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7. Abstract

This document provides the essential characterization data for Double-Shell Tank AW-105

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Tank Characterization Report for Double-Shell Tank 241-AW-105

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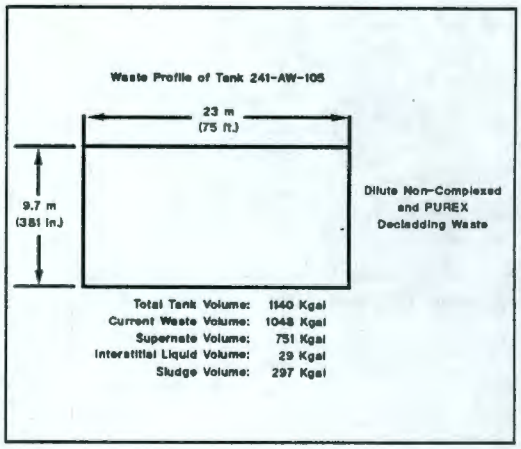
EXECUTIVE SUMMARY

Double-Shell Tank 241-AW-105 is a radioactive waste tank most recently sampled in May of 1990. Sampling and characterization of the waste in Tank 241-AW-105 contributes toward the fulfillment of Milestone M-44-05 of the *Hanford Federal Facility Agreement and Consent Order*. Characterization will also provide support for Tank Farm Operations, safety programs and design of retrieval, pretreatment, and disposal systems.

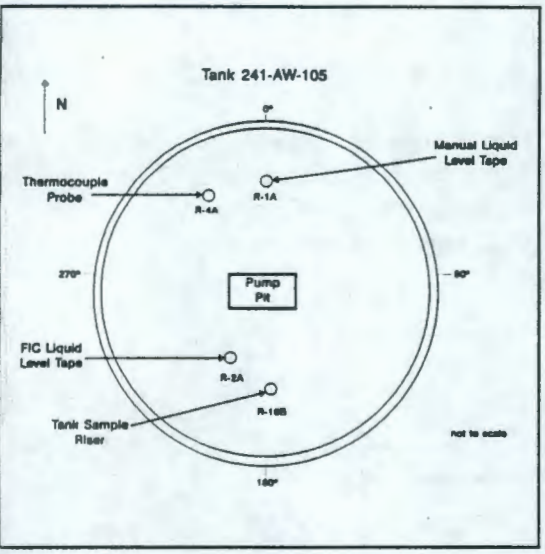


Tank 241-AW-105, located in the 200 East Area AW Tank Farm, was constructed and went into service in 1980 by receiving flush water. Early in the life of the tank it received complexed waste from the 242-A Evaporator and dilute non-complexed waste from B-Plant. The primary wastes stored since 1984 have been produced at the PUREX Plant, including Neutralized Cladding Removal Waste and other miscellaneous wastes. The final disposal of the waste in Tank 241-AW-105 will be as high- and low-level glass fractions. The tank has an operational capacity of 1,140,000 gallons, and currently contains 1,048,000 gallons. Waste has been removed periodically for processing and concentration through the 242-A Evaporator and distributed among other double-shell tanks. However, this tank has continued to receive wastes from the various waste management processes in the 200 East Area. The tank is not classified as a Watch List tank and is considered to be sound. There are no Unreviewed Safety Questions associated with Tank 241-AW-105 at this time.

The waste is heterogeneous, containing both sludge and supernate. The predominant waste constituents in the solids include sodium, zirconium, potassium, aluminum, iron, silicon, fluoride, nitrate, nitrite, and carbonate. The most prevalent soluble analytes include aluminum, potassium, sodium, hydroxide, carbonate, fluoride, nitrate, and nitrite. The major radionuclide constituents in the tank waste are ^{90}Sr and ^{137}Cs. No percent water analyses were performed. A high bias was noted for the metals analytical results due to uranium interference associated with the inductively coupled plasma analysis. Further sampling and/or analysis of any archive material is recommended to properly evaluate the data.

The pH of the liquid phase of the tank is 13.1 which is above the *Resource Conservation and Recovery Act* established limits for corrosivity. In addition, arsenic and selenium in the liquid phase of the tank were found at levels greater than their regulatory thresholds. The total organic carbon content in segment 7 of the tank waste was approximately 3% by weight and does cause a safety concern. Comparisons to established limits of concern for selected analytes can be made by referring to the *Tank Characterization Reference Guide* (De Lorenzo et al., 1994).

The results of the analyses have been compared to the dangerous waste codes in the *Washington Dangerous Waste Regulations* (WAC 173-303). This assessment was conducted by comparing tank contents against dangerous waste characteristics ("D" waste codes) and against state waste codes. It did not include checking tank contents against "U", "P", "F", or "K" waste codes since application of these codes is dependent on the source of the waste and not on particular constituent concentrations. The results indicate that the waste in this tank is adequately described in the Dangerous Waste Permit Application for the Double-Shell Tank System; this permit is discussed in the *Tank Characterization Reference Guide* (De Lorenzo et al., 1994).



Tank 241-AW-105

Tank Description

Type:	Double-Shell
Constructed:	1980
In-Service:	1980
Diameter:	75 feet (23 m)
Usable:	35 feet (10.7 m)
Operating Capacity:	1,140,000 gallons (4,320,000 L)
Bottom Shape:	Flat
Hanford Coordinates:	40.490° North 47.752° West
Ventilation:	Operating Exhauster

Tank Status: as of July 1994

Contents:	Dilute Non-Complexed/ PUREX Neutralized Cladding Removal Waste
Total Waste:	3,970,000 L (1,048,000 gal)
Supernate Volume:	2,840,000 L (751,000 gal)
Sludge:	1,120,000 L (297,000 gal)
Drainable Interstitial Liquid:	110,000 L (29,000 gal)
Manual Tape Surface Level:	9.65 m (380 in) (07/20/94)
FIC Surface Level:	9.68 m (381 in) (07/20/94)
Temperature:	21.7°C (71°F) (7/20/94)
Integrity Category:	Sound

Double-Shell Tank 241-AW-105
Concentrations and Inventories for Critical List Analytes
(as of May 1990)*

Physical Properties				
Density	Solid = 1.42 g/ml		Liquid = 1.08 g/ml	
pH	13.1			
Heat Load	5.46 kW			
Chemical Constituents	**Average Solid Concentration (wt%)**	**Solid Bulk Inventory (kg)**	**Average Liquid Concentration (wt%)**	**Liquid Bulk Inventory (kg)**
Al (Aluminum)	0.98	20,400	0.084	2,250
Fe (Iron)	0.637	13,300	9.9E-05	2.65
K (Potassium)	1.91	39,900	1.16	31,000
Si (Silicon)	0.632	13,200	0.234	6,270
Na (Sodium)	2.67	55,900	4.44	1.19E+05
Zr (Zirconium)	18.4	3.84E+05	1.99E-04	5.33
CO_3^{2-} (Carbonate)	3.02	63,000	0.982	26,300
F^- (Fluoride)	10.0	2.09E+05	0.739	19,800
OH^- (Hydroxide)	---	---	0.0121	32,500
NO_3^- (Nitrate)	4.64	96,900	3.40	91,000
NO_2^- (Nitrite)	1.74	36,300	1.09	29,300
Total Organic Carbon	0.86	17,900	0.229	6,130
Radionuclides				
Total Uranium	2.33 wt%	37,400 kg	0.0012 wt%	34.5 kg
^{241}Am	2.13 µCi/g	4,450 Ci	4.78E-05 µCi/g	0.128 Ci
^{238}Pu	0.450 µCi/g	939 Ci	2.19E-05 µCi/g	0.0588 Ci
$^{239/240}Pu$	2.18 µCi/g	4,550 Ci	1.41E-04 µCi/g	0.377 Ci
^{137}Cs	103 µCi/g	2.15E+05 Ci	61.4 µCi/g	1.64E+05 Ci
^{90}Sr	191 µCi/g	3.99E+05 Ci	0.00559 µCi/g	15.0 Ci
Total Alpha	3.77 µCi/g	7,870 Ci	0.00133 µCi/g	3.57 Ci
Total Beta	537 µCi/g	1.12E+06 Ci	55.6 µCi/g	1.49E+05 Ci

* These inventory values, as well as those presented in Section 5 and Appendix A, are based on the volume of the waste at the time of sampling (liquid: 2.48E+06 L; solid: 1.47E+06 L).

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LIST OF TERMS

AA	atomic absorption
AEA	alpha energy analysis
ANOVA	analysis of variance
APC	alpha proportional counting
BPC	beta proportional counting
CASS	Computer Automated Surveillance System
CFR	Code of Federal Regulations
COL	colorometric spectrophotometry
COUL	coulometric titration
CVAA	cold vapor atomic absorption
DM	direct measurement
DN	dilute non-complexed
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U. S. Department of Energy
DQO	data quality objectives
DSC	differential scanning calorimetry
EPA	U. S. Environmental Protection Agency
FAA	flame atomic absorption
FIC	Food Instrument Corporation
GEA	gamma energy analysis
IC	ion chromatography
ICP	inductively coupled plasma atomic emission spectrometry
LSC	liquid scintillation counting
MDL	method detection limit
NCRW	neutralized cladding removal waste
ND	not detected
PNL	Pacific Northwest Laboratory
PUREX	Plutonium-Uranium Extraction
SACS	Surveillance Analysis Computer System
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TOC	total organic carbon
TRU	transuranic
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

In May 1990, Double-Shell Tank 241-AW-105 was sampled to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the *Washington Administrative Code* (Ecology, 1991). This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also addresses expected concentration and bulk inventory data for the waste contents based on this latest sampling data and background tank information.

1.1 PURPOSE

The purpose of this report is to describe and characterize the waste in Double-Shell Tank 241-AW-105 (hereafter, Tank 241-AW-105) based on information given from various sources. This report summarizes the available information regarding the waste in Tank 241-AW-105, and using the historical information to place the analytical data in context, arranges this information in a useful format for making management and technical decisions concerning this waste tank. In addition, conclusions and recommendations are given based on safety issues and further characterization needs.

Specific objectives reached by the sampling and characterization of the waste in Tank 241-AW-105 are:

- Contribute toward the fulfillment of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-44-05 concerning the characterization of Hanford Site high-level radioactive waste tanks (Ecology, EPA, and DOE, 1993).

- Complete safety screening of the contents of Tank 241-AW-105 to meet characterization requirements of the *Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 93-5* (Conway, 1993).

- Provide tank waste characterization information to the Tank Waste Remediation System (TWRS) Program Elements in accordance with the *TWRS Tank Waste Analysis Plan* (Bell, 1994).

1.2 SCOPE

A broad description of the tank and its historical background are presented first. This allows a detailed estimation of the contents of Tank 241-AW-105 based on historical process information and detailed transaction records. Next, the results of the sampling and analysis effort are summarized and interpreted both qualitatively and statistically. The information obtained from historical sources is then compared with the actual waste measurements to arrive at final waste inventory and concentration estimates. Finally, conclusions and recommendations are given based on the current waste inventory and tank status.

1.3 ASSUMPTIONS

This Tank Characterization Report incorporates all available previous sampling, characterization, and transfer data concerning Tank 241-AW-105. In addition, estimates of the current tank contents based on process knowledge and waste transaction records provide important cross-checks and corroboration to the inventory estimates derived from recent analytical data. Given that the analytical data is valid and defensible, this report is therefore the definitive characterization of the contents of Tank 241-AW-105.

The term "analytical results" is used in this report to denote sample results from the most recent sampling event. Characterization data from these samples are used as the basis for the analytical section of this report, Section 5.0. The historical characterization of this tank, Section 2.4, is based on the available "historical results" prior to the 1990 sampling.

Tank 241-AW-105 remains in active service for waste management operations. Although the future contents of the tank will likely change, the characterization of Tank 241-AW-105 is considered accurate and representative of the tank contents as of the date of preparation of this report: September 1994.

2.0 HISTORICAL TANK INFORMATION

The purpose of this section is to describe Tank 241-AW-105 based on historical tank information. It is divided into five parts. A brief description and historical background of the tank comprise the first part, followed by the current tank status, a summary of the process sources that contributed to the tank waste, and an estimation of the contents of Tank 241-AW-105 based on historical information. The final part details the surveillance data taken on the tank.

2.1 TANK HISTORY

Double-Shell Tank 241-AW-105 is a tank-in-tank design consisting of a heat-treated primary steel liner inside a second steel liner. The tank has a design capacity for storing 1.16 million gallons of waste; however, safety considerations require a maximum operating capacity of 1.14 million gallons. Instruments access Tank 241-AW-105 through risers and monitor the pressure, temperature, liquid level, sludge level, and other bulk tank characteristics (Bell, 1994). A diagram of a double-shell tank is presented in Figure 2-1 (Hanlon, 1994).

Tank 241-AW-105 was constructed and went into service in 1980. It is one of six tanks that comprise the 241-AW Tank Farm located in the southeast corner of the 200 East area. Figure 2-2 details the Hanford Site's 200 East area and the location of the 241-AW Tank Farm. Tank 241-AW-105 is located in the southwest corner of the 241-AW Tank Farm.

Early in its service life, Tank 241-AW-105 received waste that had been concentrated in the 242-A Evaporator. It also received some waste solutions from B-Plant. From 1983 to the present, the primary waste types received by Tank 241-AW-105 have been decladding solids and supernate from the Plutonium-Uranium Extraction (PUREX) plant. At times, portions of the tank's contents have been removed for concentration in the 242-A Evaporator.

2.2 TANK STATUS

According to the Waste Volume Projection Historical Database (Koreski, 1994), Tank 241-AW-105 contains 1,048,000 gallons of waste as of June 1994. Since Tank 241-AW-105 has an operational capacity of 1,140,000 gallons, it is 92% full and has 92,000 gallons of reserve capacity. Of the 1,048,000 gallons of waste, 297,000 gallons are sludge, 751,000 gallons are supernatant liquid, and 29,000 gallons are drainable interstitial liquid (Hanlon, 1994). The tank integrity is classified as sound and it currently is not on a Watch List. There are no Unreviewed Safety Questions associated with Tank 241-AW-105 at this time.

Tank 241-AW-105 is still in service, which means that the tank continues to receive liquid in conjunction with production and/or waste processing. It is listed as the active receiver tank for tanks F-18, U-3, and U-4 in the PUREX facility. The waste types it receives from PUREX consist mostly of process solutions such as sump water, steam condensate, and rain water. It also receives laboratory waste and uranium nitrate and plutonium nitrate solutions from PUREX.

Figure 2-1. Double-Shell Tank Configuration.

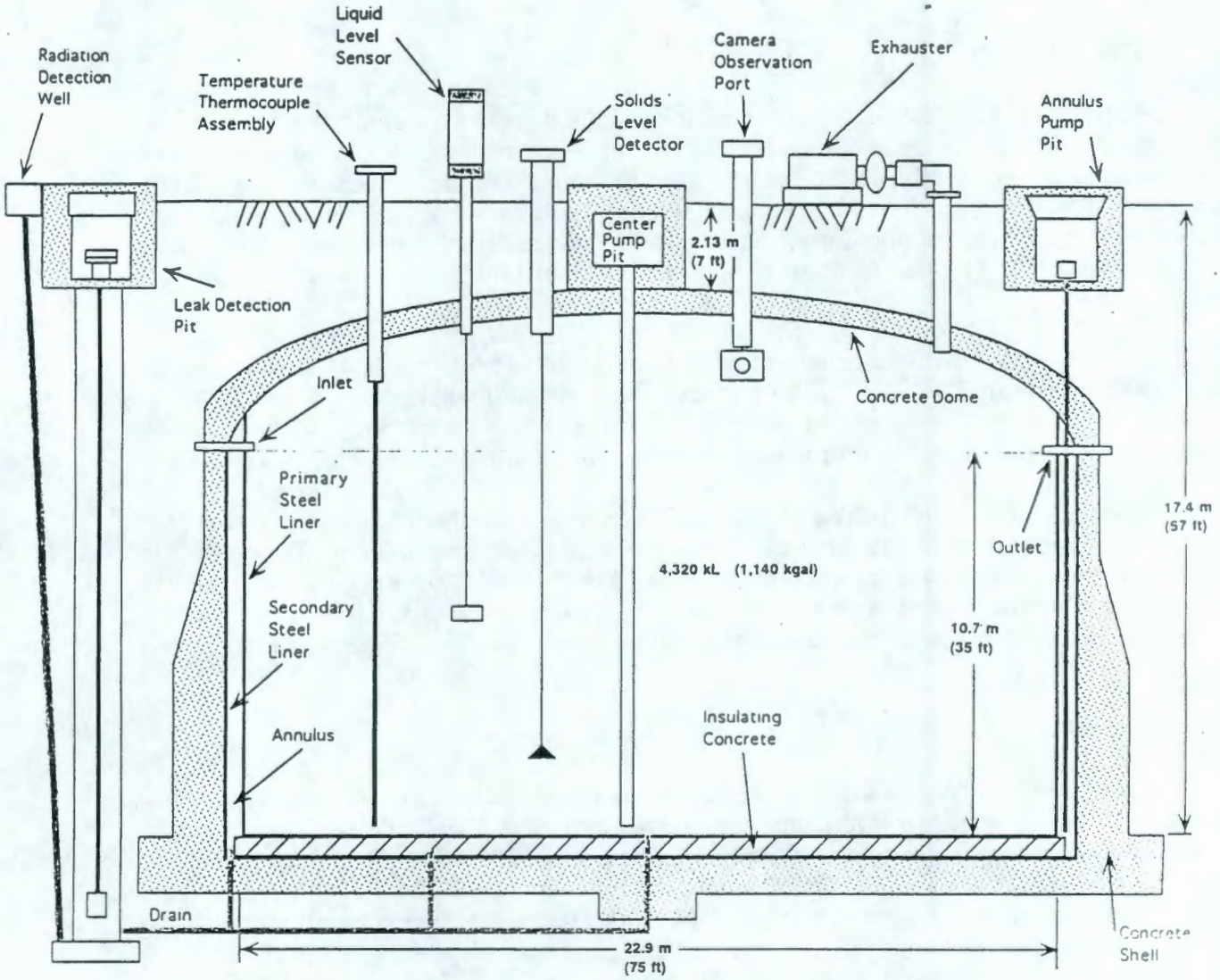
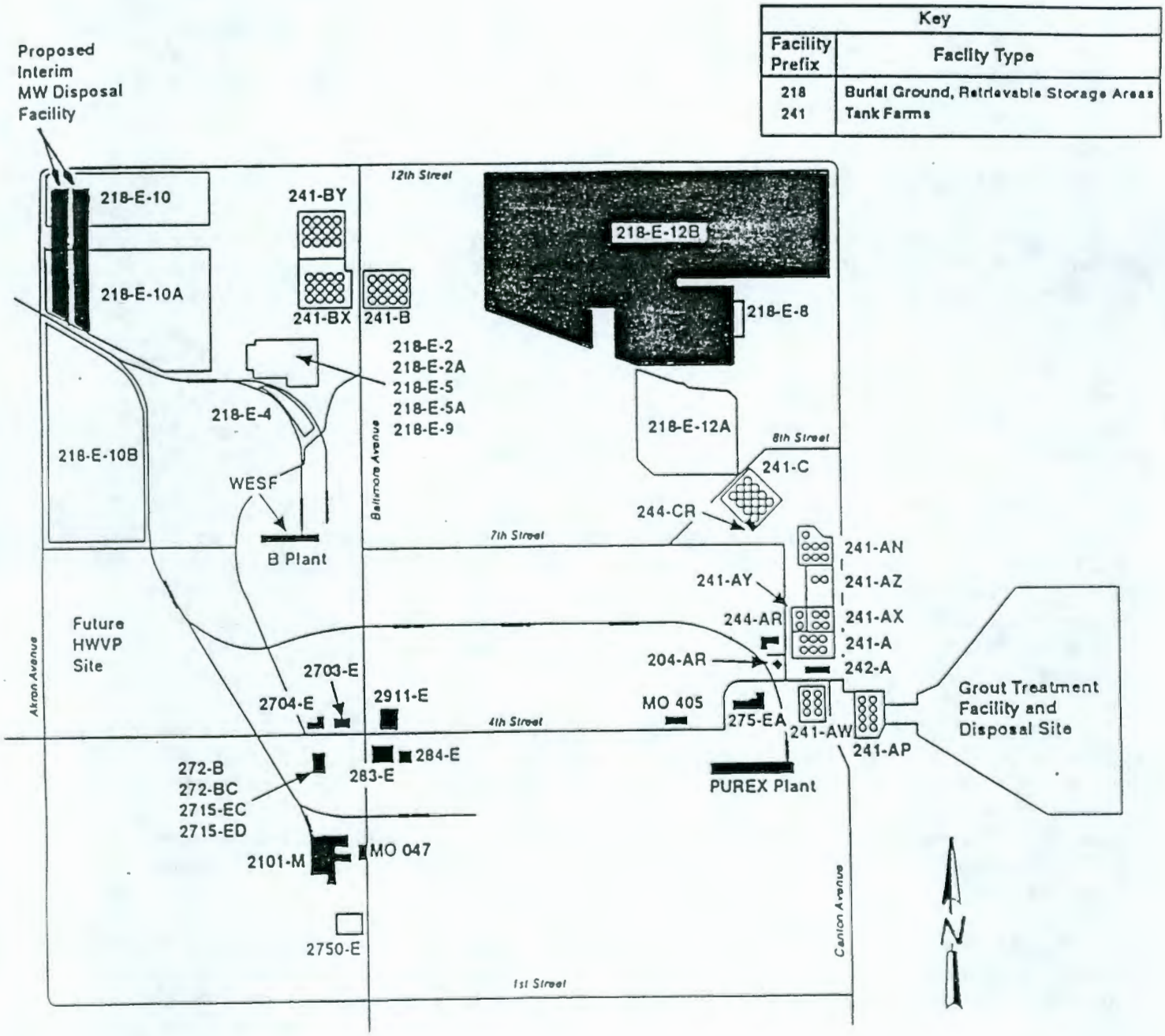


