AR TARGET SHEET

The following document was too large to scan as one unit, therefore it has been broken down into sections.

DOCUMENT # SD-WM-EV-100, Rev 0

EDMC # 42494

SECTION 1 OF 2

START 9513385.0763 EDT612655 0042494

SUPPORTING DOCUMENT

1. Total Pages 969

2. Title	3. Number	4. Rev No.
Extensive Separations Pretreatment Alternative Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement	WHC-SD-WM-EV-100	0

5. Key Words	6. Author
extensive separations, vitrification, disposal, environmental impact statement, NEPA	Name: G. Jansen/B. J. Knutson Signatures 9/21/95 Organization/Charge Code 74400/D1DDB

7. Abstract

This engineering data package provides supporting data for preparation of the TWRS Environmental Impact Statement (TWRS EIS). Data in this document addresses specifically the Extensive Separations Alternative. Engineering data packages addressing the other alternatives to be evaluated in the TWRS EIS are the No Disposal Action Alternative (WHC-SD-WM-EV-099), In Situ Disposal Alternative (WHC-SD-WM-EV-101), Tri-Party Agreement Alternative (WHC-SD-WM-EV-104), and the No Separations Alternative (WHC-SD-WM-EV-103). The Waste Retrieval and Transfer Engineering Data Package (WHC-SD-WM-EV-097) and the Closure Engineering Data Package (WHC-SD-WM-EV-107) provide additional data addressing the Tri-Party Agreement Alternative. Data provided in this document relate to impacts from construction, operations (including startup, and decontamination and decommissioning), resource utilization, transportation, and radiation dose to workers. Processes and activities addressed in this data package include radionuclide removal, low-level waste vitrification, low-level waste disposal, high-level waste vitrification, on-site interim storage of the vitrified high-level waste product, and transportation of the vitrified high-level waste product to a geologic repository. Environmental impacts associated with disposal of high-level waste in a geologic repository are not within the scope of the TWRS EIS and not addressed in this document, other than accounting for the repository disposal fee in order to equitably compare alternatives.

8. RELEASE STAMP

OFFICIAL RELEASE
BY WHC
DATE SEP 2 2 1995
Sta. 4

9513385.0764

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-EV-100, REV 0
Document Title:	Extensive Separations Pretreatment Alternative Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement
Release Date:	9/22/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara Broz — 9/22/95

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy. Available in paper copy. Printed in the United States of America. To obtain copies of this report, contact:

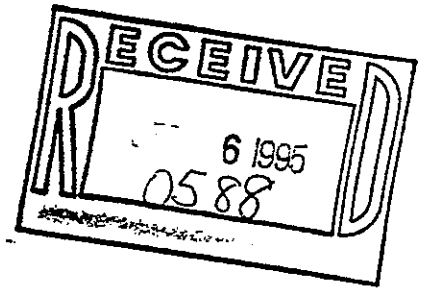
Westinghouse Hanford Company - Document Control Services
P.O. Box 1970, Mailstop H6-08, Richland, WA 99352
Telephone: (509) 372-2420; Fax: (509) 376-4989

9513385.0765

EXTENSIVE SEPARATIONS PRETREATMENT ALTERNATIVE ENGINEERING DATA PACKAGE FOR THE TANK WASTE REMEDIATION SYSTEM ENVIRONMENTAL IMPACT STATEMENT

G. Jansen
B. J. Knutson
G. K. Allen
Westinghouse Hanford Company

L. Lauerhass
Pacific Northwest Laboratory



ABSTRACT

In accordance with the National Environmental Policy Act of 1969, an environmental impact statement is required for disposal of the radioactive waste stored in 177 underground storage tanks at the Hanford Site.

This document is the engineering data package for the Extensive Separations Pretreatment alternative. It includes waste treatment operations that would take place between waste retrieval and transfer and closure of single-shell tanks and double-shell tanks. The purpose of this alternative would be to process the tank wastes and to reduce the amount of high-level waste to less than 625 cubic meters (equivalent to 1,000 glass canisters measuring 0.61 meters [m] diameter by 3.05 m long at 0.62 cubic meters each) and to reduce the curie

loading of the low-level waste to U.S. Nuclear Regulatory Commission, Class A or ALARA (as low as reasonably achievable), whichever is lower.

This data package includes two options for disposing of the cesium and strontium capsules. After the capsules have been returned to the Hanford Site, Option 1 assumes that they would be repackaged if necessary, overpacked, and sent to an offsite geological repository for final disposal. No impacts or costs for these operations are included in this data package. Option 2 would process and distribute the strontium and cesium from the capsules into high-level waste glass.

The data package also describes two options for dealing with low-level waste forms. Option A would vitrify and place low-level waste into a retrievable sulfur matrix; Option B would place low-level waste into a grout matrix.

CONTENTS

1.0 INTRODUCTION 1-1

2.0 SCOPE 2-1

3.0 OVERVIEW OF THE EXTENSIVE SEPARATIONS PRETREATMENT ALTERNATIVE 3-1
3.1 MANAGE TANK WASTES 3-1
3.2 RETRIEVAL 3-1
3.3 PRETREATMENT 3-3
3.4 TREATMENT/IMMOBILIZATION 3-3
3.5 STORAGE/DISPOSAL 3-3

4.0 PROCESS DESCRIPTION 4-1
4.1 DIFFERENCES BETWEEN THE EXTENSIVE SEPARATIONS ALTERNATIVE AND THE CLEAN OPTION 4-5
4.2 WASTE STREAM 4-6
4.2.1 Supernatant 4-7
4.2.2 Sludge 4-7
4.3 HIGH- AND LOW-LEVEL WASTE STREAMS 4-8
4.3.1 Low-Level Streams and Compositions Relative to Each Process Strategy 4-8
4.4 SOLVENT EXTRACTION 4-9
4.5 SOLVENT WASTE MINIMIZATION 4-10
4.6 SODIUM HYDROXIDE AND NITRIC ACID RECYCLE 4-10
4.7 TREATMENT PROCESS DESCRIPTIONS 4-10
4.7.1 High-Level Waste Vitrification Process 4-10
4.7.2 The Low-Level Waste Vitrification Process 4-12
4.7.3 The Low-Level Waste Grout Process 4-12
4.7.4 Strontium and Cesium Capsule Dissolution 4-13
4.7.5 Chromium Reduction And Removal 4-14
4.7.6 The Role of Recycle in Extensive Separations 4-17
4.8 UPDATING OF INFORMATION USED FOR PLANT DESIGN AND COST ESTIMATION 4-17
4.8.1 Omission of the Thermal Denitration, Caustic Recycle, and Chromium Removal Equipment 4-18
4.8.2 Undersizing of the Americium-Lanthanide Separation Process Equipment 4-18
4.8.3 Omission of the Cesium and Plutonium Removal Capability in Strontium Recovery 4-21
4.8.4 Nonconvergence of Preliminary Material Balance Computation . . 4-21

CONTENTS (Continued)

4.9 EFFECT OF OPERATING CONDITIONS ON SYSTEM PERFORMANCE 4-22

5.0 ASSUMPTIONS 5-1
5.1 INTEGRATED PROCESS 5-2
5.2 PROCESS FEED 5-3
5.3 SOLUBILITY 5-4
5.4 SOLID/LIQUID SEPARATIONS 5-4
5.5 ORGANIC DESTRUCTION (ZIMPRO PROCESS) 5-5
5.6 SOLIDS DISSOLUTION 5-5
5.7 TRIBUTYL PHOSPHATE SOLVENT EXTRACTION OF TRANSURANIC COMPONENTS 5-6
5.8 URANIUM PURIFICATION 5-7
5.9 CMPO SOLVENT EXTRACTION FOR AMERICIUM AND LANTHANIDE REMOVAL 5-8
5.10 AMERICIUM/LANTHANIDE SEPARATION BY BAND DISPLACEMENT CATION EXCHANGE 5-8
5.11 CROWN ETHER SOLVENT EXTRACTION FOR STRONTIUM AND TECHNETIUM REMOVAL 5-9
5.12 AMMONIUM PHOSPHOMOLYBDATE ION EXCHANGE FOR CESIUM REMOVAL 5-9
5.13 RESORCINOL-FORMALDEHYDE ION EXCHANGE FOR CESIUM REMOVAL 5-10
5.14 CRYSTALLINE SILICOTITANATE ION EXCHANGE FOR STRONTIUM REMOVAL 5-10
5.15 ANION EXCHANGE REMOVAL OF TECHNETIUM 5-11
5.16 STRONTIUM AND CESIUM CAPSULE DISSOLUTION AND METATHESIS (HIGH-LEVEL WASTE OPTION 2) 5-12
5.17 HIGH-LEVEL WASTE STREAM VITRIFICATION TREATMENT . . . 5-12
5.17.1 High-Level Waste Concentration/Denitration 5-12
5.17.2 High-Level Waste Melter 5-14
5.17.3 High-Level Waste Melter Offgas Processing 5-14
5.18 INITIAL TREATMENT FOR ACIDIC LOW-LEVEL WASTE TREATMENT 5-15
5.18.1 Low-Level Waste Concentration 5-15
5.18.2 Low-Level Waste Calcination (T-Thermal Process) 5-15
5.18.3 Dissolution/Concentration 5-16
5.19 LOW-LEVEL WASTE STREAM VITRIFICATION AND SULFUR MATRIX TREATMENT 5-16
5.19.1 Low-Level Waste Melter 5-16
5.19.2 Low-Level Waste Melter Offgas Processing 5-17
5.19.3 Sulfur Dioxide Removal and Sulfur Recovery 5-17

CONTENTS (Continued)

5.19.4 NOx Destruction Processing 5-17
5.19.5 Offgas Treatment System 5-18
5.20 LOW-LEVEL WASTE STREAM GROUT TREATMENT (LOW-LEVEL WASTE OPTION B) 5-18
5.20.1 Chromium Reduction 5-18
5.20.2 Salt Grout 5-18
5.21 CAUSTIC RECYCLING 5-19
5.22 NITRIC ACID RECYCLING 5-19
5.23 WATER RECYCLING 5-19
5.24 HIGH-LEVEL WASTE GLASS 5-19
5.25 HIGH-LEVEL WASTE DISPOSAL 5-20
5.26 LOW-LEVEL WASTE GLASS 5-20
5.27 LOW-LEVEL WASTE GLASS DISPOSAL 5-21
5.28 LOW-LEVEL WASTE GROUT 5-21
5.29 LOW-LEVEL WASTE GROUT DISPOSAL 5-22
5.30 PRETREATMENT/HIGH-LEVEL WASTE COMBINED - LOW-LEVEL WASTE SEPARATE 5-22
5.31 CENTRALIZED FACILITIES 5-22

6.0 PROCESS EQUIPMENT 6-1
6.1 PROCESS FLOW DIAGRAMS AND MATERIALS BALANCES 6-1
6.1.1 Pretreatment and High-Level Waste Vitrification 6-1
6.1.2 Low-Level Waste Vitrification 6-1
6.1.3 Low-Level Waste Grout (Option B) 6-2
6.2 CONTAMINATED SOILS ENCOUNTERED DURING OPERATION . . . 6-2
6.3 OPERATING NOISE 6-2
6.4 RAW CHEMICALS 6-2
6.5 OPERATING STAFF 6-2
6.6 SECONDARY WASTE 6-3

7.0 CONSTRUCTION 7-1
7.1 FACILITY LAYOUTS 7-1
7.1.1 Integrated Extensive Separations Pretreatment-HLW Vitrification Facility 7-1
7.1.2 High-Level Waste Option 1 Capsule Blending-Cesium Strontium Capsule Cut-up Cell 7-7
7.1.3 Detached Low-Level Waste Vitrification Facility 7-8
7.1.4 Detached Low-Level Waste Grout Facility 7-9
7.2 HEATING, VENTILATING AND AIR CONDITIONING 7-12
7.3 CONTAMINATED SOILS ENCOUNTERED DURING CONSTRUCTION 7-13
7.4 EARTHEN BORROW MATERIAL 7-13

CONTENTS (Continued)

7.5 CONSTRUCTION NOISE 7-14
7.6 EQUIPMENT SIZES 7-14

8.0 SITE LAYOUTS 8-1

9.0 DATA TABLES 9-1
9.1 HLW OPTION 2 CAPSULE BLENDING 9-39
9.2 LLW OPTION B GROUT 9-39

10.0 RATE DATA 10-1
10.1 YEAR-BY-YEAR DATA 10-1
10.2 YEARLY AVERAGE/PEAK 10-1

11.0 REFERENCES 11-1

9513385.0768

LIST OF FIGURES

3-1 Disposal of Tank Waste Extensive Separations Pretreatment Alternative 3-2

4-1 Process Strategy Flowsheet Comparison 4-2

4-2 Block Diagram of Extensive Separations Processing Flowsheet 4-3

4-3 Low-Level Waste Glass and Grout Treatments for the Extensive Separations Pretreatment Alternative 4-4

5-1 Solvent Extraction and Stripping Process 5-1

8-1 Site Plan for Extensive Separations Pretreatment Alternative 8-3

8-2 Site Plan for LLW Option B Grout 8-5

10-1 Construction Schedule for ESP Alternative 10-2

10-2 Staffing Schedule for ESP Alternative 10-3

10-3 Processing Cost Schedule for ESP Alternative 10-4

LIST OF TABLES

4-1 Extensive Separations Facility Equipment Cost and Flowrate Convergence Breakout by System 4-19

4-2 Comparison of Repository Fee and Its Basis for Various TWRS Alternatives . . . 4-22

4-3 Comparison of Extensive Separations Product Streams for Various Operating Conditions 4-24

5-1 Cesium And Strontium Capsule Composition And Inventory 5-13

9-1A Average Radionuclide Inventory in the HLW Glass Waste Form (Ci/m^3) 9-3

9-1B Average Radionuclide Inventory in the LLW Glass and Grout Waste Forms (Ci/m^3) 9-5

9-1C Extensive Separations Flowsheet HLW Glass Composition Results 9-7

9-1D Extensive Separations Flowsheet LLW Glass Composition and Grout Results 9-9

9-2 Unit Process: Operating Personnel Requirements (Staff Hours) 9-11

9-3 Operating Personnel Requirements (Staff Hours) 9-12

9-4 Operating Resource Requirements 9-13

9-5 Nonradiological Operating Emissions 9-16

9-6 Radiological Operating Emissions (Curies) 9-18

9-7 Transportation in Support of Processing (Units as Indicated) 9-19

9-8 Construction Personnel Requirements (Staff Hours) 9-20

9-9 Construction Personnel Requirements (Staff-Hours) 9-21

9-10 Construction Resource Requirements (Units as Indicated) 9-22

9-11 Nonradiological Construction Emission (Units as Indicated) 9-23

9-12 Transportation of Earthen Borrow Construction Material (Units as Indicated) 9-24

9513385.0769

LIST OF TABLES (Continued)

9-13 Transportation of Other Construction Material (Units as Indicated) 9-25

9-14 Decommissioning of Noncontaminated Treatment/Storage Facilities (Metric Kilo-Tons) 9-26

9-15 Decommissioning of Contaminated Treatment/Storage Facilities (Metric Kilo-Tons) 9-27

9-16 Process Module: Overall Cost (Millions of 1995 Dollars) 9-28

9-17 Overall Cost Component (Millions of 1995 Dollars) 9-29

9-18 Capital Cost Component (Millions of 1995 Dollars) 9-31

9-19 Operating Cost Component (Millions of 1995 Dollars) 9-32

9-20 Overall Schedule 9-33

9-21 Unit Process: Sequence of Construction (Calendar Year Start/Completion Date) 9-34

9-22 Construction Equipment Schedule (Units) 9-35

9-23 Comparison of Alternatives by Average Radiation Dose at Facility (millirems) 9-36

9-24 Overall Schedule 9-37

9-25 Construction Type by Duration (Percent of Construction) 9-38

9-26 Cesium and Strontium Capsule Cut-Up Cell Project Cost Summary 9-39

9-27 Cost Comparison - Low-Level Waste Vitrification and Grout 9-40

9-28 Low-Level Waste Grout Facility Costs 9-40

10-1 Table/Figure Key 10-1

LIST OF TERMS

ALARA	as low as reasonably achievable
APM	Ammonium Phosphomolybdate
BUSS	beneficial uses shipping system
CMPO	octylphenyl-N, N-diisobutylcarbamoylmethylphosphine oxide
CST	Crystalline Silicotitanate
CVS	Composition Variability Study
DOE	U.S. Department of Energy
DSSF	double-shell slurry feed
DST	double-shell tank
DTPA	diethylenetriaminepentaacetic acid
EDTA	ethylenediaminetetraacetic acid
EIS	Environmental Impact Statement
ESP	Extensive Separations Pretreatment (alternative)
gpm	gallons per minute
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste
HVAC	heating, ventilating, and air conditioning
LLW	low-level waste
m	meter
M	molar
m^2	square meter
m^3	cubic meter
MPC	multi-purpose canister
NOI	Notice of Intent
NRC	U.S. Nuclear Regulatory Commission
PUREX	plutonium uranium extraction
RCRA	*Resource Conservation and Recovery Act*
SST	single-shell tank
TBP	tributyl phosphate
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
TRUEX	transuranic extraction
VROM	Very Rough Order of Magnitude
WESF	Waste Encapsulation and Storage Facility

1.0 INTRODUCTION

In accordance with the National Environmental Policy Act of 1969, an environmental impact statement is required for disposal of the radioactive waste stored in 177 underground storage tanks at the Hanford Site. On January 28, 1994, the U.S. Department of Energy (DOE) announced by a Notice of Intent (NOI) in the Federal Register that an environmental impact statement (EIS) would be prepared for the disposal of waste in 177 underground storage tanks and the approximately 2,000 cesium and strontium capsules at the Hanford Site. The purpose of the EIS is to identify and evaluate the impacts of the proposed actions in the recently amended *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1994).

The Tank Waste Remediation System organization of the Westinghouse Hanford Company has been assigned the task of preparing the EIS. The Tank Waste Remediation System has established an outline for the EIS stating that it will encompass the following five alternatives:

No disposal action
In situ disposal
Extensive separations pretreatment
No separations
Tri-Party Agreement preferred alternative.

In addition to the five alternatives listed above, three other data packages will be created. They address the following:

Waste retrieval and transfer
Tank closure
Disposition of cesium and strontium capsules.

Engineering data will be provided in the form of tables and figures to the Jacobs Engineering Company. The data will be equivalent to the data prepared for the *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes* (DOE 1987) and the *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste - Environmental Impact Statement* (RHO 1985), plus any additional information the Jacobs Engineering Company requests. All data will be compiled into individual data packages.

This document is the data package for the Extensive Separations Pretreatment alternative.

This page intentionally left blank.

2.0 SCOPE

The Extensive Separations Pretreatment alternative data package includes waste treatment operations that would take place between waste retrieval and transfer and closure of single-shell tanks (SSTs) and double-shell tanks (DSTs). Retrieval and transfer and tank closure are not covered here but are addressed in a separate data package.

This data package includes two options for disposing of the cesium and strontium capsules and two options for treating low-level waste (LLW).

- After the strontium and cesium capsules have been returned to the Hanford Site, Option 1 assumes that the capsules would be repackaged if necessary, overpacked, and sent to a geologic repository for final disposal. This option is the same as that assumed in the Tri-Party Agreement preferred alternative. No impacts or costs for this option are included.

- In Option 2, strontium and cesium would be processed and distributed into high-level waste glass. The process and the characteristics of HLW for Options 1 and 2 are addressed.

- In Option A, LLW would be vitrified and placed into a retrievable sulfur matrix. This option is the same as that assumed in the Tri-Party Agreement alternative.

- In Option B, LLW would be placed retrievably into a grout matrix in removable tubes in concrete vaults.

The data package addresses the impacts of the following three integrated combinations of the above options:

- Option 1 and Option A (or Option 1A). This combination of cesium and strontium capsule overpacking and LLW Option A glass is the same combination of options as that assumed in the Tri-Party Agreement preferred alternative. The combination is designated as the Extensive Separations Pretreatment (ESP) or Extensive Separations alternative. Section 9.0 data tables contain the results of combining these two options. No impacts or costs from capsule overpacking activity are included. For information on capsule overpacking impacts and costs, refer to *Disposition of Cesium and Strontium Capsules Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement* (Nankani 1995).

- Option 2 and Option A (or Option 2A). This combination of cesium and strontium capsule blending and LLW Option A glass would process and distribute cesium and strontium uniformly into HLW glass. The process and the characteristics of HLW glass with blended cesium and strontium are addressed in combination with the treatment of LLW to produce a glass-sulfur matrix. The combination is designated as HLW Option 2 capsule blending. The difference in impacts and costs between this and the Extensive Separations alternative are discussed in Section 9.1, but the results are not included in Section 9.0 data tables.

- Option 1 and Option B (or Option 1B). This combination of cesium and strontium capsule overpacking and LLW Option B grout would place LLW into a grout matrix in combination without blending of cesium and strontium from capsules into HLW glass. This combination is designated as LLW Option B grout. The difference in impacts and costs between this and the Extensive Separations alternative are discussed in Section 9.2, but the results are not included in Section 9.0 data tables.

The impacts from the fourth possible combination, that of Option 2 and Option B, are not addressed in this data package.

3.0 OVERVIEW OF THE EXTENSIVE SEPARATIONS PRETREATMENT ALTERNATIVE

The purpose of the Extensive Separations Pretreatment (ESP) alternative is to process tank wastes to reduce the amount of high-level waste (HLW) to less than 1,000 glass canisters (625 cubic meters [m^3] measuring 0.61 meters [m] diameter by 3.05 m long at 0.62 m^3 each) and to reduce the curie loading of the low-level waste (LLW) to U.S. Nuclear Regulatory Commission (NRC) Class A or as low as reasonably achievable (ALARA), whichever is lower. There were no radiation criteria applied to the LLW canisters. However, the LLW processing facility would be designed to be contact operated and maintained. The technical uncertainty of the processing steps is intended to be reduced through innovative research and development.

The generic outline for the ESP alternative is shown in Figure 3-1. A brief description follows.

3.1 MANAGE TANK WASTES

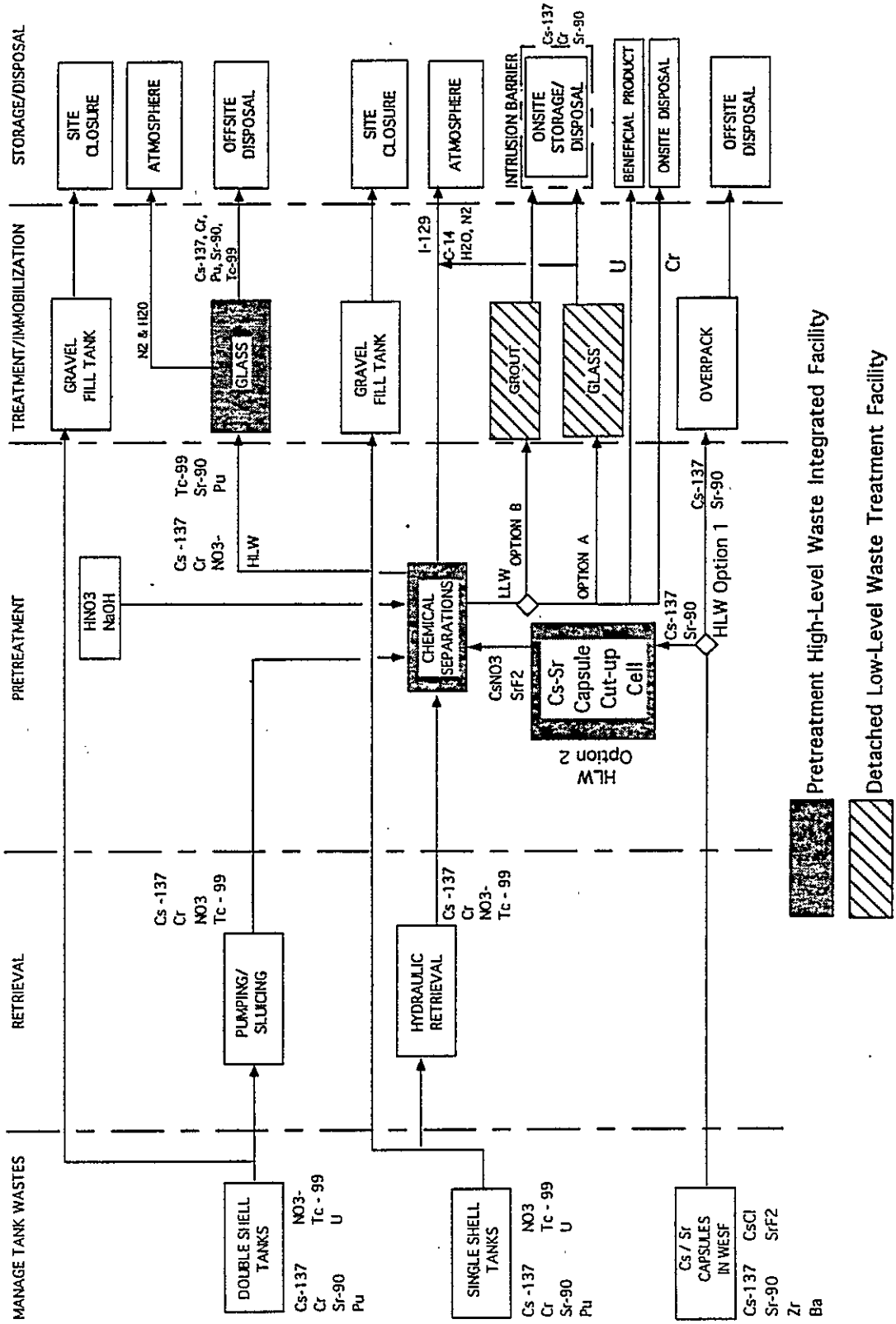
The characterization of tank wastes would provide data to support tank remediation. All salt-well pumping activities for single-shell tanks (SSTs) would be completed, and existing and future dilute liquid waste would be evaporated to increase available double-shell tank (DST) space.

3.2 RETRIEVAL

The majority of DST waste would be extracted from the tanks by slurry pumping. Hydraulic sluicing would be used to extract the majority of the waste from SSTs for transfer to DSTs. All SST waste would be removed by 2018. Retrieval efficiency would be 99 percent for SSTs and higher for DSTs.

It should be noted that material balances for the facilities are based on 100 percent waste retrieval. This was considered to be a conservative estimate for equipment sizes, facility releases, amount of final waste forms, and the curie and chemical content of final waste forms. Environmental impacts of tank residues are discussed in the *Waste Retrieval and Transfer Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement* (Fredenburg 1995) and the *Closure Technical Data Package for the Tank Waste Remediation System Environmental Impact Statement* (Scanlon et al. 1995).

Figure 3-1. Disposal of Tank Waste Extensive Separations Pretreatment Alternative.



3.3 PRETREATMENT

A pretreatment facility would be constructed to separate wastes into low-level and high-level fractions. The proposed separation processes would include the following:

- Sludge washing to remove the water soluble fraction from the insoluble fraction
- Leaching with sodium hydroxide solution to decrease the high-level solids fraction
- Acid dissolution and solids recycling to dissolve as many of the high-level solids as possible
- Solvent extracting and ion exchanging of acidic solutions to concentrate the high-level radionuclides
- Ion exchanging to remove cesium, strontium, and technetium from the alkaline low-level fraction
- Recycling of water, nitric acid, and sodium hydroxide to reduce low-level waste volumes.

3.4 TREATMENT/IMMOBILIZATION

Both LLW and HLW fractions would be converted into glass. The HLW would be placed in disposal canisters and might need onsite storage for some time before being shipping offsite for permanent disposal. A HLW canister storage building would be provided near the pretreatment facility. The LLW glass would require lag storage before final disposal.

This data package describes two facilities: an integrated pretreatment and HLW vitrification facility and a detached LLW vitrification facility. Interim storage for all HLW glass produced in the facility's lifetime will be estimated. This data package will also consider substituting a LLW grout facility for the LLW vitrification facility (see Section 2.0).

