03	8.6	n/a	1.00E-03	8.9

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	M	Analyte	Unit	Standard #	Blank	Result	Duplicate	Average	RPD %	Std. Dev. #	Det. Limit	Count Error #
S95T000328	D		Cm-243/244 by Extraction	uCi/mL	n/a	<1.590e-3	<1.77e-04	<1.04e-3	n/a	n/a	n/a	1.00E-03	29.8
S95T000328	D		Cobalt-60 by GEA	uCi/mL	104	<5.320e-4	<1.95e-02	<1.69e-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000328	D		Cesium-137 by GEA	uCi/mL	100	<5.020e-4	4.24E+02	422	4.23E+02	0.47	n/a	1.00E-03	0.15
S95T000328	D		Europium-154 by GEA	uCi/mL	n/a	<1.330e-3	<8.02e-02	<8.28e-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000328	D		Europium-155 by GEA	uCi/mL	n/a	<1.180e-3	<2.58e-01	<2.58e-1	n/a	n/a	n/a	1.00E-03	n/a
S95T000328	c	D	Tritium By Leabak	uCi/mL	100	<5.950e-5	2.42E-03	0.00226	2.34E-03	6.84	73	6.95E-05	2.32
S95T000328	D		Np237 by TTA Extraction	uCi/mL	82.92	<4.120e-4	<8.34e-04	<5.93e-4	n/a	n/a	85.5	1.00E-03	126.8
S95T000328	D		Pu-238 by Ion Exchange	uCi/mL	n/a	<5.900e-5	<6.12e-05	<6.32e-5	n/a	n/a	n/a	6.12E-05	100
S95T000328	D		Pu-239/240 by TRU-SPEC Resin	uCi/mL	95.75	<5.900e-5	<6.12e-05	<6.32e-5	n/a	n/a	n/a	6.12E-05	3.1
S95T000328	D		Strontium-89/90 High Level	uCi/mL	94.55	<9.580e-2	2.91	3.06	2.99E+00	5.03	n/a	9.80E-02	6
S95T000328	D		Technetium-99 Liq. Scint.	uCi/mL	96.68	1.00E-03	1.54E-01	0.171	1.63E-01	10.5	n/a	1.00E-03	0.99
S95T000332	V		OH- by Pot. Titration	ug/mL	99.38	<4167.0	2.93E+04	27900	2.86E+04	4.9	n/a	4.17E+03	n/a
S95T000332	e	V	Chromium (VI) by Spec.	ug/mL	102.2	<3.900e-2	6.76	5.35	6.06E+00	23.3	105.4	3.939	n/a
S95T000332	V		Iodine-129 Wipe Track Samples	uCi/mL	81.65	<5.910e-4	<4.78e-04	0.000191	n/a	n/a	n/a	4.78E-04	n/a
S95T000332	V		Bromide by Ion Chromatograph	ug/mL	100	<40.80	<4.08e+03	<4.08e3	n/a	n/a	94.3	4.08E+03	n/a
S95T000332	V		Chloride-IC-Dioxin 4000/4500	ug/mL	101.9	<5.100	1.17E+04	11500	1.16E+04	1.72	112	510	n/a
S95T000332	V		Fluoride-IC-Dioxin 4000/4500	ug/mL	96.79	<3.060	<3.06e+02	<3.06e2	n/a	n/a	81.8	306	n/a
S95T000332	V		Nitrite-IC - Dioxin 4000/4500	ug/mL	93.51	<40.80	1.45E+05	141000	1.43E+05	2.8	98.3	4.08E+03	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	R.P.D. %	Spk. Det. %	Det. Limit	Count Err. %
S95T000332	V		Nitrate-IC - Dionex 4000/4500	ug/mL	102.2	<51.00	1.83E+05	175000	1.79E+05	4.47	108	5.10E+03	n/a
S95T000332	V		Oxalate by IC - Dionex 4000/4500	ug/mL	91.68	<25.50	<2.55E+03	<2.55E3	n/a	n/a	93.2	2.55E+03	n/a
S95T000332	V		Phosphate-IC-Dionex 4000/4500	ug/mL	96.32	<30.60	3.23E+03	3000	3.17E+03	6.72	96.7	3.08E+03	n/a
S95T000332	V		Sulfate by IC-Dionex4000/4500	ug/mL	101.7	<40.80	<4.08E+03	<4.08E3	n/a	n/a	99.9	4.08E+03	n/a
S95T000332	V		Acetate by IC - Dionex 4000/4500	ug/mL	n/a	<2.000E-1	1.37E+03	1330	1.35E+03	2.96	41.2	220	n/a
S95T000332	V		Formate by Ion Chromatograph	ug/mL	n/a	<2.000E-1	4.28E+03	4210	4.24E+03	1.65	13.9	220	n/a
S95T000740			Bulk Density of Sample	g/mL	n/a	n/a	1.47	n/a	n/a	n/a	n/a	5.00E-01	n/a
SEGMENT # 4-3													
SEGMENT PORTION													
Stratum "B" Solids Composite													
S94T000273			% Water by TGA on Perkin Elmer	%	98.28	n/a	46.81	46.55	4.67E+01	0.56	n/a	n/a	n/a
S94T000273			pH on SST Samples	pH	100.2	n/a	12.85	12.92	1.29E+01	0.54	n/a	1.00E-02	n/a
S94T000273			DSC Exotherm using Mettler	Joules/g	100.2	n/a	1.70E+02	167.1	1.69E+02	1.9	n/a	n/a	n/a
S94T000273			TOC by Peroxulfate/Coulometry	ug/g	90.67	32.5	2.40E+03	2910	2.66E+03	19.2	n/a	80	n/a
S94T000273			TIC by Acid/Coulometry	ug/g	97.83	2.200	2.00E+03	2.08E+03	2.02E+03	2.47	n/a	5.000	n/a
S94T000276	A		Aluminum -ICP-Acid Digest	ug/g	97.6	2.60E-02	2.75E+04	27500	2.75E+04	0	n/a	9.67	n/a
S96T000598	c, c	A	Aluminum-ICP-Acid Digest (4)	ug/g	96.00	1.11E-01	1.81E+04	1.39E+04	1.60E+04	26.2	32.24	28.2	n/a
S94T000276	A		Calcium -ICP-Acid Digest	ug/g	101.2	2.10E-02	2.02E+02	187	1.95E+02	7.71	n/a	19.3	n/a
S94T000276	A		Chromium -ICP-Acid Digest	ug/g	95.8	1.10E-02	31.1	31	3.11E+01	0.32	n/a	1.93	n/a
S96T000598	c	A	Chromium - ICP - Acid Digest (4)	ug/g	94.40	<1.00E-02	68.6	59.2	63.9	14.7	20.16	5.64	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	AF	Analyte	Unit	Standard %	Dilut	Percent	Duplicate	Average	RPD %	Spk. Res %	Det Limit	Count Exp %
S94T00276	A		Iron - ICP-Acid Digest	ug/g	96.6	4.40E-02	47.1	49.7	4.84E+01	5.37	n/a	9.67	n/a
S96T000598	c		Iron - ICP - Acid Digest (4)	ug/g	96.60	1.46E-01	67.90	60.90	64.40	10.9	20.0	28.2	n/a
S94T00276	b		Potassium -ICP-Acid Digest	ug/g	121	2.15	2.68E+03	2750	2.72E+03	2.58	n/a	58	n/a
S96T000598	c,e		Potassium - ICP - Acid Digest (4)	ug/g	94.6	<5.00E-01	1.77E+03	1.46E+03	1.62E+03	19.2	25.36	282.0	n/a
S94T00276	A		Sodium -ICP-Acid Digest	ug/g	99.2	1.14E-01	1.59E+05	163000	1.61E+05	2.48	n/a	96.7	n/a
S96T000598	b, d		Sodium - ICP - Acid Digest (4)	ug/g	116.2	8.63E-01	2.00E+05	2.14E+05	2.07E+05	6.76	123.3	56.4	n/a
S94T00276	A		Nickel -ICP-Acid Digest	ug/g	94.6	7.00E-03	34.3	33.7	3.40E+01	1.76	n/a	3.87	n/a
S96T000598	c		Nickel - ICP - Acid Digest (4)	ug/g	96.00	<2.00E-02	23.0	20.4	21.7	12.0	19.78	11.30	n/a
S94T00276	A		Zinc -ICP-Acid Digest	ug/g	91.2	6.00E-03	36.6	36.4	3.63E+01	0.55	n/a	1.93	n/a
S94T00276	A		Zirconium -ICP-Acid Digest	ug/g	96.4	7.00E-03	< 1.950	<1.93	n/a	n/a	n/a	1.93	n/a
S94T00279	e		OH- by Pot. Titration	ug/g	99.36	<60300.0	1.46E+04	6420	1.05E+04	71.8	n/a	6.03E+03	n/a
S94T00279	W		Chromium (VI) by Spec.	ug/g	100.6	<2.290E-1	< 72.10	<22.1	n/a	n/a	108.4	22.1	n/a
S94T00279	W		Tritium By Lachar	uCi/g	93.8	<4.660E-4	<4.73E-04	<4.72E-4	n/a	n/a	87.2	4.66E-04	5.6
S94T00279	W		Bromide by Ion Chromatograph	ug/g	97.38	<1.000	< 96.80	<97.1	n/a	n/a	97.4	96.8	n/a
S96T000599	W		Bromide by Ion Chromatograph (4)	ug/g	94.09	<1.26E-01	<1.14E+03	<1.12E+03	n/a	n/a	96.17	1.14E+03	n/a
S94T00279	e		Chloride-IC-Dioxin 4000/4500	ug/g	95.73	1.188	5.88E+03	3170	4.52E+03	59.9	96.8	19.4	n/a
S96T000599	W		Chloride -IC-Dioxin 4000/4500 (4)	ug/g	92.53	<1.70E-02	4.02E+03	4.17E+03	4.10E+03	3.66	97.59	153.3	n/a
S94T00279	c		Fluoride-IC-Dioxin 4000/4500	ug/g	94.82	<1.000E-1	2.67E+02	<9.713	n/a	n/a	71.7	9.68	n/a
S96T000599	W		Fluoride - IC - Dioxin 4000/4500 (4)	ug/g	94.75	<1.3E-02	<1.17E+02	<1.16E+02	n/a	n/a	116.4	117.3	n/a
S94T00279	e		Nitrite-IC - Dioxin 4000/4500	ug/g	96.21	<1.000	7.17E+04	39600	5.56E+04	57.7	100	96.8	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	G.	A/F	Sample	Unit	Standard %	Blank	Presk	Digestion	Average	RFP %	Spk. Res %	Det. Limit	Count Error
S96T000599	W		Nitrite-IC - Dioxet 4000/4500 (4)	ug/g	90.88	<1.07e-01	4.71E+04	4.86E+04	4.78E+04	3.13	106.3	965.1	n/a
S94T000279	c	W	Nitrate by IC-Dioxet4000/4500	ug/g	96.19	<1.000	2.47E+05	465000	3.56E+05	61.2	101.2	96.8	n/a
S96T000599	W		Nitrate - IC - Dioxet 4000/4500 (4)	ug/g	94.95	2.34E-01	4.13E+05	4.13E+05	4.13E+05	0.00	112.5	1.26E+03	n/a
S94T000279	W		Oxalate by IC - Dioxet 4000	ug/g	94.81	<1.000	< 96.80	<97.1	n/a	n/a	101.4	96.8	n/a
S96T000599	W		Oxalate by IC - Dioxet 4000 (4)	ug/g	96.63	<1.05e-01	<9.47e+02	<9.63E+02	n/a	n/a	103.0	947.1	n/a
S94T000279	c	W	Phosphate-IC-Dioxet 4000/4500	ug/g	97.09	<1.000	2.32E+04	15400	1.93E+04	40.4	97.5	96.8	n/a
S96T000599	W		Phosphate - IC - Dioxet 4000/4500 (4)	ug/g	93.59	<1.19E-01	2.40E+04	2.43E+04	2.42E+04	1.24	104.8	1.07E+03	n/a
S94T000279	c	W	Sulfate by IC-Dioxet4000/4500	ug/g	95.83	<1.000	1.62E+03	1090	1.56E+03	39.1	94.2	96.8	n/a
S96T000599	W		Sulfate - IC-Dioxet 4000/4500 (4)	ug/g	97.31	<1.36e-01	1.33E+03	1.33E+03	1.54E+03	1.3	101.6	1.23E+03	n/a
S94T000279	W		Acetate by IC - Dioxet 4000	ug/g	n/a	<1.000	n/a	n/a	n/a	n/a	n/a	1	n/a
S94T000279	W		Formate by IC - Dioxet 4000	ug/g	n/a	<1.000	2.70E+03	2800	2.75E+03	3.64	91.7	96.8	n/a
S96T000599	W		Formate by IC - Dioxet 4000 (4)	ug/g	104.8	<2.00e-01	2.43E+03	2.33E+03	2.38E+03	4.2	113.6	483.8	n/a
S94T000282	R		Am-241 by Extraction	uCi/g	99.58	<2.670e-3	<2.88e-03	<2.50e-3	n/a	n/a	n/a	3.00E-03	14.2
S94T000282	R		Cm-243/244 by Extraction	uCi/g	n/a	<2.670e-3	<2.88e-03	<2.50e-3	n/a	n/a	n/a	3.00E-03	32.5
S94T000282	R		Cobalt-60 by GEA	uCi/g	107.4	<2.910e-3	<1.01e-02	0.00626	n/a	n/a	n/a	3.00E-03	NA###
S94T000282	c	R	Cesium-137 by GEA	uCi/g	103.1	<6.560e-3	2.21E+02	130	1.76E+02	51.9	n/a	7.00E-03	0.16
S94T000282	R		Europium-154 by GEA	uCi/g	n/a	<1.970e-3	<4.72e-02	<2.67e-2	n/a	n/a	n/a	8.00E-03	NA###
S94T000282	R		Europium-155 by GEA	uCi/g	n/a	<6.960e-3	<1.72e-01	<1.32e-1	n/a	n/a	n/a	7.00E-03	NA###
S94T000282	c	R	Np237 by TTA Extraction	uCi/g	80.17	<2.430e-3	<2.43e-03	<2.51e-3	n/a	n/a	72.6	5.00E-03	109.9