Figure 2-2. 200 East Area and Location of the 241-AW Tank Farm.



Tank 241-AW-105 is equipped with both a manual tape and an automated liquid indicator device for surface level readings; both are still operable. The waste occupies approximately 381 inches of the tank. All tank monitoring instruments are in compliance with documented standards (Hanlon, 1994). The tank's temperatures are stable (Husa et al., 1993).

Since Tank 241-AW-105 does not have a mixing pump, and contains both solids and liquids, its contents are not homogeneous. Active ventilation is used to keep the tank contents cool and to minimize the potential for release of airborne contaminants to the environment (Husa et al., 1993).

2.3 PROCESS KNOWLEDGE

Figure 2-3 depicts the fill history of Tank 241-AW-105 from when it became operational in July 1980, to June 1994. A detailed description of the transfers responsible for these fluctuations follows. All of the volume data were taken from the Waste Volume Projection Historical Database (Koreski, 1994).

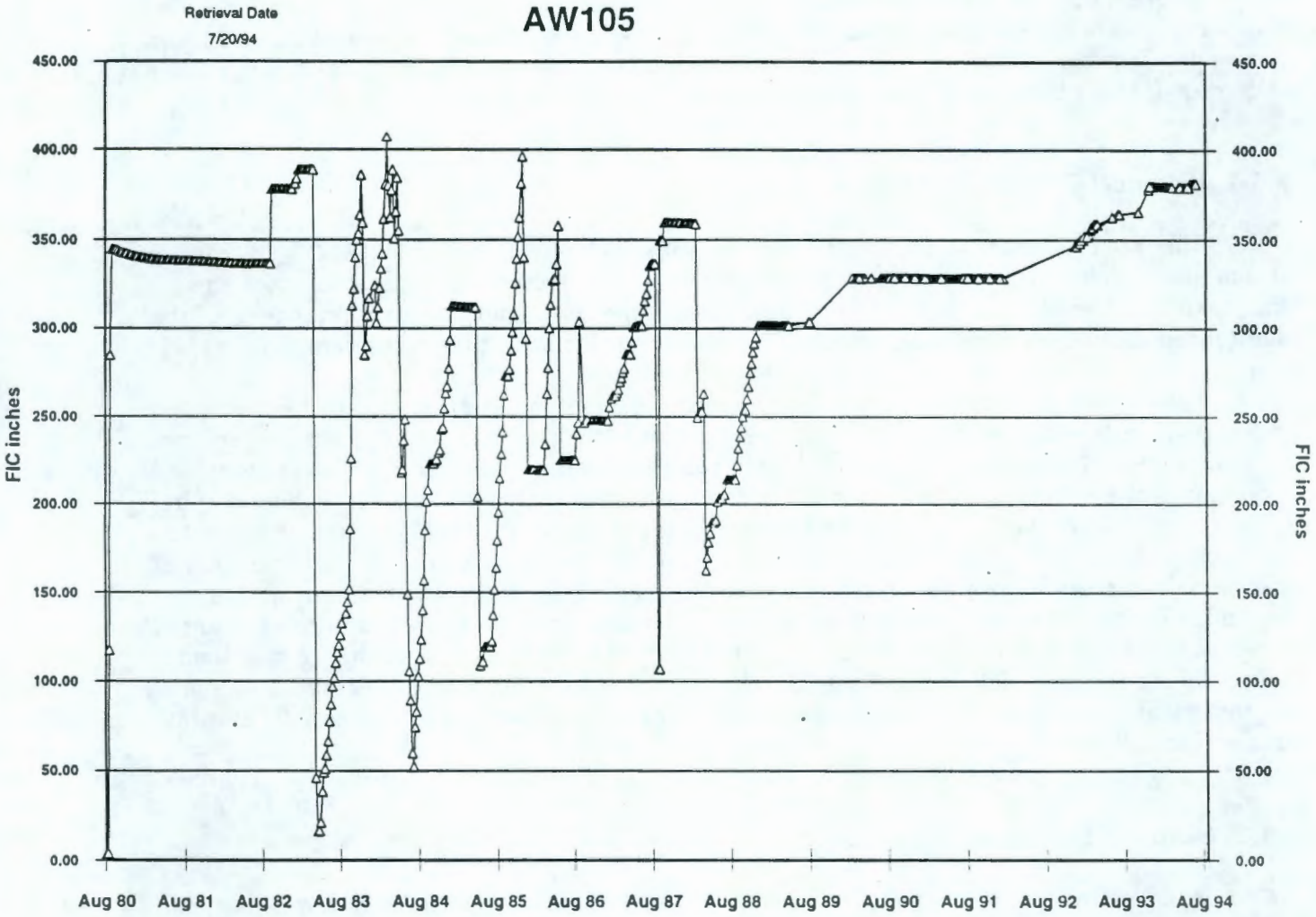
The first waste received by Tank 241-AW-105 was flush water from the leak check in August 1980. Later that month, the tank received complexed waste from the 200 West Area that had been concentrated in the 242-A Evaporator (Teats, 1982). This transfer from the evaporator brought the tank's volume to 935,000 gallons.

Over the next two years, Tank 241-AW-105 received dilute non-complexed waste originating from B-Plant. The tank reached a volume of 1,070,000 gallons in 1983. All but 52,000 gallons of the tank's contents were removed later that year. From this time forward, the tank primarily received waste from the PUREX facility. Periodic shipments from miscellaneous PUREX waste streams continued through 1983 and 1984. A transfer of 225,000 gallons from Tank 241-AW-103 in the fourth quarter of 1983 included dilute non-complexed sulfate waste from the 100-N Area.

Starting in 1984 and continuing through 1990, Tank 241-AW-105 received repeated shipments of PUREX decladding sludge and supernatant. The liquid in the tank was periodically transferred to other tanks or to the 242-A Evaporator. The PUREX decladding waste was Neutralized Cladding Removal Waste (NCRW). Solid NCRW is classified as transuranic (TRU) waste. The continuing transfers of NCRW slurry into the tank and repeated transfers of liquids to other tanks allowed accumulation of a substantial layer of NCRW solids in Tank 241-AW-105.

During this time, other waste types were transferred into Tank 241-AW-105 in relatively small quantities (about 100,000 gallons). These include dilute non-complexed waste solutions from East Area single-shell tanks and dilute complexed TRU solids from Z-Plant. Complexed waste is characterized by a high content of organic carbon in the form of organic complexants. Tank 241-AW-105 received concentrated waste from an evaporator run in 1987. The tank had been a feed tank to this evaporator run, so most of the waste received by the tank at this time was just a concentrated version of what the tank already held. Other feed tanks to this evaporator run provided non-complexed B-Plant waste.

Figure 2-3. Waste Volume History of Tank 241-AW-105.



Tank 241-AW-105 resumed receiving PUREX miscellaneous wastes in 1992. This waste consists of process solutions such as sump water, steam condensate, rain water, and laboratory waste. Engineers at the PUREX plant estimate that the plant will produce about 300,000 gallons of waste over the next two years with Tank 241-AW-105 being the primary receiver. This future waste will also contain solutions of uranium nitrate and plutonium nitrate.

2.4 HISTORICAL ESTIMATION OF THE CONTENTS OF TANK 241-AW-105

Historical inventory estimates based on transfer records and waste stream data have been generated by Steve Agnew and Los Alamos National Laboratories for many of the waste tanks at the Hanford Site. Unfortunately, no estimate has been prepared yet for Tank 241-AW-105. Nevertheless, a preliminary estimate of the tank waste constituents can be generated by reviewing the historical characterization data for the tank. Tank 241-AW-105 has been sampled a number of times. However, much of the information from these samples has become outdated because of the continued service activity of the tank.

2.4.1 Historical Estimation of Solids

The most recent core sampling effort for Tank 241-AW-105 was in 1990. The results of this effort are used for tank characterization later in this document. A previous core sample was taken in 1986. The goal of the 1986 sampling was to gain an understanding of the Neutralized Cladding Removal Waste (NCRW) that was accumulating in the tank.

Ten segments made up the 1986 core sample. Five of the segments were mostly liquids and five were solids. Most of the solids were white NCRW solids, but the bottom segment contained about 12 inches of dark solids. Analyses showed that the bottom segment contained about 70% of the americium and uranium in the tank, presumably in the 12 inch heel (Peters, 1986). The NCRW was also found to contain isotopes in excess of TRU limits (100 nCi/g.) An examination of the transfer history of Tank 241-AW-105 indicates that the composition of this solids layer would have remained relatively unchanged since the 1986 sampling and that the solids content would likely have increased. The data from this 1986 sampling event is presented in Table 2-1 as the historical inventory estimate for the solid portion of the waste. These values are also included in Table 5-10 as the Historic Tank Content Estimate. Finally, the results of these historical solids analyses are compared with more recent characterization data in Table 5-4.

2.4.2 Historical Estimation of Liquids

Much of the service activity of Tank 241-AW-105 has been repeated removal of the liquids and refilling of the tank. This means that analyses of liquid samples become outdated relatively quickly, because the liquid contents of the tank change.

A sample analyzed in 1985 was found to have a thin organic layer consisting of about 30% Tributyl Phosphate and 70% Normal Paraffin Hydrocarbons (Mauss, 1985). Another sample analyzed at the same time, but taken well below the liquid surface, did not have this organic layer. There have been no surface samples taken in Tank 241-AW-105 since this time. Though most of the liquid has been replaced between 1985 and 1990 by repeated removal of supernate and refilling of the tank, it is possible that this organic layer remains and has continued to float on the surface. Further surface liquid sampling will be necessary to determine whether an organic layer persists in Tank 241-AW-105.

Table 2-1. Historical Tank Inventory Estimate of Tank 241-AW-105. (2 pages)

Analyte	Liquid		Solid
Metals	(μg/L)	(μg/g)	(μg/g)
Aluminum	1.05E+6	1,040	2,280
Boron	---	---	115
Calcium	37,800	37.5	517
Cerium	---	---	18.5
Chromium	58,200	57.7	628
Iron	---	---	1,450
Lanthanum	---	---	322
Magnesium	28,900	28.7	133
Manganese	---	---	769
Molybdenum	---	---	1.98
Neodymium	---	---	134
Neptunium	18.4	0.183	---
Nickel	---	---	145
Potassium	---	---	8,080
Rodium	---	---	20.5
Ruthenium	---	---	35.1
Silicon	---	---	3,820
Sodium	1.95E+07	19,400	1.05E+05
Tellurium	---	---	12.6
Thallium	---	---	35.0
Zinc	---	---	10.8
Zirconium	---	---	69,200
Ions	(μg/L)	(μg/g)	(μg/g)
Ammonia	7.55E+05	749	1,220
Carbonate	2.01E+06	1,990	7,430
Chloride	1.53E+05	152	425
Fluoride	3.25E+06	3,200	56,200
Hydroxide	6.60E+05	6,550	8,230
Nitrate	1.60E+05	159	28,100
Nitrite	1.50E+05	149	7,770
Phosphate	4,730	469	---
Sulfate	9.70E+05	962	1,080

Table 2-1. Historical Tank Inventory Estimate of Tank 241-AW-105. (2 pages)

Analyte	Liquid		Solid
Radionuclides	**(μCi/L)**	**(μCi/g)**	**(μCi/g)**
^{241}Am	< 0.841	< 8.34E-04	0.204
^{125}Sb	---	---	8.25
^{144}Ce	---	---	24.8
^{134}Cs	5,750	5.70	0.815
^{137}Cs	< 92	< 0.913	45.7
^{60}Co	---	---	0.0232
^{154}Eu	---	---	0.358
^{155}Eu	---	---	0.425
^{238}Pu	---	---	0.0691
$^{239/240}Pu$	---	---	0.603
^{106}Ru	---	---	19.8
^{90}Sr	26.3	0.0261	---
Total Alpha	0.372	3.69E-04	---
Physical Properties			
Density	1.008 g/mL	---	1.30 g/mL
pH	12.9	---	---
Weight % solids	5.40%	---	---
TOC	4.98E+05 μg/mL	494 μg/g	5,250 μg/g

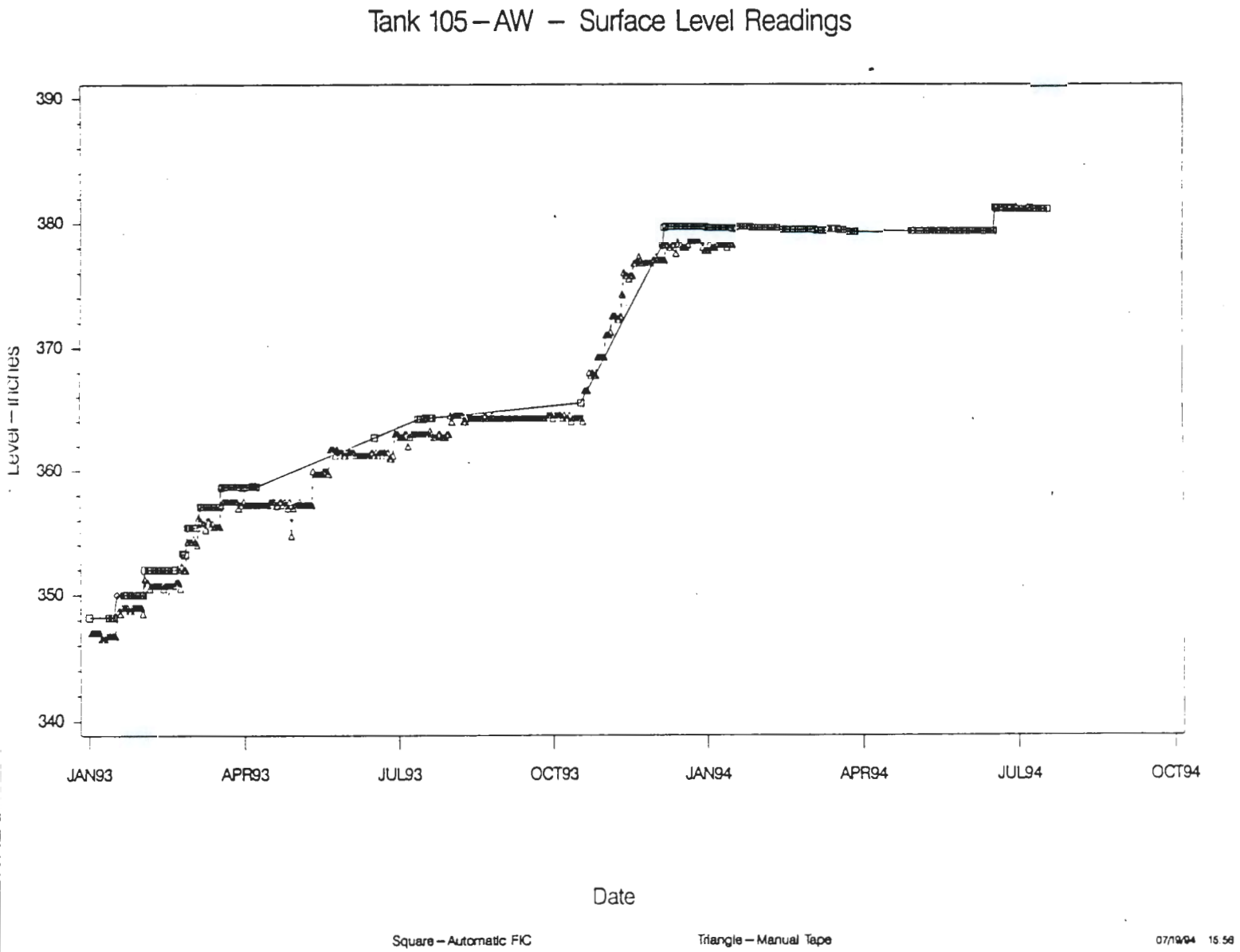
A liquid sampling effort from 1988 (Coroneos, 1990) should be representative of the current liquid contents of the tank, because the transfers into the tank since 1988 are relatively similar to liquids already in the tank. Therefore, the analytical results from the 1988 sampling event are used as the historical inventory estimate for the liquid portion of the waste. These results are listed in Table 2-1, and in Table 5-9 as the Historic Tank Content Estimate. A comparison of the results of these analyses to the most recent core sampling liquid data (1990) is found in Table 5-4.