3.5 STORAGE/DISPOSAL

The HLW fraction would be sent offsite to a geologic repository for final disposal. The LLW fraction would be disposed of onsite near the surface in a retrievable form.

This data package assumes that LLW would be disposed of onsite in 5,300 m^3 vaults in a polymer/sulfur matrix (glass) or in a grout matrix. Criteria in the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994) state:

> "There shall be engineered features to allow for retrieval of the glass product in a sulfur cement matrix form OR in bulk glass form stored in 10 m^3 [cubic meter] casks."

Alternately the LLW would be placed retrievably into a grout matrix in removable tubes in the concrete vaults.

4.0 PROCESS DESCRIPTION

The process strategy for the example Extensive Separations Pretreatment (ESP) flowsheets are compared in Figure 4-1 with the Tri-Party Agreement preferred alternative.

The Tri-Party Agreement alternative would use only three unit processes to separate the solids from the water solubles, to reduce the solids volume by sodium hydroxide leach, and to reduce the cesium in the alkaline low-level waste (LLW) to U. S. Nuclear Regulatory Commission (NRC) Class C limits.

The ESP alternative would be more complex, requiring 15 processing systems to reduce the high-level waste (HLW) volume and the radionuclide content of the LLW to NRC Class A limits. In HLW Option 2 capsule blending, unit processes would be added to dissolve the cesium chloride in water and exchange the chloride for nitrate.

A simplified ESP processing flowsheet is shown in Figure 4-2. The strategy would be to successively leach the solids with water, sodium hydroxide solution, nitric acid, and acidic fluoride solution to dissolve as much of the bulk inert constituents as possible. The acidic solutions would then be treated by solvent extraction and ion exchange to remove the radionuclides from the nonradioactive bulk materials. The alkaline solutions obtained by solids separation and water leaching of the solids would be treated by ion exchange to remove cesium, strontium, and technetium. Water, nitric acid, and sodium hydroxide would be recovered for recycling. The purified radionuclides would be combined to make HLW glass. After nitrate destruction to recycle sodium hydroxide, the acidic and alkaline bulk materials would be combined to make LLW glass.

The optional processes of chromium reduction and removal and the Clean Salt process shown in Figure 4-2 are discussed in Sections 4.7.5 and D23.0 respectively. The optional iodine recovery process is discussed by Boldt (1995).

Block diagrams for LLW vitrification and for LLW Option B grout are shown in Figure 4-3. The LLW Option B grout may require an additional unit process to remove chromium before making grout (see Section 4.7.5).

The extensive processing unit operations described in this section are as follows:

Separate and Dissolve Solids

- Separate and wash sludge
- Leach sludge with sodium hydroxide
- Dissolve sludge with nitric acid
- Dissolve sludge with nitric acid containing fluoride.

Figure 4-1. Process Strategy Flowsheet Comparison.

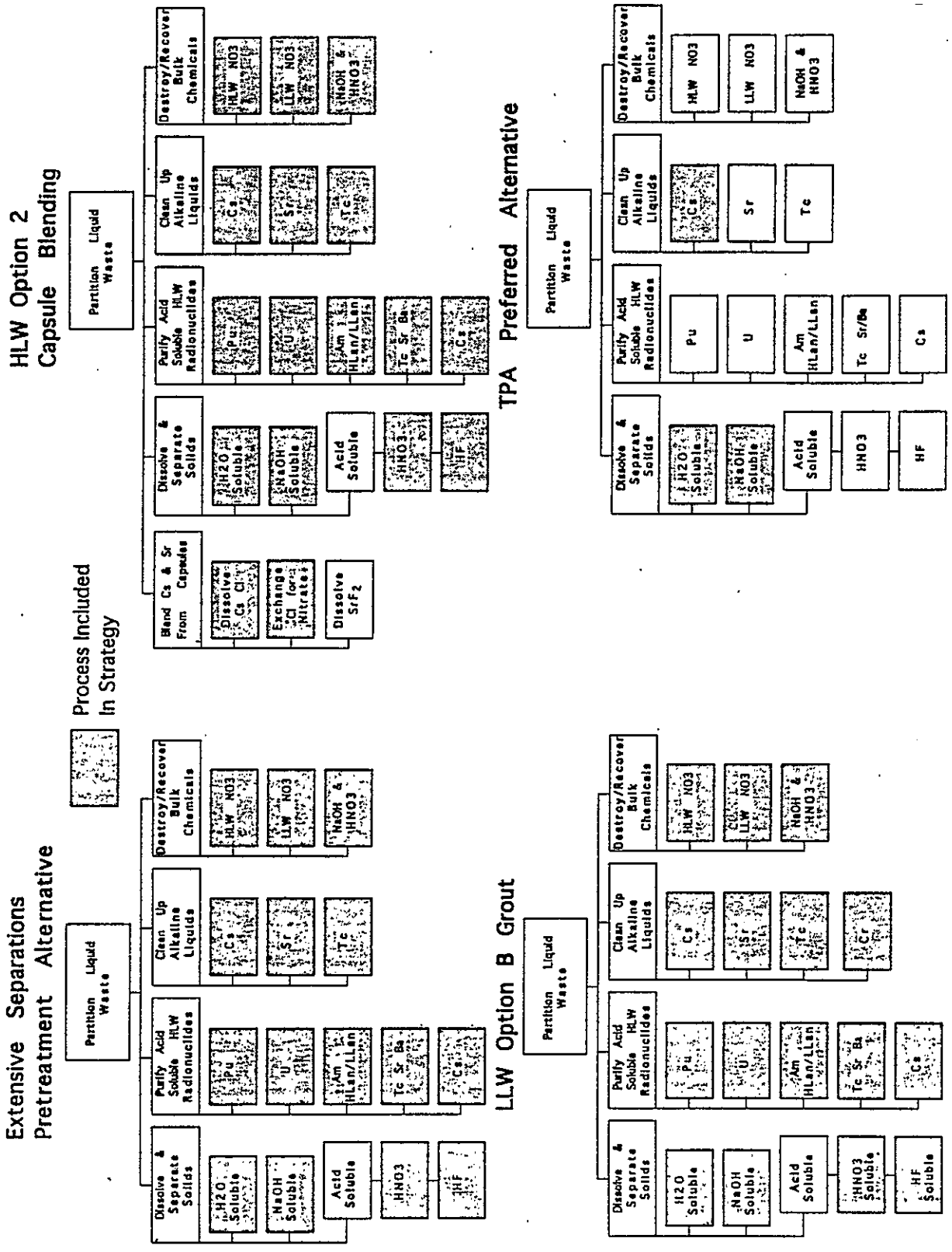


Figure 4-2. Block Diagram of Extensive Separations Processing Flowsheet.

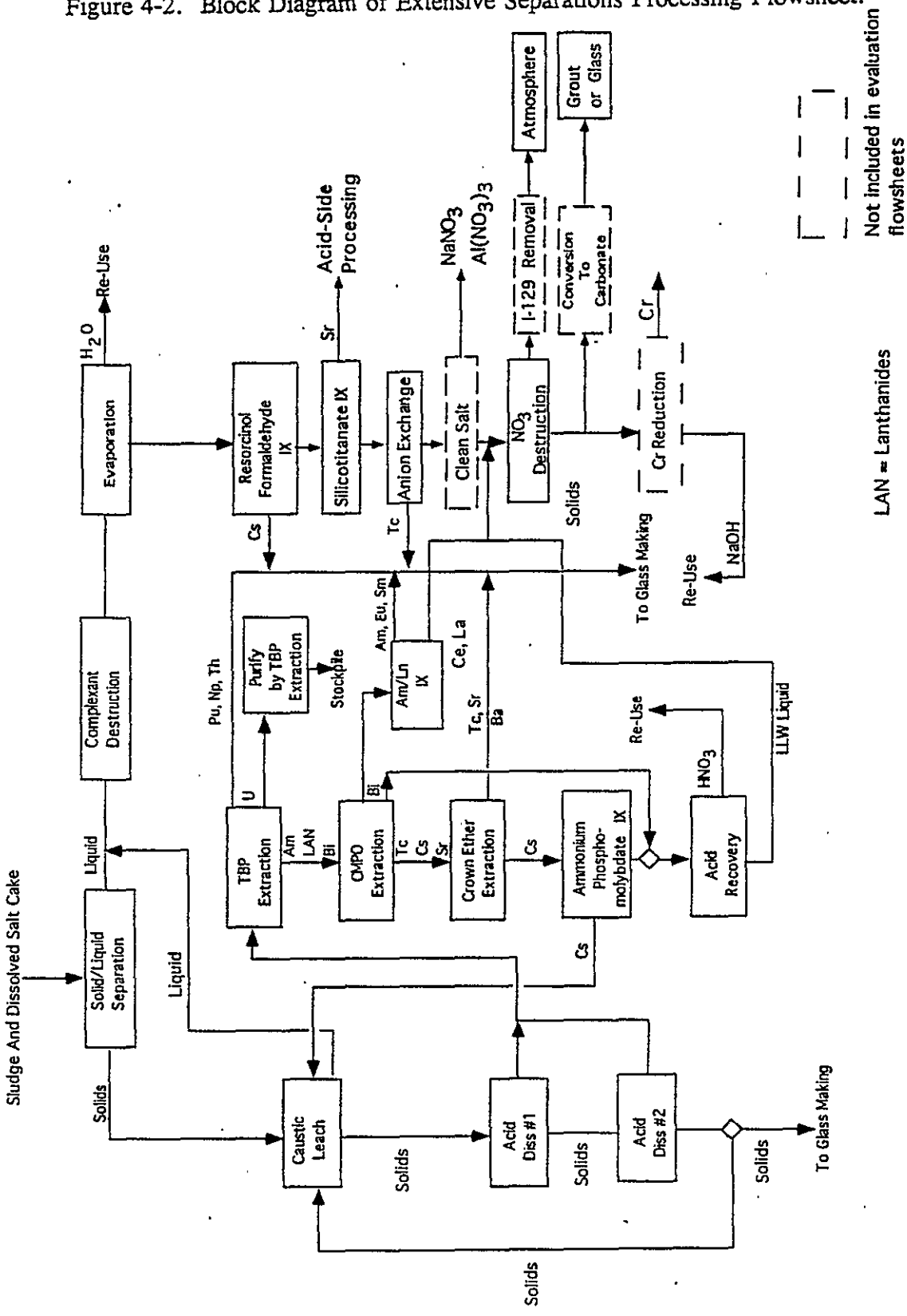
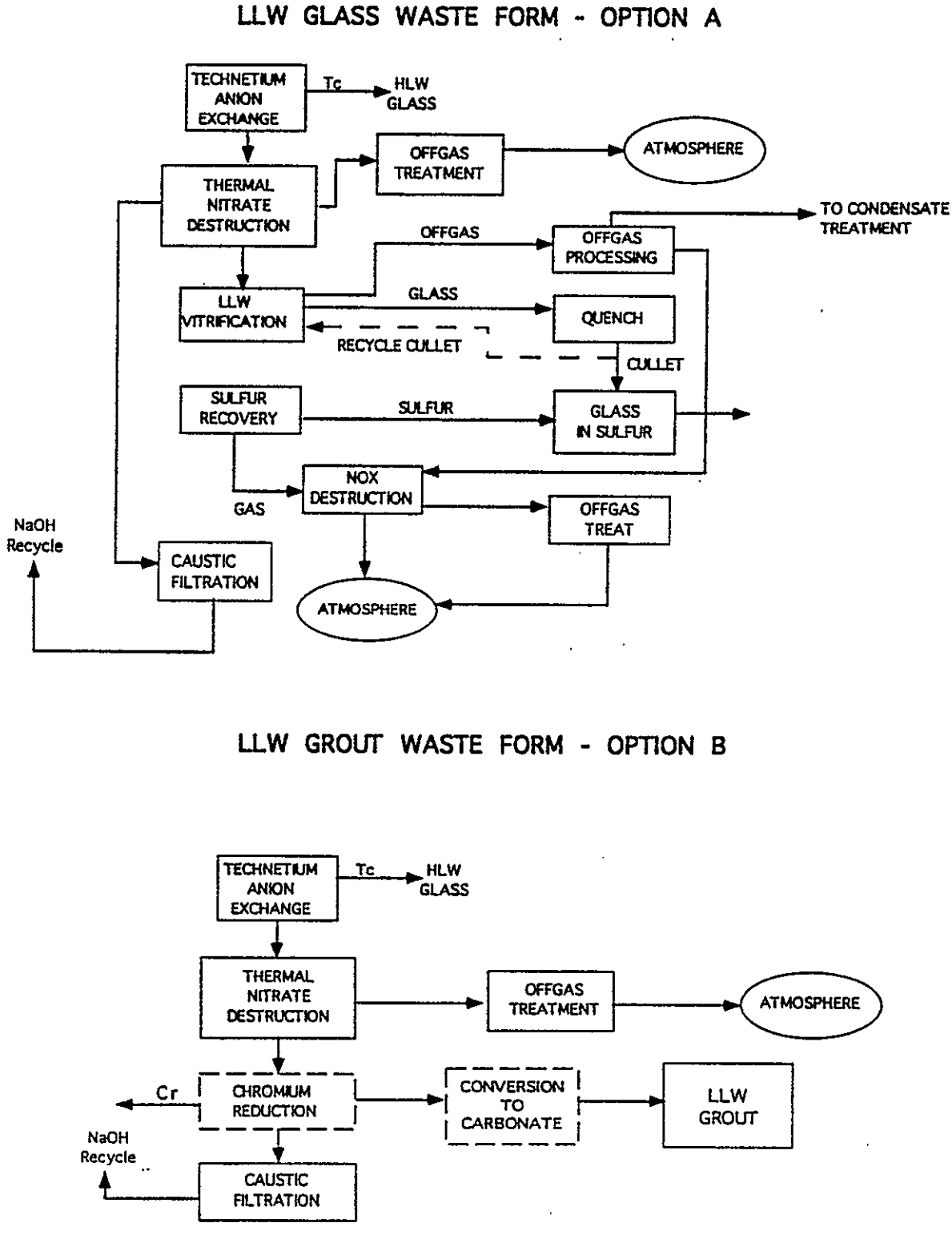


Figure 4-3. Low-Level Waste Glass and Grout Treatments for the Extensive Separations Pretreatment Alternative.



Purify Acid Soluble Radionuclides

- Extract uranium, plutonium, neptunium, and thorium with tributyl phosphate
  - Purify uranium with tributyl phosphate
- Extract americium and lanthanides with octylphenyl-N, N-diisobutylcarbamoylmethylphosphine oxide (CMPO)
  - Purify americium and higher lanthanides by chromatographic ion exchange
- Extract technetium, strontium, and barium with a crown ether compound
- Remove and recycle cesium by ammonium phosphomolybdate sorption

Remove Radionuclides from Alkaline Liquids

- Destroy complexants hydrothermally
- Remove cesium by resorcinol formaldehyde IX
- Remove and recycle strontium by crystalline silicotitanate IX
- Remove technetium by anion exchange

Recover and Reuse Bulk Chemicals

- Evaporate and reuse water
- Distill fractionate and reuse nitric acid
- Destroy nitrate by calcination or electrolysis
- Recover and recycle sodium hydroxide

Remove Heavy Metals

- Chromium reduction and removal from recycled sodium hydroxide may be included for the LLW grout treatment option (see Section 4.7.5).

4.1 DIFFERENCES BETWEEN THE EXTENSIVE SEPARATIONS ALTERNATIVE AND THE CLEAN OPTION

The purpose of Extensive Separations Pretreatment is the same as the CLEAN Option (Swanson 1993), that is, to produce a low volume of HLW glass and LLW that meets NRC Class A specifications.

During the process design, the following differences were introduced into the ESP flowsheet design:

- The strontium - barium chromatographic separation was deleted because the reference feed stream contained much less barium than Swanson had assumed. This deletion would cause no apparent significant impact on the HLW glass volume.

- The supercritical water oxidation was replaced by the widely used Zimpro process, which uses a lower temperature and pressure for organic destruction. This choice was supported by the Initial Pretreatment Module Organic/Ferrocyanide Technology's Selection Panel's selection of low temperature hydrothermal/wet air oxidation processing as the technology to be held as a backup for safety issue resolution (Beeman 1994).

- The generic LLW thermal denitration process was implemented by gas-fired calcination. For LLW Option B grout, the gas-fired process has the capability of mixing the gaseous combustion products with the calcined product to produce sodium carbonate, a less hazardous material for LLW grout. Unfortunately, this action could not be implemented because it was incompatible with the recycle of sodium hydroxide. If desired, it should be possible in the future to produce carbon dioxide by destruction of formic acid and to convert the sodium hydroxide to sodium carbonate before making grout.

- The chelating ion exchange process for removing traces of strontium from the alkaline LLW stream before calcination was replaced by a crystalline sodium silicotitanate ion exchange, which is still in an early stage of development. The chelating ion exchanger would have been regenerated and reused several times, removing only strontium. The silicotitanate process also picks up traces of cesium and plutonium that would produce an NRC Class A stream from this process. The silicotitanate, loaded with irreversibly sorbed radionuclides, is then recycled to the head end, where it is dissolved by nitric acid, returning the radionuclides to HLW and the ion exchanger components to LLW.

4.2 WASTE STREAM

The masses, concentrations, and compositions of major process streams are presented in Appendix A. Component names have been adapted from the *Tank Waste Technical Options Report* (Boomer et al. 1993). The names often do not describe the expected chemical form of the elements or compounds. For example, silicon might exist as SiO_2 or silicate minerals in the solid phase or as the silicate anion or silicic acid in solution, but it is described in the set as Si+4, which would not exist in the materials dealt with during tank waste processing. Similarly, Total Organic Carbon (TOC) represents total organic carbon and is arbitrarily

assigned a molecular weight equal to the atomic weight of carbon. Such component names describe the occurrence of an element where often the actual chemical and physical forms are unknown. To perform the calculations supporting this report, all that is required is to maintain a mass balance, which is often achieved by using a stand-in component formula such as Si+4 and TOC.

The waste feed stream representing the Hanford Site single-shell tanks (SSTs) and double-shell tanks (DSTs) is primarily a $NaNO_3$---$NaNO_2$-Na_3PO_4-Na_2CO_3-Na_2SO_4 mixture with substantial aluminum in the supernatant (presumably as the aluminate anion) and as a precipitate (presumably as an aluminum hydroxide or an aluminosilicate). In the supernatant, sodium is the dominant cation with a mole concentration more than 50 times greater than the next most abundant cation, potassium. It is assumed that the solid phase would include primarily the sodium aluminosilicate cancrinite, nickel ferrocyanide, and an aluminum-uranium-zirconium-sodium-bismuth-calcium-chromium-iron-strontium cation mixture balanced by the principal anions phosphate, hydroxide, nitrate, and carbonate.

4.2.1 Supernatant

The supernatant stream would be subjected to the elevated temperatures and pressures of the Zimpro process (i.e., a calcination process) to destroy most of the organics including complexants that are assumed to hold some otherwise insoluble species in solution. It is assumed that the organic destruction step would destroy 99 percent of the complexants and cause some species in the supernatant to precipitate to form corresponding solid species. It is also assumed that a major fraction of aluminum would be precipitated.

The fraction of complexants that would survive calcination may complex the elements that it is desired to precipitate, but the Zimpro process can be readily adjusted to achieve a higher degree of destruction. The process performance assumptions are further described in Section 5.0 and Appendix D.

4.2.2 Sludge

Section 5.0 and Appendix D describe characteristics and assumptions pertaining to the solid portion of the waste stream (sludge), including acid dissolution of the solids for the ESP alternative. The assumed solids in the waste feed would be an aluminum-sodium-bismuth-calcium-chromium-iron-zirconium-uranium mixture of hydroxides, phosphates, carbonates, and nitrates.

The ESP alternative would use three dissolution steps and undissolved sludge recycling to minimize the amount of sludge routed to HLW. One cycle would involve sequential sludge processing, including sodium hydroxide leach, nitric acid/oxalic acid dissolution, and nitric

acid/hydrofluoric acid dissolution. Solid-liquid separation would occur after each step. The sodium hydroxide leach step is assumed to dissolve significant amounts of cancrinite and metathesize nickel ferrocyanide [$Ni_2Fe(CN)_6$] if present.

In the ESP alternative flowsheet simulation model, most of the undissolved solids from the second acid dissolution step would be returned for sodium hydroxide leaching to begin another dissolution cycle. Five percent of the remaining solids would be diverted to HLW treatment, and the remainder would be recycled to the sodium hydroxide dissolution step.

Nearly all species other than cancrinite would be dissolved completely. The undissolved solids that would result would be relatively enhanced in cancrinite and nickel ferrocyanide because of the assumed dissolution characteristics. The actual undissolved solids also would contain contributions from process recycle streams; for example, crystalline sodium silicotitanate would be routed from alkaline stream processing. It would not dissolve in the nitric acid dissolution step but would probably dissolve in the subsequent acidic fluoride dissolution step.

4.3 HIGH- AND LOW-LEVEL WASTE STREAMS

Both process strategies (ESP and Tri-Party Agreement preferred alternatives) produce waste fractions that would be recombined into HLW and LLW mixtures. Only the ESP alternative would produce a purified uranium stream for shipment to national stockpiles. Bulk chemical recovery would be used for recycling within the process flowsheet. The discussion that follows considers the HLW and LLW streams and compositions relative to the objectives of each process strategy.

4.3.1 Low-Level Streams and Compositions Relative to Each Process Strategy

Tables 9-1A through 9-1D show the HLW and LLW glass/grout radionuclide fractions and glass compositions for each process strategy. Note that the ESP alternative has a concentrated HLW glass stream that is high in strontium, aluminum, silicon, sodium, barium, and thorium oxides.

The ESP alternative process strategy would reduce the amount of ^{90}Sr in the LLW to a level less than the NRC Class A limit (0.04 curies per cubic meter). Other major radionuclides requiring significant removal to meet NRC Class A limits include ^{137}Cs, ^{239}Pu, and ^{241}Am. A removal process for ^{63}Ni was not added to the ESP alternative flowsheet, but it may be required to meet LLW NRC Class A limits.

The ^{99}Tc, ^{129}I, and ^{238}U could be prime contributors to long-term radioactivity-related risk even at concentrations allowed by the NRC Class A limits. Therefore, in conformance with ALARA (as low as reasonably achievable), the ESP alternative flowsheet includes steps to

reduce these radionuclide concentrations in the LLW fraction. As shown in Table 9-1B, the ESP alternative would reduce the amount of ^{99}Tc and ^{238}U reporting to the LLW. The separated uranium would undergo purification in the ESP alternative so that it could be added to existing uranium stockpiles.

The ESP alternative flowsheet also includes separations to send ^{232}Th and ^{151}Sm to the HLW fraction. Thorium separation is included because thorium is likely to be present in SSTs receiving wastes from irradiated thorium-^{233}U recovery campaigns. Samarium-151 can be routed to HLW where americium is separated from bulk lower-atomic-number lanthanides.

4.4 SOLVENT EXTRACTION

The ESP alternative processing strategy would use three solvent extraction processes: (1) a tributyl phosphate process would remove tetravalent and hexavalent actinides (pentavalent neptunium also would be converted to the hexavalent state for removal); (2) a CMPO process would remove trivalent actinides and trivalent lanthanides; and (3) a crown ether process would remove strontium and technetium. The assumptions in these modeling processes are discussed briefly in Section 5.0 and in more detail in Appendix D.

The solvent composition for the first solvent process would be the same as that usually used in the well-known plutonium-uranium extraction process, that is, 30 percent tributyl phosphate in hydrocarbon diluent. In the first extraction contactor of this tributyl phosphate cycle, uranium, plutonium, neptunium, and thorium would be extracted into the tributyl phosphate organic phase. The extracted plutonium, neptunium, and thorium would be selectively stripped back into an aqueous phase in a second contactor (to be routed to HLW glass for disposal), and the uranium would be stripped in a third contactor.

The raffinate from the first tributyl phosphate cycle would be routed to a CMPO solvent extraction process to remove trivalent lanthanides, americium, and bismuth. The solvent used would be 0.2 molar (M) CMPO + 1.4M tributyl phosphate in hydrocarbon diluent, a typical solvent composition proposed for the transuranic extraction (TRUEX) process. In this extraction step, the lanthanides, americium, and bismuth in the dissolved sludge solution would be extracted by the solvent. The raffinate from this extraction would retain all the cesium, strontium, and technetium and undergo further processing, removing these components. Americium and trivalent actinides would be stripped from the CMPO extract into dilute nitric acid in the second contactor. Bismuth would be retained in the extract and removed from the solvent in a sodium carbonate wash step with added ethylenediaminetetraacetic acid (EDTA) complexant to prevent bismuth precipitation.

The raffinate from the CMPO extraction cycle would contain all of the components of the dissolved sludge solution except the actinides, the lanthanides, and the bismuth. This raffinate would be concentrated by evaporation with subsequent contacting with crown ether

solvent to remove strontium (barium and technetium would also be extracted). The solvent would be stripped to remove the strontium, barium, and technetium. The strip solution would be concentrated by evaporation, then sent to HLW treatment.

4.5 SOLVENT WASTE MINIMIZATION

For solvent extraction operations, evaporation steps downstream of the processes would recover solvent from the aqueous streams that would contact the organic solvents. Where evaporator condensate contains solvent, the condensate would be sent to a decanter, and the organic phase would be recycled to the closest upstream solvent extraction system to minimize discharging solvent to water treatment.

4.6 SODIUM HYDROXIDE AND NITRIC ACID RECYCLE

A major feature of the ESP alternative process strategy would be the recycling of process chemicals (especially sodium hydroxide) to minimize the growth of waste during processing. The ESP alternative flowsheet includes a calcination process, based on work in the EM-50 Underground Storage Tank Integrated Demonstration, as a means of destroying nitrates and nitrites. Calcination also would allow the recovery of sodium hydroxide. Sodium hydroxide would result from the calcination step because of the presence of sodium in the waste being treated (see Section D17.2).

Recycling of nitric acid would not be required to minimize the increase in LLW disposal volume because tank wastes contain large quantities of sodium. However, the ESP alternative flowsheet also would include nitric acid recovery to minimize the release of nitrate destruction products to the atmosphere, to decrease the processing load on calcination and NO_x destruction operations, and to provide flowsheet flexibility for other low-sodium waste streams. The bulk of the nitric acid recovery would occur from recovery of the NO and NO_x that evolve when the concentrated acidic HLW waste solutions are denitrated by reaction with sucrose. Other nitric acid recovery would occur during evaporation steps.

4.7 TREATMENT PROCESS DESCRIPTIONS

The configuration used for costing would consist of two separate facilities: one for integrated pretreatment-HLW vitrification and a second for LLW treatment.

4.7.1 High-Level Waste Vitrification Process

The HLW vitrification portion of the integrated facility would receive HLW from the separation processes. All tankage associated with the HLW process is located within the extensive pretreatment area.

The HLW streams from the separation steps would be combined, and a concentrated nitric acid liquid would be produced by evaporation. Dilute acid vapor from this operation would be sent to acid recovery. The concentrated nitric acid solution and formic acid eluant containing cesium from the resorcinol-formaldehyde ion exchange operation would be mixed and undergo denitration by reaction with sucrose and formic acid.

The denitrated HLW solid slurry would be routed to the HLW centrifuge. The centrifuged HLW solids (assumed 20 wt%) would be sent to the melter feed section, and the liquid would go to a HLW evaporator. The HLW evaporator would concentrate the stream to decrease the amount of water entering the HLW melter. Evaporator bottoms would be routed to the melter feed section.

After sampling, cooling, and necessary adjustments, the process slurry would be transferred to the HLW melter feed system. In HLW Option 2, the liquids from the processing of strontium and cesium capsules would be added at this time.

The melter feed system periodically would receive batches of melter-ready feed slurry containing solids and glass-forming frit from the feed preparation system. The melter feed system would provide continuous and controlled delivery of prepared melter feed slurry to the melter system.