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	AP	Analyte	Unit	Standard %	Blank	Peak	Diphenyl	Average	RFD %	Sp. Rec. #	Det. Limit	Count Err %
S94T000282	R		Pu-238 by Ion Exchange	uCi/g	n/a	<3.510e-4	<3.13e-04	<4.32e-4	n/a	n/a	n/a	3.13E-04	100
S94T000282	R		Pu-239/240 by TRU-SPEC Resin	uCi/g	98.59	<3.510e-4	<3.13e-04	<4.32e-4	n/a	n/a	n/a	3.13E-04	11.8
S94T000282	e		Strontium-89/90 High Level	uCi/g	93.69	2.00E-03	1.65	0.954	1.30E+00	53.5	n/a	2.00E-03	1.5
S94T000299	F		Uranium by Phosphorescence	ug/g	108.5	<2.120e-2	<2.12e-02	<2.03e-2	n/a	n/a	107.3	2.10E-02	n/a
S94T000299	F		Alpha of Digested Solid	uCi/g	97.6	<3.270e-3	<4.51e-03	<5.50e-3	n/a	n/a	87.8	8.00E-03	500
S94T000299	F		Am-241 by Extraction	uCi/g	102.5	<5.790e-2	<1.52e-02	<1.47e-2	n/a	n/a	n/a	1.50E-02	19.2
S94T000299	F		Cm-243/244 by Extraction	uCi/g	n/a	<5.790e-2	<1.52e-02	<1.47e-2	n/a	n/a	n/a	1.50E-02	113.2
S94T000299	F		Bea. of Solid Sample	uCi/g	90.06	3.20E-01	1.79E+02	162	1.71E+02	9.97	87.5	2.38E-01	0.8
S94T000299	F		Cobalt-60 by GEA	uCi/g	105.4	<2.090e-2	<2.35e-02	<2.27e-2	n/a	n/a	n/a	2.10E-02	n/a
S94T000299	F		Cerium-137 by GEA	uCi/g	96.94	<3.970e-2	1.39E+02	128	1.34E+02	8.24	n/a	4.00E-02	0.49
S94T000299	F		Europium-154 by GEA	uCi/g	n/a	<3.630e-2	<5.98e-02	<6.02e-2	n/a	n/a	n/a	3.60E-02	n/a
S94T000299	F		Europium-155 by GEA	uCi/g	n/a	<4.580e-2	<3.29e-01	<3.08e-1	n/a	n/a	n/a	4.60E-02	n/a
S94T000299	F		Iodine-129 Waste Tank Samples	uCi/g	107.9	<1.040e-1	<1.68e-01	<3.09e-1	n/a	n/a	n/a	1.68E-01	n/a
S94T000299	F		Aluminum -ICP-Fusion	ug/g	98.2	5.80E-01	1.30E+04	11900	1.24E+04	8.84	n/a	287	n/a
S94T000299	F		Calcium -ICP-Fusion	ug/g	102	4.58E-01	<5.73e+02	<548	n/a	n/a	n/a	3	n/a
S94T000299	F		Iron -ICP-Fusion	ug/g	101.2	3.42E-01	<2.87e+02	<274	n/a	n/a	n/a	1.00E-01	n/a
S94T000299	F		Potassium -ICP-Fusion (2)	ug/g	100	6.10E-02	n/a	n/a	n/a	n/a	n/a	5.00E-01	n/a
S94T000299	F		Sodium -ICP-Fusion	ug/g	98	3.87	2.23E+05	201000	2.12E+05	10.4	n/a	1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62.

Sample#	Q	A/E	Analyte	Unit	Standard %	Blank	Result	Dispersion	Average	RFD %	Spk. Rec %	Det. Limit	Count Err %
S94T000299	F		Nickel -ICP-Fusion (2)	ug/g	100.8	2.09	n/a	n/a	n/a	80.8	n/a	2	n/a
S94T000299	F		Zinc -ICP-Fusion	ug/g	102.8	-2.20E-02	< 57.30	LDL	n/a	n/a	n/a	57.3	n/a
S94T000299	F		Zirconium -ICP-Fusion	ug/g	99.6	6.70E-02	< 57.30	LDL	n/a	n/a	n/a	57.3	n/a
S94T000299	F		Np237 by TTA Extraction	uCi/g	81.27	<1.870e-2	1.45E-02	<2.40e-2	n/a	n/a	83.2	2.30E-02	102.5
S94T000299	F		Pb-218 by Ion Exchange	uCi/g	n/a	<2.900e-3	<2.42e-03	0.00999	n/a	n/a	n/a	2.00E-03	10.9
S94T000299	F		Pu-239/240 by TRUSPEC Resin	uCi/g	112.7	<2.900e-3	<2.42e-03	<2.78e-3	n/a	n/a	n/a	2.00E-03	8.6
S94T000299	F		Strontium-89/90 High Level	uCi/g	89.29	1.00E-03	1.11	1.14	1.13E+00	2.87	n/a	3.00E-03	2.1
S95T000739			Bulk Density of Sample	g/ml.	n/a	n/a	1.51	n/a	n/a	n/a	n/a	5.00E-01	n/a
S96T001319	I		Aluminum - ICP - H2O Dig/Acid (4)	ug/g	97.4	<5.00E-02	1.40E+04	1.45E+04	1.42E+04	3.51	81.70	22.6	n/a
S96T001319	e	I	Chromium - ICP - H2O Dig/Acid (4)	ug/g	102.4	<1.00e-02	10.6	12.5	11.55	16.5	103.2	4.52	n/a
S96T001319	I		Iron - ICP - H2O Dig/Acid (4)	ug/g	101.2	<5.00e-02	<22.6	<22.3	n/a	n/a	102.0	22.6	n/a
S96T001319	I		Potassium - ICP - H2O Dig/Acid (4)	ug/g	102.6	<5.00e-01	1.46E+03	1.63E+03	1.54E+03	11.0	108.5	226.0	n/a
S96T001319	I		Sodium - ICP - H2O Dig/Acid (4)	ug/g	98.6	4.51	2.13E+05	2.14E+05	2.14E+05	0.47	n/a	45.2	n/a
S96T001319	I		Nickel - ICP - H2O Dig/Acid (4)	ug/g	100.8	<2.00e-02	18.8	19.8	19.3	5.18	100.4	9.04	n/a
S95T001394	F		Chromium -ICP-Fusion	ug/g	101.3	8.90E-02	< 95.35	<93.1904	n/a	n/a	n/a	95.3	n/a
S95T001394	e, f	F	Technetium-99 Liq. Scint.	uCi/g	104.1	3.60E-02	1.26E-01	0.167	1.47E-01	28	n/a	3.10E-02	5.45

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample #	Q	A/P	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RFD %	Sp. Res. %	Dev. Limit	Causal Eff. #
SEGMENT # 2													
Lower Half													
L. Lower Half of Segment													
S94T000011	c		% Water by TGA using Mettler	%	99.1	n/a	22.45	33.45	2.80E+01	39.4	n/a	1.00E-02	n/a
S94T000011			% Water by TGA using Mettler (3)	%	99.7	n/a	47.01	n/a	n/a	n/a	n/a	1.00E-02	n/a
S94T000011			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	0.00E+00	0	0.00E+00	n/a	n/a	n/a	n/a
S94T000011			DSC Exotherm using Mettler	Joules/g	95.9	n/a	0.00E+00	no exo	n/a	n/a	n/a	n/a	n/a
S94T000012	b	F	Alpha of Digested Solid	uCi/g	110.2	<2.290E-1	<1.26E-01	<1.48E-1	n/a	n/a	109.9	3.00E-01	253
S94T000012		F	Lithium -ICP-Fusion	ug/g	98	<1.000E-2	LDL	LDL	n/a	n/a	n/a	52.1	n/a
Drainable Liquid													
S94T000015			% Water by TGA using Mettler	%	98.26	n/a	48.27	49.22	4.88E+01	1.95	n/a	1.00E-02	n/a
S94T000015	c		DSC Exotherm using Mettler	Joules/g	97.7	n/a	1.67E+02	245.1	2.00E+02	38.1	n/a	n/a	n/a
S94T000016	D		Lithium-ICP-Acid Dil.	ug/mL	99.8	1.00E-03	LDL	LDL	n/a	n/a	n/a	11	n/a
SEGMENT # 3													
SEGMENT PORTION													
L. Lower Half of Segment													
S94T000020	c		% Water by TGA using Mettler	%	99.9	n/a	21.22	17.81	1.95E+01	17.5	n/a	1.00E-02	n/a
S94T000020	c		DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	37.1	69	5.31E+01	60.1	n/a	n/a	n/a
S94T000020	c		DSC Exotherm using Mettler	Joules/g	94.9	n/a	29.2	56.7	4.30E+01	64	n/a	n/a	n/a
S94T000021	d	F	Alpha of Digested Solid	uCi/g	102.9	<1.250E-1	<1.05E-01	<1.02E-1	n/a	n/a	114.3	2.54E-01	138.6
S94T000021		F	Lithium -ICP-Fusion	ug/g	99.2	<1.000E-2	LDL	LDL	n/a	n/a	n/a	52.1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Percent	Duplicate	Average	RFD %	Spk Rec %	Det Limit	Count Err %
Drainable Liquid													
SEGMENT # 4													
L. Lower Half of Segment													
S94T000025			% Water by TGA using Mettler	%	99.22	n/a	47.41	47.83	4.76E+01	0.88	n/a	1.00E-02	n/a
S94T000025	c		DSC Exotherm using Mettler	Joules/g	98.42	n/a	1.90E+02	133.9	1.62E+02	34.9	n/a	n/a	n/a
S94T000026		D	Lithium-ICP-Acid Dil.	ug/mL	100.6	0.00E+00	LDL	LDL	n/a	n/a	n/a	11	n/a
L. Lower Half of Segment													
S94T000028	e		% Water by TGA using Mettler	%	99.41	n/a	35.51	23	2.93E+01	42.8	n/a	1.00E-02	n/a
S94T000028			% Water by TGA using Mettler (3)	%	99.7	n/a	47.21	n/a	n/a	n/a	n/a	1.00E-02	n/a
S94T000028			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	70.77	93.5	8.21E+01	27.7	n/a	1.00E-02	n/a
S94T000028	e		DSC Exotherm using Mettler	Joules/g	94.9	n/a	41.5	72	5.68E+01	53.7	n/a	n/a	n/a
S94T000028	e		TOC by Persulfate/Coulometry	ug/g	90.67	106	4.53E+03	1870	3.20E+03	83.1	n/a	153	n/a
S94T000029	b, d	F	Alpha of Digested Solid	uCi/g	112	<1.250E-1	<2.10E-01	<1.02E-1	n/a	n/a	119	2.52E-01	309.9
S94T000029	F		Lithium -ICP-Fusion	ug/g	99.2	<1.000E-2	LDL	LDL	n/a	n/a	n/a	51.7	n/a
Drainable Liquid													
SEGMENT # 5													
L. Lower Half of Segment													
S94T000032			% Water by TGA using Mettler	%	99.22	n/a	48.51	48.54	4.83E+01	0.06	n/a	1.00E-02	n/a
S94T000032			DSC Exotherm using Mettler	Joules/g	102.6	n/a	1.96E+02	203.8	2.00E+02	4.11	n/a	n/a	n/a
S94T000033		D	Lithium-ICP-Acid Dil.	ug/mL	100.6	0.00E+00	LDL	LDL	n/a	n/a	n/a	11	n/a
L. Lower Half of Segment													
S94T000036			% Water by TGA using Mettler	%	98.8	n/a	20.78	18.6	1.97E+01	11.1	n/a	1.00E-02	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AP	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Sp. Res.	Det. Limit	Conad. Dev. %
S94T000036	e		DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	46.8	0	2.34E+01	200	n/a	n/a	n/a
S94T000036			DSC Exotherm using Mettler	Joules/g	95.3	n/a	37.1	noco	n/a	n/a	n/a	n/a	n/a
S94T000037	F		Alpha of Digested Solid	uCi/g	92.14	<5.610e-1	<2.57e-01	<2.59e-1	n/a	n/a	96.3	6.15E-01	500
S94T000037	F		Lithium -ICP-Fusion	ug/g	102.4	<1.000e-2	LDL	LDL	n/a	n/a	n/a	63.5	n/a
Drainable Liquid													
S94T000040			% Water by TGA using Mettler	%	99	n/a	48.72	47.97	4.83E+01	1.55	n/a	1.00E-02	n/a
S94T000040	e		DSC Exotherm using Mettler	Joules/g	100.2	n/a	2.52E+02	180.4	2.16E+02	33	n/a	n/a	n/a
S94T000041	D		Lithium-ICP-Acid Dil.	ug/mL	101.2	0.00E+00	LDL	LDL	n/a	n/a	n/a	11	n/a
SEGMENT # 6													
Lower Half													
L. Lower Half of Segment													
S94T000055	e		% Water by TGA using Mettler	%	99.2	n/a	31.74	27.41	2.96E+01	14.6	n/a	1.00E-02	n/a
S94T000055	e		DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	3.25E+02	227.3	2.76E+02	35.3	n/a	1.00E-01	n/a
S94T000055	e		DSC Exotherm using Mettler	Joules/g	104.4	n/a	2.22E+02	165	1.93E+02	29.4	n/a	n/a	n/a
S94T000064	F		Alpha of Digested Solid	uCi/g	92.14	<5.610e-1	<3.80e-01	<2.50e-1	n/a	n/a	92.9	6.02E-01	500
S94T000064	F		Lithium -ICP-Fusion	ug/g	102.4	<1.000e-2	LDL	LDL	n/a	n/a	n/a	62.1	n/a
Drainable Liquid													
S94T000105			% Water by TGA using Mettler	%	99	n/a	49.1	49.34	4.92E+01	0.49	n/a	1.00E-02	n/a
S94T000105			DSC Exotherm using Mettler	Joules/g	100.5	n/a	1.70E+02	145.5	1.58E+02	15.5	n/a	n/a	n/a
S94T000109	D		Lithium-ICP-Acid Dil.	ug/mL	101.2	0.00E+00	LDL	LDL	n/a	n/a	n/a	6	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample #	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RFD %	Spk Rec %	Det Limit	Comment #
SEGMENT # 7													
Lower Half													
I. Lower Half of Segment													
S94T000056			% Water by TGA using Mettler (3)	%	99.7	n/a	15.3	n/a	n/a	n/a	n/a	1.00E-02	n/a
S94T000056	c		% Water by TGA using Mettler	%	98.2	n/a	48.31	17.18	3.28E+01	95.1	n/a	1.00E-02	n/a
S94T000056			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	2.51E+02	197.5	2.24E+02	23.8	n/a	1.00E-02	n/a
S94T000056			DSC Exotherm using Mettler	Joules/g	104.7	n/a	1.30E+02	163.6	1.47E+02	23.1	n/a	n/a	n/a
S94T000065		F	Alpha of Digested Solid	uCi/g	94.76	<1.970E-1	<1.97E-01	<1.95E-1	n/a	n/a	96.8	4.70E-01	183.3
S94T000065		F	Lithium -ICP-Fusion	ug/g	103	<1.000E-2	LDL	LDL	n/a	n/a	n/a	60.7	n/a
Drainable Liquid													
S94T000106			% Water by TGA using Mettler	%	99	n/a	48.89	50.69	4.98E+01	3.62	n/a	1.00E-02	n/a
S94T000106			DSC Exotherm using Mettler	Joules/g	100.5	n/a	1.54E+02	133.2	1.44E+02	14.4	n/a	n/a	n/a
S94T000110		D	Lithium-ICP-Acid Dil.	ug/mL	99.8	1.00E-03	LDL	LDL	n/a	n/a	n/a	11	n/a
SEGMENT # 8													
I. Lower Half of Segment													
S94T000057			% Water by TGA using Mettler (3)	%	99.2	n/a	15.27	n/a	n/a	n/a	n/a	1.00E-02	n/a
S94T000057	c		% Water by TGA using Mettler	%	98.2	n/a	13.67	17.84	1.58E+01	26.5	n/a	1.00E-02	n/a
S94T000057			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	0.00E+00	0	0.00E+00	n/a	n/a	1.00E-01	n/a
S94T000057			DSC Exotherm using Mettler	Joules/g	104.7	n/a	0.00E+00	no exo	n/a	n/a	n/a	n/a	n/a
S94T000066		F	Alpha of Digested Solid	uCi/g	94.76	<1.970E-1	<1.38E-1	<1.38E-1	n/a	n/a	92.4	3.29E-01	500