2.5 SURVEILLANCE DATA

2.5.1 Surface Level Readings

To determine the surface level of the waste, Tank 241-AW-105 is equipped with both an automatic gauge manufactured by the Food Instrument Corporation (FIC) and a manual tape. Surface level readings are currently being taken daily with both gauges. The most recent FIC liquid level measurement available was 381.1 inches on July 20, 1994. The manual tape reading for July 19, 1994 was 380.0 inches (Rios, 1994). A plot presenting surface level readings since January 1993 is found as Figure 2-4. It shows the increase in the waste level caused by the recent additions of PUREX miscellaneous wastes.

Figure 2-4. Tank 241-AW-105 Surface Level Data Since January 1993. (Rios, 1994)



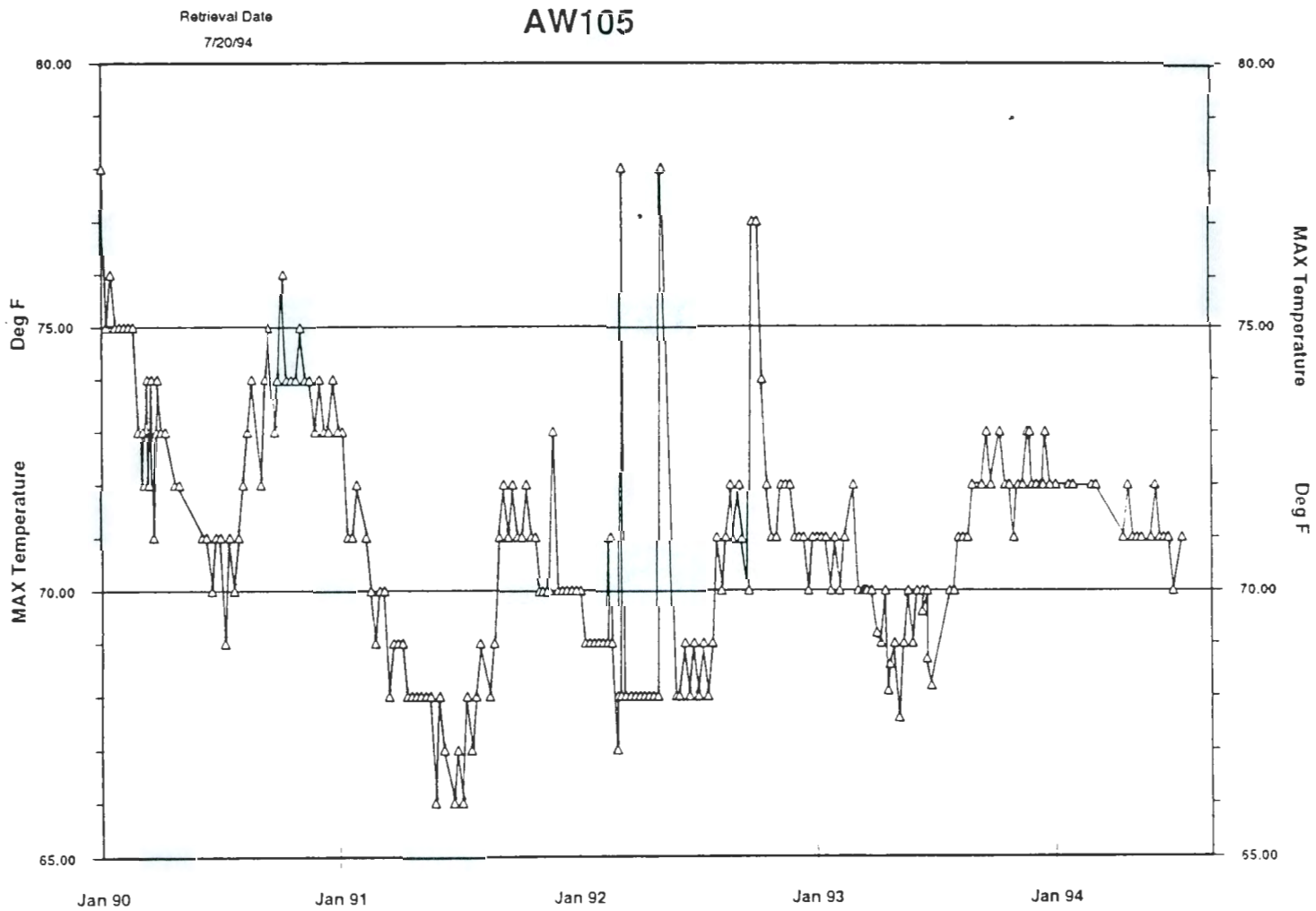
The FIC indicator uses a conductivity electrode which is lowered by machine until electrical contact is established with the waste surface. The FIC gauge is electrically connected to a computer for automatic data transmission, analysis, and reporting via the Computer Automated Surveillance System (CASS). The manual tape also uses a conductivity probe but must be lowered by hand crank. Data from the manual tape must be entered onto CASS by an operator.

2.5.2 Internal Tank Temperatures

To measure local tank temperatures, a probe with 18 thermocouples assembled in a pipe, called a thermocouple tree, is inserted into Tank 241-AW-105. The thermocouple tree monitors the waste temperatures at various levels in the tank, usually every two feet. Sixteen of the 18 thermocouples on the thermocouple tree are currently in service. The temperature readings for Tank 241-AW-105 have been automatically recorded since 1990 by Surveillance Analysis Computer Systems (SACS). Temperature readings are downloaded to SACS daily.

Temperature readings for Tank 241-AW-105 since 1990 are plotted in Figure 2-5. This graph, along with all of the temperature data, has been taken from Rios, 1994. The last available temperature reading for Tank 241-AW-105 was 21.7°C (71°F), taken in July 20, 1994. As illustrated by Figure 2-5, temperatures in the tank are stable; they range between 18.3°C (65°F) and 23.9°C (75°F), and have only occasionally exceeded 23.9°C (75°F).

Figure 2-5. Tank 241-AW-105 Thermocouple Tree Raw Temperature Plot. (Rios, 1994)



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3.0 TANK SAMPLING OVERVIEW

The sampling of Tank 241-AW-105 was conducted as part of an overall plan to characterize the wastes in all of the underground storage tanks on the Hanford Site. The results of these analyses will provide support for Tank Farm Operations, Tank Waste Remediation System safety programs, design of retrieval, pretreatment, and disposal systems, and fulfillment of milestones contained in the Tri-Party Agreement (Bell, 1994). The waste was also characterized in support of the Hanford Waste Vitrification Plant and grout development activities, as well as in support of transuranic extraction development work (WHC, 1994).

3.1 DESCRIPTION OF SAMPLING EVENT

Samples were collected on May 14, 15, 16, and 17, 1990, from riser 16B. Table 3-1 shows a list of tank farm and Pacific Northwest Laboratory sample numbers for each segment. The core samples from Tank 241-AW-105 were obtained using a core sampling truck that has sampling equipment mounted on a rotating platform. A stainless steel sampler was used to obtain a 48 cm (19 inch) long and 2.5 cm (1 inch) diameter core of waste (maximum volume of 187 milliliters). When the segment was captured within the sampler, it was sealed in a stainless steel liner within a shipping cask to prevent sample liquid from being lost. For a further description of core sampling procedures, see the *Tank Characterization Reference Guide* (De Lorenzo et al., 1994).

At the time of the latest sampling event, Tank 241-AW-105 contained about 8.33 m (328 in) of waste, including approximately 2.74 m (108 in) of sludge and 5.59 m (220 in) of supernate (Koreski, 1994 and Hanlon, 1994). Sample segments 1 and 2 consisted entirely of supernate, while segments 3 and 7 were taken from the sludge layer (although segments 3-6 contained some drainable liquid). Sampling depths could not be verified from the available data. (For sample recovery data, see Section 4.1, Table 4-1.)

3.2 REQUESTED ANALYSES

The casks were then transported to the Pacific Northwest Laboratory's 325 Laboratory. Segments 1-3 were received on May 17, 1990, segments 4-6 on May 23, 1990 and segment 7 was received on June 6, 1990. A chain of custody form was filled out for each segment. Analyses of the waste were performed during the latter half of 1990. A list of the analyses requested from the Pacific Northwest Laboratory is presented in Table 3-2. In addition to these analyses, ^{63}Ni, ^{93}Zr, and Pu isotope ratios were requested on select samples and composites. At the time of request, no analytical method existed for determining the miller number, ^{63}Ni, and ^{93}Zr.

Table 3-1. Tank 241-AW-105 Sample Numbers and Dates from Core 19, Riser 16B (WHC, 1994).

Segment	Customer Identification Number	Shipping Sample Number	Cask	Date Sampled	Date Received by PNL
1	90-014	90-S-006	C1022	5/14/90	5-17-90
2	90-015	90-S-006	1006C	5/15/90	5-17-90
3	90-016	90-S-006	C1025	5/15/90	5-17-90
4	90-017	90-S-007	C1024	5/16/90	5-23-90
5	90-018	90-S-007	1002C	5/16/90	5-23-90
6	90-019	90-S-007	C1026	5/17/90	5-23-90
7	90-020	90-S-008	1009C	5/17/90	6-06-90

Table 3-2. Tank 241-AW-105 Requested Analytes from the Pacific Northwest Laboratory (WHC, 1994). (2 pages)

	Segment							
			5					
	1,2	3,4	AR	Dilution 1:1	Dilution 1:2	6	7	3, 4, 5, 6
Physical and Rheological								
shear strength			X				X	
penetration resistance			X				X	
density	X	G	X	X	X	G	X	G
settling rate			X	X	X			
volume % settled solids		X	X	X	X	X		X
weight % settled solids		X				X		
volume % centrifuged solids		X	X	X	X	X		X
weight % centrifuged solids		X				X		X
weight % water	X	X	X	X	X	X	X	X
weight % oxides								X
rheogram			X	X	X			
Chemical								
ion chromatograph (anions)	X	X	X			L,S	X	L,S
inductively coupled plasma	X	X	X			L,S	X	L,S
total carbon, total organic carbon	X	X	X			L,S	X	L,S
pH	X						X	L,S

9513319.0532

Table 3-2. Tank 241-AW-105 Requested Analytes from the Pacific Northwest Laboratory (WHC, 1994). (2 pages)

	Segment							
	1,2	3,4	5			6	7	3, 4, 5, 6
			AR	Dilution 1:1	Dilution 1:2			
Chemical (continued)								
OH^-	X						X	L,S
NH_3/NH_4^+	X	X	X			L	X	L
Cr (III)/CR (VI)	X						X	L,S
Hg	X						X	L,S
As	X						X	L,S
Se	X						X	L,S
CN^-	X						X	L
Noble Metals (Ru, Rh, Pd)							A	A
Total U	X						X	L,S
Radiochemical								
Gamma Energy Analysis	X	X	X			L,S	X	L,S
Alpha Energy Analysis	X	X	X			L,S		
^{3}H	X						X	L,S
^{14}C	X						X	L,S
^{79}Se	X						X	L,S
^{90}Sr	X						X	L,S
^{94}Nb	X						X	L,S
^{99}Tc	X						X	L,S
^{129}I	X						X	L,S
^{237}Np	A						A	A
^{241}Am	X						X	L,S
^{244}Cm	X						X	L,S
Total Beta	X						X	L,S

A: Archive for Inductively Coupled Plasma/Mass Spectroscopy
G: Sludge, centrifuged solids and liquids
J: If justified, by Alpha Energy Analysis
L: Centrifuged liquid
S: Centrifuged solids
AR: as received

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4.0 SAMPLE HANDLING AND ANALYTICAL SCHEME

The analytical procedures performed on the samples upon receipt from the tank farm sampling activity are the focus of this section.

4.1 WASTE DESCRIPTION

The samples were extruded at the Pacific Northwest Laboratory High Level Radiochemical Facility (325-A Hot-Cell facility). Segments 1 and 2 contained 205 mL and 245 mL of opaque liquid, respectively, with no observable solids. Segments 3 through 7 contained no free liquids. Segment 3 appeared as a gray slurry on the top 27.9 cm. With increasing depth, the color lightened from gray to white at 27.9 cm near the bottom and could not hold its shape. Segment 4 was a white sludge, similar to the material at the bottom of segment 3. The material in segment 5 was dry and broke off into chunks upon extrusion. The material was white with the exception of some brown and black spots. The first 17.8 cm of segment 6 appeared similar to segment 5, but with streaks of brown. The bottom 30.5 cm were grayish white and had a margarine-like consistency. Segment 7 was very dark in color with white marbling in the top 10.2 cm. The material in segment 7 was harder than the previous segments (WHC, 1994). Table 4-1 provides further detail about each individual segment.

Table 4-1. Extrusion Data for Tank 241-AW-105 (WHC, 1994).

Segment	Date Extruded	Volume Recovered (mL)	Mass Recovered (g)	Bulk Density (g/mL)	Calculated Segment Length* (inches)	Percent Recovery
1	5-23-90	205	--	1.08**	15.2	80%
2	5-23-90	245	--	1.08**	18.2	95.7%
3	5-23-90	--	294	1.35***	17.5	92.1%
4	6-13-90	--	314	1.35***	18.7	98.4%
5	6-14-90	--	307	1.40	17.6	92.6%
6	6-15-90	--	323	1.44	18.0	94.7%
7	6-15-90	--	122	1.50	6.52	34.3%

* Based on 2.5 cm core diameter and the corresponding density
** Measurement performed on composite of segments 1 and 2
*** Measurement performed on composite of segments 3 and 4

4.2 HOLD TIME CONSIDERATIONS

For a description of hold time considerations see the *Tank Characterization Reference Guide* (De Lorenzo et al., 1994).

4.2.1 Pacific Northwest Laboratory - 325 Laboratory

Tank 241-AW-105 samples were delivered to the Pacific Northwest Laboratory's 325 Laboratory between May 17 and June 6, 1990. As noted in a letter of transaction, segments 1 and 2 were to be combined and analyzed as a single sample, as were segments 3 and 4. Segment 5 was to be analyzed in as-received form, and also after 1:1 and 1:2 dilutions with the supernate from segments 1 and 2. In addition, aliquots proportional to recovery of segments 3, 4, 5, and 6 were to be combined and analyzed as a single composite sample called "comp." Segment 7 was to be characterized separately (WHC, 1994).

4.3 SAMPLE PREPARATION

The three composite samples (1-2, 3-4, 3-4-5-6,) were prepared in equal ratios by weight as per the letter of instruction. Two dilutions, at 1:1 and 1:2 sample to supernate ratios, were prepared using the as-received material from segment 5 and the supernate from composite 1-2. These dilutions were made on a volume percent basis (WHC, 1994).

Select segments, composites, and dilutions were prepared for analysis of chemical and radiochemical components. Prior to analysis, two fusions of each of the solids were performed, and liquids were filtered through a 0.2 μm filter. The first fusion was a sodium peroxide fusion in a zirconium crucible, and the second was a potassium hydroxide fusion in a nickel crucible. The fusions were dissolved in hydrochloric acid. The chemical and radiochemical analyses were then performed on these solutions. The liquid analyses were performed on the as-received samples or dilutions of these samples. To determine transuranic content, the analysis of solids was run on a sodium peroxide fusion of the samples; the liquids were run directly. A water leach of each solid and a dilution of each liquid was used to measure the anions. The anions were measured by ion chromatography.

For a discussion of further sample preparation procedures, see *the Tank Characterization Reference Guide* (De Lorenzo et al., 1994).

4.4 ANALYTICAL METHODS

This section briefly describes the analytical methods used to characterize the waste in Tank 241-AW-105.

4.4.1 Physical and Rheological Tests

Physical and rheological tests completed at Pacific Northwest Laboratory included: shear strength, penetration resistance, density, settling rate, volume % settled solids, weight % settled solids, volume % centrifuged solids, weight % centrifuged solids, weight % water, weight % oxides, and rheogram.

4.4.2 Chemical and Radionuclide Constituent Analysis

This section briefly describes the analytical methods utilized by the Pacific Northwest Laboratory to determine chemical and radionuclide constituents in the tank. Duplicate analyses were not performed on the tank samples except for the metals. Table 4-2 lists the analytical methods used for the various analytes.

Table 4-2. Analytical Methods.

Analyte	Method	Procedure
F^-, Cl^-, Br^-, NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2-}	Ion Chromatography	+PNL-ALO-212
NH_3	Selective Ion Electrode	*PNL-ALO-226
OH^-	Direct	+597-7:40.22 (modified)
CN^-	Distillation/Spectrometric Analysis	*PNL-ALO-270
TIC	Direct	*7-40.7
Total U	Laser Fluorimetry	*HTA-4-16
As Se	GHAA[1]	*PNL-ALO-214 *PNL-ALO-215
Hg	CVAA[2]	*PNL-ALO-213
Total Metals	ICP	*PNL-SP-7
^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce, ^{154}Eu, ^{155}Eu, ^{94}Nb	Gamma Energy Analysis	*PNL-ALO-451
^{238}Pu, $^{239/240}Pu$	Alpha Energy Analysis	*PNL-ALO-423
^{14}C	Liquid Scintillation	+7-40.42, Rev. 0
^{3}H	Liquid Scintillation	*PNL-SP-30
^{79}Se ^{99}Tc	Liquid Scintillation	*PNL-ALO-444 *PNL-ALO-432
^{90}Sr	separation/Beta[3]	*PNL-ALO-433
^{129}I	Low Energy Photon Spectroscopy[4]	*PNL-ALO-454
^{237}Np	Alpha Proportional Counting	*PNL-ALO-425
^{244}Cm, ^{241}Am	separation/Alpha/AEA[5]	*PNL-ALO-424
Specific Gravity	Direct	WHC-053-1
Total Beta	Proportional Counting	PNL-ALO-431

*Winters et al., 1990
+WHC, 1994

[1]Gaseous Hydride Atomic Absorption Spectrometry
[2]Cold Vapor Atomic Absorption Spectrometry
[3]Chemical separation along with Total Beta Proportional Counting
[4]Low Energy Photon Spectroscopy
[5]Chemical separation along with Alpha Proportional Counting and Alpha Energy Analysis.