A high-temperature or stirred melter would convert the incoming feed slurry into molten borosilicate glass containing about 55 wt% waste oxides. Volatilized melter feed components would form a separate offgas stream that would pass overhead. The hot glass would be semi-continuously poured into cylindrical, stainless steel canisters measuring 0.61 meters (m) diameter by 3.05 m long at 0.62 cubic meters (m^3) each.

Glass-filled canisters would be plugged and welded closed before they were decontaminated to remove exterior contamination. The spent decontamination liquids would be accumulated and recycled to the feed preparation system for evaporation of excess water and recovery of contaminants. The decontaminated canisters, filled with monolithic HLW glass, would be placed into an overpack container (four canisters per overpack). The overpack containers would be transferred from the integrated pretreatment-HLW vitrification facility to interim storage onsite while waiting for shipment to a federal geologic repository.

The HLW melter offgas systems would receive hot combustion gases from the melter. The quenching of the offgases by countercurrent contact with cool scrub water would remove most of the entrained particulates and water-soluble contaminants and condense much of the water vapor. Excess condensates from the HLW melter offgas systems would be recycled to the HLW feed preparation system to be reevaporated. Excess process condensates would be continuously purged to the process liquid waste system while quenched offgases would pass through a mist eliminator and multiple stages of high-efficiency filtration where most remaining radionuclides would be captured. The scrubbed melter offgases would flow to a sulfur dioxide adsorption process and a catalytic NO_x destruction reactor before finally being discharged to the heating, ventilating, and air conditioning (HVAC) system. The recovered

sulfur dioxide would be converted into elemental sulfur by a Claus unit that would discharge its product to the LLW facility to be used in sulfur mixing for cullet disposal. The treated melter offgas would combine with vessel offgas before passing through NO_x abatement equipment enroute to the HVAC system.

4.7.2 The Low-Level Waste Vitrification Process

This configuration would be similar to the 2A vitrification plant design in the combined separations and low-level waste vitrification - high decontamination factor and low source term process that is outlined in the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994).

Evaporator bottoms would be sampled, cooled, and adjusted if necessary before being transferred to the LLW melter feed system. The liquid melter feed and dry glass formers would be fed into a combustion melter where the streams would combine and melt into liquid glass. The glass would exit the melter, pass through a quenching and crushing stage, and enter a cullet quench tank. The glass would cool further in the quench-tank water resulting in pea-sized fractured glass or cullet. The cullet would be sent to a lag storage area where it would be analyzed to ensure that it met product specifications. If the glass failed, it would be recycled back to the melter. If it passed, it would be combined with a sulfur/polymer mixture that facilitates transport of the cullet to near-surface vaults for disposal.

The LLW melter offgas system would receive hot combustion gases from the glass separator section of the melter. The offgases include volatile radionuclides (e.g., iodine, radiocarbon, cesium, and technetium) and volatile hazardous metals and/or their oxides. The quenching of offgases by countercurrent contact with cool scrub water would remove most of the entrained particulates and water-soluble contaminants and condense much of the water vapor. Excess condensates from the LLW melter offgas system would be recycled to the LLW feed preparation system for reevaporation. The scrubbed melter offgases would be cooled and passed through successive stages of filtration before flowing to a sulfur dioxide adsorption process and a catalytic de-NO_x reactor and finally discharging to the HVAC system. The recovered sulfur dioxide would be converted into elemental sulfur by a Claus unit that would discharge its product to LLW cullet and sulfur mixing.

4.7.3 The Low-Level Waste Grout Process

The LLW stream routed to the grout process would have undergone calcination to destroy nitrates/nitrites and may also have included chromium reduction and removal in the pretreatment separations processes (see Section 4.7.5). These processes would reduce the nitrate and chromium hazards for the grout product.

The concept for the salt grout process is to mix a waste slurry with cementitious materials to form a grout that can be pumped into removable tubes placed retrievably onsite in

underground concrete vaults (5,300 m^3 volume). The grout formulation is 1,100 grams dry mix or blend per 1 liter waste. The dry mix used in the grout flowsheet consists of 40 wt% limestone, 28 wt% fly ash, 28 wt% slag, and 4 wt% Portland cement (Hendrickson 1992 and Serny et al. 1989). Grout formulations to date have been limited to 3M total nitrate and nitrite in the feed along with a 5M sodium content. These two constraints are present in the grout flowsheet.

Lokken (1993) demonstrated acceptable grouts made with Tank 106-AN waste simulants, and Welsh (1993) reported on acceptable grouts made with radioactive waste taken from Tank 106-AN. The waste that was in Tank 106-AN is currently residing in Tank 102-AP. This established that an acceptable grout, which passed all requirements (Riebling 1991) including those for chromium, could be made from a specific tank waste.

It is important to note that the dry mix formulation given in Lokken (1992, 1993) and Welsh (1993), will probably not meet minimum criteria given in Riebling (1991) for the wastes proposed for grouting in the ESP flowsheet. These and other formulations were designed for 102-AP waste. The waste in the ESP flowsheet is chemically much different than that found in Tank 102-AP.

Two generally referenced grout formulas are shown below.

1. 21% cement, 68% fly ash, and 11% clay

2. 4% cement, 28% fly ash, 28% blast furnace slag, and 40% limestone (used in the grout flowsheet)

Formula 1 was designed to release heat early in the curing process, and it is the final formula chosen for grouting double-shell slurry feed (DSSF) waste in Tank-102-AP. Formula 2 performed poorly at higher temperatures and was in danger of not meeting new minimum strength requirements (500 pounds per square inch) when it was abandoned (Lokken 1992). None of the formulas tested may meet performance standards for strength or leach resistance if used with substantially different waste.

The cost of setting up and performing a grout formula development effort was approximately two million dollars. It took about two years to develop each dry mix formula. In general, there may be different formulas required for each waste that exceeds 15 percent compositional variation compared to the waste contained in Tank 102-AP. Efforts to develop a "universal" dry mix formulation for many types of tank waste were considered, but funds were not available at the time to expand the waste acceptability envelope.

4.7.4 Strontium and Cesium Capsule Dissolution

In HLW Option 2 of the ESP alternative, the strontium and cesium capsules would be disassembled and distributed uniformly into the HLW melter feed (see Section D15.0).

After cutting the ends off the capsules, the strontium fluoride (SrF_2) solid would be mechanically shaken out of the shells and distributed uniformly into the HLW melter feed stream. Cesium chloride (CsCl) would be dissolved from the capsules with water. The shells from both cesium and strontium capsules would be rinsed with water or dilute acid and combined with the LLW NRC Class A waste form. The cesium chloride solution would be metathesized by passing it over an anion exchange bed in the hydroxide form, with nearly quantitative replacement of chloride by hydroxide. The cesium nitrate ($CsNO_3$) solution would be distributed uniformly into the HLW melter feed, and the chloride-loaded ion exchanger would be included in the feed to the LLW melter. It would not directly affect the volume of HLW glass.

4.7.5 Chromium Reduction And Removal

An optional chromium reduction (Cr+6 to Cr+3) and removal process was included in the ESP flowsheet to allow production of a low-chromium LLW stream for the grout treatment option reducing the LLW chromium leaching hazard. It would also reduce the amount of chromium flowing through the processing system. The resulting chromium product stream would require disposal as a radioactive mixed waste stream.

Chromium removal would not directly affect the volume of HLW glass because the soluble Cr+6 would normally have left the system dissolved in the LLW solution. Nevertheless the centrifuge that removed the Cr+3 would also greatly reduce the volume of HLW glass by removing other solids from the recycle sodium hydroxide stream. These solids have already been decontaminated to NRC Class A levels but still contain chemical impurities such as P_2O_5 which have very low concentration limits in HLW glass.

Alternatively, grout research (Scheetz 1993) has shown that when appropriate grout formulas are used, which include blast furnace slag, the slag provides the reducing agent to change Cr+6 to Cr+3 as the grout cures. The reduction takes about two months to complete. This tends to reduce the toxicity of any leachate coming from the grout, because Cr+3 is less soluble than the Cr+6. When formulated correctly, the grout will easily pass 40 CFR 268.41, the Toxicity Characteristic Leaching Procedure (TCLP) a test used to simulate leaching from a landfill and have a high chromium leach resistance, as tested by ANSI 16.1. Thus, the need for separate chromium reduction and removal would be unnecessary.

Another factor in the decision to precipitate Cr+6 to Cr+3 prior to grouting is the result of the analysis of the environmental system given in the Grout Performance Assessment (Kincaid et al. 1994). Kincaid modeled chromium in the grout disposal system (without using a separate reduction step) and found no concerns with chromium leaching. If the apparent inventory of chromium in the waste dramatically increases due to new tank waste inventory information, the performance assessment analysis may have to be reexamined. However, because of the excellent retention of chromium in the grout, as tested by ANSI 16.1, it is doubtful that chromium would be a concern for the performance assessment.

To address the issues of chromium removal, the ESP flowsheet calculations included a grout product calculation with and without the prior chromium reduction and removal process. Based on the CLEAN process flowsheet (Swanson 1993), a 1.5M NH_2OH reductant would be used to reduce soluble Cr+6 to insoluble Cr+3 in the reduction process. The reaction extent was assumed to achieve 99 percent chromium reduction.

Chromium-bearing wastes are regulated as dangerous waste based on an extract concentration of >5 milligram per liter taken from the TCLP. If the chromium waste can be treated to reduce chromium below 5 mg/l in accordance with the land disposal restrictions of 40 CFR 268, and delisted per 40 CFR 260.22, the waste may be exempted from regulation under the state *Resource Conservation and Recovery Act* (RCRA) (1976) program. Then disposal would also be allowed in a non-RCRA Subtitle C disposal facility. How the chromium waste stream will be managed from a regulatory aspect (i.e., whether to pursue delisting) must be determined. The limits for chromium are the same for hazardous or mixed hazardous/radioactive waste.

Regulatory requirements for chromium disposal state that if the waste leach tests meet the requirement of below 5 milligram per liter total chromium using the TCLP test, and meet other RCRA requirements, regulators will allow on-site RCRA disposal. Negotiations may be needed to determine the frequency of product testing to assure that the TCLP limit is being met. This negotiation of testing frequency may be needed even using separate chromium reduction/removal and grouting unit operations, so there is not a quantifiable difference in the costs for testing. The cost savings for deleting the chromium precipitation and solids separations step may be significant. If centrifuges are used to separate the solids from the liquids (as performed in Hanford B-plant operations), the process may be prone to breakdowns and may be labor intensive, which may also include dose impacts to personnel. An alternate method for solid separation is to use filtration. Or, if the solids and liquids are both routed to grout, then it may be reasonable to settle the solids and recover the supernatant for reuse.

4.7.5.1 Chromium Options And Impacts. The first and main concept for chromium disposal would split the LLW stream into two streams. The first and larger stream would be grouted. The second and smaller stream would be recycled to the rest of the process for reuse. Chromium would be removed from the recycle stream and placed into the main waste stream going to grout. This would allow a clean recycle stream to the rest of the process. The upper limit for chromium concentration in the grout is listed in Hendrickson (1992) as 21,000 parts per million. Therefore, the additional chromium is not anticipated to be a concern with attainment of TCLP criteria (see Section 4.7.5).

The impact of this first chromium disposal concept is that the additional treatment and mixing equipment needed for the addition of chemicals to the sodium hydroxide recycle stream and the solid/liquid separation equipment needed to remove the precipitated chromium from the alkaline liquid would have to be included in the process, along with the addition of mixing equipment for the reintroduction of precipitated chromium into the main waste stream going to grout. Possible chromium contamination was evaluated in the Grout Performance

Assessment (Kincaid 1993), but chromium was not found to be a concern. However, it is possible that if the chromium inventory is dramatically increased based on tank inventory studies currently underway, the performance assessment would need to be reexamined.

The second concept for chromium disposal would separate all or part of the chromium from the waste stream by reduction. The precipitated chromium would then be mixed with cementitious materials to form a grout that can be pumped into (or mixed in) 55-gallon drums. This chromium could also be sent to a private, or offsite waste treatment facility for treatment. These drums would be interim stored onsite until final disposal is available in an onsite or offsite radioactive mixed waste RCRA approved landfill. The grouted waste must pass TCLP tests to be land disposed. If the waste can be delisted and meets all other applicable requirements, it would be possible that this waste could be disposed of in a non-RCRA approved landfill (see discussion in Section 4.7.5).

The impacts of this second chromium disposal concept are that the treatment and mixing equipment needed for the addition of chemicals to the sodium hydroxide recycle stream, and the solid/liquid separation equipment needed to remove the precipitated chromium from the sodium hydroxide liquid would have to be included in the process. The addition of mixing equipment for the introduction of precipitated chromium into the 55-gallon drums being filled with grout would also be required. An alternative would be to provide the chromium to a private contractor for disposal. Costs for interim and final storage at a Department of Energy approved radioactive landfill would be incurred.

If the landfill was onsite, possible long term chromium contamination would have to be evaluated. This was done in the Grout Performance Assessment (Kincaid 1993), and chromium was not found to be a concern with the grout vaults modeled. It is possible that the performance assessment would need to be reexamined if the chromium inventory is dramatically increased, or if the landfill was performed differently than the grout vaults. Offsite disposal would probably require the same performance assessment evaluations to be performed, per DOE 5820.2A, because of the assumption of radioactive contamination of the grout product.

The third concept for chromium disposal would be to remove the chromium by precipitation and put it in the HLW glass. This option would reduce chemical interaction concerns of chromium with grout and other parts of the separation process.

The impact of this third chromium disposal concept is that this option has almost all the equipment and removal unit operations costs and impacts of the second concept, but it would not increase the number of HLW glass canisters above the 800 for the base case in Table A-1a of Appendix A and the HLW glass would remain P_2O_5 limited.

4.7.6 The Role of Recycle in Extensive Separations

Although there are many recycle streams in the ESP flowsheet, they fall into the following three main categories: intraprocess recycle, interprocess recycle of bulk chemicals, and interprocess recycle of radioactives. These recycle categories are discussed below.

4.7.6.1 Intraprocess Recycle. Recycles within a process subsystem are included to meet process subsystem specifications. They generally increase the size of the flows in that process, the size of the head tanks and process equipment, the resulting cost of the facility, and they affect the operability of that process subsystem. Most ion exchange process subsystems recycle wash solutions and other intermediate concentration secondary streams to obtain a single product stream.

4.7.6.2 Interprocess Recycle of Bulk Chemicals. In the ESP flowsheet water, nitric acid and sodium hydroxide are recovered and recycled from the back end of the plant toward the head end to reduce chemical feeds, to reduce the volume and contaminants in liquid effluents, and to reduce the amount of sodium in the solid waste. The bulk recycles of water and HNO_3 are typical of the Hanford PUREX reprocessing plant and strongly affect plant operability, process flows, and plant cost. The recycle of sodium hydroxide would cause even greater difficulty in process operability and plant cost.

4.7.6.3 Interprocess Recycle of Radioactives. The radioactives recycles involve relatively low volume flows and have little effect on plant cost beyond that of the device trapping the material, the accumulation tank, and the pipe for recycle. For example, the recycles of cesium phosphomolybdate and crystalline silicotitanate ion exchanger resins to the sodium hydroxide leach have little effect on total flows and facility cost. Similarly, recycle of less than 10 percent of undissolved solids by trapping in filters will have little effect on plant flows and plant costs. On the other hand, the effect of the efficiency of trapping and number of recycles on achieving total process system performance is great. One small stream added to the feed to the LLW glass or grout can prevent achieving NRC Class A LLW limits by one or two orders of magnitude. One stream that may be only a small fraction of the total solids in the tanks, if added to the HLW glass feed, can easily increase the number of glass canisters by an order of magnitude.

While there would be little effect on facility capital and operating cost, the system objectives would not be achieved.

4.8 UPDATING OF INFORMATION USED FOR PLANT DESIGN AND COST ESTIMATION

Because of the time constraints, preliminary information had to be supplied to equipment designers before all processes had been designed. This resulted in the omission of one

important process step and the undersizing of another. A third difference results from not including the scavenging of additional radionuclides by crystalline silicotitanates. The differences are as follows.

- The thermal denitration, caustic recycle, and chromium removal functions were omitted from the preliminary data provided to the equipment designers.
- The americium-lanthanide separation process equipment is too small to adsorb all of the lanthanides based on the preliminary data provided to equipment designers.
- The crystalline sodium silicotitanate ion exchange bed, intended for strontium recovery, would also remove some cesium and plutonium.

The net results of these differences are discussed in the following subsections.

4.8.1 Omission of the Thermal Denitration, Caustic Recycle, and Chromium Removal Equipment

A Very Rough Order of Magnitude (VROM) estimate of the cost of the caustic recycle and thermal denitration addendum to the facility cost estimate was made. The total cost included $88.3 million for engineering, $50.6 million for buildings, and $225.6 million for special equipment and process systems. The total estimate of $365 million would add only another 3.5 percent to the overall cost of process modules of $10.7 billion presented in Table 9-16. The cost of the chromium reduction and removal process equipment has not been estimated.

4.8.2 Undersizing of the Americium-Lanthanide Separation Process Equipment

Swanson (1993) used the total trivalent lanthanides in the scaleup of the ion exchange columns for the original transplutonium-lanthanide chromatographic separation process. However, Swanson had used a lanthanum inventory for the SSTs that included only 10 percent of the lanthanum considered to be the best value for the inventory in this EIS study. This difference in inventories was not recognized while scaling up the ion exchange equipment for Extensive Separations Pretreatment, and the scaleup produced ion exchange equipment only 1/10 of the required size. Table 4-1 shows the relative costs of major pieces

Table 4-1. Extensive Separations Facility Equipment Cost and Flowrate Convergence Breakout by System. (2 sheets)

	System	Total Direct Cost ($ Millions)	Feed flowrate ratio, cost basis/final value
1	Acid recovery	5.2	1.80
2	CMPO extraction	8.9	0.61
3	Am/LAN ion exchange	4.0	0.25
4	Crown ether extraction	13.2	1.98
5	Low-level waste evaporation basic process condensate treatment	3.5	0.05
6	APM cesium ion exchange	4.9	1.85
7	Caustic leach	2.2	0.05
8	Uranium purification	8.1	2.49
9	Tributyl phosphate extraction	10.7	0.30
10	Nitric/HF acid dissolution #2	10.2	0.10
11	Nitric/oxalic acid dissolution #1	9.4	0.25
12	Receipt/sample tanks	10.3	--
13	Sludge wash	7.1	1.00
14	Organic destruction	18.4	1.00
15	Cesium ion exchange	10.1	0.16
16	Strontium ion exchange	5.5	0.27
17	Technetium ion exchange	8.5	0.30
18	High-level waste evaporation	1.6	*
19	High-level waste denitration	1.4	*
20	High-level waste concentration	7.0	*
21	High-level waste receipt/sample tanks	22.7	*
22	High-level waste vitrification	5.7	*

Table 4-1. Extensive Separations Facility Equipment Cost and Flowrate Convergence Breakout by System. (2 sheets)

	System	Total Direct Cost ($ Millions)	Feed flowrate ratio, cost basis/final value
23	High-level waste melter offgas processing	2.8	*
24	High-level waste feed adjustment reactor condensate	1.6	*
	Total	183.4	*

Notes:

*Nominal one metric ton of HLW glass per day.

Cost figures include major pieces of equipment only, not all equipment associated with each system.
Cost figures exclude escalation.
Cost figures exclude engineering, construction management and project management costs.

of equipment for the integrated pretreatment-HLW vitrification facility. With the ion exchange equipment at 1/10 of required scale, its cost would be only 2.2 percent of the total major equipment cost.

There is no direct way to estimate the scaleup cost or the cost of the larger process on the overall facility cost.

One alternative would be to delete the americium-lanthanide separation process and to include all of the americium-lanthanide inventory as feed to the HLW glass melter. This could reduce the cost of the major process equipment in the facility by 2.2 percent. As shown in Table A-4, the lanthanide content of HLW glass Stream 1344 would also increase from 16 percent to 19 percent. The lanthanide upper limit in HLW glass is currently an open technical issue. (Plodinec 1994).

The main impacts of deleting the americium-lanthanide separation process are to increase the base case result of 783 HLW glass canisters to 975 and to increase the mass fraction of lanthanides from 16 percent to 19 percent in the HLW glass, which may affect the HLW glass integrity.

4.8.3 Omission of the Cesium and Plutonium Removal Capability in Strontium Recovery

The crystalline silitotitanates (CST) will coexchange plutonium and cesium along with strontium at approximately the same extent as the strontium when the lower cesium and plutonium concentrations are considered. However, only the strontium exchange is represented in the flowsheet.

The strontium removal assumptions impact whether the LLW radiotoxicity objective is met and also impact the HLW volume because CST material adds oxides of sodium, titanium, and silicon during vitrification. The additional removal of cesium and plutonium could also aid in meeting the LLW radiotoxicity objective, and while not represented in the flowsheet will be addressed in the presentation of the LLW product composition results (see Table 9-1) relative to the radiotoxicity limits.

4.8.4 Nonconvergence of Preliminary Material Balance Computation

The preliminary material balance computation (dated January 24, 1995) that was used for equipment sizing in Appendix B contained approximate results due to defects in the ASPEN PLUS™[1] flowsheet language. These defects prevented complete convergence of the iterative material balance calculations to the correct material flow rates shown in Appendix A. The

[1]ASPEN PLUS is a trademark of Aspen Technology, Inc.

ratios of the unconverged feed rates to the final converged feed rates are shown in Table 4-1 for the individual process subsystems.

Equipment sizing for the HLW vitrification systems was based on a nominal one metric ton HLW glass per day throughput, and significantly exceeds all projected flow rate variations. The design and sizing of other equipment such as some of the gas absorbers and evaporators may also be nominally sized and relatively independent of flow rate, especially if the rates are low. Nevertheless variation of unconverged flow rates from 0.10 to 2.50 times the converged flow rates should prompt a recomputation of equipment sizing as the Extensive Separations concept is developed.

4.9 EFFECT OF OPERATING CONDITIONS ON SYSTEM PERFORMANCE

The two major products of the Extensive Separations processing are canisters of HLW glass to be sent to a deep geologic repository and LLW vaults of NRC Class A glass or grout retrievably disposed at Hanford. Each product has distinctly different disposal cost parameters.

The HLW disposal cost would depend upon the number of canisters (i.e., HLW volume) sent to the deep geologic repository. The repository fee covers allocated costs for transportation of HLW to and from disposal in the geologic repository (Civilian Radioactive Waste Management System). TRW Environmental Safety Systems, Inc., contractor to the Office of Civilian Radioactive Waste Management, has estimated the amount of the repository fee for each of the proposed TWRS alternatives, relative to a base case previously analyzed (TRW 1995). Estimates were made using TRW's Total System Life Cycle Cost model. A comparison of the repository fee; number of HLW canisters, waste packages, and canisters per HLW waste package; and dimensions of the HLW canister assumed for this estimate is shown in Table 4.2.

Table 4-2. Comparison of Repository Fee and Its Basis for Various TWRS Alternatives.

Alternative	HLW canister dimensions (m)	Number of HLW canisters	HLW canisters per HLW waste package	Number of HLW waste packages	Allocated repository fee (1995 $)
Tri-Party	0.68 x 4.57	6,800	4	1,700	3.96 billion
Extensive separations	0.68 x 4.57 1.2 m^3	1,000	4	250	3.39 billion
No separations	1.67 x 4.57	21,400	1	21,400	12.87 billion

The nominal number of HLW canisters selected for the Repository Fee Comparison was 1,000 1.2 m^3 HLW glass canisters. This number was also used as a basis for the transportation analysis (Green 1995). The material balance presented in Table A-1 and based on Clean Option separation parameters (Swanson 1993) produces about 400 1.2 m^3 HLW glass canisters as shown in Table 4-3. These 400 canisters correspond to 800 of the original 1,000 0.62 m^3 canisters targeted by the Clean Option as a goal. However, Table 4-1 show that there is little incentive to produce only 400 HLW canisters for the deep geologic repository because the total allocated fee would not decrease very much at less than 4,500 canisters.

Whether LLW glass or grout is produced from ESP operations has virtually no impact on the number of HLW canisters produced. Although the space occupied by 92 LLW grout vaults is much larger than the space occupied by 39 LLW glass vaults, they still fit within the site layout shown in Appendix G. Variations in processing conditions intended to affect the HLW canister count have no effect on the LLW volume.

If the NRC Class A solids were removed by centrifuge from the sodium hydroxide recycled to the caustic leaching of sludge, the HLW waste volume would be greatly reduced to 153 0.62 m^3 canisters or 75 1.2 m^3 canisters because the chemicals in those solids no longer limit glass volume. But the HLW would then be concentrated beyond the allowable heat generation limit of 1,500 watts per canister imposed by the repository accceptance criteria (DOE-OCRWM 1993), which places the minimum number of 0.62 m^3 canisters at 177 due to the thermal power of ^{137}Cs, ^{90}Sr, ^{241}Am and their daughters at an assumed shipment date of 2015. A corresponding thermal power limit for 1.2 m^3 canisters has not been found in the repository waste acceptance criteria.

Blending of strontium and cesium from capsules (see section D15.0) has no effect on the number of HLW canisters or the number of LLW vaults produced by ESP. However, the thermal power limit of 1,500 watts per canister would raise the minimum number of 0.62 m^3 canisters from 177 to 298 because of the added heat generation by ^{137}Cs and ^{90}Sr from the capsules.

If the expensive process for separating the large mass of lower nonradioactive lanthanides from the americium and higher radioactive lanthanides (see Section D9.0) is not installed in the Extensive Separations facility, the number of 1.2 m^3 glass canisters would increase only 8 percent from 394 to 426. This would, however, prevent any further volume reduction that might be obtained by removing solids from the recycle sodium hydroxide.

Use of the conservative low temperature glass formulation (see Section D16.2) used in the TWRS reference flowsheet (Orme 1994) would increase the number of HLW 1.2 m^3 canisters from 394 to 536. It would also prevent further HLW volume reduction by attempting removal of solids from the recycle sodium hydroxide.

One of the critical parameters in ESP is the assumption of relatively constant fractional dissolution of sludge by recycling the solids successively through sodium hydroxide, HNO_3-oxalic acid, and HNO_3-fluoride leaching steps (see Section D5.0). A computation assuming that 90 percent dissolution for the first cycle decreases to 10 percent on the second cycle and to 5 percent on the third cycle shows that the number of 1.2 m^3 HLW glass canisters would increase from 394 to 2,451 which would be half as many canisters as produced by the TPA alternative.

Table 4-3. Comparison of Extensive Separations Product Streams for Various Operating Conditions.