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample #	Q	AF	Analyte	Unit	Standard #	Blank	Result	Duplicate	Average	RFD #	Spk Res #	Det Limit	Count Err #
S94T000066	F		Lithium - ICF-Fusion	ug/g	100.2	<2.100e-2	LDL	LDL	n/a	n/a	n/a	81.1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AV	Analyte	Unit	Standard %	Blank	Peak	Duplicate	Average	RFD <sup>2</sup>	Spk Res %	Det Limit	Count Err %
Drainable Liquid													
S94T000107			% Water by TGA using Mettler	%	99	n/a	49.03	48.75	4.89E+01	0.37	n/a	1.00E-02	n/a
S94T000107			DSC Exotherm using Mettler	Joules/g	100.2	n/a	2.14E+02	239.2	2.27E+02	11	n/a	n/a	n/a
S94T000111	D		Lithium-ICP-Acid Dil.	ug/mL	99.8	1.00E-03	LDL	LDL	n/a	n/a	n/a	11	n/a
S94T000082			Bulk Density of Sample	g/mL	n/a	n/a	1.47	n/a	n/a	n/a	n/a	5.00E-01	n/a
S95T000283			Tot. Organic Carbon by Coul.	ug/mL	99.67	< 5.000	1.01E+04	9980	1.00E+04	1.2	n/a	105	n/a
S95T000283			% Water by TGA using Mettler	%	98.83	n/a	47.65	47.85	4.78E+01	0.42	n/a	n/a	n/a
S95T000283			pH Direct	pH	99.46	n/a	13.9	n/a	n/a	n/a	n/a	1.00E-02	n/a
S95T000283			DSC Exotherm using Mettler	Joules/g	95.96	n/a	29.2	31.4	3.03E+01	7.26	n/a	n/a	n/a
S95T000325	B		Aluminium -ICP-Acid Digest-Liq	ug/mL	99.6	-6.00E-03	3.72E+04	38000	3.76E+04	2.13	n/a	21	n/a
S95T000325	B		Boron -ICP-Acid Digest-Liquid	ug/mL	98.2	5.00E-03	81.1	81.1	8.11E+01	0	n/a	21	n/a
S95T000325	B		Barium -ICP-Acid Digest-Liquid	ug/mL	97.6	0.00E+00	< 21.00	< 21.0	n/a	n/a	n/a	21	n/a
S95T000325	B		Bismuth -ICP-Acid Digest/Liq	ug/mL	101.6	1.00E-02	< 42.00	< 42.0	n/a	n/a	n/a	42	n/a
S95T000325	B		Calcium -ICP-Acid Digest-Liq	ug/mL	103.8	8.00E-03	1.16E+02	115	1.16E+02	0.87	n/a	42	n/a
S95T000325	B		Chromium -ICP-Acid Digest-Liq	ug/mL	102.4	0.00E+00	37.1	37.9	3.73E+01	2.13	n/a	4.2	n/a
S95T000325	B		Iron -ICP-Acid Digest-Liquid	ug/mL	101.2	1.00E-03	< 21.00	< 21.0	n/a	n/a	n/a	21	n/a
S95T000325	B		Potassium -ICP-Acid Digest-Liq	ug/mL	97.6	-9.20E-02	3.50E+03	3640	3.57E+03	3.92	n/a	210	n/a
S95T000325	B		Lithium -ICP-Acid Digest-Liq	ug/mL	98.2	1.00E-03	< 4.200	< 4.20	n/a	n/a	n/a	4.2	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	Q	AAF	Analysis	Unit	Standard #	Blank	Result	Duplicate	Average	R.P.D. %	Spk. Dev. %	Dev. Limit	Count Err. %
S95T000325	B		Sodium -ICP-Acid Digest-Liquid	ug/mL	98.2	6.00E-03	1.95E+05	199000	1.97E+05	2.03	n/a	42	n/a
S95T000325	B		Nickel -ICP-Acid Digest-Liquid	ug/mL	100.6	-6.00E-03	47.4	48.8	4.81E+01	2.91	n/a	8.4	n/a
S95T000325	B		Phosphorus-ICP-Acid Adjus-Liq	ug/mL	100.4	-1.10E-02	1.15E+03	1180	1.16E+03	2.58	n/a	84	n/a
S95T000325	B		Silicon -ICP-Acid Digest-Liq	ug/mL	93.2	1.90E-02	1.17E+02	116	1.17E+02	0.86	n/a	21	n/a
S95T000325	B		Uranium -ICP-Acid Digest-Liq	ug/mL	97.4	4.70E-02	<2.10e+02	<210	n/a	n/a	n/a	2.10E+05	n/a
S95T000325	B		Zinc -ICP-Acid Digest-Liquid	ug/mL	103.2	-1.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000325	B		Zirconium -ICP-Acid Digest-Liq	ug/mL	99	4.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000329	D		Uranium by Phosphorescence	ug/mL	91.03	1.98E-01	4.06	3.8	3.93E+00	6.62	101	3.00E-02	n/a
S95T000329	D		Alpha in Liquid Samples	uCi/mL	91.91	<1.68e-02	< 5.19e-2	<8.11e-2	n/a	n/a	102.0	1.06e-01	500.0
S95T000329	D		Beta in Liquid Samples	uCi/mL	105.3	<1.910e-1	3.65E+02	348	3.57E+02	4.77	110.2	2.41E-01	0.6
S95T000329	D		Am-241 by Extraction	uCi/mL	88.27	<1.590e-3	2.09E-03	0.00191	2.00E-03	9	n/a	1.00E-03	8.9
S95T000329	D		Cm-243/244 by Extraction	uCi/mL	n/a	<1.590e-3	<1.10e-03	<1.14e-3	n/a	n/a	n/a	1.00E-03	29.5
S95T000329	D		Cobalt-60 by GEA	uCi/mL	104	<5.320e-4	2.72E-02	0.0238	2.55E-02	13.3	n/a	1.00E-03	32.01
S95T000329	D		Cesium-137 by GEA	uCi/mL	100	<1.020e-4	3.80E+02	368	3.74E+02	3.21	n/a	1.00E-03	0.16
S95T000329	D		Europium-154 by GEA	uCi/mL	n/a	<1.330e-3	<7.98e-02	<7.32e-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000329	D		Europium-155 by GEA	uCi/mL	n/a	<1.180e-3	<2.44e-01	<2.42e-1	n/a	n/a	n/a	1.00E-03	n/a
S95T000329	d, e		Tritium By Labat	uCi/mL	100	<6.950e-5	3.16E-04	0.00332	1.82E-03	165	2.16E+03	6.95E-05	4.67
S95T000329	D		Np237 by TTA Extraction	uCi/mL	82.92	<4.120e-4	<7.89e-04	<4.42e-4	n/a	n/a	81.6	1.00E-03	141.3

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	M	Analyte	Unit	Standard W	Blank	Result	Duplicate	Average	RSD, %	Spk Res. #	Det. Limit	Count Error
S95T000329	D		Pu-238 by Ion Exchange	uCi/mL	n/a	<5.900e-5	<6.41e-05	<6.51e-5	n/a	n/a	n/a	6.41E-05	15.7
S95T000329	D		Pu-239/240 by TRU-SPEC Resin	uCi/mL	93.75	<5.900e-5	6.80E-05	7.28E-05	7.04E-05	6.82	n/a	6.41E-05	8.7
S95T000329	D		Strontium-89/90 High Level	uCi/mL	91.89	<3.690e-2	2.5	2.3	2.40E+00	8.33	n/a	3.20E-02	6
S95T000329	D		Technetium-99 Liq. Scint.	uCi/mL	96.68	1.00E-03	1.44E-01	0.149	1.46E-01	3.41	n/a	1.00E-03	1.05
S95T000333	V		OH <sup>-</sup> by Pot. Titration	ug/mL	99.38	<4167.0	2.96E+04	28900	2.92E+04	2.39	n/a	4.17E+03	n/a
S95T000333	V		Chromium (VI) by Spec.	ug/mL	102.2	<3.900e-2	< 3.939	12.4	n/a	n/a	n/a	3.939	n/a
S95T000333	V		Iodine-129 Waste Tank Samples	uCi/mL	81.65	<5.910e-4	1.90E-04	0.000193	1.91E-04	1.57	n/a	1.00E-03	34
S95T000333	V		Bromide by Ion Chromatograph	ug/mL	100	<40.80	<4.06e+03	<4.06e3	n/a	n/a	n/a	4.08E+03	n/a
S95T000333	V		Chloride-IC-Dioxex 4000/4500	ug/mL	101.9	<5.100	1.17E+04	11000	1.14E+04	6.17	n/a	510	n/a
S95T000333	V		Fluoride-IC-Dioxex 4000/4500	ug/mL	96.79	<3.060	<3.06e+02	<3.06e2	n/a	n/a	n/a	306	n/a
S95T000333	V		Nitrite-IC - Dioxex 4000/4500	ug/mL	93.51	<40.80	1.43E+05	134000	1.38E+05	6.5	n/a	4.08E+03	n/a
S95T000333	V		Nitrate-IC - Dioxex 4000/4500	ug/mL	102.2	<51.00	1.78E+05	167000	1.72E+05	6.38	n/a	5.10E+03	n/a
S95T000333	V		Oxalate by IC - Dioxex 4000/4500	ug/mL	91.68	<25.50	<2.55e+03	<2.55e3	n/a	n/a	n/a	2.55E+03	n/a
S95T000333	V		Phosphate-IC-Dioxex 4000/4500	ug/mL	96.32	<30.60	3.38E+03	2980	3.18E+03	12.6	n/a	3.08E+03	n/a
S95T000333	V		Sulfate by IC-Dioxex 4000/4500	ug/mL	101.7	<40.80	<4.06e+03	<4.06e3	n/a	n/a	n/a	4.08E+03	n/a
S95T000333	V		Acetate by IC - Dioxex 4000/4500	ug/mL	n/a	<2.000e-1	1.32E+03	1340	1.33E+03	1.5	n/a	220	n/a
S95T000333	V		Formate by Ion Chromatograph	ug/mL	n/a	<2.000e-1	4.23E+03	4340	4.28E+03	2.57	n/a	220	n/a