4.5 MODULE SPECIFIC ANALYSES

The characterization program for Tank 241-AW-105 was intended to satisfy criteria set by the Tank Waste Remediation System (TWRS). The TWRS sample characterization objectives are to provide adequate description of physical, chemical, and radiological properties of Hanford Site tank wastes to support the resolution of Unreviewed Safety Questions, other safety issues surrounding the Watch List tanks, and the design of retrieval, pretreatment, and final disposal systems (Bell, 1994). For this specific tank, analyses were performed to provide sufficient information to confidently determine whether constituent concentrations are within safe operating limits. In addition these analyses were used to determine functional limits such as solids formation for operation of the evaporator. Although Tank 241-AW-105 is not engaged in a current evaporator campaign, it is a candidate for future campaigns, and characterization of Tank 241-AW-105 provides data to predict where the types and amounts of environmentally hazardous waste are likely to occur in the evaporator product streams.

5.0 ANALYTICAL RESULTS AND WASTE INVENTORY

The chemical, radiochemical, and physical results associated with Tank 241-AW-105 are presented within this document as indicated in Table 5-1. The samples from which these results were derived were collected on May 14 through May 17, 1990. This sampling event was the most recent regarding Tank 241-AW-105 and reflects the most accurate characterization of the tank waste available at the present time.

Table 5-1. Analytical Data Presentation Tables.

Analysis	Tabulated Results
Metals	Table A-1
Anions	Table A-2
Radionuclides	Table A-3
Physical Properties and Miscellaneous Chemical Data	Table A-4
Characterization Report for the Liquid Phase of Tank 241-AW-105	Table 5-9
Characterization Report for the Solid Phase of Tank 241-AW-105	Table 5-10

The sample data presented in the Appendix A tables were obtained from a preliminary characterization of the waste in Tank 241-AW-105 performed by Pacific Northwest Laboratory personnel (WHC, 1994). If an analyte was not detected in a sample, the detection limit was recorded as the result. When detection limits were not provided for an undetected analyte, ND, which abbreviates not detected, was entered as the result.

The Appendix A tables treated the liquid and solid laboratory data separately, and a representative tank concentration or "Evaluated Data Result" for each analyte was determined for both matrices. These values were derived from the average of the available data. This average was the weighted average. The segment data was also indiscriminately averaged with two composites and four segment composites. The various data points were weighted proportionally to their mass; also, the data was weighted according to the percent recoveries of each segment. However, since segment 7 was not included in any of the core composite data, this biases the data because analyte concentrations should be based on the average of the core composite data. If all available sample analyses failed to detect a particular analyte, the tank concentration of the analyte was reported to be less than the highest recorded detection limit. Detection limit values were not utilized to calculate means nor corresponding standard deviation values.

The projected tank inventory value for the liquid in Tank 241-AW-105 was calculated by multiplying the "Evaluated Data Result" by the volume of liquid in the tank at the time of sampling, 2.48E+06 liters (2.68E+06 kg). The amount of each constituent present in the 1.47E+06 liters (2.09E+06 kg) of solid phase waste was also estimated in the Appendix A tables. (Note that these waste levels differ slightly from the current levels of 2.84E+06 L of liquid and 1.12E+06 L of sludge). The appropriate conversion factors were included in the calculations to obtain the reported units.

5.1 CHEMICAL ANALYSES

5.1.1 Elemental Constituents

The major elemental constituents identified in the liquid phase of the waste were Al, K, P, Si, and Na; all were present in concentrations exceeding 500 μg/g. Although analyzed, the following elements were not detected in the liquid portion of the tank waste: Ce, Co, Dy, La, Li, Nd, Ag, Te, and Tl. Metals for which liquid phase 1986 core sample results were available are listed in Table 5-2 and are compared to the liquid sample data acquired from Tank 241-AW-105 in 1990. There is very poor agreement between the 1990 results and the 1986 core sample results. This could be due to changes in the solubility of elements and also changes in the character of the waste stream.

Table 5-2. Comparison of 1990 Analytical and 1986 Core Sample Results for Elemental Constituents of the Liquid Phase of Tank 241-AW-105.

	Lab Results from 1990[a] (μg/g)	Lab Results from 1986[b] (μg/g)	*Relative Percent (RPD) Difference
Al	840	1040	-21%
Ca	10.9	37.5	-110%
Cr	60.0	57.7	4%
Mg	0.377	28.7	-195%
Na	44,300	19,400	78%

[a]Lab results from 1990
[b]Lab results from 1986

* $RPD = ((a-b)/\frac{(a+b)}{2}) \times 100$

With respect to the solid phase of Tank 241-AW-105, Al, Cr, Co, Fe, K, P, Si, Na, U, and Zr were all detected in concentrations exceeding 2000 μg/g; however, zirconium was by far the most abundant. Of the evaluated analytes, only cerium, lithium, and thallium were not detected in the solid samples. Major elements for which solid phase 1986 core sample results were available are listed in Table 5-3 and are compared to the solid sample data acquired from Tank 241-AW-105 in 1990.

The inductively coupled plasma atomic emission spectroscopy (ICP) results associated with samples obtained from the solid phase of Tank 241-AW-105 were higher than expected for the following metals: Sb, As, Cd, Co, Dy, La, Nd, Re, Rh, Ru, Se, Ag, Te, Th, U, and V. The consistently high bias exhibited by these data indicate that interelement corrections were not performed during the analysis; however, this assumption could be neither confirmed nor denied due to the lack of quality control data available for review. Furthermore, atomic absorption data for Sb, As, Pb, Se, and Tl were either never requested or not reported and, therefore, were unavailable for comparison. When interelement corrections are not conducted during an ICP analysis, the vast array of spectral lines emitted by uranium alone cause a substantial amount of positive interference. Since the data may be predicting analyte concentrations which are erroneously high, the solid phase of the waste in Tank 241-AW-105 should be reevaluated before regulatory concerns are addressed. Failure to do so may result in an overly conservative approach toward the management of the waste.

Table 5-3. Comparison of 1990 Analytical and 1986 Core Sample Results for Elemental Constituents of the Solid Phase of Tank 241-AW-105

	Lab Results from 1990 (μg/g)	Lab Results from 1986 (μg/g)	Relative Percent Difference
Al	9,840	2,280	125%
Cr	4,010	628	146%
Fe	6,390	1,450	126%
K	19,100	8,080	81%
Si	6,340	3,820	50%
Na	26,800	100,000	-115%
Zr	184,000	69,200	91%

5.1.2 Anions

The most abundant anion in the liquid phase of the waste is nitrate. Fluoride is reported to be the major anionic constituent in the solids portion of the waste; however, this may be misleading since the solid samples were not analyzed for hydroxide. If both liquid and solid sample data were available for a given anion, the data demonstrated a greater analyte concentration in the solid rather than the liquid phase with the exception of Cr(VI). Comparisons regarding the most recent liquid and solid sample data with estimates derived from previous analyses in 1986 for the solids and 1988 for the liquids are presented in Table 5-4. Not all anions are listed in the table due to the unavailability of all relevant data.

Table 5-4. Comparison of 1990 Analytical and Lab Results from 1988 for Tank 241-AW-105 Anions in the Liquid and Solid Phase. (2 pages)

Analyte	Lab Results from 1990 (μg/g)	Lab Results From 1988 or 1986 (μg/g)	Relative Percent Difference
Liquid Phase			
Ammonia	440	749	-52%
Carbonate (TIC)	9,810	1,990	133%
Chloride	808	152	137%
Fluoride	7,410	3,220	79%
Hydroxide	12,100	6,550	60%
Nitrate	34,000	15,900	73%
Nitrite	10,900	1,480	152%
Phosphate (IC)	605	469	25%
Sulfate	1,750	962	58%

Table 5-4. Comparison of 1990 Analytical and Lab Results from 1988 for Tank 241-AW-105 Anions in the Liquid and Solid Phase. (2 pages)

Analyte	Lab Results from 1990 (μg/g)	Lab Results From 1988 or 1986 (μg/g)	Relative Percent Difference
Solid Phase			
Ammonia	---	1,220	
Carbonate (TIC)	30,200	7,430	121%
Chloride	2,100	425	133%
Fluoride	100,000	56,200	56%
Hydroxide	---	8,230	
Nitrate	46,400	28,100	49%
Nitrite	17,400	7,770	77%
Phosphate	1,360	---	
Sulfate	2,820	1,080	89%

After calculating values for phosphate from both the liquid and solid phosphorous data derived from the inductively coupled plasma (ICP) analyses, the results were compared to the corresponding phosphate data obtained by ion chromatography (IC). The comparison is displayed in Table 5-5, and inspection of the table reveals that the ICP data consistently yields a larger phosphate value than the IC result regardless of sample matrix.

Table 5-5. Comparison of ICP and IC Phosphate Results.

Analyte	Liquid Phase		Solid Phase	
	IC Result (μg/g)	ICP Result (μg/g)	IC Result (μg/g)	ICP Result (μg/g)
Phosphate	605	2320	1360	10300

The difference between IC and ICP results could be due to different sample preparation methods. IC based on water digestion gives water soluble phosphorus, whereas ICP, based on fusion digestion, gives total phosphorus. There was no available information on sample preparation for ICP.

5.2 RADIOLOGICAL DETERMINATIONS

The major radioactive constituents in the waste were ^{125}Sb, ^{144}Ce, ^{137}Cs, ^{106}Ru, and ^{90}Sr. Although these radionuclides exist in the waste, the only isotopes of real concern are those with a long half-life. Half-life is the time required for the radioactivity to fall to half its observed value at any given instant. A half life can vary from a fraction of a second to millions of years. Table 5-6 compares the most recent data obtained in 1990 and previous

data obtained from a 1986 core sample. The corresponding half-life for each radionuclide is shown in the table. From inspection of the table it can be seen that the two sources of data agreed better for the solid samples than the liquid samples.

Table 5-6. Comparison of 1990 Analytical and 1986 Core Sample Isotopic Results.

Analyte	Half-Life	Lab Result (μCi/g)		Lab Results from 1986 (μCi/g)		Relative Percent Difference	
		Liquid	Solid	Liquid	Solid	Liquid	Solid
^{125}Sb	2.77y	ND[1]	13.0	---	8.25	---	44.7%
^{144}Ce	284.3d	ND	11.1	---	24.8	---	76.3%
^{137}Cs	30.17y	61.4	103	5.70	45.7	166%	77.1%
^{106}Ru	368.2d	1.11	9.64	---	19.8	---	69.0%
^{90}Sr	287.6y	5.59E-03	191	0.0261	---	129%	---

[1]ND: Not detected

A comparison was also made between the gross Beta result and the sum of the individual Beta emitters. This was done to determine the level of agreement between the two values. The activity of the individual Beta emitters is summed by using the following equation: $2*^{90}Sr + ^{137}Cs + ^{99}Tc$. As can be seen in Table 5-7, there is good corroboration between the numbers for both the liquid and solid samples.

Table 5-7. Total Beta Comparison.

Analyte	Half-Life	Solid (μCi/g)	Liquid (μCi/g)
^{90}Sr	28.6y	191	5.59E-03
^{137}Cs	30.17y	103	61.4
^{99}Tc	$2.13x10^5$y	0.719	0.0176
Total Beta Sum[1]	--	486	61.4
Gross Beta Result	--	537	55.6

[1]Calculated by using the equation: $2*^{90}Sr + ^{137}Cs + ^{99}Tc$

5.3 ORGANIC CONSTITUENTS

Volatile and semi-volatile organic analyses were not conducted on samples obtained from Tank 241-AW-105. However, volatile and semivolatile target analytes are not expected to be present in the tank due to their volatile nature and relatively small contribution to the waste as indicated by the historical records. Data from the total organic carbon analysis (Table 5-10) reveals that organic carbon does exist in Tank 241-T-105, and is concentrated in segment 7; in fact, segment 7 is about 3% organic carbon by weight.

5.4 PHYSICAL MEASUREMENTS

5.4.1 Density, Percent Solids, and Percent Water

Table 5-8 details the physical measurements data by segment. Density was measured on all 7 segments of the core, as well as on 1:1 and 1:2 dilutions of segment 5 (using the sample supernate from segments 1 and 2 as the dilutant). Segments 1-2 were measured as a composite as were segments 3-4. Segments 5 through 7 were measured singly. Values ranged from 1.08 g/mL for composite 1-2, to 1.50 g/ml for segment 7. The density figures show a steady upward trend as core depth increases.

Table 5-8. Tank 241-AW-105 Physical Measurements by Segment (WHC, 1994).

Physical Property		1-2	3-4	5	5 1:1	5 1:2	6	7	3-6
Density (g/mL)	Sample	1.08	1.35	1.40	1.22	1.16	1.44	1.50	1.39
	Centrifuged Supernate	1.08	1.21				1.09		1.01
	Centrifuged Solids	---	1.42				1.59		1.58
Settled Solids	Vol%	---	100	100	96.9	85.6	100		100
	Wt%	---	100	100			100	100	
Centrifuged Solids	Vol%	---	63.1	75	38	26	70		71
	Wt%	---	66.8				77.3		78

Percent solids were measured as vol% and as wt%, on settled solids and on centrifuged solids. The segment 1-2 composite showed no settled or centrifuged solids. The centrifuged solids results showed a high of 75 vol% for segment 5, and a low value of 63.1 vol%. Settled solids exhibited a value of 100 vol% for all samples with the exception of the segment 1-2 composite. Wt% values showed a similar trend. A 1:1 dilution reduced the vol% solids for segment 5 from 75 vol% to 38 vol%, a factor of nearly 2. A subsequent 1:2 dilution of segment 5 further vol% solids to 26%, a factor of nearly 1.5. These numbers suggest that the supernate in the sample is either at or near saturation with respect to the solids.

No percent water analyses were performed.

5.4.2 Particle Size

Particle size was not determined in this suite of analyses. However, particle size was determined on a previous sample (Scheele and McCarthy, 1986). Roughly 10% of the particles had a size in the range of 4.9 to 5.67 μm, with an average diameter of 8.65 μm.

5.4.3 Rheology

Shear stress as a function of shear rate is only applicable to materials that flow. Since segment 5, the only segment for which rheology data was available, was a solid that did not flow shear stress as a function of shear rate was only measured after the sample was diluted. Therefore, 1:1 and 1:2 sample to supernate dilutions of segment 5 were evaluated. Both dilutions of segment 5 displayed yield points when shear stress was investigated as a function of shear rate, and these yield points correspond to yield stresses of 9.6 Pa and 3.0 Pa for the 1:1 and 1:2 dilutions, respectively.

The viscosities of the dilutions varied only slightly with shear rate beyond the yield point. The viscosity of the 1:1 dilution fell from 130 centipoise to 30 centipoise over a shear rate increasing from 100 to 450 hz. The viscosity of the 1:2 dilution decreased from 42 centipoise to 15 centipoise during the same range of shear rate. The Pacific Northwest Laboratory reported the shear strength of the segment 5 samples to be 16,400 dynes/cm^2.

5.4.4 Energetics

Differential scanning calorimetry analyses could not be located for Tank 241-AW-105.

5.5 DATA PRESENTATION

The Tank Characterization Report Results reported in Tables 5-9 and 5-10 are the final constituent estimates for this document. The values are equal to either the "Evaluated Data Result" values presented in the Appendix A tables. If laboratory results were not available for an analyte, the Tank Characterization Result was, if possible, derived from historical data.

Table 5-9. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Liquid). (4 pages)

Analyte	Historic Tank Content Estimate		Tank Characterization Result		Total Tank Inventory
Metals	(µg/L)	(µg/g)	(µg/L)	(µg/g)	(kg)
Aluminum (Al)	1.05E+06	1,040	9.07E+05	840	2,250
Antimony (Sb)	---	---	737	0.682	1.83
Arsenic (As)	---	---	8,990	8.32	22.3
Barium (Ba)	---	---	2,310	2.14	5.73
Beryllium (Be)	---	---	2,050	1.90	5.08
Bismuth (Bi)	---	---	---	---	---
Boron (B)	---	---	9,710	8.99	24.1
Cadmium (Cd)	---	---	170	0.157	0.422
Calcium (Ca)	37,800	37.5	11,800	10.9	29.3
Cerium (Ce)	---	---	< 1,200	< 1.11	< 2.98
Chromium (Cr)	58,200	57.7	64,800	60.0	161
Cobalt (Co)	---	---	< 2,200	< 2.04	< 5.46

Table 5-9. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Liquid). (4 pages)

Analyte	Historic Tank Content Estimate		Tank Characterization Result		Total Tank Inventory
Metals (continued)	(µg/L)	(µg/g)	(µg/L)	(µg/g)	(kg)
Copper (Cu)	---	---	13,100	12.1	32.5
Dysprosium (Dy)	---	---	< 51.0	< 0.0472	< 0.126
Iron (Fe)	---	---	1,070	0.991	2.65
Lanthanum (La)	---	---	< 130	< 0.120	< 0.322
Lead (Pb)	---	---	1,320	1.22	3.27
Lithium (Li)	---	---	< 86.0	< 0.0796	< 0.213
Magnesium (Mg)	28,900	28.7	407	0.377	1.01
Manganese (Mn)	---	---	66.7	0.0618	0.165
Mercury (Hg)	---	---	---	---	---
Molybdenum (Mo)	---	---	7,380	6.83	18.3
Neodymium (Nd)	---	---	< 280	< 0.259	< 0.694
Neptunium (Np)	18.4	0.183	---	---	---
Nickel (Ni)	---	---	90,600	83.9	225
Phosphorus (P)	---	---	8.19E+05	758	2,030
Potassium (K)	---	---	1.25E+07	11,600	31,000
Rhenium (Re)	---	---	300	0.278	0.744
Rhodium (Rh)	---	---	1,040	0.963	2.58
Ruthenium (Ru)	---	---	1,950	1.81	4.84
Selenium (Se)	---	---	1,400	1.30	3.47
Silicon (Si)	---	---	2.53E+06	2,340	6,270
Silver (Ag)	---	---	< 169	< 0.156	< 0.419
Sodium (Na)	1.95E+07	19,400	4.78E+07	44,300	1.19E+05
Tellurium (Te)	---	---	< 410	< 0.380	< 1.02
Thallium (Tl)	---	---	< 12,000	< 11.1	< 29.8
Thorium (Th)	---	---	< 790	< 0.725	< 1.96
Titanium (Ti)	---	---	< 92.0	< 0.0845	< 0.228
Uranium (U)	---	---	13,900	12.9	34.5
Vanadium (V)	---	---	100	0.0926	0.248
Zinc (Zn)	---	---	3,090	2.86	7.66
Zirconium (Zr)	---	---	2,150	1.99	5.33
Ions	(µg/L)	(µg/g)	(µg/L)	(µg/g)	(kg)
Ammonia (NH_3)	7.55E+05	749	4.75E+05	440	1,180
Bromide (Br^-)	---	---	2.47E+05	229	612
Carbonate (CO_3^{2-})	2.01E+06	1,990	1.06E+07	9,810	26,300
Chloride (Cl^-)	1.53E+05	152	8.73E+05	808	2,170