Option	Run type	Location of output in Appendix A tables	Number of HLW glass canisters		Limiting HLW glass component	Number of	
			0.62 m^3	1.2 m^3		HLW package	LLW 5,300 m^3 vaults
1A	Base case LLW glass	A-1, 1a	800	394	P_2O_5	99	39
1B	Base case LLW grout	A-1, 1b	808	398	P_2O_5	100	92
1A	Cr & solids removed	A-2, 2a	153	75	Frit	19	39
1B	Cr & solids removed 1,500 watt/pkg thermal limit	A-2, 2b	153 177	75 --	Frit	19	92
2A	Capsules in glass 1,500 watt/pkg thermal limit	A-3, 3a	800 298	394 --	P_2O_5	99	39
1A	No AmLAN separation	A-4, 4a	866	426	Frit	107	39
1A	Low temp HLW glass	A-5, 5a	1,090	536	Waste loading	134	39
1A	Poor dissolution	A-6, 6a	4,982	2,451	Al_2O_3	613	36

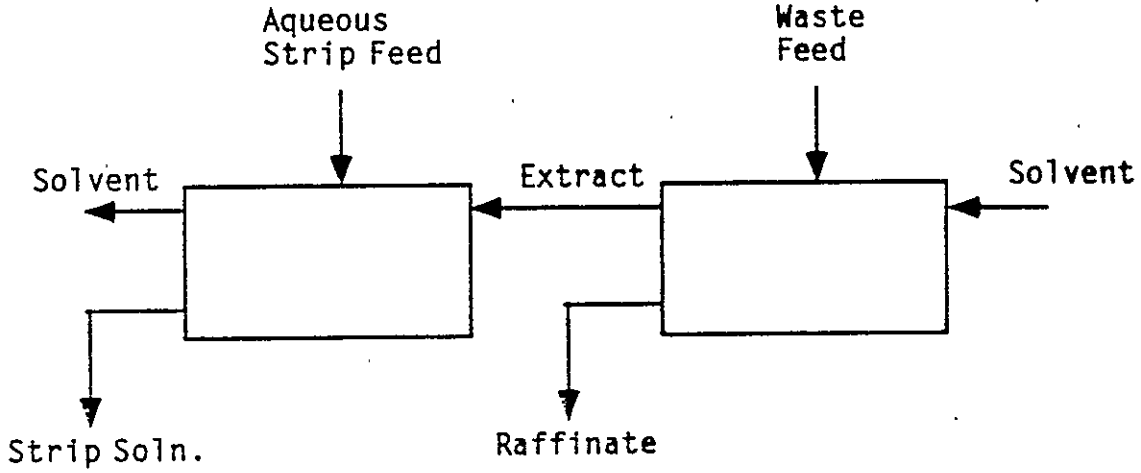
5.0 ASSUMPTIONS

The Extensive Separations Pretreatment (ESP) alternative is an aggressive yet feasible processing strategy for separating waste components to meet several main goals or objectives (often referred to as the CLEAN Option processing strategy). For example, the low-level waste (LLW) objective of ESP is to meet the U.S. Nuclear Regulatory Commission (NRC) Class A limits, concentrations of technetium and uranium are reduced as low as reasonably achievable (ALARA), and high-level waste (HLW) will be contained in less than 1,000 borosilicate glass canisters (0.625 cubic meters [m^3] per canister) that meet current Hanford Waste Vitrification Plant glass specifications. (Note that the final high-activity glass form is anticipated to be a larger volume glass monolith (0.68 meter [m] inner diameter [ID] x 4.57 m) with a net volume of 1.26 m^3). The current ESP flowsheet yielded 490 m^3 of HLW, resulting in 783 glass canisters (0.625 m^3 per canister) or 385 glass canisters (1.26 m^3 per canister).

A mass balance model is used to predict the volume of HLW glass product and radiotoxicity of the LLW glass or grout product. The major assumptions about waste characteristics and separations used in creating this data package are summarized in this section. The text also includes the rationale for selecting these assumptions as well as their relative impacts on the process. Detailed descriptions of the unit process specifications are in Appendix D.

In the solvent extraction processes described below, the solution to be extracted is called the feed, and the liquid with which the feed is contacted is called the solvent. The solvent-rich product of the extraction operation is called the extract, and the residual liquid from which solute has been removed is the raffinate. When the solvent is subsequently stripped or separated from the solute in a stripping operation, the solute-rich solution is referred to as the strip solution. These process streams are shown in Figure 5-1.

Figure 5-1. Solvent Extraction and Stripping Process.



5.1 INTEGRATED PROCESS

The main objectives of the integrated process, as stated in Section 3.0, are as follows:

- Production of less than 1,000 glass logs or canisters (0.625 m^3 per canister) or a total HLW volume of less than 625 m^3.
- Production of LLW waste meeting the upper limit of NRC Class A specifications with further reductions according to As Low As Reasonably Achievable (ALARA) requirements.

The general assumption about what the integrated process results would be had to be defined in advance for analysis activities such as transportation safety and composition-based LLW classification criteria for disposal. In a once-through calculation (such as material balance - plant design), unless feedback of calculation results into the individual process system specifications guarantees overall system performance, there will inevitably be mismatches between parts of the system and between overall performance and goals for performance. These mismatches are discussed in Section 4.8.

The ESP alternative carries more technical risk than the alternative flowsheets because it relies more heavily on technologies still being developed. For example, there is uncertainty in the optimistic acid-side dissolution assumptions, critical to the ESP alternative's HLW volume reduction relative to alternative pretreatment strategies. This uncertainty generates concern and would be addressed with an appropriate experimental assay program.

The predicted HLW volume and radiotoxicity of the LLW depend upon the following.

- Assumed composition of the waste stream (a blend of all tank wastes). Single- and double-shell tanks were assumed, for the mass balance calculations, consistent with all alternative data packages (see Sections 4.2 and 5.2).
- Assumed distribution of various components in the waste between the sludge and supernatant phases, that is, solubility assumptions from engineering judgment (see Section 5.3).
- Assumed effectiveness of the organic destruction step in destroying metal complexants in the supernatant (see Section 5.5).
- Assumed fraction of various components in the sludge that dissolve in the acid dissolution steps based upon engineering judgment (actually different tank group feedstreams would have differing dissolution factors for each specific tank sludge waste group) (see Section 5.6)

- Assumed viability of the glass composition limits or constraints used to optimize the HLW and LLW borosilicate glass products (see Sections 5.24 and 5.26).

- Assumed relationship of certain glass properties to glass composition (see Sections 5.24 and 5.26).

- Assumed use of a stripping agent for the transuranic extraction step that is not an organophosphate (0.05 M HNO_3) (see Section 5.9).

- Assumed ability of a crystalline silicotitanate sorption step to remove the remaining, presumably complexed, dissolved species (see Section 5.14).

- Assumed extent of extraction and stripping of various components in the solvent extraction processes (see Sections 5.7, 5.8, 5.9, and 5.11).

- Assumed ion exchange removal efficiency for radionuclides (i.e., americium, strontium, cesium, and technetium) (see Sections 5.10, 5.12, 5.13, 5.14, and 5.15).

The amounts of actinide elements in the waste supernatant, which are routed to the LLW form are consequences of the following assumptions: (1) their assumed concentrations in the supernatant (see Section 5.2); (2) the assumption that these concentrations are the result of complexation; and (3) the assumption that 99 percent of the complexants are destroyed in an oxidation step (see Section 5.5).

The amount of HLW glass produced may be controlled by the masses of waste components in the sludge that remain undissolved (see Sections 5.2, 5.3 and 5.6). The ESP alternative contains three acid dissolution steps to overcome these dissolution problems (see Section 5.6).

5.2 PROCESS FEED

The material balances for the facilities assume that the feed from retrieval and transfer is a homogeneous mixture of all tank waste. Furthermore, the material balances assume that the feed is adjusted to 5M soluble sodium in the retrieval and transfer steps.

The homogeneous mixture assumption was made because tank-by-tank inventories were not available, and had they been, a tank retrieval scenario has not been accepted to date. By using this assumption, all treatment scenarios have a comparable basis, and this data package remains consistent with the other pretreatment alternatives.

Note that preliminary results for tank-by-tank treatment shows that if all other assumptions remain the same in the Tri-Party Agreement preferred alternative flowsheet (Orme 1994), the high-activity glass volume would increase by a factor of about two. A similar volume increase factor is assumed for the ESP alternative also. However, due to the already greatly reduced volume of HLW produced by the ESP alternative, the impact would not be significant.

Using the sodium molarity specification in the feed has no effect on the process.

5.3 SOLUBILITY

The material balances for the facilities assume that the components in the feed stream have solubilities identical to the factors outlined in the Tri-Party Agreement preferred alternative flowsheet (Orme 1994, Slaathaug 1995).

This assumption is not expected to have a major impact on the volume of high-activity glass produced, because increases in undissolved solids will be accommodated by the extensive solids acid dissolution processes. Using this assumption ensures that all the treatment scenarios have a comparable basis, and this data package remains consistent with the other pretreatment alternatives.

5.4 SOLID/LIQUID SEPARATIONS

The extensive separations flowsheet uses centrifuges for solid/liquid separation in seven parts of the flowsheet: after waste tank retrieval, organic destruction processing, sodium hydroxide dissolution, both acid dissolution steps, and the optional chromium reduction step before sodium hydroxide production and recycling (Option B only, LLW to grout); and before the HLW melter. Common assumptions regarding separation efficiency and operation were used for all of these solid/liquid separation steps. The major assumption was that centrifuge operation and downstream filters would achieve 0.1 percent solid in clarified supernate, while supernate entrainment in the solids from the centrifuge would 12 percent of the solid weight in the centrifuge feed. Other process assumptions that apply to specific centrifuges are included in the unit operations description in Appendix D.

These solid liquid separation assumptions are based on engineering judgment. The past Hanford Site operations data for similar centrifuge operations would be reviewed, and an appropriate experimental program would be undertaken to develop desired centrifuge performance.

The ESP flowsheet also includes sand (or glass frit) filters to capture solids before all of the ion exchange column processes. These filters are assumed, by engineering judgment, to capture 99.9 percent of the solids. These solids are recycled back to the dissolution process head end. This assumption impacts the amount of solids reaching the LLW, affecting the

LLW radionuclide concentrations. It also impacts the HLW volume by forcing more solids towards HLW. The addition of the filter gas frit was assumed to be compensated by reducing the glass former addition in the subsequent glass making process.

5.5 ORGANIC DESTRUCTION (ZIMPRO PROCESS)

After initial solid/liquid separation of retrieved tank waste, the resulting liquid would undergo wet air oxidation to destroy organics and ferrocyanides. The destruction of organics using this process has been practiced commercially for 30 years by Zimpro-Passavant Environmental Systems, Inc. A reactor residence time of one hour at 325 °C and 2,000 pounds per square inch gauge 1.47 E+07 N/m^2 was assumed to provide 99 percent organic and ferrocyanide destruction. Metals complexed with organic in the reactor feed are expected to precipitate as hydroxides upon cooling. Hydroxides of strontium, nickel, calcium, and iron are likely, along with coprecipitation of transuranic components and lanthanides.

Destruction of organics and ferrocyanides, if present, is important to destroy radionuclide (e.g., strontium) complexes that could prevent complete extraction and separation. The use of an organic destruction process is considered necessary to address the expected high level of tank waste metal complexation and to ensure success of subsequent separation steps where complexation would interfere.

5.6 SOLIDS DISSOLUTION

Three dissolution steps, along with undissolved sludge recycle, are included in the flowsheet to minimize the amount of sludge routed to HLW. One dissolution cycle involves sequential sludge processing through the following steps: (1) sodium hydroxide leach; (2) nitric acid/oxalic acid dissolution; and (3) nitric acid/hydrofluoric acid dissolution, where solid/liquid separation occurs after each of these steps. Several hours of digestion at approximately 90 °C in appropriately designed reactors are anticipated for all these processes, under the following basic/acidic conditions:

Sodium Hydroxide Leach	$[OH^-]$	= 4.0M
Nitric/Oxalic acid	$[H^+]$	= 4.5M
Acid Dissolution	$[C_2O_4^{-2}]$	= 0.3M (approx. 1 mole/mole cations dissolved)
Nitric/HF acid	$[H^+]$	= 4.5M
Dissolution	$[F^-]$	= 1.0M (approx. 1 mole/mole equivalent of cations dissolved)

The extent of dissolution assumed, by component, are presented in Table D-1 for each dissolution process. An extract from Table D-1 shows major waste components.

Component Dissolution by Base/Acid Process.

Solid phase species	<------ % Dissolution ------>		
	Caustic	Nitric/oxalic	Nitric/HF
AL+3	90%	50%	50%
AL_2O_3	50%		
Cancrinite	50%		10%
CR+3		90%	50%
FE+3		90%	50%
$FECN_6$-3		90%	90%
MN+2		90%	90%
MNO^2		90%	90%
NI+3		90%	90%
NI_2FECN_6	90%		
PO_4-3	90%	90%	90%
PU+4		90%	50%
SO_4-2	90%	90%	90%
ZR+4		90%	90%
ZRO_2:$2H_2$		90%	50%

In the ESP alternative flowsheet simulation model, 95 percent of the undissolved solids from the second acid dissolution step are returned for sodium hydroxide leaching to begin another dissolution cycle; the remaining 5 percent solids are diverted to HLW treatment.

There is uncertainty in the optimistic acid-side dissolution assumptions critical to the ESP alternative's HLW volume reduction, relative to alternative pretreatment strategies. This dissolution performance uncertainty would be addressed with an appropriate experimental assay program.

5.7 TRIBUTYL PHOSPHATE SOLVENT EXTRACTION OF TRANSURANIC COMPONENTS

The tributyl phosphate (TBP) solvent extraction process is designed to remove uranium, plutonium, neptunium, and thorium. The solvent composition is 30 percent TBP in hydrocarbon diluent, the same as that usually used in the well-known plutonium-uranium extraction (PUREX) process.

Table D-2 presents the percent split of feed components among the various product streams from this process. It was assumed that 98.99 percent of thorium and plutonium, and 99.98 percent of neptunium are split to the high-level stream, while 99.88 percent of uranium is split to uranium product purification. The dissolved sludge stream is assumed to be decontaminated from uranium and neptunium by factors of 10^4 and from thorium and plutonium by a factor of 10^2. Cesium, strontium, americium, and trivalent lanthanides are inextractable by TBP; and technetium extracts very little at the high acidity used here (~4M HNO_3). Thus, these elements will remain in the dissolved sludge stream in this step, along with the nonradioactive elements present in the stream. The TBP solvent loss is assumed to be minimal because downstream evaporators recover and recycle 99.87 percent of any solvent carried away in the aqueous streams. Only 0.13 percent is assumed to proceed to the basic-side feed leaving this process.

The TBP extraction assumptions are engineering judgment based on the PUREX process. The extraction of transuranic elements is necessary to achieve the reduced HLW volume and LLW radiotoxicity objectives.

5.8 URANIUM PURIFICATION

Final uranium purification is accomplished in a second TBP cycle that is based on the 2D Cycle of the Hanford Site PUREX process. Significant uranium "loss" occurs from the contactor due to conditions of low acidity and the high degree of saturation of the TBP by uranium, but the "loss" is recovered by backcycling this stream (after evaporation) to the start of the first TBP cycle. Finally, the purified uranium is again stripped into dilute acid, then concentrated by evaporation and stored for shipment for offsite use.

The distribution of key components among the outlet streams from this operation is shown in Table D-3. The uranium recovery was assumed to be 94.29 percent. The TBP solvent loss is assumed to be minimal because downstream evaporators recover and recycle 99.95 percent of any solvent carried away in the aqueous streams. Only 0.05 percent is assumed to proceed to the LLW stream leaving this process.

The TBP extraction assumptions are engineering judgment based on the well-known PUREX process. The assumption that uranium would be separated as a product stream helps reduce the amount of LLW inventory.

5.9 CMPO SOLVENT EXTRACTION FOR AMERICIUM AND LANTHANIDE REMOVAL

The raffinate (i.e., the residual liquid from which solute has been removed [see Figure 5-1]) from the TBP extraction process is routed to an CMPO solvent extraction process to remove trivalent lanthanides, americium, and bismuth. This extraction process contains extraction, stripping, and solvent wash steps. The solvent used is 0.2M CMPO + 1.4M TBP in hydrocarbon diluent.

Table D-4 shows the distribution of key components among the outlet streams from this process. It was assumed that 99.98 percent of the americium and 99.99 percent of the curium and lanthanides, are extracted and routed to the Am/LAN ion exchange process, while 99.00 percent of the bismuth was assumed to split to the low-level waste. The CMPO solvent loss is assumed to be minimal because downstream evaporators recover and recycle 99.74 percent of any solvent carried away in the aqueous streams. Only 0.26 percent is assumed to proceed to the LLW stream leaving this process.

A Hanford Waste Pretreatment Technology Review Panel in 1990 (DOE 1991) concluded that the acid-based TRUEX process using the CMPO solvent was very similar to the PUREX process successfully implemented at the Hanford Site. Consequently, the panel stated that no great leap in technology would be required for successful application of the CMPO solvent.

5.10 AMERICIUM/LANTHANIDE SEPARATION BY BAND DISPLACEMENT CATION EXCHANGE

Two cation exchange resins loaded in sequential columns are used to separate americium and curium from lanthanides. Wheelwright et al. (1974) recommends Dowex* 50w, X-8 (100 to 200 mesh) for both the feed adsorption of column and the subsequent elution columns where band development of diethylenetriaminepentaacetic acid (DTPA) complexes with the +3 metals occurs. Concentrate from CMPO stripping would be contacted with a cation exchange resin in preparation for separation by displacement cation exchange. Elution of the resin is made with DTPA onto a zinc-loaded cation exchange resin column. Continued elution through a series of columns would establish discrete bands of metal ions in a sequence depending upon the magnitudes of constants controlling the formation of metal ion-DTPA complexes.

Table D-5 shows the distribution of key components among the outlet streams from this process. It was assumed using engineering judgement based on Wheelwright et al. (1974) that 99.89 percent of the americium, curium, and heavy lanthanides (e.g., samarium) are separated and split to the high-level stream, while 99.89 percent of the light lanthanides (e.g., cerium) were assumed to split to the low-level waste streams.

*Dowex is a trademark of the Dow Chemical Company.

This process was included to allow placement of transuranic elements in the HLW waste glass, because glass composition experts maintain that transuranic elements would not have a significant impact on glass stability and formation. However, the mass balance results will contain an additional case that has this process step removed (see Section 4.8.2).

The Am/LAN-ion exchange separation flowsheet (Swanson 1993) was based primarily on that given by Wheelwright et al. (1974), with quantities adjusted in proportion to the relative trivalent ion contents of the waste studied by Wheelwright et al. and of the Hanford Site single-shell tank waste (Swanson 1993). Assuming the ratios are correct, the information contained in these two documents was used to calculate an approximate feed volume to resin volume ratio of ~60.

5.11 CROWN ETHER SOLVENT EXTRACTION FOR STRONTIUM AND TECHNETIUM REMOVAL

The raffinate from the CMPO extraction process would be concentrated by evaporation with subsequent contacting with a specially synthesized crown ether solvent to remove strontium (barium and technetium would also be extracted). The solvent would be stripped to remove the strontium, barium, and technetium. The strip solution would be concentrated by evaporation and then sent to HLW treatment.

Table D-6 shows the distribution of key components among the outlet streams from this process. It was assumed that 99.99 percent of the strontium and barium and 99.00 percent of the technetium were extracted. The crown ether solvent loss is assumed to be minimal because downstream evaporators recover and recycle 99.95 percent of any solvent carried away in the aqueous streams. Only 0.05 percent is assumed to proceed to the LLW stream leaving this process. All of these assumed efficiencies are based on engineering judgment.

5.12 AMMONIUM PHOSPHOMOLYBDATE ION EXCHANGE FOR CESIUM REMOVAL

The final acid-side processing step uses ammonium phosphomolybdate (APM) to remove 99.99 percent of the cesium from the raffinate from the crown ether extraction separation process. It is assumed that the inorganic cation exchanger used is APM on an alumina substrate (10 wt% APM) to meet the mass and heat transfer requirements for this application. Because cesium cannot be readily eluted from APM, the loaded sorbent (50 grams cesium per kilogram APM) is routed to the sodium hydroxide leach step of the sludge dissolution process. Alkaline conditions will dissolve 90 percent of the alumina, APM and its associated cesium, with ultimate cesium removal by basic-side ion exchange.

The APM dissolution assumptions under hot sodium hydroxide processing are based on an analogy to similar reactions cited in literature (Cotton and Wilkinson, 1972) related to APM decomposition in strong base.

Alumina used as a column support would be the gamma form of Al_2O_3. This form of alumina may be soluble in alkaline solutions, according to standard chemical handbooks (e. g., *CRC Handbook of Chemistry and Physics*).

5.13 RESORCINOL-FORMALDEHYDE ION EXCHANGE FOR CESIUM REMOVAL

The combined basic-side feed undergoes 99.61 percent cesium removal via ion exchange with a regenerable resorcinol-formaldehyde resin. Table D-7 provides volumetric information on the regeneration/wash streams required for this ion exchange process.

Preliminary flowsheet modeling work of cesium ion exchange using resorcinol-formaldehyde resin was recently completed by Penwell et al. (1994). That work used experimental results of work done by the Pacific Northwest Laboratory (Bray et al. 1993). The analysis showed that fresh, unloaded resorcinol-formaldehyde resin may achieve 220 bed volumes per cycle (neutralized current acid waste feed). In normal cyclical operation, an average of 180 bed volumes is expected because all resin beds (three in series) are expected to be loaded to some extent. An average is used because the resin bed volume will vary with resin condition. For example, resin degradation by chemical and radiolytic action may cause the processable volume to fall below the predicted average. Resin particle size may impact the loading characteristics, but the impacts are not considered. These results are based on a four-column carousel operation with three columns online in series, with the fourth column offline and being eluted and regenerated. Therefore, it was assumed that 180 bed or column volumes were needed to reach breakthrough.

These assumptions had a small effect on the volume of high-activity glass produced. The regeneration of the columns does have an impact, but it is estimated to be much less than 10 percent and one percent of the total high-activity and low-activity glass produced, respectively.

5.14 CRYSTALLINE SILICOTITANATE ION EXCHANGE FOR STRONTIUM REMOVAL

The alkaline stream remaining after cesium ion exchange is sent to a cation exchange column containing crystalline sodium silicotitanate, which removes 99.6 percent of the strontium. The crystalline silicotitanate (CST) bed is not regenerated because strontium cannot be eluted from the resin. The strontium-loaded resin (4 wt% strontium loading for engineered CST) would be recycled to the acid-side dissolution processes. Dissolution of the resin and associated strontium (90 percent dissolution per pass) would occur in the nitric acid-hydrofluoric acid dissolver.

The CST will coexchange plutonium and cesium along with strontium at approximately the same extent as the strontium when the lower cesium and plutonium concentrations are considered. However, only the strontium exchange is represented in the flowsheet (see Section 4.8.3).

The strontium removal assumptions impact whether the LLW radiotoxicity objective is met, and also impact the HLW volume because CST material adds oxides of sodium, titanium, and silicon during vitrification. However, the silicon added from the CST can be compensated for by adjusting the amount of glass formers added to the melt. The additional removal of cesium and plutonium could also aid in meeting the LLW radiotoxicity objective, and while not represented in the flowsheet, will be addressed in the presentation of the LLW product composition results (see Section 4.8.3 and Table 9-1) relative to the radiotoxicity limits.

Decomposition of the CST sorbent during vitrification will add oxides of sodium, titanium, and silicon to the HLW glass volume. If the HLW volume objective was not met with CST sorbent, the sorbent could be replaced by a regenerable complexing organic ion exchanger as included in the original CLEAN option example flowsheet (Swanson 1993).

The CST performance assumptions were based on information provided by Sandia National Laboratory staff during a December 1994 meeting with Westinghouse Hanford Company and Pacific Northwest Laboratory staff. The CST development is controlled by an 18-month cooperative research and development agreement (March 1994 through September 1995) that supports CST development by UOP, Inc. in collaboration with Sandia. The cesium-specific CST powder can now be purchased commercially, and UOP, Inc. has demonstrated the capability to produce CST powder of high quality in large batch sizes.

The CST capacity for strontium has not been established but was estimated as 5-10 wt%. This estimate is based on demonstrated CST loadings of 1 wt% for cesium (from a solution of 7M sodium with Cs+ at 10 parts per million), and the fact that the distribution coefficient for strontium-specific CST is an order of magnitude greater than the coefficient for cesium-specific CST.

5.15 ANION EXCHANGE REMOVAL OF TECHNETIUM

The raffinate from the basic-side strontium ion exchange process undergoes anion exchange to achieve 99.5 percent removal of technetium as pertechnetate ion (TcO_4^-). Table D-8 contains volumetric data on regeneration/wash streams required for this operation. The technetium would be eluted with 6M nitric acid, concentrated by evaporation, and sent to HLW treatment. Vapor from the evaporation would be sent to a fractionator where nitric acid would be recovered and recycled for use in the technetium ion exchange step. Raffinate is sent to basic LLW treatment.

The *Tank Waste Technical Options Report* (Boomer et al. 1993) contains a summary of feed and regeneration rates for technetium ion exchange. Using a strong base anion exchange resin, 100 stream or column volumes of feed were assumed processed to reach breakthrough. This data is based on experimental work done by Schulz (1980). That work used the NO_3^- form of three different resins: Dowex 1x4, Dowex MSA-1, and Amberlite IRA 401*. Results are provided in the body of that report for only the last two of these three resins.

5.16 STRONTIUM AND CESIUM CAPSULE DISSOLUTION AND METATHESIS (HIGH-LEVEL WASTE OPTION 2)

In HLW Option 2 of the ESP alternative, the strontium and cesium capsules are disassembled and mixed uniformly into the HLW melter feed. The main capsule components were assumed to be strontium fluoride (SrF_2) and cesium chloride (CsCl). A metathesis process using an anion exchanger (e.g., Dowex 2x8) would exchange the Cl^- ion with NO_3^- ion in the cesium compound before HLW vitrification.

There are 601 strontium capsules and 1,328 cesium capsules containing 20.5 and 47.4 MCi, respectively (decay date of January 1, 2000), based on the separate EIS data package for disposition of cesium and strontium capsules (Nankani 1995). To facilitate the flowsheet mass balance, the capsule isotopic composition was assumed to be that of the tank waste (see Appendix A). This assumption allowed the correct amount of radioactivity to be maintained while allowing the mass to deviate somewhat from the known capsule composition. Table 5-1 provides the cesium and strontium capsule compositions and inventories. The small mass inventory difference is considered to have minimal impact on the HLW glass inventories. However, the heat generation in the HLW glass will increase significantly with the inclusion of the capsule cesium and strontium and higher heat loads may degrade the glass more rapidly (DOE 1993).

5.17 HIGH-LEVEL WASTE STREAM VITRIFICATION TREATMENT

5.17.1 High-Level Waste Concentration/Denitration

From the separation steps described in the previous sections (i.e., undissolved sludge purge from acid dissolution, strontium and technetium from crown ether extraction, americium and lanthanides from band ion exchange, transuranics from TBP extraction, and technetium from basic-side ion exchange), the HLW streams would be combined and concentrated by evaporation to a 3M HNO_3 solution. The HLW evaporator would operate under a vacuum in order to remove the nitric acid. Dilute acid vapor from this operation would be sent to acid

*Amberlite IRA-401 is a trademark of Rohm and Haas.

Table 5-1. Cesium And Strontium Capsule Composition And Inventory.[1]

Cesium capsules (1328)				Strontium capsules (601)			
Specie	Mass (kg)	wt %	Moles	Specie	Mass (kg)	wt %	Moles
137Cs	547.57	15.678	3996.87	90Sr	150.22	20.267	1669.10
Total Cs	3081.09	88.217	23183.54	Total Sr	635.96	85.801	7259.79
Al	0.00	0.000	0.10	Ba	17.87	2.411	130.45
Ba	327.00	9.363	2381.68	Ca	4.20	0.567	104.83
Fe	0.00	0.000	0.06	Re	1.08	0.146	5.82
K	13.97	0.400	357.20	Fe	0.13	0.018	2.33
Mg	0.03	0.000	1.33	Zr	81.68	11.020	895.63
Mn	0.01	0.000	0.24	Si	0.07	0.009	2.33
Na	70.42	2.016	3061.70	Mg	0.06	0.008	2.33
Pb	0.04	0.001	0.20	Al	0.06	0.008	2.33
Rb	0.04	0.001	0.51	Mn	0.09	0.012	1.63
Total	3492.62	100.00	28986.56	Total	741.20	100	8407.47
NO_3	1437.49		23183.54	F	275.87		14519.59
316-L Stainless Steel	6657.74			316-L Stainless Steel	1712.50		
				Hastelloy C	1630.67		
Total Ci 137Cs =	4.74E+07			Total Ci 90Sr =	2.05E+07		
(Decayed to January 1, 2000)				(Decayed to January 1, 2000)			

Notes:

[1]Nankani, F. D., 1995, *Preliminary Tank Waste Remediation System Environmental Impact Statement*, Engineering Data Package for Disposition of Cesium and Strontium Capsules, WHC-SD-WM-DP-087, Rev. 0, July 1995, Westinghouse Hanford Company, Richland Washington.

Lohman, G. W., and W. E. Poling, 1980, *Caustic Strike Flowsheet for Final Purification in B Plant*, RHO-F-14, Rockwell Hanford Operations, Richland, Washington.