SEGMENT # 9

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	AP	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RTP %	Spk Res %	Det Limit	Count Err %
Stratum C Composite Solids													
S94T00068			% Water by TGA using Mettler	%	99.2	n/a	46.03	44.64	4.53E+01	3.07	n/a	1.00E-02	n/a
S94T00068			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	3.22E+02	316.3	3.19E+02	1.63	n/a	1.00E-01	n/a
S94T00068			DSC Exotherm using Mettler	Joules/g	104.7	n/a	1.74E+02	175.1	1.74E+02	0.92	n/a	n/a	n/a
S94T00067	d	F	Uranium by Phosphorescence	ug/g	98.26	1.81	6.49E+02	602	6.20E+02	7.51	123	1.31	n/a
S94T00067	e	F	Alpha of Digested Solid	uCi/g	91.61	<2.120E-1	8.71E-01	0.589	7.30E-01	38.6	99.1	4.28E-01	53.3
S94T00067	e	F	Am-241 by Extraction	uCi/g	100.8	<1.580E-1	6.13E-01	0.484	5.48E-01	23.5	n/a	1.44E-01	6.1
S94T00067		F	Ctr-243/244 by Extraction	uCi/g	n/a	<1.580E-1	<1.44E-01	<3.20E-1	n/a	n/a	n/a	1.44E-01	25.3
S94T00067		F	Beta of Solid Sample	uCi/g	91.36	3.07	4.30E+02	406	4.18E+02	5.74	87.8	2.28	1.6
S94T00067		F	Cesium-137 by GEA	uCi/g	98.47	4.49E-01	2.93E+02	296	2.95E+02	1.02	n/a	4.49E-01	0.94
S94T00067		F	Iodine-129 Waste Tank Samples	uCi/g	100	<6.020E-2	<6.22E-02	<8.22E-2	n/a	n/a	n/a	6.20E-02	n/a
S94T00067		F	Aluminum -ICP-Fusion	ug/g	98.6	2.90E-01	3.89E+04	36100	3.75E+04	7.47	n/a	275	n/a
S94T00067		F	Calcium -ICP-Fusion	ug/g	101.4	2.50E-01	8.08E+02	LDL	n/a	n/a	n/a	549	n/a
S94T00067	e	F	Chromium -ICP-Fusion	ug/g	102.2	2.90E-02	6.23E+03	5070	5.65E+03	20.5	n/a	54.9	n/a
S94T00067		F	Iron -ICP-Fusion	ug/g	101.2	9.00E-02	1.56E+03	1360	1.46E+03	13.7	n/a	275	n/a
S94T00067		F	Potassium -ICP-Fusion (2)	ug/g	96.6	1.40E-02	n/a	n/a	n/a	n/a	n/a	5.69E+03	n/a
S94T00067		F	Sodium -ICP-Fusion	ug/g	97.4	4.65	1.77E+05	166000	1.72E+05	6.41	n/a	549	n/a
S94T00067		F	Nickel -ICP-Fusion (2)	ug/g	101.8	10.4	n/a	n/a	n/a	n/a	n/a	110	n/a
S94T00067		F	Zinc -ICP-Fusion	ug/g	103.6	2.00E-02	< 54.90	14.1	n/a	n/a	n/a	54.9	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Population	Average	RFD <sup>2</sup> %	High Rec. #	Test Limit	Count Est. #
S94T000067	F		Zirconium -ICP-Fusion	ug/g	99.8	1.22E-01	< 54.90	135	n/a	n/a	n/a	54.9	n/a
S94T000067	F		Lithium -ICP-Fusion	ug/g	100.6	2.10E-01	LDL	LDL	n/a	n/a	n/a	60.4	n/a
S94T000067	F		Np237 by TTA Extraction	uCi/g	85.4	<1.10E-2	<1.10E-02	<1.25E-2	n/a	n/a	82.7	2.10E-02	145.4
S94T000067	F		Pu-238 by Ion Exchange	uCi/g	n/a	<3.15E-1	<2.01E-01	<3.51E-1	n/a	n/a	n/a	2.01E-01	100
S94T000067	f		Pu-239/240 by TRU-SPEC Resin	uCi/g	102.1	3.90E-01	3.79E-01	0.419	3.99E-01	10	n/a	2.01E-01	5.3
S94T000067	F		Strontium-89/90 High Level	uCi/g	99.11	7.40E-02	34.9	29.1	3.20E+01	18.1	n/a	1.00E-03	0.2
S94T000067	F		Technetium-99 Lq. Scint.	uCi/g	86.72	1.60E-02	2.28E-01	0.225	2.27E-01	1.32	82	1.50E-02	3.5
S94T000077			Bulk Density of Sample	g/mL	n/a	n/a	1.51	n/a	n/a	n/a	n/a	5.00E-01	n/a
S94T000274			pH on SST Samples	pH	100.2	n/a	13.04	12.98	1.30E+01	0.46	n/a	1.00E-02	n/a
S94T000274			TOC by Perulfuric/Coulometry	ug/g	89.33	33.8	1.00E+04	9150	9.58E+03	8.88	n/a	80	n/a
S94T000274			TIC by Acid/Coulometry	ug/g	97.00	4.500	6.45E+03	6.37E+03	6.41E+03	1.25	n/a	5.000	n/a
S94T000277	A		Aluminium -ICP-Acid Digest	ug/g	97.6	2.60E-02	2.64E+04	24200	2.53E+04	8.7	n/a	24.5	n/a
S94T000277	A		Calcium -ICP-Acid Digest	ug/g	101.2	2.10E-02	1.10E+02	107	1.09E+02	2.77	n/a	49	n/a
S94T000277	A		Chromium -ICP-Acid Digest	ug/g	95.8	1.10E-02	2.65E+02	240	2.53E+02	9.9	n/a	4.9	n/a
S94T000277	A		Iron -ICP-Acid Digest	ug/g	96.6	4.40E-02	80.9	74.5	7.77E+01	8.24	n/a	24.5	n/a
S94T000277	b		Potassium -ICP-Acid Digest	ug/g	121	2.15	3.18E+03	2900	3.04E+03	9.21	n/a	147	n/a
S94T000277	A		Sodium -ICP-Acid Digest	ug/g	99.2	1.14E-01	1.53E+05	141000	1.47E+05	8.16	n/a	98	n/a
S94T000277	A		Nickel -ICP-Acid Digest	ug/g	94.6	7.00E-03	30.2	27.6	2.89E+01	9	n/a	9.8	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard <sup>2</sup> W	Blank	Result	Duplicate	Average	RSD, %	Spk Res. \$	Det Limit	Cancel Err. %
S94T000277	A		Zinc - ICP-Acid Digest	ug/g	91.2	6.00E-03	8.08	7.86	7.97E+00	2.76	n/a	4.9	n/a
S94T000277	A		Zirconium - ICP-Acid Digest	ug/g	96.4	7.00E-03	< 4.900	< 4.90	n/a	n/a	n/a	4.9	n/a
S94T000280	W		OH <sup>-</sup> by Pot. Titration	ug/g	99.36	< 60000.0	2.00E+04	20200	2.01E+04	1	n/a	6.11E+03	n/a
S94T000280	W		Chromium (VI) by Spec.	ug/g	101.9	< 2.290E-1	61.7	63.7	6.27E+01	3.19	100.6	20.76	n/a
S94T000280	W		Tritium By Lachet	nCi/g	93.8	< 4.660E-4	< 4.69E-04	< 4.74E-4	n/a	n/a	95	5.00E-04	5.4
S94T000280	W		Bromide by Ion Chromatograph	ug/g	97.9	< 1.000	< 97.80	< 97.8	n/a	n/a	99	97.8	n/a
S94T000280	W		Chloride-IC-Dioxet 4006/4500	ug/g	96.4	< 2.000E-1	7.44E+03	7360	7.40E+03	1.08	104.1	19.6	n/a
S94T000280	W		Fluoride-IC-Dioxet 4006/4500	ug/g	94.64	< 1.000E-1	3.76E+02	418	3.97E+02	10.6	67.4	9.78	n/a
S94T000280	W		Nitrite-IC - Dioxet 4006/4500	ug/g	96.4	< 1.000	7.91E+04	80700	7.99E+04	2	102.8	97.8	n/a
S94T000280	W		Nitrate by IC-Dioxet 4006/4500	ug/g	97.23	< 1.000	9.54E+04	97400	9.64E+04	2.07	99.1	97.8	n/a
S94T000280	W		Oxalate by IC - Dioxet 4006	ug/g	95.43	< 1.000	2.31E+04	23300	2.32E+04	0.86	100.8	97.8	n/a
S94T000280	W		Phosphate-IC-Dioxet 4006/4500	ug/g	96.7	< 1.000	8.37E+03	8520	8.44E+03	1.78	98.6	97.8	n/a
S94T000280	W		Sulfate by IC-Dioxet 6003/4500	ug/g	95.99	< 1.000	6.38E+03	6380	6.38E+03	0	95	97.8	n/a
S94T000280	c	W	Acetate by IC - Dioxet 4006	ug/g	n/a	< 1.000	3.41E+02	394	3.68E+02	14.4	72.2	98	n/a
S94T000280	d	W	Formate by IC - Dioxet 4006	ug/g	n/a	< 1.000	3.25E+03	3620	3.44E+03	10.8	123.3	98	n/a
S94T000283	c	R	Am-241 by Extraction	nCi/g	87.55	< 2.500E-3	5.18E-03	0.00318	4.18E-03	47.8	n/a	2.00E-03	9.5
S94T000283	R		Co-243/244 by Extraction	nCi/g	n/a	< 2.500E-3	< 2.45E-03	< 2.28E-3	n/a	n/a	n/a	2.00E-03	36.5
S94T000283	R		Cobalt-60 by GEA	nCi/g	97.06	< 2.990E-3	< 1.15E-02	< 1.22E-2	n/a	n/a	n/a	3.00E-03	n/a
S94T000283	R		Cesium-137 by GEA	nCi/g	94.64	< 6.900E-3	2.49E+02	267	2.58E+02	6.98	n/a	7.00E-03	0.16

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Percent	Detection	Average	RFD %	Sp. Res. %	Det. Limit	Quant. Error %
S94T000283		R	Europium-154 by GEA	uCi/g	n/a	< 0.390e-3	< 5.05e-02	< 5.95e-2	n/a	n/a	n/a	6.00E-03	n/a
S94T000283		R	Europium-155 by GEA	uCi/g	n/a	< 7.000e-3	< 1.83e-01	< 1.90e-1	n/a	n/a	n/a	7.00E-03	n/a
S94T000283	c	R	Np237 by TTA Extraction	uCi/g	80.17	< 2.420e-3	< 3.50e-03	< 2.45e-3	n/a	n/a	73.8	5.00E-03	291.7
S94T000283		R	Pu-238 by Ion Exchange	uCi/g	n/a	< 7.940e-4	< 6.76e-04	< 4.30e-4	n/a	n/a	n/a	1.00E-03	100
S94T000283	e	R	Pu-239/240 by TRU-SPEC Resin	uCi/g	113.4	< 7.940e-4	7.00E-04	0.000472	5.86E-04	38.9	n/a	1.00E-03	9.6
S94T000283	e	R	Strontium-89/90 High Level	uCi/g	93.69	2.00E-03	1.88	2.43	2.16E+00	25.5	n/a	2.00E-03	1.4
S95T000295		R	Techneium-99 Liq. Scint.	uCi/g	101.2	< 1.750e-3	1.68E-01	0.16	1.64E-01	4.88	n/a	2.00E-03	1.65
Drainable Liquid													
S94T000108			% Water by TGA using Mettler	%	99	n/a	48.7	48.95	4.88E+01	0.51	n/a	1.00E-02	n/a
S94T000108			DSC Exotherm using Mettler	Joules/g	100.2	n/a	2.88E+02	285.1	2.86E+02	0.87	n/a	n/a	n/a
S94T000112	D		Lithium-ICP-Acid Dil.	ug/mL	100.6	0.00E+00	LDL	LDL	n/a	n/a	n/a	11	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	AV	Analyte	Unit	Standard %	Bank	Bank	Percent	Average	RFD, %	Spk Res. %	Test Limit	Count In %
SEGMENT # 10													
U Upper Half of Segment													
S94T000063			% Water by TGA using Mettler	%	98.5	n/a	44.33	43.1	4.37E+01	2.81	n/a	1.00E-02	n/a
S94T000063			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	3.64E+02	352.2	3.58E+02	3.27	n/a	1.00E-01	n/a
S94T000063			DSC Exotherm using Mettler	Joules/g	99.47	n/a	2.03E+02	200.4	2.02E+02	1.09	n/a	n/a	n/a
S94T000069	c		Alpha of Digested Solid	uCi/g	91.61	<1.690E-1	3.77E-01	0.75	5.64E-01	66.2	93.4	4.52E-01	84.3
S94T000069	F		Lithium -ICP-Fusion	ug/g	103	<1.000E-2	LDL	LDL	n/a	n/a	n/a	63.8	n/a
Lower Half													
L Lower Half of Segment													
S94T000068	c		Alpha of Digested Solid	uCi/g	91.61	<2.120E-1	9.79E-01	0.797	8.88E-01	20.5	97	4.07E-01	53.3
S94T000068	F		Lithium -ICP-Fusion	ug/g	100.6	2.10E-01	LDL	LDL	n/a	n/a	n/a	57.5	n/a
S94T000070			% Water by TGA using Mettler	%	98.6	n/a	40.8	40.04	4.04E+01	1.88	n/a	1.00E-02	n/a
S94T000070			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	2.97E+02	244.3	2.68E+02	17.8	n/a	1.00E-01	n/a
S94T000070			DSC Exotherm using Mettler	Joules/g	96.31	n/a	1.73E+02	146.5	1.60E+02	16.5	n/a	n/a	n/a
SEGMENT # 11													
U Upper Half of Segment													
S94T000072			% Water by TGA using Mettler	%	97.6	n/a	46.45	45.04	4.58E+01	3.08	n/a	1.00E-02	n/a
S94T000072			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	4.24E+02	412.8	4.19E+02	2.75	n/a	1.00E-01	n/a
S94T000072			DSC Exotherm using Mettler	Joules/g	103.3	n/a	2.27E+02	226.9	2.27E+02	0.13	n/a	n/a	n/a
S94T000119	F		Alpha of Digested Solid	uCi/g	93.5	<2.510E-1	8.20E-01	0.803	8.14E-01	2.58	101.6	5.87E-01	60.4
S94T000119	F		Lithium -ICP-Fusion	ug/g	101.1	2.443	LDL	LDL	n/a	n/a	n/a	64.1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Percent	Duplicate	Average	RFD %	Std Dev %	Dist Limit	Control Chart
L Lower Half of Segment													
Lower Half													
S94T000071			% Water by TGA using Mettler	%	98.6	n/a	39.17	37.52	3.83E+01	4.3	n/a	1.00E-02	n/a
S94T000071	c		DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	1.51E+02	342	2.46E+02	77.7	n/a	1.00E-01	n/a
S94T000071	e		DSC Exotherm using Mettler	Joules/g	104.4	n/a	91.7	213.7	1.53E+02	79.9	n/a	n/a	n/a
S94T000071			DSC Exotherm using Mettler (3)	Joules/g	104.4	n/a	21.2	n/a	n/a	n/a	n/a	n/a	n/a
S94T000094	F		Alpha of Digested Solid	uCi/g	91.61	<1.690e-1	8.87E-01	0.926	9.07E-01	4.3	96.2	3.55E-01	43.7
S94T000094	F		Lithium -ICP-Fusion	ug/g	100.6	<1.000e-2	LDL	LDL	n/a	n/a	n/a	95.8	n/a
SEGMENT # 12													
U Upper Half of Segment													
Upper Half													
S94T000085			% Water by TGA using Mettler	%	100.1	n/a	40.03	42.95	4.15E+01	7.04	n/a	1.00E-02	n/a
S94T000085			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	2.07E+02	179.1	1.93E+02	14.5	n/a	n/a	n/a
S94T000085			DSC Exotherm using Mettler	Joules/g	101.2	n/a	1.26E+02	102.2	1.13E+02	19.4	n/a	n/a	n/a
S94T000120	F		Alpha of Digested Solid	uCi/g	93.5	<2.510e-1	1	0.968	9.84E-01	3.25	100.3	5.93E-01	50.5
S94T000120	F		Lithium -ICP-Fusion	ug/g	101.1	2.443	LDL	LDL	n/a	n/a	n/a	64.7	n/a
Lower Half													
L Lower Half of Segment													
S94T000090			% Water by TGA using Mettler	%	97.6	n/a	43.04	41.86	4.25E+01	2.78	n/a	1.00E-02	n/a
S94T000090			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	3.58E+02	340.6	3.49E+02	4.98	n/a	1.00E-01	n/a
S94T000090			DSC Exotherm using Mettler	Joules/g	103.3	n/a	2.04E+02	198	2.01E+02	2.94	n/a	n/a	n/a
S94T000095	d		Alpha of Digested Solid	uCi/g	97.19	<3.900e-1	<7.81e-01	<7.55e-1	n/a	n/a	119.9	8.67E-01	143.7