Table 5-9. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Liquid). (4 pages)

Analyte	Historic Tank Content Estimate		Tank Characterization Result		Total Tank Inventory
Ions (continued)	(µg/L)	(µg/g)	(µg/L)	(µg/g)	(kg)
Chromium (VI) (Cr^{6+})	---	---	13,400	12.4	33.2
Fluoride (F^-)	3.25E+06	3,220	8.00E+06	7,410	19,800
Hydroxide (OH^-)	6.60E+05	6,550	1.31E+07	12,100	32,500
Nitrate (NO_3^-)	1.60E+05	159	3.67E+07	34,000	91,000
Nitrite (NO_2^-)	1.50E+05	149	1.18E+07	10,900	29,300
Phosphate (PO_4^{3-})	4,730	469	6.53E+05	605	1,620
Sulfate (SO_4^{2-})	9.70E+05	962	1.89E+06	1,750	4,690
Radionuclides	(µCi/L)	(µCi/g)	(µCi/L)	(µCi/g)	(Ci)
^{241}Am (AEA)	< 0.841	< 8.34E-04	0.0516	4.78E-05	0.128
^{241}Am (APC)	---	---	0.730	6.76E-04	1.81
^{125}Sb	---	---	ND	---	N/A
^{14}C	---	---	0.517	4.79E-04	1.28
^{144}Ce	---	---	ND	---	N/A
^{134}Cs	---	---	483	0.447	1,200
^{137}Cs	5,750	5.70	66,300	61.4	1.64E+05
^{60}Co	< 92.0	< 0.913	84.7	0.0784	210
$^{234/244}Cu$	---	---	0.105	9.72E-05	0.260
^{154}Eu	---	---	ND	---	N/A
^{155}Eu	---	---	ND	---	N/A
^{129}I	---	---	0.0255	2.36E-05	0.0632
^{237}Np	---	---	0.00870	8.06E-06	0.0216
^{94}Nb	---	---	0.00429	3.97E-06	0.0106
^{238}Pu	---	---	0.0237	2.19E-05	0.0588
$^{239/240}Pu$	---	---	0.152	1.41E-04	0.377
^{106}Ru	---	---	1,200	1.11	2,980
^{79}Se	---	---	0.0277	2.56E-05	0.0687
^{90}Sr	26.3	0.0261	6.04	0.00559	15.0
^{99}Tc	---	---	19.0	0.0176	47.1
^{3}H	---	---	6.24	0.00578	15.5
Total Alpha	0.372	3.69E-04	1.44	0.00133	3.57
Total Beta	---	---	60,000	55.6	1.49E+05

Table 5-9. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Liquid). (4 pages)

Analyte	Historic Tank Content Estimate		Tank Characterization Result		Total Tank Inventory
Physical Properties					
Density	1.008 g/mL	---	1.08 g/mL	---	---
pH	12.9	---	13.1	---	---
Weight Percent Solids	5.40 %	---	---	---	---
TOC	4.98E+05 µg/L	494 µg/g	2.47E+06 µg/L	2,290 µg/g	6,130 kg
TC	---	---	4.59E+06 µg/L	4,250 µg/g	11,400 kg

Table 5-10. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Solid). (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Result	Total Tank Inventory
Metals	(µg/g)	(µg/g)	(kg)
Aluminum (Al)	2,280	9,840	20,400
Antimony (Sb)	---	649	1,360
Arsenic (As)	---	585	1,220
Barium (Ba)	---	168	351
Beryllium (Be)	---	125	261
Bismuth (Bi)	--	---	---
Boron (B)	115	467	975
Cadmium (Cd)	---	116	242
Calcium (Ca)	517	930	1,940
Cerium (Ce)	18.5	< 1,300	< 2,710
Chromium (Cr)	628	4,010	8,370
Cobalt (Co)	---	2,500	5,220
Copper (Cu)	---	232	480
Dysprosium (Dy)	---	67.1	140
Iron (Fe)	1,450	6,390	13,300
Lanthanum (La)	322	1,350	2,820
Lead (Pb)	---	719	1,500
Lithium (Li)	---	< 32.0	< 66.8
Magnesium (Mg)	133	185	386

Table 5-10. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Solid). (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Result	Total Tank Inventory
Metals (continued)	(µg/g)	(µg/g)	(kg)
Manganese (Mn)	769	1,760	3,670
Mercury (Hg)	---	---	---
Molybdenum (Mo)	1.98	52.4	109
Neodymium (Nd)	134	601	1,260
Neptunium (Np)	---	---	---
Nickel (Ni)	145	332	693
Phosphorus (P)	---	3,350	6,990
Potassium (K)	8,080	19,100	39,900
Rhenium (Re)	---	102	213
Rhodium (Rh)	20.5	703	1,470
Ruthenium (Ru)	35.1	397	829
Selenium (Se)	---	1,240	2,590
Silicon (Si)	3,820	6,340	13,200
Silver (Ag)	---	199	415
Sodium (Na)	1.05E+05	26,800	55,900
Tellurium (Te)	12.6	539	1,130
Thallium (Tl)	35.0	< 14,000	< 29,200
Thorium (Th)	---	1,220	2,550
Titanium (Ti)	---	123	257
Uranium (U)	---	17,900	37,400
Vanadium (V)	---	79.3	166
Zinc (Zn)	10.8	325	678
Zirconium (Zr)	69,200	1.84E+05	3.84E+05
Ions	(µg/g)	(µg/g)	(kg)
Ammonia (NH_3)	1,220	---	---
Bromide (Br^-)	---	181	378
Carbonate (CO_3^{2-})	7,430	30,200	63,000
Chloride (Cl^-)	425	2,100	4,390
Chromium (VI) (Cr^{6+})	---	0.150	0.313
Fluoride (F^-)	56,200	1.00E+05	2.09E+05
Hydroxide (OH^-)	8,230	---	---
Nitrate (NO_3^-)	28,100	46,400	96,900
Nitrite (NO_2^-)	7,770	17,400	36,300
Phosphate (PO_4^{3-})	---	1,360	2,840
Sulfate (SO_4^{2-})	1,080	2,820	5,890

Table 5-10. Tank Characterization Report Data for Double-Shell Tank 241-AW-105 (Solid). (3 pages)

Analyte	Historic Tank Content Estimate	Tank Characterization Result	Total Tank Inventory
Radionuclides	(μCi/g)	(μCi/g)	(Ci)
^{241}Am (AEA)	0.204	2.13	4,450
^{241}Am (APC)	---	1.15	2,400
^{125}Sb	8.25	13.0	27,100
^{14}C	---	0.00150	3.11
^{144}Ce	24.8	11.1	23,200
^{134}Cs	0.815	0.966	2,020
^{137}Cs	45.7	103	2.15E+05
^{60}Co	0.0232	0.523	1,090
$^{243/244}$Cu	---	0.141	294
^{154}Eu	0.358	3.42	7,140
^{155}Eu	0.425	2.91	6,070
^{129}I	---	0.00250	5.22
^{237}Np	---	0.00296	6.18
^{94}Nb	---	0.00127	2.63
^{238}Pu	0.0691	0.450	939
$^{239/240}$Pu	0.603	2.18	4,550
^{106}Ru	19.8	9.64	20,100
^{79}Se	---	0.0175	36.5
^{90}Sr	---	191	3.99E+05
^{99}Tc	---	0.0719	150
^{3}H	---	0.0111	23.0
Total Alpha	---	3.77	7,870
Total Beta	---	537	1.12E+06
Physical Properties			
Density	1.30 g/mL	1.42 g/mL	---
pH	---	---	---
TOC	5,250 μg/g	8,560 μg/g	17,900 kg
TC	---	15,400 μg/g	32,000 kg

6.0 ANALYTICAL RESULTS INTERPRETATION

6.1 TANK WASTE PROFILE

Examination of the analytical results reveals that the waste in Tank 241-AW-105 consists of a supernate under which lies a heterogeneous solid. Sodium and nitrate ions were the major constituents present in the liquid phase of the tank. With respect to the solid phase of the waste, zirconium and fluoride were the major cationic and anionic analytes, respectively. The ^{137}Cs isotope demonstrated the greatest activity among radioactive constituents in the water matrix, and most of the activity associated with the solid portion of the waste was attributed to ^{137}Cs and ^{90}Sr.

Visual observations regarding the segment samples of Tank 241-AW-105 are discussed in the next section; however, the bottom segment, segment 7, of the waste was of a much thicker consistency and therefore, presumably markedly different chemical composition than the upper solid segments. Furthermore, the concentrations of Al, Cr, Fe, and total organic carbon in segment 7 were at least five times greater than their respective concentrations in the other solid segments or composites. The isotopes ^{241}Am and ^{90}Sr also demonstrated a substantial increase in concentration towards the bottom of the tank.

6.2 WASTE SUMMARY AND CONDITIONS

6.2.1 Tank Homogeneity Observations

Although a statistical analysis of tank homogeneity is discussed in Section 7.2, some general conclusions regarding tank homogeneity can be drawn by reviewing the hot cell chemist's observations of the waste. A simple comparison of these observations by segment is given in Table 6-1 (WHC, 1994).

Table 6-1. Waste Characteristics Comparison.

Segment	Color	Phase	Consistency
1	opaque	liquid	No observable solids
2	opaque	liquid	No observable solids
3	gray to white	solid	Slurry; could not hold shape
4	white	solid	Sludge
5	white with brown and black spots	solid	Dry; broke into chunks
6	white with brown streaks to grayish white	solid	Dry to margarine-like
7	dark with white marbling in top 10.2 cm	solid	Harder than the previous segments

Since only one core sample was taken, conclusions about horizontal variability could not be made. However, based upon surveillance information and reviewing the analytical data and hot cell observation, it is immediately apparent that the waste varies vertically (Table 6-1). The color of the waste changes between and within segments, varying from gray to white to dark. Two of the segments are completely liquid; the other 5 are totally composed of solids. A final proof of vertical variance is the change in consistency between segments. Segment 3 is a slurry, while segment 5 is dry and brittle. Possibly the widest range of consistency occurs in Segment 6, with the top being dry and the bottom resembling margarine, (i.e., the waste varies extensively between segments and even within segments). Because of this observed variation, it is evident that the tank waste is heterogeneous.

6.2.2 Projected Tank Heat Load

Temperature information for Tank 241-AW-105 was given in section 2.5. The amount of heat resulting from radioactivity in the tank was calculated in Table 6-2. Detection limits for some of the analytes were included in the calculation in order to obtain the most conservative estimate possible. Through the use of conversion factors, the reported heat load of 5,460 Watts translates into a tank temperature increase of approximately 24.9°C/year (44.8°F). The fluctuation of tank temperature between 18.3°C (65°F) and 23.9°C (75°F) is probably due to ambient temperature changes. Since an upper temperature limit is exhibited, it may be concluded that the heat generated from radioactive sources is dissipated throughout the year.

6.2.3 Regulatory Limits

In the liquid phase of the waste, arsenic and selenium exceeded their respective Toxicity Characteristic limits of 5.0 and 1.0 mg/L, as defined in the Code of Federal Regulations (EPA, 1990). The calculated pH of 13.1 is above the *Resource Conservation and Recovery Act* pH limit of 12.5 for corrosivity (EPA, 1990).

Table 6-2. Tank 241-AW-105 Projected Heat Load. (2 pages)

Radionuclide	Ci	Watts	Ci	Watts
	Supernate		Solids	
^{241}Am	0.128	0.00420	4,420	145
^{125}Sb	NA	NA	26,900	89.8
^{144}Ce	NA	NA	22,900	183
^{134}Cs	1,200	1,200	2,000	20.4
^{137}Cs	1.65E+05	779	214,000	1,010
^{60}Co	210	3.23	1,080	16.6
$^{243/244}Cm$	0.261	0.00898	292	10.0
^{154}Eu	NA	NA	7,080	63.9
^{155}Eu	NA	NA	6,030	4.38
^{129}I	0.0632	2.96E-05	5.18	0.00242

Table 6-2. Tank 241-AW-105 Projected Heat Load. (2 pages)

Radionuclide	Ci	Watts	Ci	Watts
	Supernate		Solids	
^{237}Np	0.0216	6.22E-04	6.14	0.177
*$^{238/241}Pu/Am$	1.81	0.0594	2,390	78.4
^{238}Pu	0.0588	0.00192	933	30.4
$^{239/240}Pu$	0.377	0.0115	4,520	138
^{106}Ru	2,970	28.7	20,000	193
^{90}Sr	15.0	0.101	3.96E+05	2,650
^{99}Tc	47.1	0.0236	149	0.075
Watts	823		4,640	
Total Watts	5,460		---	

*Conversion value from ^{241}Am for most conservative estimate.

6.3 PROGRAM ELEMENT SPECIFIC ANALYSES

The sampling and analysis of Hanford Site waste tanks is driven by the need to satisfy the characterization requirements of the various Tank Waste Remediation System (TWRS) program elements. These characterization needs are implemented and documented through the Data Quality Objective (DQO) process, and expressed in a series of program specific DQO documents. The data needs are summarized in the *TWRS Tank Waste Analysis Plan* (Bell, 1994). It is worth noting, however, that this tank was analyzed before DQOs were implemented.

According to the process and issue based data requirements, the inventory estimates and waste properties contained in this report can be applied to the data requirements of the various program elements. Contained in Table 6-3 is a summary of which program data needs are addressed through this characterization of the waste in Tank 241-AW-105, based on a review of the stated sampling and analysis requirements. In the future, the applicability of Tank Characterization Report results to each TWRS program element will be documented in tank specific Tank Characterization Plans, prior to the tank sampling. Should additional waste management operations substantially change the inventory of waste in the tank, further characterization may be necessary.

Table 6-3. Applicability of Characterization Information to the Data Needs of the TWRS Program Elements. (2 pages)

Data Quality Objective	Applicability to Characterization of Tank 241-AW-105.
Tank Safety Screening	applies[1]
Ferrocyanide Safety Issue	does not apply
Flammable Gas Tanks Crust Burn Issue	does not apply
Generic Tank Vapor Issue Resolution	not addressed

Table 6-3. Applicability of Characterization Information to the Data Needs of the TWRS Program Elements. (2 pages)

Data Quality Objective	Applicability to Characterization of Tank 241-AW-105.
Flammable Gas Tank	not completed
Waste Compatibility	applies[2]
Organic Fuel Rich Tank	does not apply
Rotary Core Vapor Sampling	does not apply
Evaporator Operations	not completed
Process Control	not completed
Waste Tank Retrieval	not completed
Waste Tank Pretreatment	not completed
High-Level Waste Immobilization	not completed
Low-Level Waste Immobilization	not completed
Solid, Low-Level Waste Disposal	not completed
RCRA Part B Permit Application	not completed
Tank C-106 High-Heat Safety Issue	does not apply
Organic Layer Sampling of Tank C-103	does not apply
Tank C-103 Vapor and Gas Sampling	does not apply

1 The sampling requirement for the Safety Screening Data Quality Objective (Babad, 1994) calls for both vertical waste samples and a vapor space sample. The sampling and analysis of Tank 241-AW-105 supports full characterization of the waste with the following exceptions: differential scanning calorimetry data were unavailable, and vapor space sampling and characterization were not conducted as part of this activity.

2 Differential scanning calorimetry data were not available.

applies - The data needs expressed in this Data Quality Objectives document are addressed in this characterization report; deficiencies are footnoted.

does not apply - The data needs expressed in this Data Quality Objectives document do not apply to the waste in Tank 241-AW-105.

not addressed - The data needs expressed in this Data Quality Objectives document were not addressed by this characterization report.

not complete - At the date of preparation of this report, this Data Quality Objectives document has not yet been completed.

7.0 STATISTICAL INTERPRETATION

7.1 MASS AND CHARGE BALANCE

7.1.1 Introduction

The principle objective in performing a mass and charge balance is to determine if the measurements are self-consistent. Mass and charge balance calculations also provide a method for estimating the weight percent of water. In calculating the balances, only analytes detected at a concentration of 1000 μg/g or greater were considered. The chemical compounds assumed to be present in the waste and the corresponding analytes are shown in Table 7-1.

Mass and charge balance results are not reported for the solid phase of the tank since percent water results were not available and there were no water digestion data to compare with the ICP anion results. Mass and charge balance results for the liquid phase of the tank are reported in Table 7-2. The identity of the analytes is shown in the left-most column. The next column lists the raw analytical data. Mass ratios between the assumed species and the corresponding analytes are used to convert from analyte concentrations to assumed-species concentrations (column 3). The last column lists the charge of an assumed species.

7.1.2 Calculations and Discussion

The charge balance is the ratio of cation microequivalents to anion microequivalents. Since the anion data are obtained from water digest ion chromatography, the anions to be considered are those that will form water-soluble species.

Total cation (microequivalents) = $[Na^+]/23.0 + [K^+]/39.0$

Total anion (microequivalents) = $[CO_3^{2-}]/30.0 + [OH^-]/17.0 + [F^-]/19.0 + [NO_3^-]/62.0 + [SiO_3^{2-}]/38 + [NO_2^-]/46.0 + [SO_4^{2-}]/48.0$

Silicon was assumed to be present in the form of metasilicate, SiO_3^{2-}. Although smaller concentrations of other forms of silicon are probably also present in the waste, they are not included in order to keep the mass-charge balance calculations simple and consistent. The charge balance result is 0.92.

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

Mass balance = % Water + 0.0001 x {Analyte Concentration} = % Water + 0.0001 x $\{[K^+] + [Na^+] + [CO_3^{2-}] + [OH^-] + [F^-] + [SiO_3^{2-}] + [NO_3^-] + [NO_2^-] + [SO_4^{2-}]\}$

However, since the experimental value for % water is not available, a mass balance cannot be obtained. In order to obtain an estimated value for the weight percent of water, the mass concentration was subtracted from a million. In other words, mass not accountable to the analyte concentrations is attributed to water. The table indicates that the predicted weight percent of water regarding the liquid phase of the waste is 86.2 %.

Table 7-1. Assumed Species if Different than Analyte.

Analyte	Assumed Species
TIC	CO_3^{2-}
Si	SiO_3^{2-}
K	K^+
Na	Na^+

Table 7-2. Tank 241-AW-105 Mass and Charge Balance.