DeWolf, R. B., 1985, *Summary - Cesium Final Purification in B Plant*, WHC-SD-WM-ER-010, Rev. 0, Rockwell Hanford Operations, Richland, Washington.

recovery. The 3M HNO_3 solution and formic acid eluant containing cesium from the resorcinol-formaldehyde ion exchange would be mixed and would undergo denitration by reaction with sucrose and formic acid destruction.

Sufficient sucrose would be supplied to this denitration step to achieve 0.5M HNO_3 in the liquid after complete sucrose conversion. This liquid would be fed to the HLW centrifuge process along with undissolved solids from the acid dissolution operation. The NOx produced by denitration would be sent to the acid recovery portion of the flowsheet for conversion back to HNO_3.

The concentration or evaporation and denitration assumptions are consistent with past operational data from similar Hanford Site processes.

5.17.2 High-Level Waste Melter

The denitrated HLW solid slurry would be centrifuged, with HLW solids (assumed 20 wt%) sent to the melter and liquid routed through an evaporator for water removal before being sent to the melter. Glass formers and an organic acid (glycolic) would be added to the melter feedstream for reduction/oxidation control. The high-activity glass melter is a joule-heated melter that would operate at a temperature of 1,200 °C. The incoming feed slurry would be converted into a molten borosilicate glass containing ~34 wt% waste oxides based on glass composition optimization calculations in the flowsheet simulation.

The process is relatively independent of the type of melter employed. In fact most of the data used for sizing and costing purposes for this document and the *Tank Waste Remediation System Facility Configuration Study* (Boomer 1994) were based on use of a combustion melter for high-activity glass vitrification. This would impact the high-activity melter's offgas equipment, but would have a small impact on the volume of offgas when compared to the low-activity melter's offgas. The masses of components in the offgas stream and the volume of glass produced would not change with the melter type.

5.17.3 High-Level Waste Melter Offgas Processing

The HLW melter offgas systems would receive the hot gases from the melter and subject them to a water quench, a Venturi scrubber/separator, a demister, and a high-efficiency particulate air (HEPA) filtering system. Quenching these offgases by countercurrent contact with cool scrub water (75 °C) would remove most of the entrained particulates and water-soluble contaminants and would condense much of the water vapor. Overall separation of gas from condensed phases achieved by these processing steps was assumed to be 99.999+ percent solid oxide removal, 100 percent Hg removal, 50 percent NH_3 removal, 100 percent Tc_2O_7 removal, with conversion to TcO_4^-(aq), and 99+ percent water removal. Condensed stream recycle would send the solid slurry to the LLW pretreatment evaporator and the liquid to HLW pretreatment evaporator.

5.18 INITIAL TREATMENT FOR ACIDIC LOW-LEVEL WASTE TREATMENT

5.18.1 Low-Level Waste Concentration

The LLW streams from the separation steps described in the previous sections (i.e., solvent wash waste from uranium purification, solvent wash waste from CMPO extraction, Am/LAN band ion exchange elution waste, solvent wash waste from crown ether extraction, and raffinate from base-side ion exchanges) would be combined and concentrated by evaporation of water to a 7M sodium hydroxide solution. This concentrated LLW stream from evaporation would be fed to the LLW calcination process while the basic evaporator overheads would be allocated to dilution water for the salt grout process and/or combined with slightly acidic evaporator overheads from the separation steps described in the previous sections (i.e., evaporator overheads from crown ether extraction, CMPO extraction, uranium purification, TBP extraction, organic destruction, and acid recovery) and recycled to the wash operations for the former separation processes. The LLW waste would be processed through an evaporator at 76 liters per minute to provide an evaporated feed of 15.1 liters per minute to the calciner.

5.18.2 Low-Level Waste Calcination (T-Thermal Process)

Low-activity waste feedstreams to the calcination process would consist of the liquid from the basic LLW evaporator and the denitrated liquid from the acidic LLW evaporation of the raffinate streams from Am/LAN band ion exchange and APM cesium ion exchange. These streams would be fed to the calcination process for nitrate destruction and the recovery of sodium hydroxide.

The amount of ammonia required as calciner fuel was based on calculating the sensible heat required to raise the reactants to a temperature of ~800 °C. Preliminary tests at the Westinghouse Science and Technology Center indicated an operating temperature range of 750 to 850 °C for the plasma arc calciner operation. However, further temperature optimization must be done together with kinetics studies.

The flowsheet equipment used assumptions of a 0.1 second residence time and an 800 °C operating temperature, under atmospheric pressure, to provide 91 to 86 percent nitrate/nitrite decomposition and 99 percent organic decomposition. The percent decomposition, not the residence time, is based on engineering judgment of the Westinghouse Science and Technology Center test data (Hendrickson 1994, Colby et al. 1994, and McLaughlin 1994). The residence time assumption is engineering judgment that would require further test data to optimize. It was assumed that 100 percent excess NH_3 was supplied, where unreacted NH_3 was oxidized to nitrogen and water.

After the reaction products are condensed, nitrogen gas would be separated from the caustic slurry (7M -). To be conservative, a 5 percent entrainment of cesium and technetium was assumed for the quench tank offgas.

Preliminary tests at the Westinghouse Science and Technology Center (McLaughlin 1994) indicate that a plasma arc calcination process can be successfully applied to Hanford Site tank waste. However, further testing is needed to verify operation over a wide feed composition range and to provide temperature optimization together with kinetic studies. The use of ammonia as a calciner fuel was necessary to support the production of sodium hydroxide for recycle to the waste pretreatment processes.

5.18.3 Dissolution/Concentration

The calciner molten salt stream, carried by the gas stream, would be redissolved in an integral water quench. Originally, the water-insoluble stream was expected to contain a majority of the transuranic isotopes, the multivalent metal oxides and hydroxides, as well as the aluminates. However, literature data suggest that the transuranics may become soluble under process conditions (Delegard et al. 1993).

The quench solution would be about 85 °C and would remove particles two microns or larger from the gas stream, some of the soluble gases, and 95 percent of the cesium and technetium. Solubility data from testing performed at Los Alamos National Laboratories indicate 25 to 30 wt% of the calcine product is insoluble (Hendrickson 1994). Thirty weight percent insoluble aluminum was assumed for the flowsheet.

5.19 LOW-LEVEL WASTE STREAM VITRIFICATION AND SULFUR MATRIX TREATMENT

5.19.1 Low-Level Waste Melter

The low-activity glass melter is a combustion-fired melter with kerosene as its fuel. The melter would operate at a temperature of 1,200 °C. The type of melter selected has its largest impact on the volume of offgas produced, but generally does not impact the masses of the components in it. The melter models have not been developed to such an extent that individual component carryover in the offgas streams is based upon the melter type. For example, it is assumed by engineering judgment that 1 wt% of the sodium in the melter feed would volatilize regardless of what type of melter it is (combustion, joule, etc.). Also, the glass produced would meet the same criteria regardless of the melter type selected.

5.19.2 Low-Level Waste Melter Offgas Processing

Low-level waste melter offgas would be sequentially processed through the following steps to remove condensables and solid carryover: water quenching (75 °C); Venturi scrubber/ separator (75 °C) processing; demisting; and HEPA filtering. Overall separation of gas from condensed phases achieved by these processing steps was assumed to be 99.999+ percent solid oxide removal, 100 percent Hg removal, 50 percent NH_3 removal, 100 percent Tc_2O_7 removal, with conversion to TcO_4^-(aq), and 99+ percent water removal. Condensed stream recycle would send the solid slurry to the LLW pretreatment evaporator and the liquid to HLW pretreatment evaporator. Remaining offgas would be sent to SO_2 removal/NOx destruction.processing.

5.19.3 Sulfur Dioxide Removal and Sulfur Recovery

Gas from melter offgas processing would undergo SO_2 removal by adsorption on CuO beds before NOx destruction would take place. The SO_2 would be desorbed, converted to H_2S, and then sent to Claus units for sulfur recovery. The CuO bed was assumed to have an operating temperature of 400 °C with 90 percent absorption of SO_2. A 10 percent excess O_2 feed was assumed along with 100 percent excess CuO in bed. The NH_3 cracking unit that supplies H_2 for bed desorption of SO_2 was assumed to have a 99 percent cracking efficiency of NH_3, where no excess NH_3 beyond stoichiometric H_2 requirement was assumed.

The CuO bed operation for SO_2 desorption was assumed to have a 100 percent conversion. The CuO bed regeneration was assumed to produce 100 percent regeneration of Cu to CuO. The air for regeneration was based on three times the stoichiometric O_2 requirement. The sulfur recovery process would mix the H_2S gas mixture from SO_2 desorption with air and heats the mixture to 800 °C where reactions would achieve 100 percent H_2S conversion. The remaining gas mixture would be cooled to 300 °C and sent through two Claus units in series, with liquid sulfur dropout before and after each Claus unit. Each Claus unit achieves 95 percent conversion of H_2S to sulfur. A 100 percent separation efficiency was assumed for sulfur removal from gas.

5.19.4 NOx Destruction Processing

The reaction conditions for NOx destruction were assumed to have an operating temperature of 500 °C with no excess NH_3. The process assumed 99 percent conversion.

5.19.5 Offgas Treatment System

Two sets of HEPA filters in series (99.95 percent fines removal by each set) would treat offgas from the following portions of flowsheet before gas would be sent to the stack: supernate evaporator; cesium ion exchange concentrator; LLW and HLW feed evaporators; gas streams from cyclones from HLW, LLW, and rework cullet fluidized transport; and HLW and LLW storage bin vent.

5.20 LOW-LEVEL WASTE STREAM GROUT TREATMENT (LOW-LEVEL WASTE OPTION B)

5.20.1 Chromium Reduction

To address the issues of chromium reduction and removal (see discussion in Section 4.7.5), the ESP flowsheet calculations included a grout product calculation with and without a prior chromium reduction and removal process. Based on the CLEAN flowsheet (Swanson 1993), a 1.5M NH_2OH reductant would be used to reduce soluble Cr+6 to insoluble Cr+3 in the reduction process. The reaction extent was assumed to achieve 99 percent Cr reduction.

Chromium-bearing wastes are regulated as dangerous waste. If the wastes can not meet the Toxicity Characteristic Leaching Procedure (TCLP, a test used to simulate leaching from a landfill) requirement of < 5 mg/L in the extract then they can not be disposed of in a landfill. For Tank wastes that are designated dangerous solely for the presence of chromium, and are delisted, an exemption can be sought, which, if successful, could exempt the waste from regulation under the state Resource Conservation and Recovery Act (RCRA) (1976) program. How the chromium waste stream will be managed must be determined (see discussion in Section 4.7.5). The limits for chromium are the same for hazardous or mixed hazardous/radioactive waste.

5.20.2 Salt Grout

The concept for the salt grout process is to mix a waste slurry with cementitious materials to form a grout that can be pumped into removable tubes placed retrievably onsite in underground concrete vaults (5,300 m^3 volume). The grout formulation is 1,100 g dry mix per 1 L waste. The dry mix used in the grout flowsheet consists of 40 wt% limestone, 28 wt% fly ash, 28 wt% slag, and 4 wt% Portland cement (Hendrickson 1992 and Serny et al. 1989). Grout formulations to date have been limited to 3M total nitrate and nitrite in the feed along with a 5M sodium content. These two constraints are present in the grout flowsheet. Further discussion of grout formulation issues is provided in Section 4.7.3.

5.21 CAUSTIC RECYCLING

The alkaline slurry produced in the calcination operation contains 7M sodium hydroxide, which can be recovered for process uses to minimize LLW disposal volume. To eliminate chromium from recycled sodium hydroxide, soluble Cr(VI) is reduced to insoluble Cr(III) with hydroxylamine. After solid-liquid separation, approximately 90 percent of this alkaline stream must be recycled to meet flowsheet requirements for sodium hydroxide (e.g., the alkaline leach step of the solid dissolution operation). The remaining portion of the sodium hydroxide slurry is incorporated into a LLW form for disposal.

5.22 NITRIC ACID RECYCLING

Acidic evaporator overheads (from HLW treatment, strontium ion exchange, and acidic LLW treatment) are contacted with NOx streams (from denitration and calcination steps) with the addition of hydrogen peroxide and air to absorb and convert NOx to nitric acid. Conversion of 80 percent NOx to acid is accomplished by oxidation by oxygen. The resulting dilute acid liquid is concentrated by acid fractionation to recover 99.5 percent of the nitric acid as 12M HNO_3. The weak acid overhead is used as water recycle.

5.23 WATER RECYCLING

Water from the numerous evaporators throughout the flowsheet would ultimately be routed to a wash water tank to provide dilution water required for the various separation processes along with the grout process.

5.24 HIGH-LEVEL WASTE GLASS

The joule-heated melter used in the HLW vitrification process would operate at a temperature of 1,200 °C. The high temperature would convert the incoming feed slurry into molten borosilicate glass containing ~34 wt% waste oxides based on glass composition optimization calculations in the flowsheet simulation. The composition and flowrate of glass formers (containing primarily SiO_2, B_2O_3, Fe_2O_3, Li_2O, Na_2O, Al_2O_3, and CaO) would be adjusted to minimize total HLW glass weight.

The HLW glass composition optimization was performed subject to the following glass constraints:

SiO_2 content	$\geq$ 42 wt%	$\leq$ 57 wt%
B_2O_3 content	$\geq$ 5 wt%	$\leq$ 20 wt%
Na_2O content	$\geq$ 5 wt%	$\leq$ 20 wt%
Li_2O content	$\geq$ 1 wt%	$\leq$ 7 wt%
Fe_2O_3 content	$\geq$ 2 wt%	$\leq$ 15 wt%

CaO content	$\leq$ 10 wt%
MgO content	$\leq$ 8 wt%
Al_2O_3 content	$\leq$ 15 wt%
ZrO_2 content	$\leq$ 13 wt%
Cr_2O_3 content	$\leq$ 0.5 wt%
P_2O_5 content	$\leq$ 3 wt%
SO_3 content	$\leq$ 0.5 wt%

These glass composition constraint limits were based on the range of the mass fraction values each component can have in the glass. They reflect the composition region over which the Composition Variability Study was performed, where the upper and lower limits used in the calculations are the bounds from phase 2a of the Composition Variability Study (CVS) (Hrma and Piepel 1992). Adjustments to those limits were made based on a literature study of acceptable glass compositions (Langowski 1994). The viability of these glass composition limits or constraints used to optimize the HLW borosilicate glass product should be verified, along with the assumed relationship of certain glass properties to glass composition, by actual glass formulation testing.

5.25 HIGH-LEVEL WASTE DISPOSAL

The final HLW glass form is a monolith of glass contained with a canister (0.61 m ID x 3.05 m) with a net volume of 0.62 m^3. A storage facility (denoted as the cask pad in site layout Figures 8-1 and 8-2) is provided to allow interim storage space for all of the high-activity glass produced. Sometime after the high-activity vitrification campaign has concluded, the canisters would be transported in Hanford Site multi-purpose canisters (4 monoliths per multi-purpose canister) to an offsite federal repository for final disposal.

The above assumption matches the assumption in the *Tank Waste Remediation System Facility Configuration Study* (Boomer 1994), which has the same assumption.

5.26 LOW-LEVEL WASTE GLASS

The combustion (kerosene fuel)-driven melter used in the LLW vitrification process would operate at a temperature of 1,200 °C. The high temperature would convert the incoming feed slurry into molten borosilicate glass containing ~31 wt% waste oxides based on glass composition optimization calculations in the flowsheet simulation. The composition and flowrate of glass formers (containing primarily SiO_2, B_2O_3, Fe_2O_3, Li_2O, Na_2O, Al_2O_3, and CaO) would be adjusted to minimize total LLW glass weight. The LLW glass composition optimization was performed subject to the following glass constraints:

Na_2O content $\leq$ 25 wt%
Al_2O_3 content = 5 wt%

CaO content = 10 wt%
SiO_2 content ≥ 50 wt%

These glass composition constraint limits were based on the range of the mass fraction values each component can have in the glass. They reflect the composition region over which the Composition Variability Study was performed, where the upper and lower limits used in the calculations are the bounds from phase 2a of the Composition Variability Study (Hrma and Piepel 1992). Adjustments to those limits were made based on a literature study of acceptable glass compositions (Langowski 1994). The viability of these glass composition limits or constraints used to optimize the LLW borosilicate glass product should be verified, along with the assumed relationship of certain glass properties to glass composition, by actual glass formulation testing. No extensive analyses or experimental glass formulation data relative to expected LLW stream compositions have been done. It is expected that the LLW glass will have different glass composition and property limits that will be defined in future work.

The 25 wt% loading assumption insures that the data package remains consistent with the other pretreatment alternatives. The aluminum oxide and calcium oxide specifications have no impact on the volume of low-activity glass produced, but they do affect the total cost for the glass formers. This affect is negligible when compared to the total operating cost.

5.27 LOW-LEVEL WASTE GLASS DISPOSAL

The low-activity glass product would be disposed of onsite in 5,300-m^3 vaults in a polymer/sulfur matrix. The sulfur polymer cement is a commercially available material developed by the U.S. Bureau of Mines. It is composed primarily of elemental sulfur with additions of plasticizing agents to inhibit crystal growth and to control polymerization and viscosity. The cement, in conjunction with aggregates, becomes concrete and is used as a construction material in acid-salt environments.

The sulfur/polymer matrix has valuable chemical (low solubility) and physical (low conductivity) properties that tend to provide good long-term performance of a LLW disposal system (Rawlins et al. 1994). However, testing of the composite glass/matrix compositions should be made to provide a solid technical basis for such a disposal system.

5.28 LOW-LEVEL WASTE GROUT

The concept for the salt grout process is to mix a waste slurry with cementitious materials to form a grout that can be pumped into removable tubes placed retrievably onsite in underground concrete vaults (5,300 m^3 volume). The grout formulation is 1,100 g dry mix per 1 L waste. The dry mix used in the grout flowsheet consists of 40 wt% limestone, 28 wt% fly ash, 28 wt% slag, and 4 wt% Portland cement (Hendrickson 1992 and Serny et al. 1989). Grout formulations to date have been limited to 3M total nitrate and

nitrite in the feed along with a 5M sodium content. These two constraints are present in the grout flowsheet. Further discussion of grout formulation issues is provided in Section 4.7.3.

5.29 LOW-LEVEL WASTE GROUT DISPOSAL

The low-activity salt grout product would be disposed of onsite in 5,300-m^3 vaults in a cementitious matrix. Further testing of the grout compositions should be made to provide a solid technical basis for such a disposal system.

5.30 PRETREATMENT/HIGH-LEVEL WASTE COMBINED - LOW-LEVEL WASTE SEPARATE

The ESP alternative would reduce HLW volume to the point that a separate HLW vitrification facility is not needed. Indeed, this alternative would incorporate the HLW vitrification process directly into the separations plant as an acid process. This would eliminate the cost of permitting and approval efforts for an additional stand-alone facility, along with costs associated with neutralization, material transport, and storage of waste at a separate facility. The combined facility assumption affects the total capital expenditures as well as the spending profile for this alternative.

5.31 CENTRALIZED FACILITIES

The facility configuration would also be centralized and share the same support facilities. The centralized facility assumption affects the total capital expenditures as well as the spending profile for this alternative.

6.0 PROCESS EQUIPMENT

The information in the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994) assumed that each facility would operate 14 years. However, the Tri-Party Agreement schedule projects 24 years operation for the pretreatment and low-level waste (LLW) facilities and 19 years for the high-level waste (HLW) facility. This data package has based production rates, emissions, staffing, raw materials usage, etc. on the operating duration.

The equipment lists for both the integrated pretreatment and HLW facility and the detached LLW facility are in Appendix B. The equipment lists include capacity/flow rate, physical size, material of construction and power requirements.

6.1 PROCESS FLOW DIAGRAMS AND MATERIALS BALANCES

6.1.1 Pretreatment and High-Level Waste Vitrification

Process flow diagrams for the pretreatment HLW vitrification integrated facility are in Appendix C. Related material balances are in Appendix A. The material balances are based on glass production rates through the LLW vitrification facility. The pretreatment facility can process 200 metric tons of glass per operating day. The HLW facility can process one metric ton of glass per operating day.

The process flow diagram for the cesium strontium capsule cut up cell in HLW Option 1 is included with the mechanical handling diagram for the cell in the Appendix E facility layouts. Strontium fluoride (SrF_2) and $CsNO_3$ were assumed to be fed to the HLW melter. A summary material balance for this option is in Appendix A.

6.1.2 Low-Level Waste Vitrification

Process flow diagrams are taken from the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994) and are in Appendix C. The material balances are in Appendix A. The material balances are based on glass production rates through the facility. The LLW facility can process 200 metric tons of glass per operating day.

6.1.3 Low-Level Waste Grout (Option B)

Process flow diagrams for LLW Option B grout are taken from the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1993) and are in Appendix C. The material balance for this option is in Appendix A for the integrated pretreatment HLW vitrification and the grout process.

6.2 CONTAMINATED SOILS ENCOUNTERED DURING OPERATION

The LLW vaults would be constructed during the operational phase of the facility. It is assumed that during vault construction no contaminated soils would be encountered. In addition, it is assumed that the excavated soil would be transported to the earthen borrow area.

6.3 OPERATING NOISE

Operating noise would be minimized so it does not exceed Occupational Safety and Health Administration and other regulatory requirements. Where operational noise must exceed requirements, safety equipment would be used, and its use would be strictly enforced. It is not anticipated that operating noise from the facilities would disturb onsite or offsite areas.

6.4 RAW CHEMICALS

Raw chemicals would be delivered to the Hanford Site by truck or train. No barging of materials is assumed to occur. Table 9-4 lists the total amount of raw material required for operation. Table 9-7 lists the number of trips and the length of travel for operational purposes. Storage of raw materials for both facilities would be at a centralized facility close to the two facilities.

Raw chemical needs were taken directly from the material balances where appropriate. If there was a discrepancy between the process flow diagram and the actual facility configuration, the chemical requirements were calculated from past experience. Table footnotes show where calculations were required.

6.5 OPERATING STAFF

The operating staff hours given in Tables 9-2 and 9-3 and the operating costs in Table 9-19 cover all operations associated with the united processes in Table 9-2. This includes startup, treatment operations, facility decommissioning, and monitoring and maintenances of the

vitrified waste products during interim onsite storage. Operating staff ramp-up and ramp-down are also included. Figure 10-2 shows the estimated annual distribution of the operating staff hours in Tables 9-2 and 9-3.

6.6 SECONDARY WASTE

Secondary waste does not include glass produced by the facilities. The only secondary waste addressed here would be ion exchange material and process effluent in excess of recycle quantities.

The spent ion exchange resin could be disposed of in one of two ways: sending the resin to a high- or low-level melter (depending upon the contamination) and burning it, or sending the resin to an onsite solid waste disposal facility. For this data package, the latter would be done. It should be noted that disposing of spent ion exchange resin at this facility is not permitted at this time.

The total amount of process effluent to be treated is assumed to be equal to 20 percent per year of the stream sent to the condensate retention basin (Stream 804) for both facilities plus one year at 100 percent. The other 80 percent per year is assumed to be recycled back to retrieval operations; the extra year is after retrieval operations have ceased. The stream to be processed is assumed to have the same composition as the feed used in the liquid effluent treatment facility's design; therefore, the effluent compositions should be identical. It should be noted that treatment of process effluent at the Liquid Effluent Treatment Facility is not permitted currently.

This page intentionally left blank.

7.0 CONSTRUCTION

Facility layouts for the integrated pretreatment and high-level waste (HLW) vitrification and the detached low-level waste (LLW) vitrification facilities were developed assuming a feed rate of 40 gallons per minute from double-shell tank (DST) feed tanks and a throughput of one metric ton in the HLW melter and 200 metric tons in the LLW melter per operating day. The total operating efficiency was projected at 60 percent. The layouts also assume the integrated pretreatment HLW facility would be operated and maintained remotely, and the detached LLW facility would be contact operated and maintained.

Defunct equipment would be removed by flasking operations in the integrated pretreatment/ HLW vitrification facility. Flasking is the operation of surrounding an item of equipment to be removed with a shielding container. It involves lowering a shielding container around the equipment to be removed, lifting the equipment item, and adding a container bottom.

7.1 FACILITY LAYOUTS

7.1.1 Integrated Extensive Separations Pretreatment-HLW Vitrification Facility

The integrated facility (see Appendix E) would have an overall footprint of 94 meters (m) x 234 m and a height of 40 m of which 20 meters extends below grade. The total area would be approximately 21,950 square meters (m^2) with a volume of approximately 735,800 cubic meters (m^3). The facility would be divided into three levels: a processing level, a level at grade, and a level at + 12.5 m. It would contain the following areas:

- Sludge washing and dissolution
- Alkaline liquid processing
- Acidic liquid processing
- Destruction, recovery, and recycle of bulk chemicals
- Feed receipt and sampling
- Chemical make-up
- Heating, ventilation and air conditioning.

The first five areas listed above are related to processing. Of these, the first four would be subdivided to perform the following specific tasks:

- Sludge washing and dissolution--sludge washing, sludge caustic dissolution, sludge acid dissolution, and sludge acidic fluoride dissolution

- Alkaline liquid processing--hydrothermal organic destruction cesium ion exchange, silicotitanate ion exchange, and technetium anion exchange, (e.g., the cesium ion exchange area would consist of a single stage of 12.5 m^3 columns and supporting tanks)

- Acidic liquid processing--tributyl phosphate solvent extraction, purification of uranium byproduct, N-diisobutylcarbamoylmethylphosphine oxide (CMPO) solvent extraction, americium-lanthanide chromatographic ion exchange, crown ether solvent extraction, and ammonium phosphotungstate ion exchange

- Bulk chemical destruction and recovery--HLW evaporation, HLW sugar denitration, LLW evaporation, LLW nitrate destruction, and optimally chromium precipitation.

Feed receipt and sampling would take place in six 379 m^3 tanks receiving feed from DSTs external to the building.

The grade level and the level at + 12.5 m would provide support services and additional process equipment. The grade level would provide space to support flasking operations (see Section 7.0) to the separation cells below, instrumentation to the process equipment, and maintenance areas. The level at + 12.5 m would provide heating, ventilating, and air conditioning (HVAC) supply and exhaust, fluidic device control, and assay facilities.

The HLW vitrification portion of the integrated facility would have an overall footprint of 30 m x 140 m and a height of 28 m of which 11 m extends below grade. The total area would be 4,255 m^2 with a volume of approximately 89,540 m^3. The facility would include the following areas:

- Melter operations
- Maintenance areas
- Canister loading
- Cold chemical make-up
- Heating, ventilation, and air conditioning.

The melter cell would contain the HLW melter and offgas equipment. The maintenance area would be used for the repair and disposal of failed equipment.

7.1.1.1 Integrated Facility - Plant Layout Design Basis. This section provides a plant lay-out design basis for the extensive separations pretreatment of supernatant liquids and sludge from the 177 underground waste storage tanks at the Hanford Site. The lay-out addresses a common facility for pretreatment and high-level waste vitrification.

The HLW vitrification capacity is sized to match the HLW fraction expected from the extensive separations process. Earlier versions of the mass balances in Appendix A and the process flow diagrams in Appendix C were used as design bases for the extensive separations pretreatment HLW vitrification integrated facility.

In addition, certain design decisions were required to develop the lay-outs from the flowsheets and mass balance. These decisions are summarized below.

1. The HLW melter is sized based on one-metric-ton-per-day production. This would result in periods of standby operation, based upon the throughput defined in the mass balance. Six tanks, each 100,000 gallons, would be provided between the separations process and the HLW melter.

2. The waste loading in the melter was assumed to be 750 percent by weight. A waste loading this high is theoretically possible but has yet to be demonstrated in practice.

3. The flowsheets frequently depict single tanks and process flows where there is likely to be more than one train (e.g., organic destruction and dissolvers). Engineering judgment was used to define where more than a single train should be used.

4. Hydrofluoric acid was used in the dissolution process. Because of the corrosiveness of hydrofluoric acid, this selection required the use of alloy piping and equipment, thus contributing to the material cost estimate for the facility.