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AP	Analyte	Unit	Standard %	Peak	Rank	Duplicate	Average	RFD %	Sub. Res. %	Det. Limit	Count Error
S94T000095	F		Lithium - ICP-Fusion	ug/g	98.4	<1,000e-2	LDL	LDL	n/a	n/a	n/a	54.1	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Percent	Duplicates	Average	RFD %	Spk Res. %	Det Limit	Concl Est %
SEGMENT # 13													
Liner Liquid													
S95T000284			Tot. Organic Carbon by Coul.	ug/mL	99.67	<5.000	4.36E+03	4270	4.32E+03	2.09	n/a	105	n/a
S95T000284			% Water by TOA using Mettler	%	98.83	n/a	69.58	69.48	6.95E+01	0.14	n/a	n/a	n/a
S95T000284			pH Direct	pH	99.32	n/a	13.63	N/A	n/a	n/a	n/a	1.00E-02	n/a
S95T000284			DSC Exotherm using Mettler	Joules/g	95.96	n/a	0.00E+00	0	0.00E+00	n/a	n/a	n/a	n/a
S95T000326	c	B	Aluminium -ICP-Acid Digest-Liq	ug/mL	99.6	4.00E-03	5.15E+03	4320	4.74E+03	18.5	n/a	21	n/a
S95T000326		B	Boron -ICP-Acid Digest-Liquid	ug/mL	98.2	5.00E-03	63	54.3	5.87E+01	14.7	n/a	21	n/a
S95T000326		B	Barium -ICP-Acid Digest-Liquid	ug/mL	97.6	0.00E+00	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000326		B	Bismuth -ICP-Acid Digest-Liq	ug/mL	101.6	1.00E-02	< 42.00	<42.0	n/a	n/a	n/a	42	n/a
S95T000326	c	B	Calcium -ICP-Acid Digest-Liq	ug/mL	103.8	8.00E-03	1.36E+02	109	1.23E+02	22	n/a	42	n/a
S95T000326	e	B	Chromium -ICP-Acid Digest-Liq	ug/mL	102.4	0.00E+00	35	29.7	3.24E+01	16.1	n/a	4.2	n/a
S95T000326		B	Iron -ICP-Acid Digest-Liquid	ug/mL	101.2	1.00E-03	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000326	e	B	Potassium -ICP-Acid Digest-Liq	ug/mL	97.6	5.20E-02	1.56E+03	1260	1.41E+03	21.3	n/a	210	n/a
S95T000326		B	Lithium -ICP-Acid Digest-Liq	ug/mL	98.2	1.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000326	c	B	Sodium -ICP-Acid Digest-Liquid	ug/mL	98.2	6.00E-03	1.10E+05	92700	1.01E+05	17.1	n/a	42	n/a
S95T000326		B	Nickel -ICP-Acid Digest-Liquid	ug/mL	100.6	4.00E-03	25.6	22.1	2.39E+01	14.7	n/a	8.4	n/a
S95T000326	e	B	Phosphorus-ICP-Acid Adjust-Liq	ug/mL	100.4	1.10E-02	1.10E+03	916	1.01E+03	18.3	n/a	84	n/a
S95T000326	e	B	Silicon -ICP-Acid Digest-Liq	ug/mL	93.2	1.90E-02	83.6	70.3	7.70E+01	17.3	n/a	21	n/a
S95T000326		B	Uranium -ICP-Acid Digest-Liq	ug/mL	97.4	4.70E-02	<2.10E+02	<210	n/a	n/a	n/a	210	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	Q	AP	Analyte	Unit	Standard #	Blank	Parent	Duplicates	Average	RPD %	Spk Res. %	Det. Limit	Count Error
S95T000326	B	Zinc	-ICP-Acid Digest-Liquid	ug/mL	103.2	<1.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000326	B	Zirconium	-ICP-Acid Digest-Liq	ug/mL	99	4.00E-03	< 4.200	<4.20	n/a	n/a	n/a	4.2	n/a
S95T000330	D	Uranium	by Phosphorescence	ug/mL	93.03	1.98E-01	5.78	5.4	5.59E+00	6.8	115	3.00E-02	n/a
S95T000330	D	Alpha in Liquid Samples		uCi/mL	93.91	<8.66E-02	< 8.11E-3	<5.19E-3	n/a	n/a	107.7	1.06E-02	500.0
S95T000330	D	Beta in Liquid Samples		uCi/mL	105.3	<1.910E-1	72	68.9	7.05E+01	4.4	109.3	2.40E-02	0.4
S95T000330	D	Am-241	by Extraction	uCi/mL	82.41	<7.430E-4	<1.00E-03	< 8.09E-4	n/a	n/a	n/a	1.00E-03	11.3
S95T000330	D	Cm-245/244	by Extraction	uCi/mL	n/a	<7.430E-4	<1.00E-03	< 8.09E-4	n/a	n/a	n/a	1.00E-03	52.5
S95T000330	D	Cobalt-60	by GEA	uCi/mL	104	<5.320E-4	<2.58E-03	0.00408	n/a	n/a	n/a	1.00E-03	n/a
S95T000330	D	Cesium-137	by GEA	uCi/mL	100	<8.020E-4	62.2	63.2	6.27E+01	1.59	n/a	1.00E-03	0.12
S95T000330	D	Europium-154	by GEA	uCi/mL	n/a	<1.330E-3	<1.31E-02	<1.29E-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000330	D	Europium-155	by GEA	uCi/mL	n/a	<1.180E-3	<3.14E-02	<3.14E-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000330	D	Tritium By Lachet		uCi/mL	100	<6.950E-5	3.19E-03	0.00285	3.02E-03	11.3	536.4	6.95E-05	2.06
S95T000330	D	Np237	by TTA Extraction	uCi/mL	91.19	<7.890E-4	<7.59E-04	<4.87E-4	n/a	n/a	81.9	1.00E-03	153.2
S95T000330	D	Pu-238	by Ion Exchange	uCi/mL	n/a	<7.670E-5	<7.13E-05	<6.17E-5	n/a	n/a	n/a	7.13E-05	9.1
S95T000330	e	Pu-239/240	by TRU-SPEC Resin	uCi/mL	96.9	<7.670E-5	1.65E-04	8.49E-05	9.50E-05	21.2	n/a	7.13E-05	5.9
S95T000330	D	Strontium-89/90	High Level	uCi/mL	91.89	<3.690E-2	1.77E-01	0.203	1.90E-01	13.7	n/a	5.10E-02	29.6
S95T000330	D	Techetium-99	Liq. Scint.	uCi/mL	96.68	1.00E-03	3.09E-02	0.0334	3.21E-02	7.78	n/a	1.00E-03	2.25
S95T000334	V	OH-	by Pot. Titration	ug/mL	99.38	<4167.0	1.42E+04	15000	1.46E+04	5.48	n/a	4.17E+03	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 621.