Analyte	Concentrations (µg/g) from Analytical Data	Concentrations (µg/g) from Assumed Species	Charge µmol/g
Cations			
K^+	11600		298
Na^+	44300		1930
Anions			
TIC/CO_3^{2-}	1960	9810	330
OH^-	12100		710
F^-	7410		390
NO_3^-	34000		550
NO_2^-	10900		240
Si/SiO_3^{2-}	2340	6340	167
SO_4^{2-}	1750		36
Total			
(+)		55900	2230
(-)		82300	2420
Charge Balance			0.92
Water est.		862000	

7.2 TANK HOMOGENEITY

As described in section 4.1, the phase of the waste varied as a function of depth. Segments 1 and 2 were a liquid, whereas segments 3-7 ranged in consistency from a slurry to a relatively hard material. Density steadily increased with depth, ranging from 1.08 g/ml in the upper liquid portion of the tank, to 1.35 g/ml in segment 3 and 1.50 g/ml in segment 7. Thus, it is apparent that the tank is heterogeneous in the sense that it contains a definite liquid and "solid" phase.

An Analysis of Variance (ANOVA) was conducted on the liquid composite (segments 1-2) and the solid composite (segments 3-6) to compare analyte concentrations between the two phases. Table 7-3 gives the means (in μg/g) for the two composites and the corresponding p values for several analytes. These analytes were chosen because they were the only ones with reliable duplicates for both the liquid and solid composites. As can be seen, all of the analytes except zinc show a significant difference (at the $\alpha = 0.10$ significance level) in analyte concentration between the two phases. Although the liquid and solid means for zinc appear very different, the reason it was not declared significant is due to the very low number of degrees of freedom available for this test (df = 1).

Table 7-3. Liquid vs. Solid Phase Homogeneity (means = μg/g).

	Al	Ba	Be	Ca	Cu	Zn	Zr
Liquid	839.4	0.2223	0.7269	7.278	0.4028	4.394	0.3102
Solid	3239	208.5	160.0	943.5	273.0	747.0	241,900
p-value	0.0625*	0.0145*	0.0080*	0.0749*	0.0163*	0.2081	0.0130*

* Significantly different at the $\alpha = 0.10$ level.

Variability in analyte concentration within the solid phase (segments 3-7) was also examined by the calculation of an ANOVA. Table 7-4 lists nine analytes and their mean percent concentration in the tank, separated by segment (WHC, 1994). Only those analytes with reliable duplicates for at least three of the segments, and a mean tank concentration of at least 0.07%, were chosen. The ANOVA indicated at least one significant difference (at the p = 0.05 significance level) between segments for all of the analytes except calcium. In order to determine which segments were significantly different from each other, a multiple comparison test known as Tukey's W procedure was utilized at the 0.05 significance level. For a given column, analyte values that have the same letter are not significantly different from each other, whereas those with different letters are significantly different. For all analytes with data available except calcium, segment 3-4 values were different from segment 7 values, and all segment 5 values except calcium and uranium were different from the segment 7 values. This strongly indicates a non-homogeneous vertical variation in the solid portion of the tank; however, the trend in concentration was not consistent for the different analytes. Four analytes increased in concentration with increasing depth, three analytes decreased in concentration with increasing depth, and two, calcium and uranium, showed no consistent trend.

Figure 7-1 is a visual representation of the analyte concentration values given in Table 7-4. The highest analyte concentration for a given segment was assigned the value of 100, and the other segments were expressed as a percentage of the highest segment concentration. This figure shows again the trend of some analytes toward increasing concentration with depth, and the opposite trend for others.

Tank 241-AW-105 therefore shows strong heterogeneity, due not only to phase and analyte concentration differences between the liquid and solid portions, but also within the solid phase itself.

Figure 7-1. Variation of Selected Analyte Concentrations with Depth.

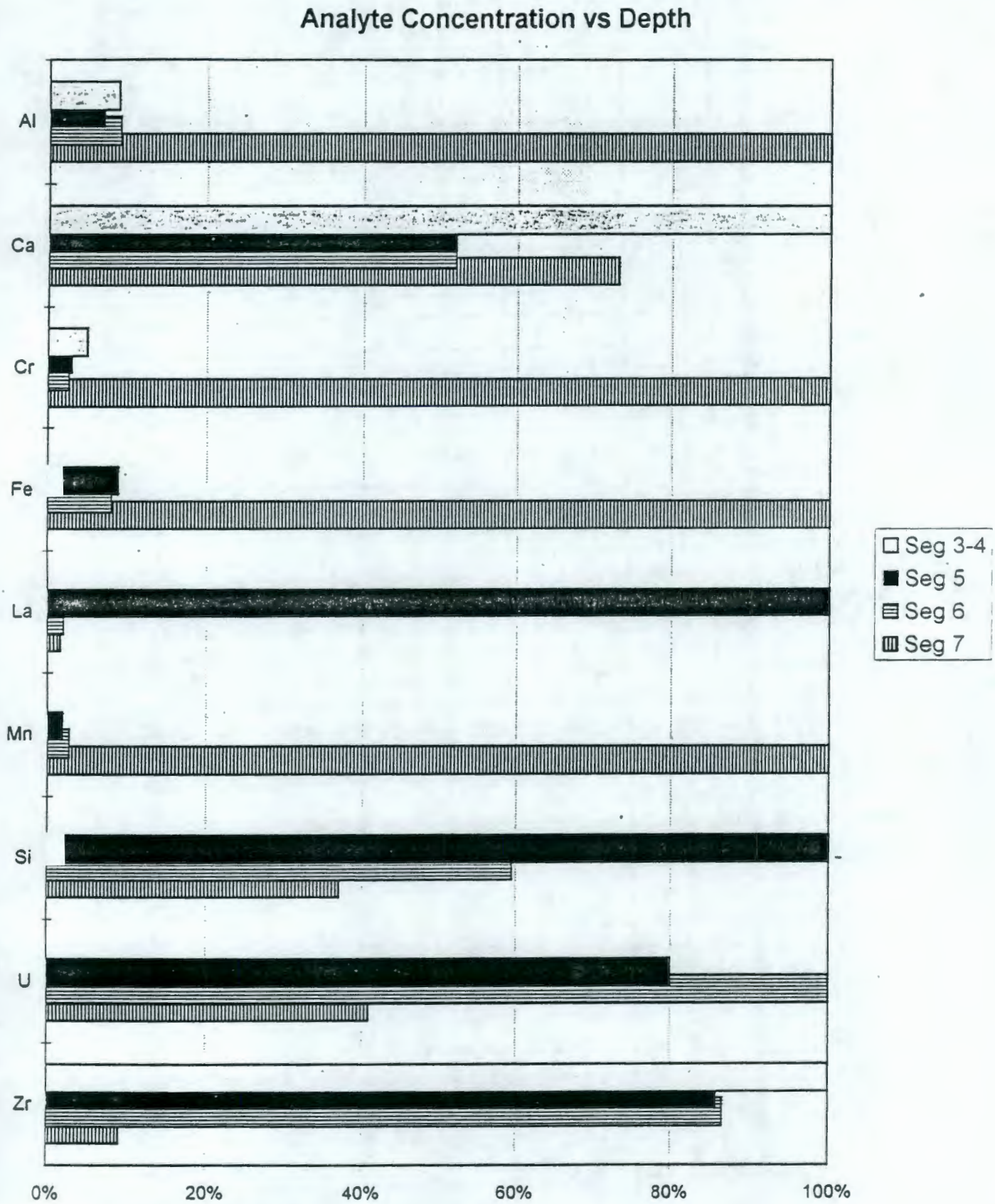

Table 7-4. Solid Phase Homogeneity (mean % concentration).

Segment	Al	Ca	Cr	Fe	La	Mn	Si	U	Zr
Seg 3-4	0.3255a	0.1336a	0.0868a	NA**	NA	NA	NA	NA	24.53a
Seg 5	0.2518b	0.0694a	0.0522b	0.1723a	0.1996a	0.0106a	0.8265a	2.445ab	21.05a
Seg 6	0.3324a	0.0695a	0.0477b	0.1576a	0.0213b	0.0152a	0.4916b	3.056a	21.24a
Seg 7	3.661c	0.0977a	1.750c	1.937b	0.0165b	0.5481b	0.3063b	1.250b	2.250b

a,b,c Values with the same letter are not significantly different from each other at the $\alpha = 0.05$ level.

** Duplicate samples not available for analysis.

7.3 ANALYTICAL ERROR ESTIMATION

An attempt is always made to quantify the different sources of error possible during the chemical analysis of a sample. When these errors are summarized, they give a strong indication of data reliability. If one or more of the error estimates are outside the acceptable limits, the accuracy of the concentration estimate is drawn into question. Possible sources of error are sample contamination, matrix interferences, analytical method error, and poor instrument calibration. Analytical error is comprised of two parts, systematic and random.

7.3.1 Systematic Analytical Error

Systematic error estimates are determined from the analysis of reference standards or spike recoveries. Since neither of these were provided in the data package, there is no way of determining their values or influence on data variability.

7.3.2 Random Analytical Error

The random analytical error can be estimated from the analytical results of the duplicate samples, or from the analysis of reference standards. Values for analytical standards were not available. Therefore, the only measure of error is from the duplicate samples. To determine this error, a relative percent difference (RPD) is calculated for each duplicate pair. The RPD is a measure of variability and is defined as the absolute value of one duplicate minus the other, divided by the mean. A relative standard deviation (RSD) is then calculated by taking the standard deviation of the two or more duplicate pairs and dividing by the overall analyte mean. This is a unitless measure of variability and allows the comparison of variation across constituents whose magnitudes may vary widely. The laboratory measurement control system has set a quality control criterion of no RPD being larger than three times the RSD for a given analyte. All data presented in this section were calculated for analytes with detected values only (no "non-detects").

Fifteen metal analytes with at least three reliable duplicate pairs were analyzed to determine if any had an RSD value exceeding the criterion of three times the random analytical error from sample results. These analytes and their RSD values are given in Table 7-5. Of

these fifteen, aluminum, calcium, and copper had one out of five duplicate pairs with an RPD over the criterion; chromium had two out of five duplicate pairs with RPDs over the criterion; and iron, lanthanum, magnesium, and manganese had two out of three duplicate pairs with RPDs over the criterion. The RPDs for the other seven analytes were all within acceptable limits. As mentioned above, the reason for these RPDs being over the criterion cannot be determined, and are simply given for informational purposes only.

Table 7-5. Measurement error estimates for Tank 241-AW-105.

Analyte	RSD	Analyte	RSD
Aluminum	3.3	Magnesium	6.7
Barium	8.2	Manganese	3.6
Beryllium	4.8	Silicon	12
Calcium	53	Strontium	13
Chromium	0.7	Uranium	17
Copper	22	Zinc	119
Iron	1.9	Zirconium	12
Lanthanum	3.0		

7.4 DATA VALIDATION FINDINGS

There was no direction to validate the data associated with Tank 241-AW-105; however, the data analyses were subject to laboratory established quality control, and the results were considered acceptable by the principal investigators.

8.0 RECOMMENDATIONS

8.1 SAFETY ISSUES

Tank 241-AW-105 is considered sound and non-leaking (Hanlon 1994), and examination of the waste volume history supports this conclusion (Koreski, 1994). Thermocouple data indicate that no self heating occurs in the waste, and that all variations in waste temperature are due to seasonal fluctuations. However, the total organic carbon content in segment 7 of the tank waste is approximately 3% by weight and does pose a safety concern (Carothers, 1991).

8.2 FURTHER CHARACTERIZATION NEEDS

Characterization of the contents of Tank 241-AW-105 has been performed in this report; however, the following studies which may involve further sampling and analysis are recommended.

- An analysis of the tank vapor space should allow final resolution of any safety concerns regarding the presence of flammable or noxious fumes.

- Historical data indicated that an organic layer may be present on the surface of the waste (refer to Section 2.4.2). A surface sample was not taken during the most recent sampling event. The potential presence of an organic layer should be further investigated.

- Additional core samples will be needed if horizontal variability is to be studied, since only one core sample was taken during the last sampling event.

- Even though the volume of liquid in the tank is about 2.5 times greater than the volume occupied by the solid material, the lower segments obtained from sampling were quite dry. Therefore, differential scanning calorimetry analyses should be performed in order to determine the thermodynamic properties of the waste, especially in the bottom-most layer of the tank.

- Since the metals analytical results were determined to be biased high because of uranium interference associated with the inductively coupled plasma analysis, further sampling and/or reanalysis of any archived material is recommended to properly evaluate the data. Use of the current metals data to address regulatory and operations concerns may result in an overly conservative approach toward the management of the waste.

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APPENDIX A

ANALYTICAL RESULTS

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A.1 INTRODUCTION

A.1.1 Appendix A presents the chemical and radiological characteristics of Tank 241-AW-105 in a tabular form, in terms of the specific concentrations of anions, metals, physical properties, and radionuclides.

The data table for each analyte lists laboratory sample identification, an analytical data result for each sample, range of values, an evaluated data result, a standard deviation, and a projected tank inventory for the particular analyte. The projected tank inventory column is not applicable for the density, ph, or weight percent solid data. The data are listed in standard notation for values >.001 and <100,000. Values outside these limits are listed in scientific notation.

A.2 TABLE DESCRIPTION

A.2.1 Abbreviations

Standard abbreviations are used to describe analytical methods.

Metals:	ICP - Inductively Coupled Plasma (generic for all metals unless otherwise known)
	CVAA - Cold Vapor Atomic Absorption
	FAA - Flame Atomic Absorption
Anions:	IC - Ion Chromatography
	KTN - Kjeldahl's Total Nitrogen
Radionuclides:	GEA - Gamma Energy Analysis
	AEA - Alpha Energy Analysis
	APC - Alpha Proportional Counting
	BPC - Beta Proportional Counting
	LSC - Liquid Scintillation Counting
Physical Properties:	PT - Physical Testing
	DM - Direct Measurement
	DSC - Differential Scanning Calorimetry
	TGA - Thermogravimetric Analysis

A.3 Column Headings

A.3.1 The "Analyte" column contains, in addition to the name of the analyte or physical characteristic, information about the method of measurement.

The analyte and method are presented as follows: "method.analyte." For example, the specific concentration of ^{90}Sr was measured with a beta proportional counter and is listed "BPC.^{90}Sr."

A.3.2 The "Laboratory Sample Identification" column lists the samples for which the analyte was measured; this identification number is different from the number assigned to the samples at the tank farm. Sampling rationale, locations, and descriptions of sampling events are contained in Section 3.0.

A.3.3 "Analytical Data Result" is the specific concentration of the analyte determined at different sampling points. No quality control data such as matrix spikes, serial dilutions, or duplicate analyses are listed. This information may be obtained from the 241-AW-105 data package. Data which was qualified as estimated (denoted by "J" or "UJ" in the data package) will be enclosed in parentheses, i.e., (395) μg/ml. Unusable data (denoted by "R" in the data package) will be entered with a strikeout, i.e., ~~395~~ μg/ml. Unqualified data will be entered in standard form.

A.3.4 The "Range of Values" column lists the highest and the lowest values for a particular analyte. If a measurement method has a constant method detection limit (MDL), and all results are less than the MDL, no range is given. However, if the MDL changes, (i.e., due to radiation background variations in radiochemistry) a range of detection limit values is given.

A.3.5 The "Evaluated Data Result" is an average of all the listed sample results that were at or above the detection limit.

A.3.6 Column 6, "Standard Deviation," is a square root of the arithmetic average of the squares of the deviations from the mean.

A.3.7 Column 7, "Projected Inventory," is the product of the concentration of the analyte and the volume of the waste in the tank at the time of sampling. (Liquid = 655,000 gallons or 2,480,000 liters; Solids = 388,000 gallons or 1,470,000 liters).

LIST OF TABLES FOR APPENDIX A

Table A-1. Tank 241-AW-105 Analytical Data:
Aluminum A-5
Antimony A-5
Arsenic A-6
Barium A-6
Beryllium A-7
Boron A-7
Cadmium A-8
Calcium A-8
Cerium A-9
Chromium A-9
Cobalt A-10
Copper A-10
Dysprosium A-11
Iron A-11
Lanthanum A-12
Lead A-12
Lithium A-13
Magnesium A-13
Manganese A-14
Molybdenum A-14
Neodymium A-15
Nickel A-15
Phosphorus A-16
Potassium A-16
Rhenium A-17
Rhodium A-17
Ruthenium A-18
Selenium A-18
Silicon A-19
Silver A-19
Sodium A-20
Tellurium A-20
Thallium A-21
Thorium A-21
Titanium A-22
Uranium A-22
Vanadium A-23
Zinc A-23
Zirconium A-24

Table A-2. Tank 241-AW-105 Analytical Data:
Ammonia A-24
Bromide A-25
Carbonate A-25
Chloride A-26
Chromium (VI) A-26

LIST OF TABLES FOR APPENDIX A (continued)

Table A-2. Tank 241-AW-105 Analytical Data: continued
Fluoride A-27
Hydroxide A-27
Nitrate A-28
Nitrite A-28
Phosphate A-29
Sulfate A-29

Table A-3. Tank 241-AW-105 Analytical Data:
Americium-241 . . . . . A-30
Antimony-125 . . . . . A-30
Carbon-14 . . . . . A-31
Cerium-144 . . . . . A-31
Cesium-134 . . . . . A-32
Cesium-137 . . . . . A-32
Cobalt-60 . . . . . A-33
Curium-243/244 . . . . . A-33
Europium-154 . . . . . A-34
Europium-155 . . . . . A-34
Iodine-129 . . . . . A-35
Neptunium-237 . . . . . A-35
Niobium-94 . . . . . A-36
Americium-241 . . . . . A-36
Plutonium-238 . . . . . A-37
Plutonium-239/240 . . . . . A-37
Ruthenium-106 . . . . . A-38
Selenium-79 . . . . . A-38
Strontium-90 . . . . . A-39
Technetium-99 . . . . . A-39
Tritium A-40
Total Alpha. A-40
Total Beta A-41

Table A-4. Tank 241-AW-105 Analytical Data:
Density A-41
pH A-42
Total Organic Carbon A-42
Total Carbon A-43

Table A-1. Tank 241-AW-105 Analytical Data: Aluminum

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Al	Composite Sample 1-2	906	684 to 1,130	907	223	2,250
	Segment Sample 6	1,130				
	Composite Sample 3-6	684				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Al	Composite Sample 3-4	3,240	2,520 to 36,600	9,840	15,000	20,400
	Segment Sample 5	2,520				
	Segment Sample 6	3,320				
	Segment Sample 7	36,600				
	Composite Sample 3-6	3,520				

Table A-1. Tank 241-AW-105 Analytical Data: Antimony

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Sb	Composite Sample 1-2	0.510	0.500 to 1.20	0.737	0.401	1.83
	Segment Sample 6	1.20				
	Composite Sample 3-6	0.500				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Sb	Composite Sample 3-4	800	611 to 800	649	84.5	1,360
	Segment Sample 5	611				
	Segment Sample 6	611				
	Segment Sample 7	611				
	Composite Sample 3-6	611				