5. All evaporators are thermal syphon evaporators.

6. The early flowsheets provided for the extensive separations facility omitted a thermal denitration process that also provides caustic recovery for recycle. The thermal denitration process requires three kerosene-fired furnaces while the associated caustic recycle step requires an ammonia-(NH_3) fired furnace.

The plant layout and capital estimate do not include the omitted processes. A separate very rough order of magnitude estimate will be provided for the addition of these processes. The estimate will address the addition of four furnaces and associated tankage, offgas, and ancillary equipment required for the processes.

7.1.1.2 Integrated Facility - Systems Location and Operation/Maintenance Philosophies. This section explains the location of the major plant and systems together with the operation and maintenance philosophies adopted in the facility layout. The general arrangement designs in Appendix E.

The philosophy adopted for the integrated extensive pretreatment and high-level waste vitrification facility includes the following:

1. Locate radioactive process vessels below grade to minimize shielding and seismic requirements.

2. Use a standard cell size wherever practical.

3. Locate the process by system to minimize piping requirements.

4. Incorporate access to the maintenance facility at grade level to minimize elevation changes during flasking operations.

5. The high-level waste vitrification melter is assumed to be a one-metric-ton-per-day high temperature ceramic lined unit.

6. HLW melter and associated pour line equipment is gravity fed.

7. Melter cut-up facilities are located at grade adjacent to the melter cell to facilitate removing a failed melter and introducing new melter units.

8. In accordance with the *Tank Waste Facility Configuration Study* (Boomer et al. 1994) first tier, the centralized control building is remotely located from the facilities.

Below grade cells are located in three banks, each segregated by a 10 m wide corridor. The corridors would help the initial vessel installation and provide flask maintenance areas.

Each lower maintenance corridor would be serviced by a 20 ton electric overhead traveling crane. Roof hatches at grade level would provide flask access to the small component maintenance facility. Dedicated areas below the intermediate maintenance floor would be provided for condensate lag storage, plant washdown tankage, plant and equipment for fluidization liquors of ion exchange columns, and spent resin storage prior to discharge to the HLW waste melter.

The cells for process tankage and equipment would be configured to provide adequate access around the vessels during installation and an envelope above the vessels for routing piping, HVAC duct work, associated liquor transfer, and control equipment.

An active pipe chase, located above each lower maintenance corridor between +0.000 m and -4.000 m, would minimize unnecessary in-cell pipe routing. Cells would be provided with HVAC exhaust filtration equipment.

Grade to + 12.500 meters: The area over each bank of process cells would be a dedicated flasking area. Each would be serviced by a 20-ton electric overhead traveling crane.

The areas above the 10 m wide corridors would provide adequate space for nonradioactive plant service loops, HVAC work and electrical cable trunks. Areas would be dedicated to the cold chemical feed cabinets and plant wash cabinets. Vertical concrete ducts running from 0.000 m to +13.000 m would route potentially radioactive piping associated with fluidic transfer equipment and steam ejectors.

+12.500 m to +19.000 meters: The upper floor would house analytical laboratories, control equipment for ejector/fluidic devices, and HVAC supply rooms.

A small component decontamination/maintenance facility would be located together with workshop space at one end of the facility and adjacent to the import/export bay. This maintenance facility would handle all replaceable and maintainable items such as pumps, valves, controls, and cross-flow filtration.

7.1.1.3 Integrated Facility - High-Level Waste Vitrification. The HLW vitrification facility is located at the opposite end of the pretreatment facility, relative to the maintenance facility. All tankage associated with the HLW process is located within the extensive pretreatment area.

The HLW waste vitrification portion of the facility would be designed around the high-temperature ceramic-lined melter and associated areas for glass monolith handling and export. The melter has a one-metric-ton-per-day capacity. Heavy pieces of equipment, including the melter and handling equipment for concrete shielding casks, have been located to eliminate elevation changes during normal facility operation and change out/maintenance operations. Similarly, HLW liquor feeds and associated conditioning/feed tanks would be located to minimize routing of the final conditioned waste to the melter.

The HLW vitrification process influences the overall width of the facility. The facility would be laid out to package four canisters of glass (0.62 m^3 per canister) in a multi-purpose canister (MPC), then place the MPC in a concrete shielding cask. The concrete shielding cask receiving the MPC is estimated at approximately 125 tons. The concrete shielding cask would be placed on a bogie (a self-propelled cart) to travel in and out of the facility.

The overall dimensions of the glass canister would require that cranes move the canisters through the facility. Only glass canisters would undergo elevation changes. The concrete shielding cask would not be lifted in the facility.

The melter cell would be located on the 0.00 m level to avoid having to lift the melter for removal. Both the in-cell and the operating areas around the melter would be sized to provide room for making and breaking melter connections. New melter components would enter the facility at the import bay. The components would placed on a bogie and assembled in the melter assembly area.

The melter cell would house the melter and the offgas quench tower which would be installed as a module. The operating face for the melter cell would use either shielded windows, closed circuit television cameras, or a combination to allow using remote equipment for melter maintenance or replacement.

Molten glass would be poured from the melter from an overflow riser using an air or vacuum lift. The pour cell would have an operating face fitted with shielded windows and closed circuit television camera equipment to allow remote equipment to operate and maintain equipment in the cell.

The pour cell height was determined by the standard reference canister with a 0.61 m outer diameter and a 3.05 m overall height. The canister would be transported using in-cell polar cranes. The cell height would allow a canister to be lifted in and out of the cooling racks.

Empty canisters would be brought into the facility at the -10.00 m level and inspected in the canister inspection and posting area. After inspection, the canister would be lowered through a gamma gate to the canister introduction bogie on the -15.00 m level. The pour cell gamma gate would be opened, and the bogie would be rolled into the pour cell.

Once inside the cell, the canister would be moved to the pour lines and loaded on the carousel. The carousel would index the canister and raise it to the pour spout. The canister would be filled, and the lid would be placed on the canister. A polar crane would move the canister to the cooling rack where it would cool for two days before being moved to the lid welding machine. Once the lid was welded and inspected, the canister would be moved into the decontamination area.

In the decontamination area, the canister would be placed inside a decontamination vessel equipped with high-pressure spray lines. Once decontaminated, the canister would be moved into the swabbing and monitoring area where it would be swabbed with a robotic arm. The swab would be monitored to verify that the canister does not have any external loose surface contamination, then the canister would be lifted through the gamma gate into the canister and MPC packaging area on the +0.00 m level.

The pour cell would have two polar overhead cranes: one would move the container between the carousel and the canister decontamination station; the other would cross from the swab and monitoring area and to move the canister back unto the swab area. This would prevent contaminating the canister by lifting it with a contaminated crane.

The pour cell would have a maintenance area at both ends. One area would be used to maintain the contaminated crane, the in-cell equipment, and the canister introduction bogie; the other to maintain the clean crane and the swabbing and monitoring equipment.

The canister and MPC packing area would be located on the 0.00 m level so that the concrete shielding cask would not need to be lifted. Multi-purpose canisters and their temporary concrete shielding casks would be brought on bogies. The shielding cask lid

would be removed in the lid/de-lid area, and the shielding cask would be moved into the canister and MPC packaging area.

In the canister and MPC packaging area, filled glass canisters would be lifted through gamma gates from the -10.00 m level. After each four canisters are placed in a MPC, the MPC would be lidded, welded, and lifted into a shielding cask. The bogie would move the shielding cask into the lid/de-lid area, and the cask lid would be placed. Personnel would now be able to enter the area to bolt the shielding cask lid down and perform the final assay of the package. After final assay, the package would exit the building through the import/export area.

The melter breakdown, cut up and packaging cell would be adjacent to the melter cell. Here failed melters would be remotely dismantled and packaged for disposal. Solid waste generated during the cut up of melters would be transferred into the equipment decontaminating area. After decontamination was completed, the material would be segregated and packaged in standard drums or containers. The containers would be lidded, decontaminated, swabbed, and monitored before being placed into shielding casks and transported out of the facility.

7.1.2 High-Level Waste Option 1 Capsule Blending-Cesium Strontium Capsule Cut-up Cell

This section describes a layout for a cesium/strontium capsule cut up cell as an option for the Tank Waste Remediation System Extensive Separations Facility. The design assesses how the estimate for the extensive separations facility would change with the addition of a capacity for handling the cesium and strontium capsules.

The cell dimensions (see Appendix E) are 15 m by 7.5 m by 14 m high with a volume of 1,600 m^3.

The following documents and information were used as a design basis for the cesium/strontium capsule cut up cell:

1. Flow diagrams 111-15/111-16 from the *Tank Waste Technical Options Report* (Boomer et al. 1993) were used as initial design input. The following modifications were made:

   - Chemical decontamination was provided in lieu of laser decontamination
   - A chloride ion exchanger was added for the cesium waste stream
   - Seven capsules would be handled in one basket and transfer cask; the cell's processing capacity would be a minimum of 1 basket per week.

2. Since the cut-up facility was considered part of the extensive separations-HLW integrated facility, it was assumed that HVAC and supporting utilities would be available with negligible cost impact on the larger facility.

3. It was assumed that capsules would be received from the Waste Encapsulation Storage Facility (WESF) in a beneficial uses shipping system cask (BUSS).

The cesium/strontium capsules would be transferred from WESF to the extensive separations/HLW vitrification complex using a BUSS cask. Internal cask transfer to the cesium/strontium capsule disposal facility would take place by the Extensive Separation Facility electric overhead traveling crane.

The cask would be loaded onto a bogie (CC2, see Figure E-4) and transferred to the cask lid/delid machine (CN15). After delidding, the cask would be rolled beneath the gamma gate. The capsule basket within the cask would be lifted by the jib hoist (CN12A) up through the gamma (GG1) at elevation 3.75 m to the basket stand (ST3) in the outer capsule ending cell. Individual capsules would be removed from the basket and placed in the storage/cooling rack (RK4) using the jib hoist. Capsules would be removed from the cooling rack and transferred to the end crop machine (FX5) where one end of the outer capsule would be removed. From the end crop machine, the inner capsules would be moved to a through wall shielded turnstile (GG6).

The area associated with the above equipment could be contact maintained once capsules were transferred to the hot cell or shielded by returning them to the shipping cask. Provision would be made for remote removal of failed equipment to a disposal container area by decontamination tankage.

Once in the hot cell, inner capsules would be transferred from the turnstile to the end crop machine (FX7), using a manipulator or tongs. After end cropping, the cesium capsules would be transferred to the cesium rinse tank (TK21) via a basket (BB9). Dissolved cesium would be transferred from the cesium collection tank (TK22), to an ion exchanger (IX25) to remove chloride ions prior to blending with the main HLW stream.

Strontium fluoride capsule contents would be removed by a hydraulic press located on the end crop machine table and transferred to a slurry tank (TK20) via roll crushers. The strontium fluoride then would be transferred to HLW for blending and vitrification.

Outer and inner capsule hulls would be decontaminated in tank TK24 and shredded for size reduction (FX13). The shredded material would be drummed and removed from the facility for burial.

The upper floor (El 7.50 m) of the facility would be dedicated to maintenance of all in-cell machinery. All machines within the facility would be designed to be removed by the waste drum route on failure or final decommissioning.

7.1.3 Detached Low-Level Waste Vitrification Facility

The LLW vitrification facility (see Appendix E) has an overall footprint of 24 m x 75 m and a height of 21 m. The total area would be approximately 1,800 m^2 with a volume of approximately 38,000 m^3. The aboveground building would include a process level, a grade level, and a level at + 9 m; and the following areas:

- Feed receipt and sampling
- Melter operations
- Cullet processing
- Sulfur operations
- Cold chemical make-up
- Heating, ventilation, and air conditioning.

The process level would contain the following areas: feed receipt and sampling, process evaporation for feed concentration, and cullet processing areas. The cullet processing area would consists of quench tanks located below the evaporators and 18 cullet storage tanks.

The grade level and +9 m level would provide space for support services and process equipment. The grade level would provide space to support flasking operations to the separation cells, instrumentation to the process equipment, melter operations, process evaporator for LLW melter feed, maintenance areas, and sulfur operations. The +9 m level would provide space for electrical services and cold chemical make-up.

7.1.4 Detached Low-Level Waste Grout Facility (Low-Level Option B Grout)

In Option B, the LLW vitrification facility would be replaced by a LLW grout facility (see Appendix E). The grout facility would be designed for sodium nitrate in the LLW. It would be contact maintained. The grout vaults would be 5,300 m^3, the same size as the sulfur matrix vaults for the LLW glass in Option A. About seven pairs of grout vaults with a footprint as shown in Figure 8-2 would be needed.

The grout facility would fill cylinders or tubes already located within a storage vault, thus eliminating the need to move the product from the grout facility to storage. Vaults are constructed in pairs, and 7 pairs of vaults would be required over the 14-year grout campaign.

Although grout operations would be controlled from a central facility, local control also would be provided. Heating, ventilating, and air conditioning and nonradioactive feeds would be distributed from the central facility.

The facility design would be based upon the following:

- The LLW grout facility would receive LLW liquid feed from the extensive separations facility and immobilize it in grout in retrievable form.
- The feed rate to the facility would be based on mass balance data for the extensive separations process.
- All waste would be processed within 14 years, assuming a 60 percent theoretical operating efficiency.
- The flowsheet would modify the salt grout process in the *Tank Waste Technical Options Report* (Boomer et al. 1993) to make provisions to retrieve the LLW grout product. No costs are included in the estimate for retrieving the grout.
- Each vault would be sized for one year LLW processing.
- The vault would allow retrieval of the grout product within a building enclosure.

The grout facility would be 78 m wide x 265 m long x 35 m high (19 m above grade). It would include four major components:

- A concrete vault containing removable LLW grout tubes.
- A mobile grouting unit and associated grout feed distribution equipment tubes.
- A superstructure housing the mobile grout unit, the vault, and ancillary equipment.
- A mobile powder receipt and blend unit to receive and blend the grout powder and distribute it to the mobile grouting unit.

The grout tube vault would consist of a concrete enclosure 60 m wide x 233 m long x 14 m deep (internal dimensions) and would contain 1,350 grout tubes on a 18 x 75 matrix at 3 m centers. Each grout tube would be an annular carbon steel cylinder having an outside diameter of 2 m and an inside diameter of 0.3 m. The inner tube helps remove heat during grout curing.

Each tube, 12 m long, would have a welded base and lid and sit on and within guides located in the main grout vault. Each tube would have an integral lifting point to aid retrieval and a number of top entries for filling, venting, and level measurement.

Above each grout tube in the vault roof, there is a concrete shield plug that could be removed to lift the grout tube out of the vault. Removing a grout tube is not a normal occurrence and would only occur for samples if the grout in that tube was not within product specification or for alternative disposal.

No cranes would be provided in facilities to enable removing the shield plug or grout cylinder. It is thought that a floor-mounted unit would be capable of removing the shield plug and one grout tube.

Two rows of 18 tubes would be filled by one 0.080 m diameter carbon steel distribution manifold connected to the mobile grout unit. A branch of the manifold would feed each grout tube and could be isolated by a valve. Valves on the manifold would enable sequential filling of each of 36 tubes, fed from the one manifold.

The shafts of each valve would extend through the vault roof to an actuator. There are 54 actuators per distribution manifold. The actuators would be disconnected and reused on the next manifold.

The mobile grout unit (16 m wide x 17 m long x 18.5 high) would run on rails adjacent to the vault and along its length within the building. The unit would contain two blended powder day bins for powder receipt and blending. The bins would receive the dry mix or blend (see Section 4.7.3) from a second mobile unit. The day bins sequentially would feed a pug mill unit by means of a screwfeeder. The blended powder would be weighed to control the feed of powder to the pug mill.

The pug mill would blend the grout powder with a LLW liquid feed stream to form a wet grout mixture. The mixture then would be pumped from a surge tank to any of the distribution manifolds feeding the grout tubes.

The mobile grout unit would fill 6 grout tubes per day and would move to the adjacent manifold every seventh day.

The pug mill, surge tank, and pump, which are located in a shielded, ventilated enclosure, would have through-wall equipment to enable disconnection and subsequent horizontal flasking of components for disposal. All drive motors would be external to the shielded enclosure.

A connection bulge underneath the pump enclosure would enable connection of the mobile grout unit to the grout manifold station by gamma gates and a raise/lower pipe connection.

The grout manifold connection stations are located along the length of the vault between the rails of the mobile grout unit.

The pipe connection from the pump could be rotated to an adjacent grout washing tank, which facilitates flushing of the pug mill, surge tank pump, and interconnections. A sample station would be installed to sample and flask the grout for analysis in a remote centralized analytical facility. An adjacent shielded enclosure would facilitate the connection of the mobile grout unit to the valved branches of the LLW feed line which would run in an enclosed radioactive duct under the facility floor.

It is intended that two grout facilities would be constructed simultaneously for two year's production time. This would enables one mobile grout unit to feed the two facilities without moving the unit to the next facility.

The facilities would be separated by the mobile powder receipt and blend unit which would run on tracks between the two buildings.

Thirty-eight distribution manifolds would feed the facility with the mobile grout unit, and 37 manifolds would feed the adjacent facility by concrete ducts which would run below grade into the adjacent vault. It is intended that one vault would be filled before filling the adjacent vault.

The building would have a steel framed roof and walls cladded with siding to cover the entire vault area and mobile grout unit. Rooms and corridors would be provided at both ends of the vault for HVAC, electrical, instrumentation and control, and ancillary equipment.

The building would provide weather protection for the vault and mobile grout unit and a controlled area, if there was a requirement to retrieve any grout tube.

The mobile powder receipt and blend unit (13 m wide x 18 m long x 18.5 high) would receive the dry mix or blend (see Section 4.7.3) from a centralized storage facility adjacent to the 14 grout facilities into day storage silos. The grout constituents then would be gravity fed in correct proportions into blending tanks, where they would be homogenized before being air transported using a dense phase pump and flexible pipework into the mobile grout facility by means of a connection through the building envelope. The silos, blending tanks, and pumps would be installed in a framework on rails. This would enable the unit to be moved down the facility to each connection through the building envelope. Eleven connections would be installed so that the unit would move once every 20 operating days. This would eliminate long lengths of flexible pipework which would be required if the unit was static. The rails also would enable the unit to move onto the next two facilities after processing had been completed in the first two.

7.2 HEATING, VENTILATING AND AIR CONDITIONING

The HVAC systems are designed for two distinct operating regimes: the grout pouring/curing period and the post curing period.

7.5 CONSTRUCTION NOISE

Construction noise would not exceed Occupational Safety and Health Administration and other regulatory requirements (see Table 9-25). The effects of construction noise onsite and offsite would need to be considered when selecting a site.

7.6 EQUIPMENT SIZES

Equipment sizes are based on information from the construction of the Defense Waste Production Facility in Savannah River. This information includes size, construction material, and costs. Equipment lists for the integrated pretreatment and HLW vitrification facility, the detached LLW vitrification facility, and alternatively, the LLW grout facility are shown in Appendix B. The equipment lists include capacity and flow rate, physical size, material of construction, and power requirements.

This page intentionally left blank.

The design for the grout pouring/curing period is based on controlling contamination and removing heat generated by grout hydration. During the 12 months that each vault is being filled, the load on the HVAC system would be relatively high. Following the curing of the grout, the HVAC system would have a supply system and a Zone 1 extract system. All air supplied to areas of low contamination would be cascaded by HEPA filters to Zone 1 areas and discharged after HEPA filtration.

Following the grout curing period, the heat generated by the grout is reduced to radiolytic heat. No forced cooling of the grout cylinders would be required. However, until all areas of the building were declared free from contamination, a negative pressure would be required to ensure confinement. This would be achieved by providing a relatively small Zone 1 exhaust system within the grout vault facility, not supply system. The adoption of this system would provide the following advantages:

- Easier control of the Zone 1 exhaust system to facilitate the large turndown ratio required during post grouting
- Higher energy efficiency.

Air movement through the grout facility would be provided by in-leakage (driven by the negative pressure within the Zone 1 areas). Air would be discharged from the Zone 1 system through a stack after HEPA filtration.

7.3 CONTAMINATED SOILS ENCOUNTERED DURING CONSTRUCTION

During the site selection process, one factor to be considered is whether contaminated materials would need to be encountered, disturbed, or moved (e.g., soils) during construction. If a site is selected where contaminated materials would be encountered, disposal methods (e.g., drumming for solid waste disposal) would need to be employed. For purposes of this document, it is assumed that no contaminated materials would be encountered.

7.4 EARTHEN BORROW MATERIAL

Engineering judgment assumes that earthen borrow material for construction of the processing facilities and ancillary buildings would be located within a 3-kilometer radius of the construction sites. For additional information on the number and length of trips, see Table 9-12.

Restoration plans for the borrow area and other areas disturbed include revegetation and reseeding to ensure habitat renewal.

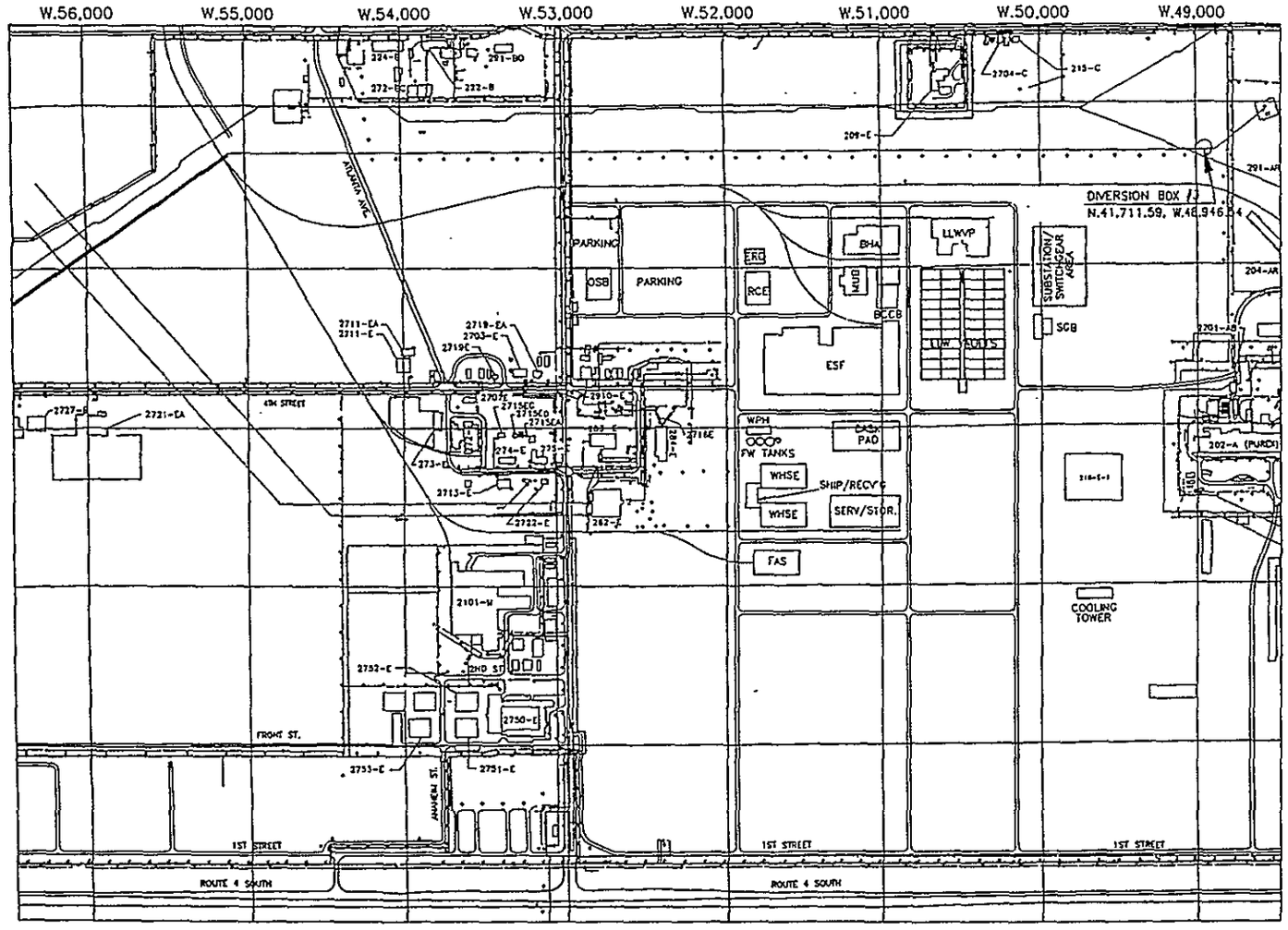
8.0 SITE LAYOUTS

A typical site for the Extensive Separations Pretreatment (ESP) alternative is shown in Figure 8-1. The site includes an area about 160 m by 200 m for storage of LLW glass. This site was used to estimate costs for the ESP data package.

A similar site for the LLW Option B Grout facility is shown in Figure 8-2. An area about 880 m by 350 m is included for storage of LLW grout in vaults.

Site layouts for the areas disturbed by construction and operation of the facilities, the temporary facilities and laydown areas associated with construction of the facilities, and the aggregate pit associated with the construction are given in Appendix G for the Tri-Party Agreement preferred alternative. Differences between these three site layouts and the corresponding ESP site layouts are expected to be small.

Figure 8-1. Site Layout for Extensive Separation Alternative with Low-Level Waste Vitrification.



200 EAST AREA

LEGEND

BCCB	BULK HANDLING & COLD CHEMICAL MAKE-UP BUILDING
BHA	BULK HANDLING AREA
ERC	EMERGENCY RESPONSE CENTER
ESF	EXTENSIVE SEPARATIONS FACILITY/HLWVP
FW TANKS	FIRE WATER TANKS
	HLWVP PROCESS
	HCHA/CANISTER/CASK/HANDLING ANNEX
	HCBB/CONTACT FILTER BUILDING
	ANALYTICAL LAB
	CONDENSATE COLLECTION ANNEX
FAS	FABRICATION & ASSEMBLY SHOP
WPH	WATER PUMPHOUSE
LLWVP	LLW TREATMENT
	LOW SOURCE TERM
MUB	MECHANICAL UTILITY BUILDING
OSB	OPERATIONS SUPPORT BUILDING
RCE	REGULATED TWRS COMPLEX ENTRY
SERV/STOR	SERVICE/STORAGE
SGB	SWITCHGEAR BUILDING/ TRANSFORMER PAD
SHIP/RECV'G	SHIPPING/RECEIVING BUILDING
WHSE	WAREHOUSE

NOTE:
1. 200 ACRES DISTURBED AREA FOR SITE ARRANGEMENT.