Sample#	Q	A/P	Analyte	Unit	Standard %	Blank	Pass/Fail	Duplicate	Average	RFD %	Sub. Res. %	Dev. Limit	Compl. Error
S95T000334	V		Chromium (VI) by Spec.	ug/mL	103.2	<3.900e-2	64.7	78.8	7.18E+01	19.7	n/a	3.939	n/a
S95T000334	V		Iodine-129 Waste Tank Samples	uCi/mL	92.51	<5.640e-4	<4.88e-04	<6.44e-4	n/a	n/a	n/a	1.00E-03	n/a
S95T000334	V		Bromide by Ion Chromatograph	ug/mL	103.5	<8.000e-1	1.56E+04	16390	1.69E+04	4.39	n/a	1.68E+03	n/a
S95T000334	V		Chloride (C)-Dioxin 4000/4500	ug/mL	103.2	<1.000e-1	4.14E+03	4200	4.17E+03	1.44	n/a	210	n/a
S95T000334	V		Fluoride (C)-Dioxin 4000/4500	ug/mL	97.86	<6.000e-2	3.22E+02	<1.26e2	n/a	n/a	n/a	126	n/a
S95T000334	V		Nitrite-IC - Dioxin 4000/4500	ug/mL	97.59	<8.000e-1	4.86E+04	49800	4.92E+04	2.44	n/a	1.68E+03	n/a
S95T000334	V		Nitrate-IC - Dioxin 4000/4500	ug/mL	102.2	<1.000	6.47E+04	68800	6.68E+04	6.14	n/a	2.10E+03	n/a
S95T000334	V		Oxalate by IC - Dioxin 4000i	ug/mL	92.87	<5.000e-1	<1.05e+03	<1.05e3	n/a	n/a	n/a	1.05E+03	n/a
S95T000334	V		Phosphate-IC-Dioxin 4000/4500	ug/mL	96.12	<6.000e-1	2.56E+03	2860	2.71E+03	11.1	n/a	1.26E+03	n/a
S95T000334	V		Sulfate by IC-Dioxin4000/4500	ug/mL	103.7	<8.000e-1	3.83E+03	4000	3.92E+03	4.34	n/a	1.68E+03	n/a
S95T000334	V		Acetate by IC - Dioxin 4000i	ug/mL	n/a	n/a	7.16E+02	757	7.37E+02	5.57	n/a	220	n/a
S95T000334	V		Formate by Ion Chromatograph	ug/mL	n/a	n/a	2.08E+03	2130	2.10E+03	2.38	n/a	220	n/a
U Upper Half of Segment													
S94T000088			% Water by TGA using Mettler	%	97.7	n/a	39.77	39.85	3.98E+01	0.2	n/a	1.00E-02	n/a
S94T000088			DSC Exotherm Dry Calculated	Joule/g Dry	n/a	n/a	2.98E+02	352.6	3.26E+02	16.7	n/a	1.00E-01	n/a
S94T000088			DSC Exotherm using Mettler	Joule/g	104.7	n/a	1.80E+02	212.1	1.96E+02	16.5	n/a	n/a	n/a
S94T000121	F		Alpha of Digested Solid	uCi/g	93.5	<3.710e-1	1.06	1.18	1.13E+00	8.85	98.6	7.57E-01	67.6
S94T000121	F		Labium -ICF-Fusion	ug/g	99.05	7.642	LDL	LDL	n/a	n/a	n/a	66.2	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RFD %	Spk. Res. %	Des. Limit	Concl. Exp. %
L Lower Half of Segment													
S94T000091			% Water by TGA using Mettler	%	98.5	n/a	41.2	39.23	4.02E+01	4.9	n/a	1.00E-02	n/a
S94T000091			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	6.19E+02	641.4	6.30E+02	3.49	n/a	1.00E-01	n/a
S94T000091			DSC Exotherm using Mettler	Joules/g	102	n/a	3.64E+02	389.8	3.77E+02	6.79	n/a	n/a	n/a
S94T000091			Cyanide Dry - Calculated w TGA	ug/g Dry Wt	n/a	n/a	43.03	44.76	4.39E+01	3.94	n/a	2.00E-02	n/a
S94T000091			Cyanide EDTA Addition	ug/g	90.46	<2.00E-3	25.3	27.2	2.63E+01	7.24	n/a	3.00E-01	n/a
S94T000091			TOC by Persulfate/Coulometry	ug/g	93.33	20.9	1.12E+04	10400	1.08E+04	7.41	n/a	400	n/a
S94T000096	d	F	Alpha of Digested Solid	uCi/g	97.19	<3.90E-1	<7.27E-01	0.913	n/a	n/a	117.8	8.06E-01	143.7
S94T000096		F	Lithium -ICP-Fusion	ug/g	98.4	<1.00E-2	LDL	LDL	n/a	n/a	n/a	96.1	n/a
SEGMENT # 14													
U Upper Half of Segment													
S94T000089			% Water by TGA using Mettler	%	97.7	n/a	40.84	36.77	3.88E+01	10.5	n/a	1.00E-02	n/a
S94T000089			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	2.53E+02	234.4	2.45E+02	8.3	n/a	1.00E-01	n/a
S94T000089			DSC Exotherm using Mettler	Joules/g	104.7	n/a	1.51E+02	148.2	1.49E+02	1.67	n/a	n/a	n/a
S94T000122	F	F	Alpha of Digested Solid	uCi/g	93.5	<3.710E-1	9.89E-01	0.993	9.91E-01	0.4	103.8	6.92E-01	54.9
S94T000122		F	Lithium -ICP-Fusion	ug/g	99.05	7.642	LDL	LDL	n/a	n/a	n/a	60.4	n/a
L Lower Half of Segment													
S94T000092			% Water by TGA using Mettler	%	98.5	n/a	40.59	41.61	4.11E+01	2.48	n/a	1.00E-02	n/a
S94T000092			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	3.97E+02	531.4	4.66E+02	29.1	n/a	1.00E-01	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Blank	Blank	Duplicate	Average	RSD %	Std. Dev. %	Dev. Limit	Comment
S94T000092			DSC Exotherm using Mettler	Joules/g	102	n/a	2.36E+02	310.3	2.73E+02	27.4	n/a	n/a	n/a	n/a
S94T000092			Cyanide Dry - Calculated w TGA	ug/g Dry Wt	n/a	n/a	1.53E+02	161.5	1.57E+02	5.27	n/a	2.00E-02	n/a	n/a
S94T000092	c		Cyanide EDTA Addition	ug/g	90.46	<1.000e-1	91	94.3	9.27E+01	3.56	82.8	6.64	n/a	n/a
S94T000092	e		TOC by Persulfate/Coulometry	ug/g	93.33	20.9	6.48E+03	14100	1.03E+04	74.1	n/a	400	n/a	n/a
S94T000097		F	Alpha of Digested Solid	uCi/g	94.76	<3.180e-1	1.43	1.65	1.54E+00	14.3	99.3	5.67E-01	36.1	n/a
S94T000097		F	Lithium -ICP-Fusion	ug/g	98.4	<1.000e-2	LDL	LDL	n/a	n/a	n/a	58.6	n/a	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample ID	Q	A/E	Analyte	Unit	Standard %	Blank	Reagent	Duplicate	Average	RSD %	Spk. Rec. %	Disc. Limit	Control Limit
SEGMENT # 15													
Liner Liquid													
S95T000282			Bulk Density of Sample	g/mL	n/a	n/a	1.16	n/a	n/a	n/a	n/a	5.00E-01	n/a
S95T000285			Tot. Organic Carbon by Coul.	ug/mL	99.67	<5.000	3.81E+03	3960	3.88E+03	3.86	n/a	105	n/a
S95T000285			% Water by TGA using Mettler	%	99.34	n/a	75.35	74.73	7.50E+01	0.83	n/a	n/a	n/a
S95T000285			pH Direct	pH	99.46	n/a	13.5	n/a	n/a	n/a	n/a	1.00E-02	n/a
S95T000285			DSC Exotherm using Mettler	Joules/g	107.2	n/a	0.00E+00	0	0.00E+00	n/a	n/a	n/a	n/a
S95T000327	B		Aluminium -ICP-Acid Digest-Liq	ug/mL	99.6	-6.00E-03	3.08E+03	3060	3.07E+03	0.65	n/a	21	n/a
S95T000327	B		Boron -ICP-Acid Digest-Liquid	ug/mL	98.2	5.00E-03	33.2	34.4	3.38E+01	3.55	n/a	21	n/a
S95T000327	B		Barium -ICP-Acid Digest-Liquid	ug/mL	97.6	0.00E+00	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000327	B		Bismuth -ICP-Acid Digest/Liq	ug/mL	101.6	1.00E-02	< 42.00	<42.0	n/a	n/a	n/a	42	n/a
S95T000327	B		Calcium -ICP-Acid Digest-Liq	ug/mL	103.8	8.00E-03	75.2	86.4	8.06E+01	13.9	n/a	42	n/a
S95T000327	B		Chromium -ICP-Acid Digest-Liq	ug/mL	102.4	0.00E+00	5.49	5.24	5.37E+00	4.66	n/a	4.2	n/a
S95T000327	B		Iron -ICP-Acid Digest-Liquid	ug/mL	101.2	1.00E-03	< 21.00	<21.0	n/a	n/a	n/a	21	n/a
S95T000327	B		Potassium -ICP-Acid Digest-Liq	ug/mL	97.6	-9.20E-02	1.20E+03	1190	1.20E+03	0	n/a	210	n/a
S95T000327	B		Lithium -ICP-Acid Digest-Liq	ug/mL	98.2	1.00E-03	69.1	68.7	6.89E+01	0.58	n/a	4.2	n/a
S95T000327	B		Sodium -ICP-Acid Digest-Liquid	ug/mL	98.2	6.00E-03	7.34E+04	73000	7.32E+04	0.55	n/a	42	n/a
S95T000327	B		Nickel -ICP-Acid Digest-Liquid	ug/mL	100.6	-6.00E-03	26.6	26.1	2.64E+01	1.9	n/a	8.4	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample ID	Q	A/E	Sample	Unit	Standard %	Blank	Result	Detection	Average	RPD %	Std. Dev. %	Dev. Limit	Control Limit
S95T000327		B	Phosphorus-ICP-Acid Adjust-Liq	ug/mL	100.4	-1.10E-02	6.35E+02	640	6.38E+02	0.78	n/a	84	n/a
S95T000327		B	Silicon -ICP-Acid Digest-Liq	ug/mL	93.2	1.90E-02	84.1	88.9	8.65E+01	5.55	n/a	21	n/a
S95T000327		B	Uranium -ICP-Acid Digest-Liq	ug/mL	97.4	4.70E-02	< 2.10E+02	< 210	n/a	n/a	n/a	210	n/a
S95T000327		B	Zinc -ICP-Acid Digest-Liquid	ug/mL	103.2	-1.00E-03	< 4.200	< 4.20	n/a	n/a	n/a	4.2	n/a
S95T000327		B	Zirconium -ICP-Acid Digest-Liq	ug/mL	99	4.00E-03	< 4.200	< 4.20	n/a	n/a	n/a	4.2	n/a
S95T000331	e	D	Uranium by Phosphorescence	ug/mL	93.03	1.98E-01	4.64	5.82	5.23E+00	22.6	116	3.00E-02	n/a
S95T000331		D	Alpha in Liquid Samples	uCi/mL	93.91	< 8.68E-02	< 4.61E-3	< 6.94E-3	n/a	n/a	98.00	1.06E-02	196.0
S95T000330		D	Alpha in Liquid Samples	uCi/mL	93.91	< 8.68E-02	< 8.11E-3	< 5.19E-3	n/a	n/a	107.7	1.06E-02	500.0
S95T000331		D	Beta in Liquid Samples	uCi/mL	105.3	< 1.910E-1	1.10E+02	115	1.13E+02	4.44	109	2.40E-02	0.3
S95T000331		D	Am-241 by Extraction	uCi/mL	82.41	< 7.430E-4	< 1.12E-03	< 1.83E-3	n/a	n/a	n/a	1.00E-03	20
S95T000331		D	Cm-248/244 by Extraction	uCi/mL	n/a	< 7.430E-4	< 1.12E-03	< 1.83E-3	n/a	n/a	n/a	1.00E-03	74.2
S95T000331		D	Cobalt-60 by GEA	uCi/mL	104	< 5.320E-4	< 4.76E-03	< 4.72E-3	n/a	n/a	n/a	1.00E-03	n/a
S95T000331		D	Cesium-137 by GEA	uCi/mL	100	< 8.020E-4	1.04E+02	104	1.04E+02	0	n/a	1.00E-03	0.1
S95T000331		D	Europium-154 by GEA	uCi/mL	n/a	< 1.330E-3	< 2.32E-02	< 2.28E-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000331		D	Europium-155 by GEA	uCi/mL	n/a	< 1.180E-3	< 4.08E-02	< 4.06E-2	n/a	n/a	n/a	1.00E-03	n/a
S95T000331	c, e	D	Tritium By Lachart	uCi/mL	100	< 6.950E-5	6.89E-03	0.00198	4.43E-03	111	20.9	6.95E-05	1.45
S95T000331		D	Np237 by TTA Extraction	uCi/mL	91.19	< 7.890E-4	< 6.53E-04	0.000679	n/a	n/a	87.6	1.00E-03	217.8
S95T000331		D	Pu-238 by Ion Exchange	uCi/mL	n/a	< 7.670E-5	< 6.57E-05	< 6.10E-5	n/a	n/a	n/a	6.57E-05	100

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Pinch	Dropouts	Average	RPD %	Spk. Res. %	Det. Limit	Count Err %
S95T000331		D	Pu-239/240 by TRU-SPEC Resin	uCi/mL	96.9	< 7.670e-5	< 6.57e-05	< 6.10e-5	n/a	n/a	n/a	6.57E-05	100
S95T000331		D	Strontium-89/90 High Level	uCi/mL	91.89	< 3.690e-2	3.25E-01	0.318	3.22E-01	2.18	n/a	5.20E-02	19.5
S95T000331		D	Technetium-99 Liq. Scam.	uCi/mL	96.68	1.00E-03	4.28E-02	0.039	4.09E-02	9.29	n/a	1.00E-03	2.03
S95T000335		V	OH- by Pot. Titration	ug/mL	99.38	< 4167.0	1.30E+04	12700	1.28E+04	2.33	n/a	4.17E+03	n/a
S95T000335	c	V	Chromium (VI) by Spec.	ug/mL	102.2	< 3.900e-2	8.18	11	9.59E+00	29.4	n/a	3.939	n/a
S95T000335		V	Iodine-129 Waste Tank Samples	uCi/mL	92.51	< 5.640e-4	< 4.38e-04	< 5.82e-4	n/a	n/a	n/a	1.00E-03	n/a
S95T000335		V	Bromide by Ion Chromatograph	ug/mL	103.5	< 8.000e-1	1.76E+04	17500	1.76E+04	0.57	n/a	1.69E+03	n/a
S95T000335		V	Chloride-IC-Dioxec 4000/4500	ug/mL	103.2	< 1.000e-1	3.86E+03	3880	3.87E+03	0.52	n/a	210	n/a
S95T000335		V	Fluoride-IC-Dioxec 4000/4500	ug/mL	97.86	< 6.000e-2	< 1.26e+02	< 1.26e2	n/a	n/a	n/a	126	n/a
S95T000335		V	Nitrite-IC - Dioxec 4000/4500	ug/mL	97.59	< 8.000e-1	4.15E+04	41400	4.14E+04	0.24	n/a	1.68E+03	n/a
S95T000335		V	Nitrate-IC - Dioxec 4000/4500	ug/mL	102.2	< 1.000	5.93E+04	59200	5.92E+04	0.17	n/a	2.10E+03	n/a
S95T000335		V	Oxalate by IC - Dioxec 4000/	ug/mL	92.87	< 5.000e-1	< 1.05e+03	< 1.05e3	n/a	n/a	n/a	1.05E+03	n/a
S95T000335		V	Phosphate-IC-Dioxec 4000/4500	ug/mL	96.12	< 6.000e-1	1.68E+03	1720	1.70E+03	2.35	n/a	1.26E+03	n/a
S95T000335		V	Sulfate by IC-Dioxec4000/4500	ug/mL	103.7	< 8.000e-1	2.55E+03	2570	2.56E+03	0.78	n/a	1.66E+03	n/a
S95T000335		V	Acetate by IC - Dioxec 4000/	ug/mL	n/a	n/a	7.05E+02	692	6.99E+02	1.86	n/a	220	n/a
S95T000335		V	Formate by Ion Chromatograph	ug/mL	n/a	n/a	2.09E+03	2010	2.05E+03	3.9	n/a	220	n/a
L. Lower Half of Segment													
S94T000093			% Water by TGA using Master	%	100.1	n/a	68.87	68.64	6.88E+01	0.33	n/a	1.00E-02	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RFD %	Spt Rec. %	Det Limit	Count Err#
S94T00089			DSC Exotherm Dry Calculated	Joules/g Dry	n/a	n/a	0.00E+00	0	0.00E+00	n/a	n/a	n/a	n/a
S94T00093			DSC Exotherm using Mettler	Joules/g	102.6	n/a	0.00E+00	0	0.00E+00	n/a	n/a	n/a	n/a
S94T00098	F		Alpha of Digested Solid	uCi/g	94.76	< 3.18E-1	5.09E-01	< 4.88E-1	n/a	n/a	97.1	6.08E-01	89.5
S94T00098	F		Lithium -ICP-Fusion	ug/g	104	< 1.00E-2	2.08E+03	1810	1.94E+03	13.9	n/a	120	n/a
S95T000157	W		Bromide by Ion Chromatograph	ug/g	100.3	< 1.000	2.44E+04	24000	2.42E+04	1.65	97	1	n/a
S94T000104			% Water by TGA using Mettler	%	99	n/a	74.74	75.39	7.51E+01	0.87	n/a	1.00E-02	n/a
S94T000104			DSC Exotherm using Mettler	Joules/g	100.2	n/a	1.56E+02	205.3	1.81E+02	27.4	n/a	n/a	n/a
S94T000104			Sulfate by IC-Dioxet4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.99E-01	n/a
S94T000104			Phosphate-IC-Dioxet 4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.99E-01	n/a
S94T000104			Nitrate-IC - Dioxet 4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.99E-01	n/a
S94T000104			Nitric-IC - Dioxet 4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.99E-01	n/a
S94T000104			Fluoride-IC-Dioxet 4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.00E-01	n/a
S94T000104			Chloride-IC-Dioxet 4006/4500	ug/mL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2.00E-01	n/a
S94T000104			Bromide by Ion Chromatograph	ug/mL	103	< 1.000	1.93E+04	18900	1.91E+04	2.09	96.6	1	n/a
S94T000113	D		Lithium-ICP-Acid Dil.	ug/mL	100.6	0.00E+00	LDL	LDL	n/a	n/a	n/a	11	n/a
S95T000156	A		Lithium -ICP-Acid Digest	ug/g	96.6	0.00E+00	1.92E+02	193	1.93E+02	0.52	n/a	2.19	n/a
SEGMENT # 10-14													
SEGMENT PORTION													
Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RFD %	Spt Rec. %	Det Limit	Count Err#

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 021.