Table A-1. Tank 241-AW-105 Analytical Data: Arsenic

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.As	Composite Sample 1-2	6.76	6.76 to 11.1	8.99	2.17	22.3
	Segment Sample 6	9.12				
	Composite Sample 3-6	11.1				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.As	Composite Sample 3-4	476	476 to 817	585	140.00	1,220
	Segment Sample 5	817				
	Segment Sample 6	616				
	Segment Sample 7	509				
	Composite Sample 3-6	509				

Table A-1. Tank 241-AW-105 Analytical Data: Barium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ba	Composite Sample 1-2	0.250	0.250 to 4.54	2.31	2.15	5.73
	Segment Sample 6	4.54				
	Composite Sample 3-6	2.13				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ba	Composite Sample 3-4	209	86.0 to 209	168	48.3	351
	Segment Sample 5	184				
	Segment Sample 6	168				
	Segment Sample 7	86.0				
	Composite Sample 3-6	194				

Table A-1. Tank 241-AW-105 Analytical Data: Beryllium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Be	Composite Sample 1-2	0.785	0.785 to 2.70	2.05	1.09	5.08
	Segment Sample 6	2.65				
	Composite Sample 3-6	2.70				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Be	Composite Sample 3-4	160	15.5 to 172	125	62.8	261
	Segment Sample 5	138				
	Segment Sample 6	139				
	Segment Sample 7	15.5				
	Composite Sample 3-6	172				

Table A-1. Tank 241-AW-105 Analytical Data: Boron

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.B	Composite Sample 1-2	3.27	3.27 to 19.9	9.71	8.93	24.1
	Segment Sample 6	19.9				
	Composite Sample 3-6	5.96				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.B	Composite Sample 3-4	< 1,200	N/A	467	N/A	975
	Segment Sample 5	467				
	Segment Sample 6	467				
	Segment Sample 7	467				
	Composite Sample 3-6	467				

Table A-1. Tank 241-AW-105 Analytical Data: Cadmium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Cd	Composite Sample 1-2	0.100	0.100 to 0.290	0.170	0.104	0.422
	Segment Sample 6	0.290				
	Composite Sample 3-6	0.120				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Cd	Composite Sample 3-4	< 24.0	N/A	116	N/A	242
	Segment Sample 5	116				
	Segment Sample 6	116				
	Segment Sample 7	116				
	Composite Sample 3-6	116				

Table A-1. Tank 241-AW-105 Analytical Data: Calcium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ca	Composite Sample 1-2	7.86	7.83 to 19.4	11.8	6.61	29.3
	Segment Sample 6	8.03				
	Composite Sample 3-6	19.4				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ca	Composite Sample 3-4	944	694 to 1,340	930	265	1,940
	Segment Sample 5	694				
	Segment Sample 6	696				
	Segment Sample 7	977				
	Composite Sample 3-6	1,340				

Table A-1. Tank 241-AW-105 Analytical Data: Cerium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ce	Composite Sample 1-2	< 1.20	N/A	< 1.20	N/A	< 2.98
	Segment Sample 6	< 1.20				
	Composite Sample 3-6	< 1.20				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ce	Composite Sample 3-4	< 630	N/A	< 1,300	N/A	< 2,710
	Segment Sample 5	< 1,300				
	Segment Sample 6	< 1,300				
	Segment Sample 7	< 1,300				
	Composite Sample 3-6	< 1,300				

Table A-1. Tank 241-AW-105 Analytical Data: Chromium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Cr	Composite Sample 1-2	32.5	28.9 to 133	64.8	59.1	161
	Segment Sample 6	28.9				
	Composite Sample 3-6	133				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Cr	Composite Sample 3-4	676	477 to 17,500	4,010	7,540	8,370
	Segment Sample 5	522				
	Segment Sample 6	477				
	Segment Sample 7	17,500				
	Composite Sample 3-6	868				

Table A-1. Tank 241-AW-105 Analytical Data: Cobalt

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Co	Composite Sample 1-2	< 2.20	N/A	< 2.20	N/A	< 5.46
	Segment Sample 6	< 2.20				
	Composite Sample 3-6	< 2.20				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Co	Composite Sample 3-4	903	903 to 2,900	2,500	893	5,220
	Segment Sample 5	2,900				
	Segment Sample 6	2,900				
	Segment Sample 7	2,900				
	Composite Sample 3-6	2,900				

Table A-1. Tank 241-AW-105 Analytical Data: Copper

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Cu	Composite Sample 1-2	0.450	0.450 to 23.7	13.1	11.8	32.5
	Segment Sample 6	23.7				
	Composite Sample 3-6	15.2				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Cu	Composite Sample 3-4	273	130 to 294	232	73.9	480
	Segment Sample 5	130				
	Segment Sample 6	176				
	Segment Sample 7	294				
	Composite Sample 3-6	285				

Table A-1. Tank 241-AW-105 Analytical Data: Dysprosium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Dy	Composite Sample 1-2	< 0.051	N/A	< 0.051	N/A	< 0.126
	Segment Sample 6	< 0.051				
	Composite Sample 3-6	< 0.051				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Dy	Composite Sample 3-4	35.5	35.5 to 75.0	67.1	17.7	140
	Segment Sample 5	75.0				
	Segment Sample 6	75.0				
	Segment Sample 7	75.0				
	Composite Sample 3-6	75.0				

Table A-1. Tank 241-AW-105 Analytical Data: Iron

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Fe	Composite Sample 1-2	0.655	0.655 to 1.27	1.07	0.355	2.65
	Segment Sample 6	1.27				
	Composite Sample 3-6	1.27				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Fe	Composite Sample 3-4	3,590	1,580 to 19,400	6,390	7,460	13,300
	Segment Sample 5	1,720				
	Segment Sample 6	1,580				
	Segment Sample 7	19,400				
	Composite Sample 3-6	5,680				

Table A-1. Tank 241-AW-105 Analytical Data: Lanthanum

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.La	Composite Sample 1-2	< 0.130	N/A	< 0.130	N/A	< 0.322
	Segment Sample 6	< 0.130				
	Composite Sample 3-6	< 0.130				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.La	Composite Sample 3-4	1,800	165 to 2,550	1,350	1,090	2,820
	Segment Sample 5	2,000				
	Segment Sample 6	213				
	Segment Sample 7	165				
	Composite Sample 3-6	2,550				

Table A-1. Tank 241-AW-105 Analytical Data: Lead

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Pb	Composite Sample 1-2	1.76	1.10 to 1.76	1.32	0.381	3.27
	Segment Sample 6	1.10				
	Composite Sample 3-6	1.10				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Pb	Composite Sample 3-4	337	337 to 1,360	719	383	1,500
	Segment Sample 5	700				
	Segment Sample 6	598				
	Segment Sample 7	1,360				
	Composite Sample 3-6	598				

Table A-1. Tank 241-AW-105 Analytical Data: Lithium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Li	Composite Sample 1-2	< 0.0860	N/A	< 0.0860	N/A	< 0.213
	Segment Sample 6	< 0.0860				
	Composite Sample 3-6	< 0.0860				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Li	Composite Sample 3-4	< 140	N/A	< 32.0	N/A	< 66.8
	Segment Sample 5	< 32.0				
	Segment Sample 6	< 32.0				
	Segment Sample 7	< 32.0				
	Composite Sample 3-6	< 32.0				

Table A-1. Tank 241-AW-105 Analytical Data: Magnesium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Mg	Composite Sample 1-2	0.355	0.340 to 0.525	0.407	0.103	1.01
	Segment Sample 6	0.340				
	Composite Sample 3-6	0.525				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Mg	Composite Sample 3-4	91.0	81.0 to 580	185	223	386
	Segment Sample 5	41.0				
	Segment Sample 6	81.0				
	Segment Sample 7	580				
	Composite Sample 3-6	131				

Table A-1. Tank 241-AW-105 Analytical Data: Manganese

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Mn	Composite Sample 1-2	0.0400	0.0400 to 0.0900	0.0667	0.0252	0.165
	Segment Sample 6	0.0900				
	Composite Sample 3-6	0.0700				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Mn	Composite Sample 3-4	954	106 to 5,500	1,760	2,240	3,670
	Segment Sample 5	106				
	Segment Sample 6	152				
	Segment Sample 7	5,500				
	Composite Sample 3-6	2,110				

Table A-1. Tank 241-AW-105 Analytical Data: Molybdenum

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Mo	Composite Sample 1-2	2.78	2.78 to 11.9	7.38	4.56	18.3
	Segment Sample 6	11.9				
	Composite Sample 3-6	7.45				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Mo	Composite Sample 3-4	30.0	30.0 to 79.0	52.4	17.4	109
	Segment Sample 5	51.0				
	Segment Sample 6	51.0				
	Segment Sample 7	79.0				
	Composite Sample 3-6	51.0				

Table A-1. Tank 241-AW-105 Analytical Data: Neodymium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Nd	Composite Sample 1-2	< 0.280	N/A	< 0.280	N/A	< 0.694
	Segment Sample 6	< 0.280				
	Composite Sample 3-6	< 0.280				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Nd	Composite Sample 3-4	949	351 to 949	601	235	1,260
	Segment Sample 5	627				
	Segment Sample 6	351				
	Segment Sample 7	420				
	Composite Sample 3-6	658				

Table A-1. Tank 241-AW-105 Analytical Data: Nickel

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ni	Composite Sample 1-2	0.990	0.990 to 200	90.6	101	225
	Segment Sample 6	200				
	Composite Sample 3-6	70.9				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ni	Composite Sample 3-4	377	178 to 556	332	144	693
	Segment Sample 5	178				
	Segment Sample 6	288				
	Segment Sample 7	556				
	Composite Sample 3-6	261				

Table A-1. Tank 241-AW-105 Analytical Data: Phosphorus

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.P	Composite Sample 1-2	317	317 to 1180	819	448	2,030
	Segment Sample 6	959				
	Composite Sample 3-6	1180				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.P	Composite Sample 3-4	4,320	1,230 to 5,860	3,350	1,780	6,990
	Segment Sample 5	5,860				
	Segment Sample 6	1,230				
	Segment Sample 7	2,500				
	Composite Sample 3-6	2,850				

Table A-1. Tank 241-AW-105 Analytical Data: Potassium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.K	Composite Sample 1-2	13,700	8,910 to 14,900	12,500	3,170	31,000
	Segment Sample 6	8,910				
	Composite Sample 3-6	14,900				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.K	Composite Sample 3-4	20,200	4,710 to 36,500	19,100	12,300	39,900
	Segment Sample 5	23,700				
	Segment Sample 6	10,300				
	Segment Sample 7	4,710				
	Composite Sample 3-6	36,500				

Table A-1. Tank 241-AW-105 Analytical Data: Rhenium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Re	Composite Sample 1-2	< 0.110	< 0.110 to 0.300	0.300	N/A	0.744
	Segment Sample 6	0.300				
	Composite Sample 3-6	0.300				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Re	Composite Sample 3-4	89.0	89.0 to 105	102	7.16	213
	Segment Sample 5	105				
	Segment Sample 6	105				
	Segment Sample 7	105				
	Composite Sample 3-6	105				

Table A-1. Tank 241-AW-105 Analytical Data: Rhodium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Rh	Composite Sample 1-2	0.400	< 0.280 to 1.68	1.04	N/A	2.58
	Segment Sample 6	1.68				
	Composite Sample 3-6	< 0.280				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Rh	Composite Sample 3-4	449	449 to 1,090	703	250	1,470
	Segment Sample 5	1,090				
	Segment Sample 6	801				
	Segment Sample 7	587				
	Composite Sample 3-6	587				

Table A-1. Tank 241-AW-105 Analytical Data: Ruthenium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ru	Composite Sample 1-2	0.500	0.500 to 3.84	1.95	1.71	4.84
	Segment Sample 6	3.84				
	Composite Sample 3-6	1.50				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ru	Composite Sample 3-4	< 340	< 340 to 397	397	N/A	829
	Segment Sample 5	397				
	Segment Sample 6	397				
	Segment Sample 7	397				
	Composite Sample 3-6	397				

Table A-1. Tank 241-AW-105 Analytical Data: Selenium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Se	Composite Sample 1-2	< 1.23	< 1.23 to 1.40	1.40	N/A	3.47
	Segment Sample 6	1.40				
	Composite Sample 3-6	< 1.24				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Se	Composite Sample 3-4	< 960	< 960 to 1,240	1,240	N/A	2,590
	Segment Sample 5	1,240				
	Segment Sample 6	1,240				
	Segment Sample 7	1,240				
	Composite Sample 3-6	1,240				

Table A-1. Tank 241-AW-105 Analytical Data: Silicon

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Si	Composite Sample 1-2	213	213 to 5,340	2,530	2,600	6,270
	Segment Sample 6	2,030				
	Composite Sample 3-6	5,340				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Si	Composite Sample 3-4	8,880	3,060 to 8,880	6,340	2,400	13,200
	Segment Sample 5	8,270				
	Segment Sample 6	4,920				
	Segment Sample 7	3,060				
	Composite Sample 3-6	6,590				

Table A-1. Tank 241-AW-105 Analytical Data: Silver

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ag	Composite Sample 1-2	< 0.169	N/A	< 0.169	N/A	< 0.419
	Segment Sample 6	< 0.169				
	Composite Sample 3-6	< 0.169				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ag	Composite Sample 3-4	< 17.0	< 17.0 to 314	199	87.6	415
	Segment Sample 5	218				
	Segment Sample 6	314				
	Segment Sample 7	119				
	Composite Sample 3-6	144				

Table A-1. Tank 241-AW-105 Analytical Data: Sodium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Na	Composite Sample 1-2	34,200	34,200 to 58,600	47,800	12,400	1.19E+05
	Segment Sample 6	58,600				
	Composite Sample 3-6	50,500				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Na	Composite Sample 3-4	27,000	25,500 to 28,700	26,800	1,260	55,900
	Segment Sample 5	27,000				
	Segment Sample 6	28,700				
	Segment Sample 7	25,500				
	Composite Sample 3-6	25,800				

Table A-1. Tank 241-AW-105 Analytical Data: Tellurium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Te	Composite Sample 1-2	< 0.410	N/A	< 0.410	N/A	< 1.02
	Segment Sample 6	< 0.410				
	Composite Sample 3-6	< 0.410				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Te	Composite Sample 3-4	433	433 to 566	539	59.5	1,130
	Segment Sample 5	566				
	Segment Sample 6	566				
	Segment Sample 7	566				
	Composite Sample 3-6	566				

Table A-1. Tank 241-AW-105 Analytical Data: Thallium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Tl	Composite Sample 1-2	< 12.0	N/A	< 12.0	N/A	< 29.8
	Segment Sample 6	< 12.0				
	Composite Sample 3-6	< 12.0				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Tl	Composite Sample 3-4	< 9,800	< 9,800 to < 14,000	< 14,000	N/A	< 29,200
	Segment Sample 5	< 14,000				
	Segment Sample 6	< 14,000				
	Segment Sample 7	< 14,000				
	Composite Sample 3-6	< 14,000				

Table A-1. Tank 241-AW-105 Analytical Data: Thorium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Th	Composite Sample 1-2	< 0.780	< 0.780 to < 0.790	< 0.790	N/A	< 1.96
	Segment Sample 6	< 0.780				
	Composite Sample 3-6	< 0.790				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Th	Composite Sample 3-4	936	936 to 1,290	1,220	158	2,550
	Segment Sample 5	1,290				
	Segment Sample 6	1,290				
	Segment Sample 7	1,290				
	Composite Sample 3-6	1,290				

Table A-1. Tank 241-AW-105 Analytical Data: Titanium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Ti	Composite Sample 1-2	< 0.0910	< 0.0910 to < 0.0920	< 0.0920	N/A	< 0.228
	Segment Sample 6	< 0.0910				
	Composite Sample 3-6	< 0.0920				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Ti	Composite Sample 3-4	47.0	47.0 to 196	123	63.2	257
	Segment Sample 5	196				
	Segment Sample 6	162				
	Segment Sample 7	68.0				
	Composite Sample 3-6	141				

Table A-1. Tank 241-AW-105 Analytical Data: Uranium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.U	Composite Sample 1-2	16.7	< 5.80 to 16.7	13.9	N/A	34.5
	Segment Sample 6	11.0				
	Composite Sample 3-6	< 5.80				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.U	Composite Sample 3-4	3,100	3,100 to 30,600	17,900	10,600	37,400
	Segment Sample 5	24,400				
	Segment Sample 6	30,600				
	Segment Sample 7	12,500				
	Composite Sample 3-6	19,000				

Table A-1. Tank 241-AW-105 Analytical Data: Vanadium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.V	Composite Sample 1-2	0.100	< 0.0690 to 0.100	0.100	N/A	0.248
	Segment Sample 6	< 0.0690				
	Composite Sample 3-6	< 0.0700				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.V	Composite Sample 3-4	72.5	72.5 to 81.0	79.3	3.80	166
	Segment Sample 5	81.0				
	Segment Sample 6	81.0				
	Segment Sample 7	81.0				
	Composite Sample 3-6	81.0				

Table A-1. Tank 241-AW-105 Analytical Data: Zinc

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Zn	Composite Sample 1-2	4.75	1.73 to 4.75	3.09	1.53	7.66
	Segment Sample 6	2.78				
	Composite Sample 3-6	1.73				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Zn	Composite Sample 3-4	747	138 to 747	325	246	678
	Segment Sample 5	251				
	Segment Sample 6	138				
	Segment Sample 7	320				
	Composite Sample 3-6	171				

Table A-1. Tank 241-AW-105 Analytical Data: Zirconium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Metal (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
ICP.Zr	Composite Sample 1-2	0.450	0.450 to 5.27	2.15	2.70	5.33
	Segment Sample 6	5.27				
	Composite Sample 3-6	0.740				
Metal (Solid)		µg/g	µg/g	µg/g	µg/g	kg
ICP.Zr	Composite Sample 3-4	2.38E+05	23,600 to 2.38E+05	1.84E+05	90,300	3.84E+05
	Segment Sample 5	2.10E+05				
	Segment Sample 6	2.16E+05				
	Segment Sample 7	23,600				
	Composite Sample 3-6	2.32E+05				

Table A-2. Tank 241-AW-105 Analytical Data: Ammonia

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
KTN.NH_3	Composite Sample 1-2	1,020	13.4 to 1,020	475	436	1,180
	Composite Sample 3-4	13.4				
	Segment Sample 5	820				
	Segment Sample 6	748				
	Segment Sample 7	152				
	Composite Sample 3-6	94.7				