0 100 200 300 400 500
GRAPHIC SCALE IN METERS

0 100 400 700 1000 1300 1600
GRAPHIC SCALE IN FEET

U.S.DEPARTMENT OF ENERGY

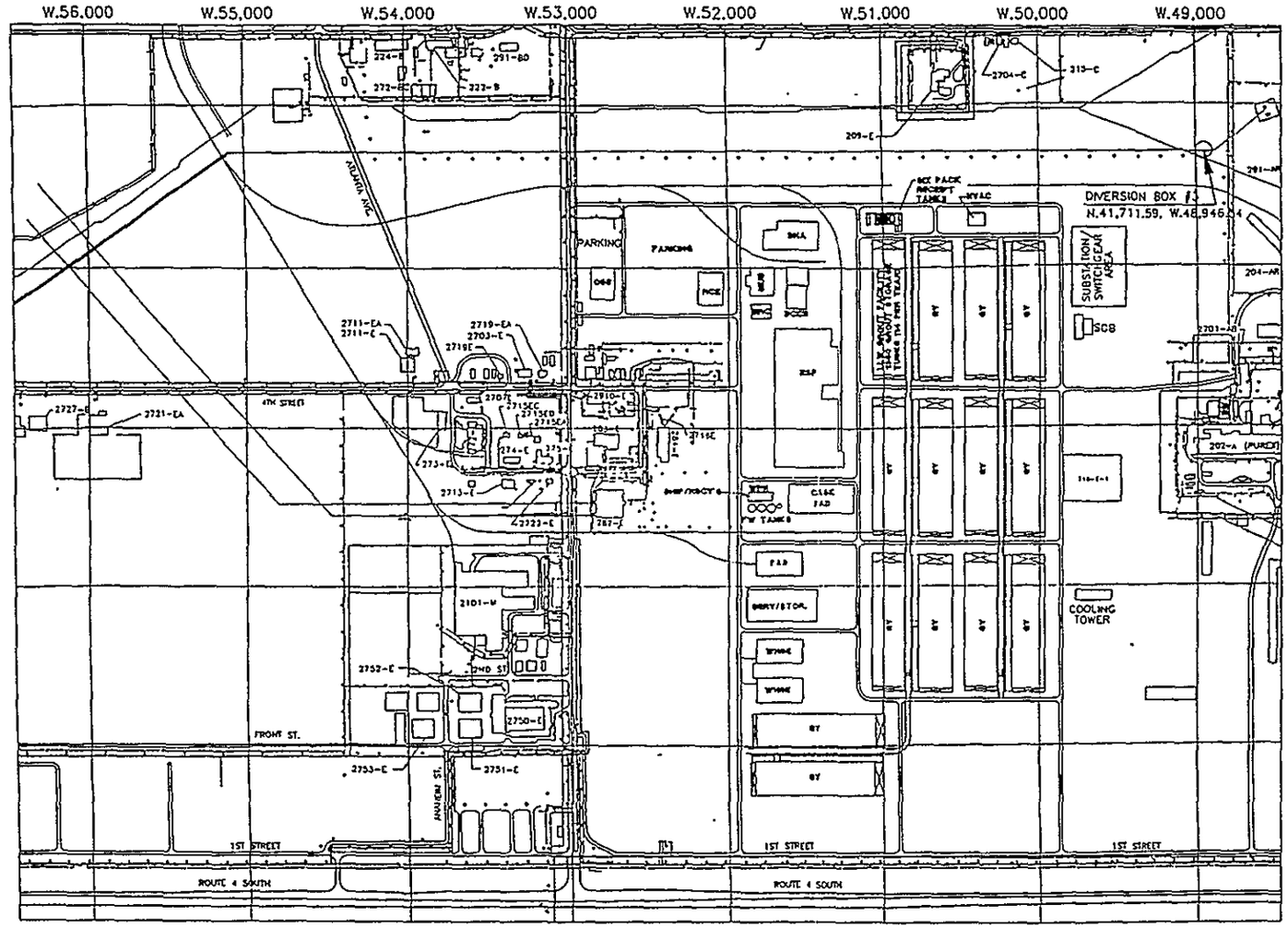
EIS
EXTENSIVE SEPARATIONS ALTERNATIVE WITH LLW GLASS
SITE PLAN

1:3000

REFERENCE DRAWINGS
NOT USED ON

NONE | NOT REQD

Figure 8-2. Site Layout for Extensive Separation Alternative with Low-Level Waste Grout.



200 EAST AREA

LEGEND

BCCB	BULK HANDLING & COLD CHEMICAL MAKE-UP BUILDING
BHA	BULK HANDLING AREA
ERC	EMERGENCY RESPONSE CENTER
ESF	EXTENSIVE SEPARATIONS FACILITY/HLWVP
FW TANKS	FIRE WATER TANKS
	HLWVP PROCESS
	HCHA/CANISTER/CASK/HANDLING ANNEX
	HCBB/CONTACT FILTER BUILDING
	ANALYTICAL LAB
	CONDENSATE COLLECTION ANNEX
FAS	FABRICATION & ASSEMBLY SHOP
WPH	WATER PUMPHOUSE
LLWGP	LLW TREATMENT SALT GROUT FACILITY LOW SOURCE TERM
MUB	MECHANICAL UTILITY BUILDING
OSB	OPERATIONS SUPPORT BUILDING
RCE	REGULATED TWRS COMPLEX ENTRY
SERV/STOR	SERVICE/STORAGE
SCB	SWITCHGEAR BUILDING/ TRANSFORMER PAD
SHIP/RECV'G	SHIPPING/RECEIVING BUILDING
WHSE	WAREHOUSE
GV	LLW GROUT VAULTS

NOTE:

1. 200 ACRES DISTURBED AREA FOR SITE ARRANGEMENT.

0 100 200 300 400 500
GRAPHIC SCALE IN METERS

0 100 400 700 1000 1300 1600
GRAPHIC SCALE IN FEET

U.S.DEPARTMENT OF ENERGY

EIS
EXTENSIVE SEPARATIONS ALTERNATIVE WITH LOW-LEVEL GROUT
SITE PLAN

1:3000

REFERENCE DRAWINGS

9.0 DATA TABLES

Table footnotes are used to explain calculations and/or calculation methods, the rationale for engineering judgment, and references. Backup tables used to further explain the data tables are in Appendix F and WHC-SD-WM-DP-129.

No calculations of radiation dose have been made for Phase 1 of the Extensive Separations Pretreatment alternative. The radiation dose for the Tri-Party Agreement alternative is given in Table 9-27 as an example of the sources of exposure.

Data accuracy is defined as the delta range expected between a calculated or estimated value and the actual value. It is difficult to accurately define table data because of the immaturity of the process and the technical uncertainties that surround it. Therefore, rather than relying upon the accuracy of the data alone, the Westinghouse Hanford Company will ensure that there is consistency between the data packages for comparison purposes.

A list of data tables follows.

Inventory

9-1A Average Radionuclide Inventory in the High-Level Glass Waste Form
9-1B Average Radionuclide Inventory in the Low-Level Glass/Grout Waste Form
9-1C Extensive Separations Flowsheet HLW Glass Composition and Inventory
9-1D Extensive Separations Flowsheet LLW Glass Composition and Inventory

Operating

9-2 Unit Process: Operating Personnel Requirements (Staff Hours)
9-3 Operating Personnel Requirements (Staff Hours/Year)
9-4 Operating Resource Requirements
9-5 Nonradiological Operating Emissions
9-6 Radiological Operating Emissions
9-7 Transportation in Support of Processing

Construction

9-8 Unit Process: Construction Personnel Requirements
9-9 Construction Personnel Requirements (Staff Hours)
9-10 Construction Resource Requirements
9-11 Nonradiological Construction Emissions
9-12 Transportation of Earthen Borrow Construction Material
9-13 Transportation of Other Construction Material

Decontamination and Decommissioning

9-14 Decommissioning of Noncontaminated Treatment/Storage Facilities
9-15 Decommissioning of Contaminated Treatment/Storage Facilities

Cost

9-16 Process Module: Overall Cost
9-17 Overall Cost Component
9-18 Capital Cost Component
9-19 Operating Cost Component

Schedule

9-20 Overall Schedule
9-21 Unit Process: Sequence of Construction
9-22 Construction Equipment Schedule
9-23 Comparison of Alternatives by Average Radiation Dose At Facility
9-24 Operating Schedule
9-25 Construction Type by Duration

Table 9-1A. Average Radionuclide Inventory in the HLW Glass Waste Form (Ci/m³). (2 sheets)

Radionuclide Inventory	Extensive Separation Option [1]					
	HLW Glass Base Case (A-1)	HLW Glass w/Cr Removal (A-2)	HLW Glass w/Cs/Sr Capsule Blend (A-3)	HLW Glass Without Am/La IX (A-4)	HLW Glass With Low Temp. Limits (A-5)	HLW Glass With Incomplete Dissolution (A-6)
^{241}Am	1.09E+03	1.09E+03	2.09E+02	3.86E+02	1.53E+02	3.36E+01
^{243}Am	3.49E-01	3.49E-01	6.69E-02	1.24E-01	4.91E-02	1.07E-02
^{14}C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	1.20E+00	1.20E+00	2.30E-01	3.21E-01	1.69E-01	3.69E-02
^{135}Cs	1.52E+00	1.52E+00	4.77E-01	2.69E-01	2.14E-01	4.67E-02
^{137}Cs	3.66E+05	3.66E+05	1.15E+05	6.48E+04	5.15E+04	1.13E+04
^{129}I	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	1.42E+01	1.42E+01	8.45E+00	7.80E+00	6.20E+00	7.11E+00
^{237}Np	7.31E-01	7.31E-01	1.40E-01	1.34E-01	1.03E-01	2.25E-02
^{238}Pu	1.12E+01	1.12E+01	2.15E+00	2.01E+00	1.58E+00	3.46E-01
^{239}Pu	2.74E+02	2.74E+02	5.25E+01	4.90E+01	3.85E+01	8.43E+00
^{240}Pu	6.96E+01	6.96E+01	1.33E+01	1.24E+01	9.79E+00	2.14E+00
^{241}Pu	7.79E+02	7.79E+02	1.49E+02	1.39E+02	1.09E+02	2.40E+01
^{226}Ra	2.82E-09	2.82E-09	7.13E-10	4.98E-10	3.96E-10	5.93E-11
^{106}Ru	3.95E-04	3.95E-04	1.00E-04	6.99E-05	5.56E-05	8.32E-06

Table 9-1A. Average Radionuclide Inventory in the HLW Glass Waste Form (Ci/m^3). (2 sheets)

Radionuclide Inventory	Extensive Separation Option [1]					
	HLW Glass Base Case (A-1)	HLW Glass w/Cr Removal (A-2)	HLW Glass w/Cs/Sr Capsule Blend (A-3)	HLW Glass Without Am/La IX (A-4)	HLW Glass With Low Temp. Limits (A-5)	HLW Glass With Incomplete Dissolution (A-6)
^{126}Sn	6.54E+00	6.54E+00	1.66E+00	1.16E+00	9.19E-01	1.38E-01
^{90}Sr	5.59E+05	5.59E+05	1.24E+05	9.89E+04	7.85E+04	9.13E+04[2]
^{99}Tc	3.36E+02	3.36E+02	6.43E+01	5.94E+01	4.72E+01	9.41E+00
^{230}Th	4.07E-07	4.07E-07	1.03E-07	7.19E-08	5.72E-08	8.56E-09
^{233}U	2.00E-07	2.00E-07	3.85E-08	3.79E-08	2.82E-08	3.22E-08
^{234}U	3.50E-06	3.50E-06	6.74E-07	6.64E-07	4.94E-07	5.64E-07
^{235}U	3.40E-04	3.40E-04	6.55E-05	6.46E-05	4.80E-05	5.48E-05
^{238}U	7.94E-03	7.94E-03	1.53E-03	1.51E-03	1.12E-03	1.28E-03
^{93}Zr	6.14E-02	6.14E-02	9.58E-02	9.56E-02	7.02E-02	1.72E-02
Total m^3	9.51E+01	9.51E+01	4.96E+02	5.38E+02	6.77E+02	3.09E+03

Notes:

[1]Ref: ESP Flowsheets, Tables A-1 through A-6 of Appendix A.

[2]This value was estimated and does not agree with the material balances in Table A-6 in Appendix A. The strontium extraction process represented only 50% strontium removal versus the 99.99% removal to HLW as in the other runs due to a lack of full convergence of the simulation run.

Table 9-1B. Average Radionuclide Inventory in the LLW Glass and Grout Waste Forms (Ci/m³). (2 sheets)

Radionuclide Inventory	Extensive Separation Option[1]								
	Waste Class A Upper Limits	LLW Glass Base Case (A-1A)	LLW Glassw/Cr Removal (A-2A)	LLW Glass w/Cs/Sr Capsule Blend (A-3A)	LLW Glass Without Am/La IX (A-4A)	LLW Glass With Low Temp. Limits (A-5A)	LLW Glass With Incomplete Dissolution (A-6A)	LLW GroutBase Case (A-1B)	LLW Grout w/Cr Removal (A-2B)
^{241}Am	2.66E-02	7.34E-04	7.34E-04	7.34E-04	7.34E-04	7.34E-04	7.75E-04	2.18E-04	2.18E-04
^{243}Am	2.66E-02	2.35E-07	2.35E-07	2.35E-07	2.35E-07	2.35E-07	2.48E-07	6.98E-08	6.98E-08
^{14}C	8.00E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{244}Cm	2.66E-02	4.56E-06	4.58E-06	4.56E-06	4.56E-06	4.56E-06	4.71E-06	1.36E-06	1.35E-06
^{135}Cs	no limit	9.16E-07	9.34E-07	9.16E-07	9.16E-07	9.16E-07	2.51E-06	2.72E-07	2.78E-07
^{137}Cs	1.00E+00	2.21E-01	2.25E-01	2.21E-01	2.21E-01	2.21E-01	6.04E-01	6.56E-02	6.70E-02
^{129}I	8.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
^{63}Ni	3.50E+00	1.83E+00	1.83E+00	1.83E+00	1.83E+00	1.83E+00	1.81E+00	5.42E-01	5.42E-01
^{237}Np	2.66E-02	1.87E-05	1.78E-05	1.88E-05	1.88E-05	1.88E-05	3.44E-06	5.59E-06	5.28E-06
^{238}Pu	2.66E-02	7.80E-05	7.79E-05	7.80E-05	7.80E-05	7.80E-05	8.05E-05	2.32E-05	2.32E-05
^{239}Pu	2.66E-02	1.90E-03	1.90E-03	1.90E-03	1.90E-03	1.90E-03	1.97E-03	5.65E-04	5.65E-04
^{240}Pu	2.66E-02	4.84E-04	4.83E-04	4.84E-04	4.84E-04	4.84E-04	5.00E-04	1.44E-04	1.44E-04
^{241}Pu	9.31E-01	5.41E-03	5.40E-03	5.41E-03	5.41E-03	5.41E-03	5.59E-03	1.61E-03	1.61E-03
^{226}Ra	no limit	7.20E-16	7.33E-16	7.21E-16	7.20E-16	7.21E-16	6.28E-13	2.14E-16	2.18E-16
^{106}Ru	7.00E+02	1.01E-10	1.03E-10	1.01E-10	1.01E-10	1.01E-10	8.81E-08	3.01E-11	3.06E-11
^{151}Sm	no limit	1.68E-03	1.71E-03	1.68E-03	1.68E-03	1.68E-03	1.46E+00	5.00E-04	5.08E-04
^{126}Sn	no limit	1.67E-06	1.70E-06	1.68E-06	1.67E-06	1.68E-06	1.46E-03	4.97E-07	5.06E-07

Table 9-1B. Average Radionuclide Inventory in the LLW Glass and Grout Waste Forms (Ci/m³). (2 sheets)

Radionuclide Inventory	Extensive Separation Option[1]								
	Waste Class A Upper Limits	LLW Glass Base Case (A-1A)	LLW Glassw/Cr Removal (A-2A)	LLW Glass w/Cs/Sr Capsule Blend (A-3A)	LLW Glass Without Am/La IX (A-4A)	LLW Glass With Low Temp. Limits (A-5A)	LLW Glass With Incomplete Dissolution (A-6A)	LLW GroutBase Case (A-1B)	LLW Grout w/Cr Removal (A-2B)
^{90}Sr	4.00E-02	3.72E-02	3.76E-02	3.75E-02	3.75E-02	3.75E-02	4.06E-02[3]	1.11E-02	1.11E-02
^{99}Tc	3.00E-01	1.06E-03	1.06E-03	1.06E-03	1.06E-03	1.06E-03	2.44E-02	3.15E-04	3.14E-04
^{230}Th	no limit	1.04E-13	1.06E-13	1.04E-13	1.04E-13	1.04E-13	9.07E-11	3.10E-14	3.10E-14
^{233}U	no limit	5.19E-11	5.16E-11	5.19E-11	5.19E-11	5.19E-11	5.45E-11	1.54E-11	1.54E-11
^{234}U	no limit	9.10E-10	9.04E-10	9.10E-10	9.10E-10	9.10E-10	9.55E-10	2.71E-10	2.69E-10
^{235}U	no limit	8.84E-08	8.78E-08	8.84E-08	8.84E-08	8.84E-08	9.28E-08	2.63E-08	2.61E-08
^{238}U	no limit	2.06E-06	2.05E-06	2.06E-06	2.06E-06	2.06E-06	2.17E-06	6.14E-07	6.10E-07
^{93}Zr	no limit	2.68E-02	2.68E-02	2.68E-02	2.68E-02	2.68E-02	2.84E-02	7.96E-03	7.95E-03
Total m^3		1.48E+05	1.48E+05	1.48E+05	1.48E+05	1.48E+05	1.40E+05	4.89E+05	4.87E+05

Notes:

[1]Ref: ESP Flowsheets, Tables A-1A through A-6A, A-1B, and A-2B of Appendix A.

[2]Conversion factor: 2.66E-03 Ci/m3 per nCi/gm

[3]This value was estimated and does not agree with the material balances in Table A-6A in Appendix A. The strontium extraction process represented only 50% strontium removal versus the 99.99% removal to HLW as in the other runs due to a lack of full convergence of the simulation run.

Table 9-1C. Extensive Separations Flowsheet HLW Glass Composition Results. (2 sheets)

HLW Glass formulation wt%	HLW glass base case (A-1)*	HLW glass w/ Cr removal (A-2)*	HLW glass w/ Ca/Sr capsule blend (A-3)*	HLW glass w/o Am/La IX (A-4)*	HLW glass w/ low temperature limits (A-5)	HLW glass w/ incomplete dissolution (A-6)*
CL-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
F-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SO_3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Al_2O_3	14.86%	14.58%	14.75%	13.62%	10.84%	11.00%
B_2O_3	9.14%	5.00%	8.71%	5.00%	12.98%	17.00%
CaO	0.18%	0.04%	0.18%	0.16%	0.13%	0.03%
Cr_2O_3	0.10%	0.25%	0.10%	0.10%	0.08%	0.09%
Fe_2O_3	3.21%	2.00%	3.22%	2.98%	4.00%	4.00%
Li_2O	1.00%	1.00%	1.00%	1.00%	2.00%	3.54%
MgO	0.02%	0.00%	0.02%	0.02%	0.01%	0.00%
Na_2O	5.00%	11.89%	5.00%	5.00%	7.00%	7.00%
P_2O_5	3.00%	0.05%	3.00%	2.77%	2.20%	0.26%
SiO_2	57.00%	42.00%	57.00%	42.00%	56.00%	56.00%
UO_3	0.21%	1.10%	0.21%	0.21%	0.15%	0.18%
ZrO_2	0.65%	0.42%	0.65%	0.65%	0.48%	0.12%
$Al_2O_3 + ZrO_2$	15.50%	14.99%	15.40%	14.27%	11.32%	11.12%
$Al_2O_3 + Fe_2O_3 + ZrO_2$	18.72%	16.99%	18.61%	17.25%	15.32%	15.12%
CaO + MgO	0.19%	0.05%	0.19%	0.18%	0.14%	0.04%
$Rh_2O_3 + Ru_2O_3$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HLW oxide loading	34.10%	65.70%	34.50%	52.70%	25.00%	21.60%

Table 9-1C. Extensive Separations Flowsheet HLW Glass Composition Results. (2 sheets)

HLW Glass formulation wt%	HLW glass base case (A-1)*	HLW glass w/ Cr removal (A-2)*	HLW glass w/ Cs/Sr capsule blend (A-3)*	HLW glass w/o Am/La IX (A-4)*	HLW glass w/ low temperature limits (A-5)	HLW glass w/ incomplete dissolution (A-6)*
Al_2O_3 in the frit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
B_2O_3 in the frit	13.84%	14.57%	13.27%	10.55%	17.27%	21.64%
Fe_2O_3 in the frit	0.00%	1.70%	0.00%	0.00%	2.19%	4.23%
Li_2O in the frit	1.51%	2.91%	1.52%	2.11%	2.66%	4.51%
Na_2O in the frit	2.74%	0.00%	2.78%	4.36%	6.21%	3.87%
IO_2 in the frit	81.90%	80.82%	82.43%	82.99%	71.68%	65.76%
This produces 0.62-m^3 HLW canisters	799.4	153.1	799.2	865.6	1089.8	4981.9
This produces 1.26-m^3 HLW canisters	393.3	75.3	393.2	426.0	536.2	2451.4
HLW glass is limited by:	P_2O_5	FRIT	P_2O_5	FRIT	Waste Loading	Al_2O_3

Notes:

*These simulations were run using CVS limits and glass formers.

Table 9-1D. Extensive Separations Flowsheet LLW Glass Composition And Grout Results. (2 sheets)

LLW Glass formulation wt%	LLW glass (A-1A)	LLW glass (A-2A)	LLW glass (A-3A)	LLW glass (A-4A)	LLW glass (A-5A)	LLW glass (A-6A)	LLW grout (A-1B)	LLW grout (A-2B)
CL-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
F-	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
SO_3	1.61%	1.56%	1.61%	1.61%	1.61%	0.63%		
Al_2O_3	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%		
B_2O_3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
CaO	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%		
Cr_2O_3	0.07%	0.02%	0.07%	0.07%	0.07%	0.07%		
Fe_2O_3	0.97%	0.94%	0.97%	0.97%	0.97%	0.42%		
K_2O	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%		
Li_2O	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
MgO	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%		
Na_2O	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%		
P_2O_5	0.95%	0.95%	0.95%	0.95%	0.95%	1.01%		
SiO_2	55.91%	56.05%	55.91%	55.91%	55.90%	57.35%		
UO_3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
ZrO_2	0.18%	0.18%	0.18%	0.18%	0.18%	0.19%		
$Al_2O_3 + ZrO_2$	5.18%	5.18%	5.18%	5.18%	5.18%	5.19%		
$Al_2O_3 + Fe_2O_3 + ZrO_2$	6.15%	6.12%	6.15%	6.15%	6.15%	5.61%		
CaO + MgO	10.01%	10.01%	10.01%	10.01%	10.01%	10.01%		
$Rh_2O_3 + Ru_2O_3$	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		

Table 9-1D. Extensive Separations Flowsheet LLW Glass Composition And Grout Results. (2 sheets)

LLW Glass formulation wt%	LLW glass (A-1A)	LLW glass (A-2A)	LLW glass (A-3A)	LLW glass (A-4A)	LLW glass (A-5A)	LLW glass (A-6A)	LLW grout (A-1B)	LLW grout (A-2B)
LLW oxide loading	31.40%	31.30%	31.40%	31.40%	31.40%	29.80%		
Al_2O_3 in the frit	4.36%	4.31%	4.36%	4.36%	4.36%	4.39%		
CaO in the frit	14.51%	14.48%	14.51%	14.51%	14.51%	14.17%		
Fe_2O_3 in the frit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
Li_2O in the frit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
ZrO_2 in the frit	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		
SiO_2 in the frit	81.13%	81.21%	81.13%	81.13%	81.13%	81.44%		
This produces 5300-m^3 LLW vaults.	38.53	38.44	38.57	38.56	38.51	36.39	92.3	91.9

Table 9-2. Unit Process: Operating Personnel Requirements (Staff Hours)[1].

Unit Process	Extensive Separation Alternative
Sludge wash	0
Cesium removal	2.1 E+07
Other radionuclide removal	See [2]
Low-level waste vitrification	5.5 E+06
Low-level waste disposal	2.0 E-05
High-level waste vitrification	5.8 E+06
High-level waste transportation/disposal	2.5 E+05
Total	3.3 E+07

Notes:

[1]Includes staffing for start-up, decontamination and decommissioning, and monitoring and maintenance.

[2]Operating staff for "Other Radionuclide Removal" is included with "Cesium Removal."

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-3. Operating Personnel Requirements (Staff Hours)[1,2].

Operating Personnel	Extensive Separation Alternative
Nonexempt	
Radiation worker	0
Nonradiation worker	3.3 E+06
Exempt	
Radiation worker	8.5 E+06
Nonradiation worker	0
Bargaining Unit	
Radiation worker	2.1 E+07
Nonradiation worker	0
Total Staff Hours	3.3 E+07

Notes:

[1]All exempt and bargaining unit employees are assumed to be radiation workers. All nonexempt employees are nonradiation workers.

[2]Includes staffing for start-up, decontamination and decommissioning, and monitoring and maintenance.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-4. Operating Resource Requirements. (3 sheets)

Operating Resource	Extensive Separation Alternative [1]
Land (m^2)	
Surface committed permanently	120,000
Water (m^3) total	3.12×10^7 m^3
Raw water (m^3)	3.0×10^7 m^3
Sanitary water (m^3)	1.21×10^6 m^3
Energy	
Electrical (GWh)	1.66×10^4
Kerosene (m^3)	93,560
Materials	
	3.55×10^5 Mg
Glass Former	5.75×10^4 Mg
B_2O_3	1.4×10^1 Mg
Fe_2O_3	2.1×10^3 Mg
LiO_2	2.87×10^5 Mg
SiO_2	4.1×10^3 Mg
MgO	4.1×10^3 Mg
CaO	
Resin total	4.9×10^3 m^3
R-F for Cs Removal	9×10^2 m^3
CST for Sr Removal	8×10^2 m^3
Reillex HPQ for Tc Removal	3×10^3 m^3
AMP for Cs Removal	1.6×10^2 m^3
Reillex HPQ for Am/LAN Removal	5×10^1 m^3
Nitric Acid 50%	4.65×10^5 Mg
-, 50% [2][3]	1.5×10^5 Mg
Flocculent - Polyelectrolyte	150 Mg
Glycolic Acid, 100%	7.7×10^3 Mg
Oxalic Acid, 50%	1.2×10^4 Mg
FeSA	4.72×10^3 Mg
Aluminum Nitrate	1.12×10^2 Mg
CMPO	5 Mg
TBP	755 Mg
NPH	703 Mg

Table 9-4. Operating Resource Requirements. (3 sheets)

Operating Resource	Extensive Separation Alternative [1]
Sodium Carbonate	1.8×10^2 Mg
Crown Ether	284 Mg
Formic Acid, 96%	1.47×10^3 Mg
HF	740 Mg
H_2O_2, 100%	6.4×10^3 Mg
Sodium Oxalate	2.09×10^4 Mg
Sodium Bicarbonate	1.25×10^4 Mg
Zinc Nitrate	.47 Mg
Na_3 DTPA	1.96×10^2 Mg
APM	10 Mg
Hydroxylamine Nitrate	9.5×10^1 Mg
HLW Glass Steel	4.48×10^2 Canisters 3.36×10^2 Mg
Ammonia	9.24×10^3 Mg
DCPD	4.46×10^3 Mg
CPD	4.46×10^3 Mg
Sulfur	1.7×10^5 Mg

Table 9-4. Operating Resource Requirements. (3 sheets)

Decontamination Chemicals	1.4×10^4 Mg
Material for Construction of LLW Vaults Concrete (m^3) Steel (Mg)	 1.4×10^5 1.6×10^4

Notes:

GWh	=	gigawatt hours
HLW	=	high-level waste
Mg	=	megagrams
m^2	=	square meters
m^3	=	cubic meters

[1]CLEAN Flowsheet, XXX9J Revision, January 24, 1995. The chemical makeup is calculated in the following calculations:

E/B-SD-W236B-CAL-PR-EIS-010-REV0A
E/B-SD-W236B-CAL-PR-EIS-017-REV0A
E/B-SD-W236B-CAL-PR-EIS-018-REV0A
E/B-SD-W236B-CAL-PR-EIS-021-REV0A

[2]The January 19, 1995 material balance did not reflect the sodium hydroxide requirement for caustic leaching process. An estimate of 50,000 Mg of sodium hydroxide (50 percent solution) is added to the flowsheet projection.

[3]The current consumption estimate does not include recovery of sodium hydroxide from low- level liquid waste (pretreated supernatant). The recovery of sodium hydroxide in the amount of 15,000 Mg will reduce fresh caustic solution makeup by 15,000 Mg, and will increase ammonia consumption by 52,000 Mg and can potentially reduce glassified low-level waste by 48,000 Mg.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-5. Nonradiological Operating Emissions. (2 sheets)

Item	Extensive Separation Alternative
Thermal release[1]	1.94×10^{16}J
Particulates[2]	3.08×10^{5}kg
PM-10 content, percent	0.003
VOC[3]	9.8×10^{3} kg
Fugitive dust	n/a
Toxic Air Pollutants[4]	
Formic Acid	1.54×10^{3} kg
Hydrofluoric Acid	1.26×10^{3} kg
Hydrogen Peroxide	2.8×10^{1} kg
Nitric Acid	2.16×10^{4} kg
Oxalic Acid	Negligible
Sodium Hydroxide	9.8×10^{1} kg
Hazardous Air Pollutants[4]	
Arsenic	Negligible
Beryllium	Negligible
Cadmium	Negligible
Chromium	4.48×10^{1} kg
Nickel	1.4 kg
Manganese	9.8 kg
Mercury	Negligible
Lead	Negligible

Table 9-5. Nonradiological Operating Emissions. (2 sheets)

NOx (as NO_2)[4]	1.47×10^7 kg
SOx (as SO_2)[4]	1.33×10^6 kg
CO[4]	2.44×10^6 kg

Notes:

n/a = not applicable

[1]Refer to calculation E/B-SD-W236B-CAL-PR-EIS-016.