SampleID	Q	MF	Analyte	Unit	Standard %	Blank	Blank	Duplicate	Average	RPD %	Sp. Res. %	Det. Limit	Comment
S94T000271			Bulk Density of Sample	g/mL	n/a	n/a	1.57	n/a	n/a	n/a	n/a	5.00E-01	n/a
S94T000275			% Water by TGA on Perkin Elmer	%	98.28	n/a	32.13	33.85	3.90E+01	5.21	n/a	n/a	n/a
S94T000275			pH on SST Samples	pH	100.2	n/a	13.08	13.05	1.31E+01	0.23	n/a	1.00E-02	n/a
S94T000275			DSC Endotherm using Mettler	Joule/g	100.2	n/a	1.56E+02	160.7	1.59E+02	2.78	n/a	n/a	n/a
S94T000275			TOC by Perulfur/Coulometry	ug/g	89.33	33.8	1.03E+04	10800	1.06E+04	4.74	n/a	80	n/a
S94T000275			TTC by Acid/Coulometry	ug/g	97.00	4.500	8.66e+03	8.95e+03	8.80e+03	3.29	n/a	5.000	n/a
S94T000278	A		Aluminium -ICP-Acid Digest	ug/g	97.6	2.60E-02	3.48E+04	35200	3.50E+04	1.14	n/a	43	n/a
S94T000278	A		Calcium -ICP-Acid Digest	ug/g	101.2	2.10E-02	3.55E+02	346	3.51E+02	2.57	n/a	85.9	n/a
S94T000278	A		Chromium -ICP-Acid Digest	ug/g	95.8	1.10E-02	6.50E+03	6600	6.55E+03	1.53	n/a	8.59	n/a
S94T000278	A		Iron -ICP-Acid Digest	ug/g	96.6	4.40E-02	2.11E+03	2120	2.12E+03	0.47	n/a	43	n/a
S94T000278	b		Potassium -ICP-Acid Digest	ug/g	121	2.15	3.31E+03	3380	3.34E+03	2.09	n/a	258	n/a
S94T000278	A		Sodium -ICP-Acid Digest	ug/g	99.2	1.14E-01	1.88E+05	186000	1.87E+05	1.07	n/a	172	n/a
S94T000278	A		Nickel -ICP-Acid Digest	ug/g	94.6	7.00E-03	1.02E+02	101	1.02E+02	0.99	n/a	17.2	n/a
S94T000278	A		Zinc -ICP-Acid Digest	ug/g	91.2	6.00E-03	23.7	23.2	2.35E+01	2.13	n/a	8.59	n/a
S94T000278	A		Zirconium -ICP-Acid Digest	ug/g	96.4	7.00E-03	58.2	55	5.66E+01	5.65	n/a	8.59	n/a
S94T000281	W		OH: by Pot. Titration	ug/g	99.36	<0.0300.0	1.81E+04	18800	1.84E+04	3.79	n/a	5.94E+03	n/a
S94T000281	W		Chromium (VI) by Spec.	ug/g	101.9	<2.290E-1	1.54E+02	148	1.51E+02	3.97	100.6	21.75	n/a
S94T000281	W		Tritium By Lachar	nCi/g	93.8	<4.600E-4	n/a	n/a	n/a	n/a	n/a	1.00E-04	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62.

Sample/ Q	A.P.	Analyte	Unit	Summary #	Blank	Reack	Duplicates	Average	RFP #	Spk. Rec. #	Des Limit	Chem Err%
S94T000281	W	Bromide by Ion Chromatograph	ug/g	97.9	<1.000	< 95.10	<96.1	n/a	n/a	88.8	95.1	n/a
S94T000281	W	Chloride-IC-Dionex 4000/4500	ug/g	96.4	<2.000e-1	7.08E+03	6980	7.03E+03	1.42	93.5	19	n/a
S94T000281	W	Fluoride-IC-Dionex 4000/4500	ug/g	94.64	<1.000e-1	1.55B+03	1570	1.56E+03	1.28	84.3	9.51	n/a
S94T000281	W	Nitrite-IC - Dionex 4000/4500	ug/g	96.4	<1.000	8.06E+04	83200	8.19E+04	3.17	102.1	95.1	n/a
S94T000281	W	Nitrate by IC-Dionex4000/4500	ug/g	97.23	<1.000	9.72E+04	99000	9.81E+04	1.83	97.6	95.1	n/a
S94T000281	W	Oxalate by IC - Dionex 4000	ug/g	95.43	<1.000	2.07E+04	20800	2.08E+04	0.48	90.7	95.1	n/a
S94T000281	W	Phosphate-IC-Dionex 4000/4500	ug/g	96.7	<1.000	1.55E+04	15800	1.56E+04	1.92	88.4	95.1	n/a
S94T000281	W	Sulfate by IC-Dionex4000/4500	ug/g	95.99	<1.000	7.77E+03	7880	7.82E+03	1.41	88	95.1	n/a
S94T000281	W	Acetate by IC - Dionex 4000	ug/g	n/a	<1.000	3.16B+03	3100	3.13E+03	1.92	100.6	95	n/a
S94T000281	W	Formate by IC - Dionex 4000	ug/g	n/a	<1.000	4.83E+03	5090	4.96E+03	5.24	90.1	95	n/a
S94T000284	R	Au-241 by Extraction	uCi/g	87.55	<2.500e-3	7.87E-03	<2.37e-3	n/a	n/a	n/a	3.00E-03	6.6
S94T000284	R	Cm-243/244 by Extraction	uCi/g	n/a	<2.500e-3	<2.51e-03	<2.37e-3	n/a	n/a	n/a	3.00E-03	24.6
S94T000284	R	Cobalt-60 by GEA	uCi/g	97.06	<2.990e-3	<1.14e-02	0.0228	n/a	n/a	n/a	3.00E-03	n/a
S94T000284	R	Cesium-137 by GEA	uCi/g	94.64	<6.900e-3	2.50E+02	251	2.51E+02	0.4	n/a	7.00E-03	0.15
S94T000284	R	Europium-154 by GEA	uCi/g	n/a	<6.390e-3	<5.47e-02	<5.37e-2	n/a	n/a	n/a	6.00E-03	n/a
S94T000284	R	Europium-155 by GEA	uCi/g	n/a	<7.000e-3	<1.81e-01	<1.83e-1	n/a	n/a	n/a	7.00E-03	n/a
S94T000284	R	Np237 by ITA Extraction	uCi/g	80.17	<2.420e-3	<2.60e-03	<3.59e-3	n/a	n/a	80.4	5.00E-03	500
S94T000284	R	Po-238 by Ion Exchange	uCi/g	n/a	<7.940e-4	5.07E-04	<3.95e-4	n/a	n/a	n/a	3.72E-04	7.1

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62.

Sample#	Q	AF	Analyte	Unit	Standard %	Blank	Peak	Duplicate	Average	RPD %	Spk. Res. %	Det. Limit	Count Error
S94T00234	R	Pe-239/240 by TRU-SPEC Beam	uCi/g	113.4	<7.940e-4	9.41E-04	<3.95e-4		n/a	n/a	n/a	3.72E-04	100
S94T00234	R	Strontium-89/90 High Level	uCi/g	91.89	2.10E-02	2.21	2.1		2.16E+00	5.1	n/a	2.10E-02	4.3
S94T00300	F	Uranium by Fluorescence	ug/g	106.5	<2.120e-2	8.18E+02	795		7.77E+02	10.7	113.1	2.10E-02	n/a
S94T004300	F	Alpha of Digested Solid	uCi/g	97.6	<3.270e-3	6.01E-01	0.535		5.68E-01	11.6	82.6	5.00E-03	4.1
S94T00300	F	Am-241 by Extraction	uCi/g	102.5	<5.790e-2	7.11E-01	0.625		6.68E-01	12.9	n/a	1.02E-01	6.9
S94T00300	F	Cm-243/244 by Extraction	uCi/g	n/a	<5.790e-2	<1.02e-01	<1.13e-1		n/a	n/a	n/a	1.02E-01	22.5
S94T00300	e	Beta of Solid Sample	uCi/g	106.2	9.80E-02	4.96E+02	368		4.32E+02	29.6	98.2	1.62E-01	0.4
S94T00300	F	Cobalt-60 by GEA	uCi/g	105.4	<2.090e-2	5.21E-02	0.0458		4.90E-02	12.9	n/a	2.10E-02	23.21
S94T00300	e	Cesium-137 by GEA	uCi/g	96.94	<3.970e-2	2.68E+02	196		2.32E+02	31	n/a	4.00E-02	0.29
S94T00300	F	Europium-154 by GEA	uCi/g	n/a	<3.630e-2	7.97E-01	0.712		7.54E-01	11.3	n/a	3.60E-02	15.8
S94T00300	F	Europium-155 by GEA	uCi/g	n/a	<4.580e-2	<7.21e-01	0.655		n/a	n/a	n/a	4.60E-02	n/a
S94T00300	F	Iodine-129 Waste Tank Samples	uCi/g	107.9	<1.040e-1	<1.46e-01	<5.25e-2		n/a	n/a	n/a	1.46E-01	n/a
S94T00300	F	Calcium -ICP-Fusion	ug/g	102	4.58E-01	<3.95e+02	LDL		n/a	n/a	n/a	395	n/a
S94T00300	F	Potassium -ICP-Fusion (2)	ug/g	100	6.10E-02	n/a	n/a		n/a	n/a	n/a	1.18E+03	n/a
S94T00300	e	Sodium -ICP-Fusion	ug/g	98	3.87	1.61E+05	120000		1.40E+05	29.2	n/a	395	n/a
S94T00300	F	Nickel -ICP-Fusion (2)	ug/g	100.8	2.09	n/a	n/a		n/a	n/a	n/a	79	n/a
S94T00300	F	Zinc -ICP-Fusion	ug/g	102.8	2.08E-02	< 39.50	LDL		n/a	n/a	n/a	39.5	n/a
S94T00300	F	Zirconium -ICP-Fusion	ug/g	99.6	6.70E-02	< 39.50	LDL		n/a	n/a	n/a	39.5	n/a
S94T00300	a	Np237 by TTA Extraction	uCi/g	71.07	9.00E-03	<1.49e-02	<1.20e-2		n/a	n/a	82	1.50E-02	129

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62'.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Result	Duplicates	Average	RFD %	Sp. Res. %	Det. Limit	Count Err. %
S94T000300	F		Pu-238 by Ion Exchange	uCi/g	n/a	<2.90e-3	1.53E-02	0.0169	1.62E-02	8.64	n/a	8.00E-03	4.5
S94T000300	F		Pu-239/240 by TRU-SPEC Resin	uCi/g	112.7	<2.90e-3	6.67E-02	0.0579	6.23E-02	14.1	n/a	8.00E-03	2.6
S94T000300	F		Strontium-89/90 High Level	uCi/g	89.29	1.00E-03	37.5	32.2	3.49E+01	15.2	n/a	9.00E-03	0.7
S95T000291	W		Iodine-129 Waste Tank Samples	uCi/g	114.8	<2.29e-2	<2.34e-02	<2.23e-2	n/a	n/a	n/a	2.30E-02	n/a
S95T000296	R		Technetium-99 Liq. Scant.	uCi/g	101.2	<1.750e-3	1.42E-01	0.127	1.35E-01	11.2	n/a	2.00E-03	1.79
S95T001395	F		Aluminum -ICP-Fusion	ug/g	98.98	5.427	3.97E+04	39400	3.96E+04	0.85	n/a	242	n/a
S95T001395	F		Chromium -ICP-Fusion	ug/g	101.3	8.90E-02	1.07E+04	9700	1.02E+04	10.2	n/a	48.4	n/a
S95T001395	F		Iron -ICP-Fusion	ug/g	100	4.319	2.86E+03	2550	2.70E+03	11.3	n/a	242	n/a

Table A-1. Laboratory Data Results for Tank 241-SY-103, Core 62<sup>1</sup>.

Sample#	Q	A/F	Analyte	Unit	Standard %	Blank	Result	Duplicate	Average	RPD %	Spk Res %	Det Limit	Count Err %
S95T001395	f	F	Tetrachloro-99 Liq. Scint.	µCi/g	104.1	3.60E-02	2.47E-01	0.246	2.44E-01	1.64	n/a	1.50E-02	3.6

Notes:

- LDL = less than detect in limit
- R = replicate analysis
- A/F = aliquot class
- A = acid-digest
- B = acid digestion of a liquid
- D = acid dilution
- F = fusion digested sample
- n/a = not applicable
- I = water digested - acid added to sample for ICP
- K = water digested/acid added sample for radiochemistry
- V = water dilution
- W = water digestion acid
- (2) = NI crucible and KOH are used in fusion
- (3) = Result is a rerun analysis
- (4) = Analytes were run on centrifuged solids. Other strata B analyses performed on slurry of solids/liquid.

Perkin Elmer is a trademark of Perkin-Elmer Corporation, Norwalk, Connecticut  
 Mettler is a trademark of Mettler Instrument Corporation, Highstown, New Jersey  
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<sup>1</sup>Rise (1995)

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**APPENDIX B**

**1994 AUGER SAMPLING DATA**

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Table B-1. 136-Day Deliverable Summary Table for Tank 241-SY-103 Auger Sample - Riser 7B.