Table A-2. Tank 241-AW-105 Analytical Data: Bromide

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.Br^-	Composite Sample 1-2	40.0	40.0 to 500	247	234	612
	Segment Sample 6	200				
	Composite Sample 3-6	500				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.Br^-	Composite Sample 3-4	300	5.00 to 300	181	107	378
	Segment Sample 5	200				
	Segment Sample 6	200				
	Segment Sample 7	200				
	Composite Sample 3-6	5.00				

Table A-2. Tank 241-AW-105 Analytical Data: Carbonate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Cation (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
CO_3^{2-}	Composite Sample 1-2	6,480	6,480 to 18,100	10,600	6,510	26,300
	Segment Sample 7	7,200				
	Composite Sample 3-6	18,100				
Cation (Solid)		µg/g	µg/g	µg/g	µg/g	kg
CO_3^{2-}	Composite Sample 3-4	80,000	9,500 to 80,000	30,200	28,800	63,000
	Segment Sample 5	12,000				
	Segment Sample 6	21,000				
	Segment Sample 7	28,500				
	Composite Sample 3-6	9,500				

Table A-2. Tank 241-AW-105 Analytical Data: Chloride

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.Cl^-	Composite Sample 1-2	440	440 to 1,300	873	430	2,170
	Segment Sample 6	1,300				
	Composite Sample 3-6	880				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.Cl^-	Composite Sample 3-4	1,820	1,500 to 2,800	2,100	531	4,390
	Segment Sample 5	2,800				
	Segment Sample 6	2,500				
	Segment Sample 7	1,900				
	Composite Sample 3-6	1,500				

Table A-2. Tank 241-AW-105 Analytical Data: Chromium (VI)

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Cation (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
Colormetric. Cr^{+6}	Composite Sample 1-2	22.2	4.50 to 22.2	13.4	N/A	33.2
	Composite Sample 3-6	4.50				
Cation (Solid)		µg/g	µg/g	µg/g	µg/g	kg
Colormetric. Cr^{+6}	Segment Sample 7	0.283	0.0170 to 0.283	0.150	N/A	0.313
	Composite Sample 5	0.0170				

Table A-2. Tank 241-AW-105 Analytical Data: Fluoride

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.F^-	Composite Sample 1-2	8,300	7,700 to 8,300	8,000	300	19,800
	Segment Sample 6	8,000				
	Composite Sample 3-6	7,700				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.F^-	Composite Sample 3-4	86,800	22,000 to 1.70E+05	1.00E+05	60,100	2.09E+05
	Segment Sample 5	1.70E+05				
	Segment Sample 6	1.50E+05				
	Segment Sample 7	22,000				
	Composite Sample 3-6	71,800				

Table A-2. Tank 241-AW-105 Analytical Data: Hydroxide

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
AUTOTIT .OH^-	Composite Sample 1-2	12,900	12,900 to 13,100	13,100	N/A	32,500
	Composite Sample 3-6	13,100				

Table A-2. Tank 241-AW-105 Analytical Data: Nitrate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.NO_3^-	Composite Sample 1-2	24,000	24,000 to 49,000	36,700	12,500	91,000
	Segment Sample 6	49,000				
	Composite Sample 3-6	37,000				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.NO_3^-	Composite Sample 3-4	41,500	21,500 to 81,000	46,400	21,600	96,900
	Segment Sample 5	46,000				
	Segment Sample 6	42,000				
	Segment Sample 7	81,000				
	Composite Sample 3-6	21,500				

Table A-2. Tank 241-AW-105 Analytical Data: Nitrite

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.NO_2^-	Composite Sample 1-2	4,900	4,900 to 19,500	11,800	7,330	29,300
	Segment Sample 6	19,500				
	Composite Sample 3-6	11,000				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.NO_2^-	Composite Sample 3-4	12,100	7,700 to 30,000	17,400	8,420	36,300
	Segment Sample 5	18,000				
	Segment Sample 6	19,000				
	Segment Sample 7	30,000				
	Composite Sample 3-6	7,700				

Table A-2. Tank 241-AW-105 Analytical Data: Phosphate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.PO_4^{-3}	Composite Sample 1-2	660	400 to 900	653	250	1,620
	Segment Sample 6	400				
	Composite Sample 3-6	900				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.PO_4^{-3}	Composite Sample 3-4	1,120	500 to 2,900	1,360	909	2,840
	Segment Sample 5	2,900				
	Segment Sample 6	500				
	Segment Sample 7	1,300				
	Composite Sample 3-6	1,000				

Table A-2. Tank 241-AW-105 Analytical Data: Sulfate

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Anion (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
IC.SO_4^{-2}	Composite Sample 1-2	1,760	1,760 to 2,100	1,890	186	4,690
	Segment Sample 6	1,800				
	Composite Sample 3-6	2,100				
Anion (Solid)		µg/g	µg/g	µg/g	µg/g	kg
IC.SO_4^{-2}	Composite Sample 3-4	2,600	1,000 to 5,600	2,820	1,750	5,890
	Segment Sample 5	3,100				
	Segment Sample 6	1,800				
	Segment Sample 7	5,600				
	Composite Sample 3-6	1,000				

Table A-3. Tank 241-AW-105 Analytical Data: Americium-241

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
AEA.^{241}Am	Composite Sample 1-2	0.0991	0.00419 to 0.0991	0.0516	N/A	0.128
	Segment Sample 6	ND				
	Composite Sample Liquid	0.00419				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
AEA.^{241}Am	Composite Sample 3-4	1.50	0.745 to 5.43	2.13	1.90	4,450
	Segment Sample 5	1.95				
	Segment Sample 6	0.745				
	Segment Sample 7	5.43				
	Composite Sample Solid	1.04				

ND = Not Detected

Table A-3. Tank 241-AW-105 Analytical Data: Antimony-125

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA.^{125}Sb	Composite Sample 1-2	ND	N/A	N/A	N/A	---
	Segment Sample 7	ND				
	Composite Sample Liquid	ND				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA.^{125}Sb	Composite Sample 3-4	13.9	10.8 to 14.8	13.0	1.75	27,100
	Segment Sample 5	12.5				
	Segment Sample 6	14.8				
	Segment Sample 7	ND				
	Composite Sample Solid	10.8				

Table A-3. Tank 241-AW-105 Analytical Data; Carbon-14

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
LSC.^{14}C	Composite Sample 1-2	0.124	0.124 to 0.910	0.517	N/A	1.28
	Composite Sample Liquid	0.910				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
LSC.^{14}C	Segment Sample 7	0.00270	3.00E-04 to 0.00270	0.00150	N/A	3.11
	Composite Sample Solid	3.00E-04				

Table A-3. Tank 241-AW-105 Analytical Data: Cerium-144

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA.^{144}Ce	Composite Sample 1-2	ND	N/A	N/A	N/A	---
	Segment Sample 7	ND				
	Composite Sample Liquid	ND				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA.^{144}Ce	Composite Sample 3-4	29.9	3.61 to 29.9	11.1	12.6	23,200
	Segment Sample 5	4.14				
	Segment Sample 6	3.61				
	Segment Sample 7	ND				
	Composite Sample Solid	6.58				

Table A-3. Tank 241-AW-105 Analytical Data: Cesium-134

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA. ^{134}Cs	Composite Sample 1-2	583	374 to 583	483	105	1,200
	Segment Sample 7	374				
	Composite Sample Liquid	493				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA. ^{134}Cs	Composite Sample 3-4	1.71	0.548 to 1.71	0.966	0.533	2,020
	Segment Sample 5	0.994				
	Segment Sample 6	0.613				
	Segment Sample 7	ND				
	Composite Sample Solid	0.548				

Table A-3. Tank 241-AW-105 Analytical Data: Cesium-137

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA. ^{137}Cs	Composite Sample 1-2	46,800	46,800 to 85,100	66,300	19,200	1.64E+05
	Segment Sample 7	85,100				
	Composite Sample Liquid	67,100				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA. ^{137}Cs	Composite Sample 3-4	104	69.2 to 176	103	42.6	2.15E+05
	Segment Sample 5	82.9				
	Segment Sample 6	83.2				
	Segment Sample 7	176				
	Composite Sample Solid	69.2				

Table A-3. Tank 241-AW-105 Analytical Data: Cobalt-60

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
GEA.^{60}Co	Composite Sample 1-2	21.0	21.0 to 131	84.7	57.0	210
	Segment Sample 7	131				
	Composite Sample Liquid	102				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
GEA.^{60}Co	Composite Sample 3-4	0.560	0.430 to 0.597	0.523	0.0638	1,090
	Segment Sample 5	0.532				
	Segment Sample 6	0.496				
	Segment Sample 7	0.597				
	Composite Sample Solid	0.430				

Table A-3. Tank 241-AW-105 Analytical Data: Curium-243/244

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
AEA.$^{243/244}$Cm	Composite Sample 1-2	0.0286	6.53E-04 to 0.287	0.105	0.158	0.260
	Segment Sample 7	0.287				
	Composite Sample Liquid	6.53E-04				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
AEA.$^{243/244}$Cm	Composite Sample 3-4	0.0162	0.0162 to 0.376	0.141	0.164	294
	Segment Sample 5	ND				
	Segment Sample 6	ND				
	Segment Sample 7	0.376				
	Composite Sample Solid	0.0309				

Table A-3. Tank 241-AW-105 Analytical Data: Europium-154

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA. ^{154}Eu	Composite Sample 1-2	ND	N/A	N/A	N/A	---
	Segment Sample 7	ND				
	Composite Sample Liquid	ND				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA. ^{154}Eu	Composite Sample 3-4	ND	0.410 to 8.90	3.42	4.76	7,140
	Segment Sample 5	0.939				
	Segment Sample 6	ND				
	Segment Sample 7	8.90				
	Composite Sample Solid	0.410				

Table A-3. Tank 241-AW-105 Analytical Data: Europium-155

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA. ^{155}Eu	Composite Sample 1-2	ND	N/A	N/A	N/A	---
	Segment Sample 7	ND				
	Composite Sample Liquid	ND				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA. ^{155}Eu	Composite Sample 3-4	1.55	0.433 to 11.1	2.91	4.60	6,070
	Segment Sample 5	0.433				
	Segment Sample 6	0.821				
	Segment Sample 7	11.1				
	Composite Sample Solid	0.649				

Table A-3. Tank 241-AW-105 Analytical Data: Iodine-129

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
GEA.^{129}I	Composite Sample 1-2	0.0269	0.0241 to 0.0269	0.0255	N/A	0.0632
	Composite Sample Liquid	0.0241				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
GEA.^{129}I	Segment Sample 7	0.00347	0.00152 to 0.00347	0.00250	N/A	5.22
	Composite Sample Solid	0.00152				

Table A-3. Tank 241-AW-105 Analytical Data: Neptunium-237

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
AEA.^{237}Np	Composite Sample 1-2	0.00189	0.00189 to 0.0155	0.00870	N/A	0.0216
	Composite Sample Liquid	0.0155				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
AEA.^{237}Np	Segment Sample 7	0.00345	0.00247 to 0.00345	0.00296	N/A	6.18
	Composite Sample Solid	0.00247				

Table A-3. Tank 241-AW-105 Analytical Data: Niobium-94

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
GEA.^{94}Nb	Composite Sample 1-2	0.00482	0.00376 to 0.00482	0.00429	N/A	0.0106
	Composite Sample Liquid	0.00376				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
GEA.^{94}Nb	Composite Sample 3-4	0.00226	2.72E-04 to 0.00226	0.00127	N/A	2.63
	Composite Sample Solid	2.72E-04				

Table A-3. Tank 241-AW-105 Analytical Data: Americium-241

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
APC.^{241}Am	Composite Sample 1-2	---	N/A	0.730	N/A	1.81
	Segment Sample 7	0.730				
	Composite Sample Liquid	---				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
APC.^{241}Am	Composite Sample 3-4	1.02	0.437 to 2.00	1.15	0.790	2,400
	Segment Sample 5	2.00				
	Segment Sample 6	0.437				
	Segment Sample 7	---				
	Composite Sample Solid	---				

Table A-3. Tank 241-AW-105 Analytical Data: Plutonium-238

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
AEA. ^{238}Pu	Composite Sample 1-2	0.0450	0.00236 to 0.0450	0.0237	N/A	0.0588
	Segment Sample 7	---				
	Composite Sample Liquid	0.00236				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
AEA. ^{238}Pu	Composite Sample 3-4	---	0.291 to 0.608	0.450	N/A	939
	Segment Sample 5	---				
	Segment Sample 6	---				
	Segment Sample 7	0.608				
	Composite Sample Solid	0.291				

Table A-3. Tank 241-AW-105 Analytical Data: Plutonium-239/240

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
AEA. $^{239/240}$Pu	Composite Sample 1-2	0.0450	0.00946 to 0.402	0.152	0.217	0.377
	Segment Sample 7	0.402				
	Composite Sample Liquid	0.00946				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
AEA. $^{239/240}$Pu	Composite Sample 3-4	3.04	0.237 to 3.04	2.18	1.20	4,550
	Segment Sample 5	2.98				
	Segment Sample 6	1.78				
	Segment Sample 7	0.237				
	Composite Sample Solid	2.87				

Table A-3. Tank 241-AW-105 Analytical Data: Ruthenium-106

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
GEA. ^{106}Ru	Composite Sample 1-2	935	923 to 1,730	1,200	462	2,980
	Segment Sample 7	1,730				
	Composite Sample Liquid	923				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
GEA. ^{106}Ru	Composite Sample 3-4	19.1	5.24 to 19.1	9.64	6.43	20,100
	Segment Sample 5	8.22				
	Segment Sample 6	5.24				
	Segment Sample 7	ND				
	Composite Sample Solid	5.99				

Table A-3. Tank 241-AW-105 Analytical Data: Selenium-79

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		µCi/L	µCi/L	µCi/L	µCi/L	Ci
LSC. ^{79}Se	Composite Sample 1-2	0.0215	0.0215 to 0.0338	0.0277	N/A	0.0687
	Composite Sample Liquid	0.0338				
Radionuclide (Solid)		µCi/g	µCi/g	µCi/g	µCi/g	Ci
LSC. ^{79}Se	Segment Sample 7	0.0324	0.00266 to 0.0324	0.0175	N/A	36.5
	Composite Sample Solid	0.00266				

Table A-3. Tank 241-AW-105 Analytical Data: Strontium-90

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
BPC.^{90}Sr	Composite Sample 1-2	0.382	0.382 to 11.7	6.04	N/A	15.0
	Composite Sample Liquid	11.7				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
BPC.^{90}Sr	Segment Sample 7	300	81.5 to 300	191	N/A	3.99E+05
	Composite Sample Solid	81.5				

Table A-3. Tank 241-AW-105 Analytical Data: Technetium-99

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
LSC.^{99}Tc	Composite Sample 1-2	6.85	6.85 to 31.2	19.0	N/A	47.1
	Composite Sample Liquid	31.2				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
LSC.^{99}Tc	Segment Sample 7	0.0901	0.0536 to 0.0901	0.0719	N/A	150
	Composite Sample Solid	0.0536				

Table A-3. Tank 241-AW-105 Analytical Data: Tritium

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
LSC.^{3}H	Composite Sample 1-2	6.58	5.90 to 6.58	6.24	N/A	15.5
	Composite Sample Liquid	5.90				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
LSC.^{3}H	Segment Sample 7	0.0168	0.00541 to 0.0168	0.0111	N/A	23.0
	Composite Sample Solid	0.00541				

Table A-3. Tank 241-AW-105 Analytical Data: Total Alpha

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
APC.Total Alpha	Composite Sample 1-2	---	N/A	1.44	N/A	3.57
	Segment Sample 7	1.44				
	Composite Sample Liquid	---				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
APC.Total Alpha	Composite Sample 3-4	4.14	2.22 to 4.95	3.77	1.40	7,870
	Segment Sample 5	4.95				
	Segment Sample 6	2.22				
	Segment Sample 7	---				
	Composite Sample Solid	---				

Table A-3. Tank 241-AW-105 Analytical Data: Total Beta

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Statistical Mean	Standard Deviation	Projected Inventory
Radionuclide (Liquid)		**µCi/L**	**µCi/L**	**µCi/L**	**µCi/L**	**Ci**
BPC.Total Beta	Composite Sample 1-2	49,500	49,500 to 70,400	60,000	N/A	1.49E+05
	Composite Sample Liquid	70,400				
Radionuclide (Solid)		**µCi/g**	**µCi/g**	**µCi/g**	**µCi/g**	**Ci**
BPC.Total Beta	Segment Sample 7	820	254 to 820	537	N/A	1.12E+06
	Composite Sample Solid	254				

Table A-4. Tank 241-AW-105 Analytical Data: Density

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation
Physical Property		**g/mL**	**g/mL**	**g/mL**	**g/mL**
Density (Liquid)	Composite Sample 1-2	1.08	N/A	1.08	---
Density (Solid)	Composite Sample 3-4	1.35	1.35 to 1.50	1.42	---
	Segment Sample 5	1.40			
	Segment Sample 6	1.44			
	Segment Sample 7	1.50			
	Composite Sample 3-6	1.39			

Table A-4. Tank 241-AW-105 Analytical Data: pH

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation
Physical Property					
pH	Composite Sample 1-2	13.2	12.8 to 13.4	13.1	0.306
	Segment Sample 7	12.8			
	Composite Sample 3-6	13.4			

Table A-4. Tank 241-AW-105 Analytical Data: Total Organic Carbon

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Physical Property (Liquid)		µg/mL	µg/mL	µg/mL	µg/mL	kg
TOC	Composite Sample 1-2	648	28.8 to 6,740	2,470	3,710	6,130
	Segment Sample 6	28.8				
	Composite Sample 3-6	6,740				
Physical Property (Solid)		µg/g	µg/g	µg/g	µg/g	kg
TOC	Composite Sample 3-4	3,000	2,900 to 29,300	8,560	11,600	17,900
	Segment Sample 5	4,100				
	Segment Sample 6	3,500				
	Segment Sample 7	29,300				
	Composite Sample 3-6	2,900				

Table A-4. Tank 241-AW-105 Analytical Data: Total Carbon

Analyte	Laboratory Sample Identification	Analytical Data Result	Range of Values	Evaluated Data Result	Standard Deviation	Projected Inventory
Physical Property (Liquid)		**µg/mL**	**µg/mL**	**µg/mL**	**µg/mL**	**kg**
TC	Composite Sample 1-2	1,940	1,440 to 10,400	4,590	5,040	11,400
	Segment Sample 6	1,440				
	Composite Sample 3-6	10,400				
Physical Property (Solid)		**µg/g**	**µg/g**	**µg/g**	**µg/g**	**kg**
TC	Composite Sample 3-4	19,000	4,800 to 36,800	15,400	13,400	32,000
	Segment Sample 5	6,500				
	Segment Sample 6	7,700				
	Segment Sample 7	36,800				
	Composite Sample 3-6	4,800				

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