Riser 7B, Subsample A: Flutes 1, 2, 3, 4, and 6

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5398	>586 J/g (dry)	103.0	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5398	NA	95.9	NA	8.02	8.56	8.29	6.51	NA	NA

Riser 7B, Subsample B: Flutes 1, 2, 3, 4, and 6

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5399	>586 J/g (dry)	102.3	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5399	NA	98.5	NA	11.96	17.82	14.89	39.3	NA	NA

Riser 7B, Composite: Flutes 1, 2, 3, 4, and 6

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
TIC (µgC/g)	R5430	NA	94.6	4.30 µg C	2.25 E+04	3.13 E+04	2.69 E+04	32.7	NA	4.00 E+02
TOC (µgC/g)	R5430	>3.00 E+04 (µgC/g)	90.0	17.60 µg C	1.00 E+04	7.70 E+03	8.85 E+03	26.0	NA	4.00 E+02

Table B-2. 136-Day Deliverable Summary Table for Tank 241-SY-103 Auger Sample - Riser 14A.

Riser 14A, Subsample A: Flute 2

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5376	>586 J/g (dry)	100.8	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5376	NA	98.1	NA	33.21	33.52	33.36	0.93	NA	NA

Riser 14A, Subsample B: Flute 2

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5377	>586 J/g (dry)	100.2	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5377	NA	98.4	NA	30.85	31.95	31.40	3.50	NA	NA

Riser 14A, Composite: Flute 2

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
TIC (µg/C/g)	R5429	NA	94.6	4.30 µg C	1.76 E+04	2.00 E+04	1.88 E+04	12.8	NA	4.00 E+02
TOC (µg/C/g)	R5429	>3.00 E+04 (µgC/g)	90.0	17.60 µg C	1.23 E+04	1.07 E+04	1.15 E+04	13.9	NA	4.00 E+02

Table B-3. 136-Day Deliverable Summary Table for Tank 241-SY-103 Auger Sample - Riser 22A.

Riser 22A, Subsample A: Flute 2

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5372	>586 J/g (dry)	105.1	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5372	NA	102.2	NA	11.37	11.98	11.67	5.23	NA	NA

Riser 22A, Subsample B: Flute 3

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5373	>586 J/g (dry)	105.1	NA	NO EXO	NA	NA	NA	NA	NA
DSC (cal/g)	R5373	>586 J/g (dry)	105.1	NA	NA	NO EXO	NA	NA	NA	NA
TGA (% water)	R5373	NA	98.1	NA	24.04	23.61	23.82	1.80	NA	NA

Riser 22A, Subsample C: Flute 6

Analysis (units)	Lab ID #	Notification Limits	Std Recovery (%)	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
DSC (cal/g)	R5374	>586 J/g (dry)	105.1	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5374	NA	98.1	NA	26.84	23.93	25.38	1.80	NA	NA

Table B-3. 136-Day Deliverable Summary Table for Tank 241-SY-103 Auger Sample - Riser 22A.

Riser 22A, Subsample D: Flute 7		Std Recovery	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
Analysis (units)	Lab ID #	Notification Limits							
DSC (gal/g)	R5375	> 586 J/g (dry)	NA	NO EXO	NO EXO	NA	NA	NA	NA
TGA (% water)	R5375	NA	NA	26.29	24.77	25.53	5.95	NA	NA

Riser 22A, Composite 1: Flute 1-3		Std Recovery	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
Analysis (units)	Lab ID #	Notification Limits							
TIC ( $\mu\text{g}/\text{C}/\text{g}$ )	R5425	NA	3.40 $\mu\text{g C}$	8.19 E+03	7.00 E+03	7.60 E+03	15.7	~183.0	4.00 E+02
TOC ( $\mu\text{g}/\text{C}/\text{g}$ )	R5425	> 3.00 E+04 ( $\mu\text{gC}/\text{g}$ )	27.1 $\mu\text{g C}$	1.03 E+04	6.39 E+03	8.34 E+03	~46.9	91.0	4.00 E+02

Riser 22A, Composite 2: Flute 4-8		Std Recovery	Prep Blank	Sample	Duplicate	Mean	RPD (%)	Spike Rec. (%)	Det. Limit
Analysis (units)	Lab ID #	Notification Limits							
TIC ( $\mu\text{g}/\text{C}/\text{g}$ )	R5426	NA	3.40 $\mu\text{g C}$	1.11 E+04	1.52 E+04	1.32 E+04	~31.2	~230.0	4.00 E+02
TOC ( $\mu\text{g}/\text{C}/\text{g}$ )	R5426	> 3.00 E+04 ( $\mu\text{gC}/\text{g}$ )	27.1 $\mu\text{g C}$	9.46 E+03	7.47 E+03	8.47 E+03	~26.0	~60.7	4.00 E+02

Note:

~ TCP Laboratory Acceptance Criteria Exceeded

**APPENDIX C**

**1986 CORE SAMPLING DATA**

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Table C-1. Elements and Anion Concentrations of Waste from Double-Shell Tank 241-SY-103.

Species	Concentration, wt% <sup>1</sup>		
	No. 2	No. 7	No. 12
Al	4.45	4.15	4.77
B	0.105	0.012	0.009
Ba	ND	0.0005	0.0004
Ca	0.020	0.027	0.016
Cr	0.30	0.59	0.58
Fe	0.094	0.16	0.20
K	0.38	0.34	0.26
La	0.002	0.005	0.002
Mg	0.001	0.003	0.0009
Mn	0.023	0.047	0.051
Mo	0.013	0.012	0.009
Na	21.7	20.7	29.7
Nd	ND	0.008	ND
Ni	0.008	0.013	0.012
Si	0.016	0.034	0.060
Sr	ND	0.0003	ND
Zn	ND	0.004	0.042
Zr	0.002	0.003	0.002
CO <sub>3</sub> <sup>2-</sup>	1.64	2.70	2.44
F	<0.15	<0.15	<0.11
Cl	0.73	0.68	0.53
NO <sub>2</sub>	8.35	7.91	7.31
PO <sub>4</sub>	0.31	0.38	0.42
NO <sub>3</sub>	10	10	25
SO <sub>4</sub>	0.24	0.46	0.38
OH	2.10N	2.06N	1.55N

Notes:

ND = Not detected

<sup>1</sup>With the exception of HO

Table C-2. Radionuclide Concentrations of Waste from Double-Shell Tank 241-SY-103.

Radionuclide	Sample Number, mCi/g of Sample		
	No. 2	No. 7	No. 12
Total beta	$6.09\text{E-}1 \pm 1.22\text{E-}2$	$6.21\text{E-}1 \pm 1.38\text{E-}2$	$5.09\text{E-}1 \pm 1.40\text{E-}2$
$^{239-240}\text{Pu}$	$3.81\text{E-}5 \pm 1.91\text{E-}6$	$7.03\text{E-}5 \pm 1.84\text{E-}6$	$7.38\text{E-}5 \pm 1.87\text{E-}6$
$^{241}\text{Am} + ^{238}\text{Pu}$	$3.21\text{E-}4 \pm 21.9\text{E-}5$	$5.15\text{E-}4 \pm 2.30\text{E-}5$	$6.35\text{E-}4 \pm 3.74\text{E-}5$
$^{241}\text{Pu}$	$4.59\text{E-}3 \pm 1.87\text{E-}3$	$< 5.15\text{E-}3$	$< 5.37\text{E-}3$
$^{60}\text{Co}$	$8.32\text{E-}5 \pm 2.60\text{E-}5$	$1.47\text{E-}4 \pm 3.36\text{E-}5$	$3.64\text{E-}4 \pm 2.66\text{E-}5$
$^{137}\text{Cs}$	$4.95\text{E-}1 \pm 8.12\text{E-}3$	$4.78\text{E-}1 \pm 1.38\text{E-}2$	$3.46\text{E-}1 \pm 6.07\text{E-}3$
$^{154}\text{Eu}$	$7.75\text{E-}4 \pm 9.33\text{E-}5$	$1.49\text{E-}3 \pm 1.56\text{E-}4$	$2.12\text{E-}3 \pm 1.07\text{E-}3$
$^{155}\text{Eu}$	$6.21\text{E-}4 \pm 2.23\text{E-}4$	$1.84\text{E-}3 \pm 2.62\text{E-}4$	$< 1/36\text{E-}3$

Table C-3. Solids Settling Behavior for Sample No. 2.

Time (hr)	Solids Height, mm	
	No. 2 at 10 °C	No. 2 at 46 °C
0.00	54.52	50.60
1.75	53.36	50.60
2.95	53.36	49.50
3.90	52.20	49.50
4.75	52.20	50.60
22.33	52.20	33.55
26.83	52.20	33.00
28.75	52.20	33.00
46.33	52.20	33.00
51.25	51.62	33.00

Table C-4. Solids Settling Behavior for Sample No. 2-1:1

Time (hr)	Solids settling behavior for sample no. 2-1:1	
	No. 2-1:1 at 10 °C	No. 2-1:1 at 46 °C
0.00	61.36	56.84
1.25	59.00	15.08
2.45	53.10	9.28
3.40	11.80	8.12
4.25	9.44	8.12
21.83	7.08	8.12
26.33	7.08	8.12
28.23	7.08	8.12
45.83	7.08	8.12
50.75	7.08	8.12

Table C-5. Solids Settling Behavior for Sample No. 12-1:1.

Time (hr)	Solids Height, mm	
	No. 12-1:1 at 10 °C	No. 12-1:1 at 46 °C
0.00	59.28	57.12
1.08	57.00	50.40
2.28	54.72	36.96
3.23	57.00	30.24
4.08	59.28	28.00
21.67	22.80	20.16
26.17	21.66	19.60
28.08	21.66	20.16
45.67	19.38	19.60
50.58	19.38	19.60

Table C-6. Solids Settling Behavior for Sample No. 12-1:2.

Time (hr)	Solids height, mm	
	No. 12-1:2 at 10 °C	No. 12-1:2 at 46 °C
0.00	63.44	61.36
1.00	57.34	55.46
2.20	42.70	41.30
3.15	34.16	33.04
4.00	31.11	30.09
21.58	20.74	20.06
26.08	20.74	20.06
28.00	19.52	18.88
45.58	18.91	18.29
50.50	18.91	18.29

Table C-7. Rheological Parameters for Diluted and Undiluted Samples of Waste from Double-Shell Tank 241-SY-103 at 10 °C and 46 °C.

Parameter	No. 2	No. 7	No. 12	No. 2-1:1	No. 7-1:1	No. 12-1:1	No. 12-1:2
46 °C							
$\tau_y$ (Pa)	0	0	17.7	0	0	0	0
K (Pa-sec)	0.0400	0.0856	0.9462	0.0010	0.0051	0.0070	0.0033
n	0.92	0.95	0.95	1.18	0.97	0.99	1.03
R <sup>2</sup>	0.999	0.999	0.996	0.991	0.998	0.995	0.995
10 °C							
$\tau_y$ (Pa)	0	0	NA	0	0	0	0
K (Pa-sec)	0.2747	0.596	NA	0.0053	0.0101	0.0092	0.0041
n	0.96	0.91	NA	1.022	0.98	1.06	1.1
R <sup>2</sup>	0.999	0.999	NA	0.998	0.999	0.997	0.998

Note:

NA = Unable to obtain Data

Table C-8. Apparent Viscosities (cp) of Waste from Double-Shell Tank 241-SY-103 at Shear Rates Corresponding to 50 and 75 gal/min in a 3-in. Schedule 40 pipe.

Flow Rate	Shear Rate	No. 2		No. 7		No. 12		No. 2-1:1		No. 7-1:1		No. 12-1:1		No. 12-1:2	
		10 °C	46 °C	10 °C	46 °C	10 °C	46 °C	10 °C	46 °C	10 °C	46 °C	10 °C	46 °C	10 °C	46 °C
50 gpm	70 sec <sup>-1</sup>	234.1	29.0	415.8	70.1	--	1027.0	5.7	2.0	9.3	4.5	11.7	6.7	6.1	3.7
75 gpm	104 sec <sup>-1</sup>	230.4	28.1	401.2	68.7	--	929.2	5.8	2.2	9.3	4.5	12.0	6.7	6.4	3.8

Note:

NA = Unable to obtain data.

**APPENDIX D**

**1994 BLIND SAMPLE RESULTS**

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**APPENDIX D**

**1994 BLIND SAMPLE RESULTS**

Blind Sample Results

The tank characterization plan requested blind results for three analyses; total inorganic carbon/total organic carbon, IC, and inductively coupled plasma. Presented below are the results from the water pollution performance evaluation study.

Table D-1. Inductively-Coupled Plasma Blind Results ( $\mu\text{g/L}$ ).

	Reported	True	Evaluation	Study ID
Al	568	610	Acceptable	WP033
Ca	87.8	89.0	Acceptable	WP033
Cr	527	529	Acceptable	WP033
Fe	1290	1300	Acceptable	WP033
K	13.7	14.0	Acceptable	WP033
Na	95.2	94.2	Acceptable	WP033
Ni	1070	1080	Acceptable	WP033
Zn	722	726	Acceptable	WP033

Table D-2. IC Blind Results (mg/L).

	Reported	True	Evaluation	Study ID
Chloride	168	170	Acceptable	WP033
Fluoride	4.03	4.00	Acceptable	WP033
Sulphate	108	110	Acceptable	WP033
Nitrate	.880	.860	Acceptable	WP033

Table D-3. Total Organic Carbon Blind Results (mg/L).

	Reported	True	Evaluation	Study ID
TOC	17.9	35	Not Accept	WP033
TOC	44.0	44.0	Acceptable	WP032
TOC	79.0	82.0	Acceptable	WP031
TOC	8.25	14.0	Not Accept	WP030

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7309 Indian School Road  
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CST-14 MS-J586  
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R. J. Anema X

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