[2]Particulate emission estimate assumes cooling tower emissions are 95 percent of total particulate emissions (i.e., cooling tower emissions/0.95 = total emissions). Particulate emissions are essentially PM_{10}. Refer to calculation E/B-SD-W236-CAL-PR-EIS-004.

[3]VOC emissions are not presented in material balance but are estimated based on vapor liquid equilibrium during storage. Refer to calculation E/B-SD-W236-CAL-PR-EIS-004.

[4]Emissions of Toxic Air Pollutants (TAP) Hazardous Air Pollutants (HAP) NOx, SO_2 and CO are not presented in the material balance but are estimated based on vapor liquid equilibrium during storage. Refer to calculation E/B-SD-W236-CAL-PR-EIS-004.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-6. Radiological Operating Emissions (Curies).

Radionuclide[1]	Extensive Separation Alternative[2]	
	Air[3]	Water
^{241}Am	5.2E-2	4.2E-4
^{14}C	5.3E+3	n/a
^{137}Cs	1.7E+1	6.9E-2
^{129}I	1.7E+1	3.5E-4
$^{239,240}Pu$	1.6E+1	4.2E-4
^{106}Ru	1.9E-8	1.0E-2
^{151}Sm	3.2E-1	n/a
^{90}Sr	2.7E+1	2.8E-3
^{99}Tc	1.6E-2	n/a
^{93}Zr	2.0E-3	n/a
Percent PM -10 [4]	1.4E-6	—[5]

Notes:

n/a = not applicable
PM = particulate material
VOC = volatile organic compound

[1]All values in Ci except for percent PM - 10 which is in metric tons.

[2]Air values are based on material balances (streams 907 and 917 in LLW Vitrification Flowsheet; streams 1371, 1374, and 1543 in Integrated Pretreatment-HLW Vitrification Flowsheet - see Table A-7 of Appendix A) with radionuclide distribution determined using waste inventory data from Golberg (1995). Carbon-14 and iodine-129 values were not explicitly represented in flowsheet. Valuess estimated for the TPA Preferred Alternative (Slaathaug 1995) were used based on consistency of other radionuclide values between the two alternatives. Golberg, C. E., 1995, *Single-Shell and Double Shell Tank Waste Inventory Data Package for the Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-EV-102, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

[3]Values were based on those estimated for the TPA Preferred Alternative (Slaathaug 1995). The water values are based on effluent stream 1210 in the Integrated Pretreatment-HLW Vitrification Flowsheet and effluent stream 807 in the LLW Vitrification Flowsheet, along with the design basis for the Liquid Effluent Treatment Facility (LETF) C-018.

[4]Percent PM - 10 set equal to the total amount of solids in the streams as a percentage.

[5]LETF design sheet include solids, but for the discharge stream "—" was entered.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Slaathaug, E. J., 1995, *Tri-Party Agreement Alternative Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-EV-104, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

9513385.0818

Table 9-7. Transportation in Support of Processing (Units as Indicated).

Item	Extensive Separation Alternative
Normal Operation Route location (State mileage)	Portland/Seattle (400 kilometers)
Roadtype (gravel or asphalt)	Asphalt
Number of trips per year [1] Truck Train [2]	 513 637
High-level waste transportation Route location (State mileage)	 1,330 [3]
Number of overpack canisters	125 [4]
Number of total trips by train	10 [5]

Notes:

[1]Based on yearly loads of glass formers and other cold chemicals. Resins are transported by truck.

[2]Trains consist of 130-ton railcars with 20 cars per train.

[3]Mileage based on travel from Hanford to Yucca Mountain per Table 3-7 (TRW 1995).

Information provided by Hanford Railroad - Transportation.

[4]Based on 4 canisters placed in a Hanford overpack canister.

[5]Based on the transportation of 10 multi-purpose canisters by 10 railcars per week from Hanford to future repository.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

TRW, 1995, *Assessment of Pre-Closure System Cost and Health and Safety Impacts of Hanford High-Level Waste Vitrification Options on the Civilian Radioactive Waste Management System A00000000-01717-5707-00003*, Rev. 0, TRW Environmental Safety Systems, Inc., Vienna, Virginia.

Table 9-8. Construction Personnel Requirements (Staff Hours).

Unit Process	Extensive Separation Option
Sludge wash	0
Radionuclide removal	3.0 E+07
Low-level waste vitrification	7.5 E+06
Low-level waste disposal	0
High-level waste vitrification	6.9 E+06
High-level waste transportation	0
High-level waste disposal	0
Centralized facilities	7.5 E+06
Total	5.2 E+07

Notes:

Excludes low-level vaults.

Includes high-level waste canister storage building.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-9. Construction Personnel Requirements (Staff-Hours).

Construction Personnel	Extensive Separation Alternative
Design and Engineering	1.4 E+07
Construction Radiation worker Nonradiation worker	 0 2.9 E+07
Supervisory	8.6 E+06
Total	5.2 E+07

Notes:

Excludes low-level waste vaults.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-10. Construction Resource Requirements (Units as Indicated).

Construction Resource	Extensive Separation Alternative
Land (m^2) Surface committed temporarily	1.3 E+06
Water (m^3)	5.2 E+05
Energy	
Electrical (gigawatt hours)	8.9 E+01
Propane (m^3)	0
Diesel fuel (liters)	2.9 E+07
Gasoline (liters)	9.7 E+06
Materials	
Concrete (m^3)	4.4 E+05
Steel	
Carbon steel (Mg)	1.3 E+05
Stainless steel (Mg)	1.7 E+04
Hastelloy/Incl. (Mg)	1.8 E+03
Excavation (m^3)	1.8 E+06
Riprap (m^3)	
Structural backfill (m^3)	8.5 E+05

Notes:

Mg = megagrams
m^2 = square meters
m^3 = cubic meters

Includes construction of the low-level waste vaults.

Excavation represents structural excavation for building and vault construction.

Structural backfill is at the buildings and vaults.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-11. Nonradiological Construction Emission (Units as Indicated).

Construction Emission Pollutant	Extensive Separation Alternative
Particulate (kg)	2.7 E+05
SOx (as SO2) (kg)	3.1 E+04
CO (kg)	6.7 E+07
Hydrocarbons (kg) (exhaust and fugitive)	3.4 E+06
NOx (as NO_2) (kg)	3.9 E+06
Aldhydes (as HCHO) (kg)	1.2 E+05
Organic acids (kg)	n/a
Thermal releases (J)	1.1 E+15
Fugitive dust (t)	1, 029

Notes:

J = joules
kg = kilogram
t = tons

Includes construction of the low-level waste vaults.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-12. Transportation of Earthen Borrow Construction Material (Units as Indicated)[1].

Item	Extensive Separation Alternative
Borrow source Location[2] (State)	3 km northwest of Site
Route location (State/mileage)	Route 3 to Route 4 (5 km)
Road type (gravel or asphalt)	Gravel, level
Total number of trips Truck Train Barge	 6.1 E+04 0 0
New road construction (miles)	0
Load volumes (m^3) [2]	6.1

Notes:

km = kilometers
m^3 = cubic meters

[1]Includes construction of the low-level waste vaults.

[2]Crushed coarse aggregate for concrete, from onsite borrow pit.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-13. Transportation of Other Construction Material (Units as Indicated).

Item	Extensive Separation Alternative
Route location (State mileage)	Tri-Cities (79 kilometers)
Total number of trips Truck Train Barge	 2.7 E+04 0 0
Route location (State mileage)	Portland/Seattle (400 kilometers)
Total number of trips (Average/peak) Truck Train Barge	 1.1 E+04 0 0

Note:

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-14. Decommissioning of Noncontaminated Treatment/Storage Facilities (Metric Kilo-Tons).

Item	Extensive Separation Alternative
Steel Quantity Disposition	 115 entombed in place
Concrete Quantity Disposition	 672 entombed in place
Soil Quantity Disposition	 0
Debris Quantity Disposition	 39 regulated landfill

Note:

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-15. Decommissioning of Contaminated Treatment/Storage Facilities (Metric Kilo-Tons).

Item	Extensive Pretreatment Alternative
Steel	
Quantity	19
Disposition	Low-level waste burial grounds
Concrete	
Quantity	30
Disposition	Low-level waste burial grounds
Soil	
Quantity	0
Disposition	
Debris	
Quantity	2.5
Disposition	Low-level waste burial grounds

Note:

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-16. Process Module: Overall Cost (Millions of 1995 Dollars).

Process Module	Extensive Separation Alternative
Radionuclide removal	$6,098
Low-level waste vitrification	1,917
Low-level waste disposal	248
High-level waste vitrification	1,685
High-level waste transportation[1]	7
High-level waste disposal	3,404
Centralized facilities	638
Total	$13,997

Note:

[1]Cost for high-level waste transportation and disposal are based upon 1000 canisters in 250 multi-purpose canisters.

[2]These cost results apply to the integrated combination of HLW Option 1 and LLW Option A (Option 1A). This combination of cesium and strontium capsule overpacking and LLW glass is the same combination of options as that assumed in the Tri-Party Agreement preferred alternative.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-17. Overall Cost Component (Millions of 1995 Dollars). (2 sheets)

Cost Component	Extensive Separation Alternative
Capital	$5,202[1]
Operating	4,556[2]
Research and development	846[3]
Repository fee	3,393[4]
Total	$13,997

Notes:

[1]Total capital cost includes 40 percent contingency. Contingency is excluded from other costs. Also see Table 9-18 for additional explanation.

[2]Includes start-up, decontamination and decommissioning, and monitoring and maintenance costs for process facilities. Does not include costs associated with routine tank farm operations (estimated at $4,340 million in 1995 dollars). Also does not include costs associated with TWRS program management characterization, tank farm upgrades, single-shell tank saltwell pumping, and tank farm safety.

[3]Based on *Tank Waste Remediation System Integrated Technology Plan* WHC 1994), June 10, 1994 draft. The Research and Development costs depicted above are estimates based upon the pro ratio of capital costs with the Tri-Party Agreement Alternative.

[4]Table D-8, TRW 1995, estimates the repository fee for the Extensive Separations Alternative (Case 3-5SC) would be $679 million lower than the estimated repository fee for Case 1C, using the TRW Total System Life Cycle Cost (TSLCC) model developed for the Office of Civilian Radioactive Waste Management. Per informal communications with Mr. don Nitti of TRW on 5/31/95 and 7/13/95, Hanford's repository fee for Case 1C is estimated as follows:

Two repository case total life cycle cost	=	$48.294 billion
Defense program share	=	15.7%
Hanford's share based on ratio of number of Hanford waste packages (2,465) to total defense program waste packages (4,588), from Table 2-4 of TRW 1995	=	53.7%
Hanford's share of Case 1C: ($48.294 billion x 0.157 x 0.537)	=	$4.072 billion

Table 9-17. Overall Cost Component (Millions of 1995 Dollars). (2 sheets)

Notes: Continued

TRW, 1995, *Assessment of Pre-Closure System Cost and Health and Safety Impacts of Hanford High-Level Waste Vitrification Options on the Civilian Radioactive Waste Management System A00000000-01717-5707-00003*, Rev. 0, TRW Environmental Safety Systems, Inc., Vienna, Virginia..

WHC, 1994, *Tank Waste Remediation System Multi-Year Program Plan*, WHC-SP-1101, Westinghouse Hanford Company, Richland, Washington.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-18. Capital Cost Component (Millions of 1995 Dollars)[2].

Capital Cost Component	Extensive Separation Alternative
Labor	$2,225
Materials and supplies	998
Equipment	1,682
Local purchases[1]	297
Total	$5,202

Notes:

[1]Local purchases - 15 percent of materials and supplies are assumed to be local purchases.

[2]Costs in this table reflect Option 1A as described in Section 2.0. This includes construction of the detached LLW vitrification facility and vaults. However, it does not include filling of the vaults with LLW glass/SPC. These costs are included in Table 9-19. Section 9.1 and Table 9-26 provide additional capital costs for Option 2A for the Cs/Sr cut-up cell. Section 9.2 and Table 9-27 provide the adjustments necessary to reflect capital costs for Option 2B, as described in Section 2.0. Costs of filling the grout tubes in Option 2B is covered in Table 9-19. Costs in this table also include a rough order of magnitude estimate of 365 million dollars for caustic recycling and thermal denitration. These process steps were not included in the original flowsheet upon which the detailed cost estimate for the balance of the facility was based (see Section 4.8.1).

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-19. Operating Cost Component (Millions of 1995 Dollars)[1].

Operating Cost Component	Extensive Separation Alternative
Labor	$1,803
Materials and supplies[2]	$2,007
Equipment[2]	$333
Local purchases[2]	$413
Total	$4,556

Notes:

[1]Includes filling of low-level waste vaults for vitrified LLW (Option 1A) as well as start-up, decontamination and decommissioning, and monitoring and maintenance costs. For grouted LLW (Option 2B), operating costs would be higher (see Section 9.2 and Tables 9-27 and 9-28).

[2]Local purchases are based on 15 percent of materials and supplies and equipment.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-20. Overall Schedule[5].

Activity	Extensive Separation Alternative
Construction	12/97 - 12/2006[1]
Operation	1/2004 - 9/2019[2]
Decontamination and decommissioning	10/2019 - 10/2024[3]
Monitoring and maintenance	3/2019 - 9/2029[4]
Research and development	1995 - 2018

Notes:

[1]See the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994), pages 63 and 114.

[2]See Boomer et al. 1994, pages 33, 63, and 114.

[3]Five years of decontamination and decommissioning assumed after completion of all processing and vitrification.

[4]Based upon 1,000 canisters, 250 multi-purpose canisters; shipments to repository beginning in 2020 and ending in 2029 per canister pickup schedule in Table D-6, Case 3-5 SC, TRW 1995. (See Table 9-7 for related information.)

[5]The assumed construction schedule and the 14 year facility operations schedule are highly optimistic for the extensive separations alternative. There is considerably higher technical risk for extensive separations than for the other TWRS-EIS alternatives evaluated. Consequently, there is higher schedule risk associated with this alternative than with the other alternatives.

Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. M. Winkler, 1994, *Tank Waste Remediation System Facility Configuration Study*, WHC-SD-WM-ES-295, Westinghouse Hanford Company, Richland, Washington. See Appendix F also.

TRW, 1995, *Assessment of Pre-Closure System Cost and Health and Safety Impacts of Hanford High-Level Waste Vitrification Options on the Civilian Radioactive Waste Management System A00000000-01717-5707-00003*, Rev. 0, TRW Environmental Safety Systems, Inc., Vienna, Virginia..

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-21. Unit Process: Sequence of Construction (Calendar Year Start/Completion Date).

Unit Process	Extensive Separation Alternative
Sludge wash	n/a
Radionuclide removal	7/2001 - 12/2006[1]
Low-level waste vitrification	12/1997 - 07/2005[2]
Low-level waste disposal	09/2005 - 09/2019[3]
High-level waste vitrification	07/2001 - 12/2006[4]
High-level waste transportation/disposal	n/a

Notes:

n/a = not applicable

[1]See the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994), page 114.

[2]See Boomer et al. 1994, page 63.

[3]See Boomer et al. 1994, pages 33 and 63.

[4]See Boomer et al. 1994, page 144.

[5]The assumed construction schedule and the 14 year facility operations schedule are highly optimistic for the extensive separations alternative. There is considerably higher technical risk for extensive separations than for the other TWRS-EIS alternatives evaluated. Consequently, there is higher schedule risk associated with this alternative than with the other alternatives.

Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. M. Winkler, 1994, *Tank Waste Remediation System Facility Configuration Study*, WHC-SD-WM-ES-295, Westinghouse Hanford Company, Richland, Washington.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-22. Construction Equipment Schedule (Units).

Unit Process	Extensive Separation Alternative
Heavy-duty diesel equipment	81
Light-duty diesel equipment[1]	297
Light-duty gasoline vehicles	259
Small gasoline engines	790
Construction noise (decibels)[2]	85

Notes:

[1]Light-duty diesel equipment has been added to this chart. It represents diesel engine equipment that runs at idle speed for a major portion of its time (e.g., lift cranes).

[2]Represents noise near a twin-engine scraper with 2 push dozers at full throttle.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-23. Comparison of Alternatives by Average Radiation Dose at Facility (millirems)[1,2].

Activity	Extensive Separation Alternative
Sludge wash	n/a
Radionuclide removal	2.1 E+06
Low-level waste vitrification	.5 E+05
Low-level waste disposal	2.0 E+04
High-level waste vitrification	5.7 E+05
High-level waste transportation/disposal	2.5 E+04
Total	3.3 E+06

Notes:

[1]200 millirems per year is assumed for all radiation workers.
[2]Radiation dose to nearby facilities is assumed to be zero.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-24. Overall Schedule[4].

Activity	Extensive Separation Alternative
Sludge wash	n/a
Cesium and other radionuclide removal	1/2004 - 9/2018(1)
Low-level waste vitrification	9/2005 - 9/2024(2)
Low-level waste disposal	9/2005 - 9/2024(2)
High-level waste vitrification	3/2005 - 3/2019(1)
High-level waste transportation/disposal	2020 - 2029(3)

Notes:

n/a = not applicable

[1]See the *Tank Waste Remediation System Facility Configuration Study* (Boomer et al. 1994), page 114.

[2]See Boomer et al. 1994, page 63.

[3]Based on canister pickup schedule in Table D-6, Case 3-5 SC, TRW 1995.

[4]The assumed construction schedule and the 14 year facility operations schedule are highly optimistic for the extensive separations alternative. There is considerably higher technical risk for extensive separations than for the other TWRS-EIS alternatives evaluated. Consequently, there is higher schedule risk associated with this alternative than with the other alternatives.

Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. M. Winkler, 1994, *Tank Waste Remediation System Facility Configuration Study*, WHC-SD-WM-ES-295, Westinghouse Hanford Company, Richland, Washington.

TRW, 1995, *Assessment of Pre-Closure System Cost and Health and Safety Impacts of Hanford High-Level Waste Vitrification Options on the Civilian Radioactive Waste Management System A00000000-01717-5707-00003*, Rev. 0, TRW Environmental Safety Systems, Inc., Vienna, Virginia.

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Table 9-25. Construction Type by Duration (Percent of Construction).

Unit Process	Extensive Separation Alternative
Clearing	1.6
Grubbing	1.6
Earthwork	4.9
Foundations	7.8
Structure	25.9
Mechanical and electrical	29.1
Piping	29.1

Note:

For additional information, see Appendix F, and also Jansen, G., 1995, *Backup Information for Data Tables in Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-129, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

9.1 HLW OPTION 2 CAPSULE BLENDING

A very rough order of magnitude capital cost estimate was made for the cesium/strontium capsule cut-up cell of HLW Option 2. The cost data is shown in Table 9-26. The intent of the design and estimate is to assess how the estimate for the extensive separations facility would change with the addition of a capacity for handling the Cs and Sr capsules.

The added capital cost of a cut-up cell is $36 million, which would increase the capital cost of extensive separations by less than 1 percent. The cut-up cell adds no appreciable operating cost to the extensive separations facility. As such, the overall impact of the addition of a cut-up cell on the EIS tables is negligible.

Table 9-26. Cesium and Strontium Capsule Cut-Up Cell Project Cost Summary.

Description	Total dollars
Engineering	$8,728,000
Buildings	$2,975,000
Special equipment/process systems	$24,300,000
Project Total	$36,003,000

9.2 LLW OPTION B GROUT

An estimate of the capital and operating costs was made for a LLW grout facility substituted for the LLW vitrification facility.

The substitution of a grout facility for the LLW vitrification facility used in the development of the EIS tables would also entail the replacement of the sulfur vaults with grout vaults. For both the grout and sulfur vaults, the first vault constructed is considered a capital expense. The remaining vaults are operational expenses. A comparison of these costs is provided in Table 9-27. Table 9-28 provides a cost estimate breakdown for the LLW grout facility.

Table 9-27. Cost Comparison - Low-Level Waste Vitrification and Grout (Millions of dollars).

	LLW Vitrification	Grout	Change
Capital cost (facility with first vault)	$755	410	-$345
Remaining vaults	$185	$1,932	+ $1,747
Total	$940	$2,342	+ $1,402

Table 9-28. Low-Level Waste Grout Facility Costs.

Description	Total dollars
Capital costs (1 vault)	
Engineering	$99,348,000
Buildings	$164,290,000
Special equipment/process systems	$146,171,000
Project Total (capital cost)	$409,809,000
Operating costs (13 vaults)	
Total 13 vaults	$2,341,808,000

The higher cost of grout reflects the following factors:

- The grout storage reflects approximately 4 times the volume of comparable glass storage in sulfur.
- As currently designed, a high volume of hardware is used and abandoned in each grout vault, including pipe, valves, and ducts.
- The estimated cost for the LLW vitrification and vaults, above, does not include the capability to retrieve wastes.

There are differences in operational costs which would affect the environmental impact statement tables are as follows:

- The grout facility is estimated to require less staff than the LLW vitrification facility. Approximately 160 people are required for the operation of LLW vitrification. The grout facility will require less than 40 people. The staffing differential is attributable to the simpler process and minimal handling of wastes due to the direct pouring of grout into removal tubes. The lower staffing will result in an approximate $250 million reduction in personnel costs over the life of the facility. Thermal denitration, before either LLW treatment option, would be part of extensive separations. The staffing of the extensive separations facility, estimated at approximately 620, would not be appreciably affected.

- The predominant change to costs for cold chemicals is the difference between glass former + sulfur cement and grouting materials. The grout option results in an approximate saving of $5 million, when compared with vitrification.

- The bulk of operational emissions from the extensive separations option are from LLW vitrification. The grout facility will have fewer and smaller emissions, other than fugitive dust.

The overall impact of a substitution of the grout facility for LLW vitrification will be an approximate 5 percent increase in cost of the extensive separations option shown in Table 9-17. Improvements in the grout vault design could be expected to reduce the differential. However, it is unclear whether grout will result in comparable life cycle costs with glass for LLW disposal.

This page intentionally left blank.

10.0 RATE DATA

The calculation of the peak and average for the data given in the data tables (Section 9.0) is outlined in this section. The assumed construction schedule and the 14 year facility operations schedule are highly optimistic for the extensive separations alternative. There is considerably higher technical risk for extensive separations than for the other TWRS-EIS alternatives evaluated. Consequently, there is higher schedule risk associated with this alternative than with the other alternatives.

10.1 YEAR-BY-YEAR DATA

Figures 10-1 through 10-3 give year-by-year data for construction, staffing, and total processing cost respectively. Table 10-1 lists the figures to which the data in the data tables correspond.

Table 10-1. Table/Figure Key.

Figure	Title	Data Tables
10-1	Construction Schedule for ESP Alternative	9-8, 9-9, 9-10, 9-11, 9-12, 9-13, 9-18
10-2	Staffing Schedule for ESP Alternative	9-2, 9-3, 9-19 (staff only)
10-3	Processing Cost Schedule for ESP Alternative	9-16, 9-17

For the construction and staffing figures, the totals from the appropriate data tables can be multiplied by the percentage that corresponds to the year in question. Percentages were given so that the figures could be used for more than one data table (the use of absolute numbers would require each table to have its own figure). For the total processing cost figure, the absolute value can be read directly from the chart.

10.2 YEARLY AVERAGE/PEAK

As shown in the previous section, the data in many of the charts could easily be shown on a year-by-year basis. Unfortunately not all of the information in all of the data tables could be displayed this way. Therefore, to estimate the yearly average and peak, the following method should be followed.

Figure 10-1. Construction Schedule for ESP Alternative.

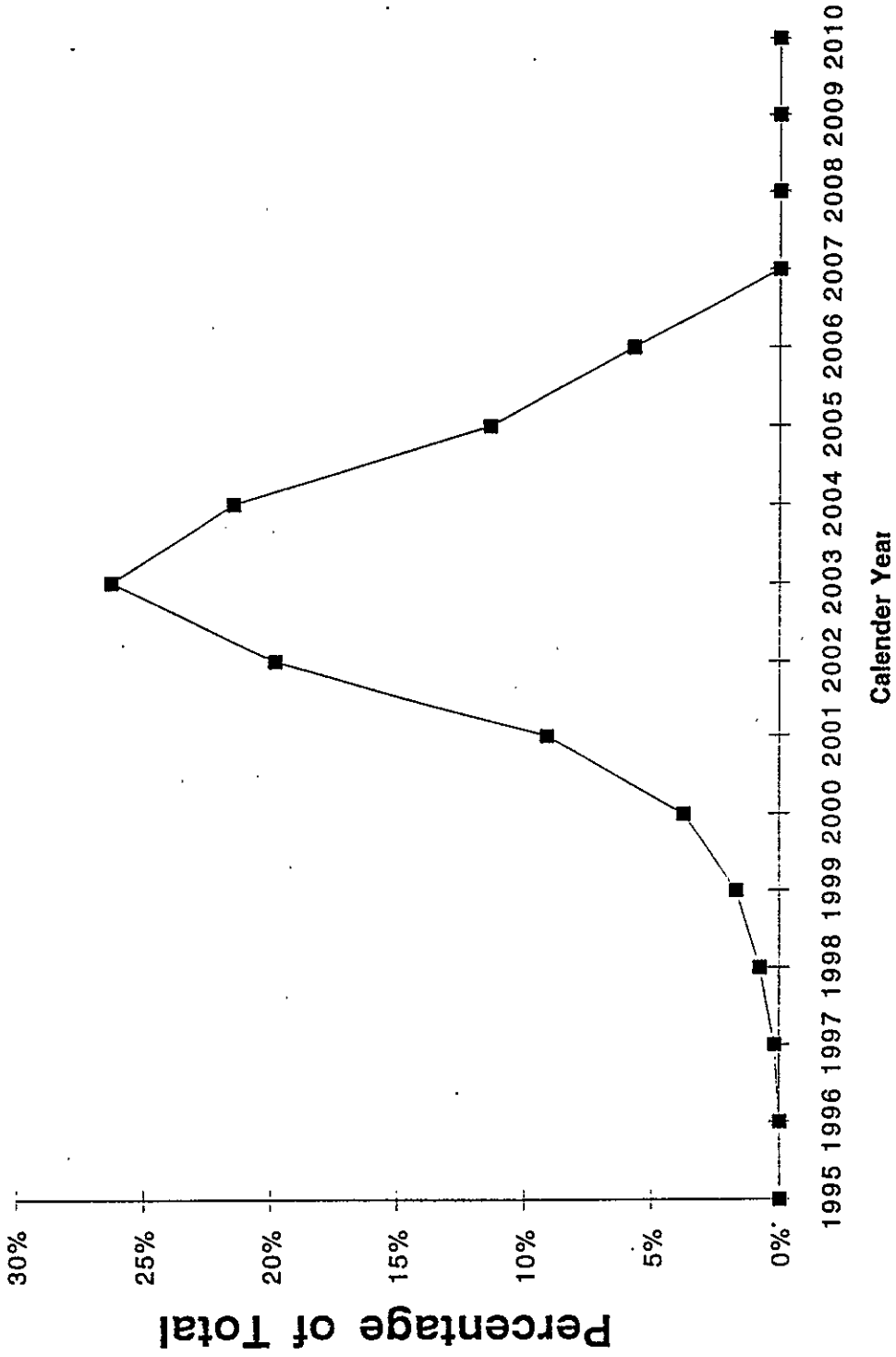


Figure 10-2. Staffing Schedule for ESP Alternative.

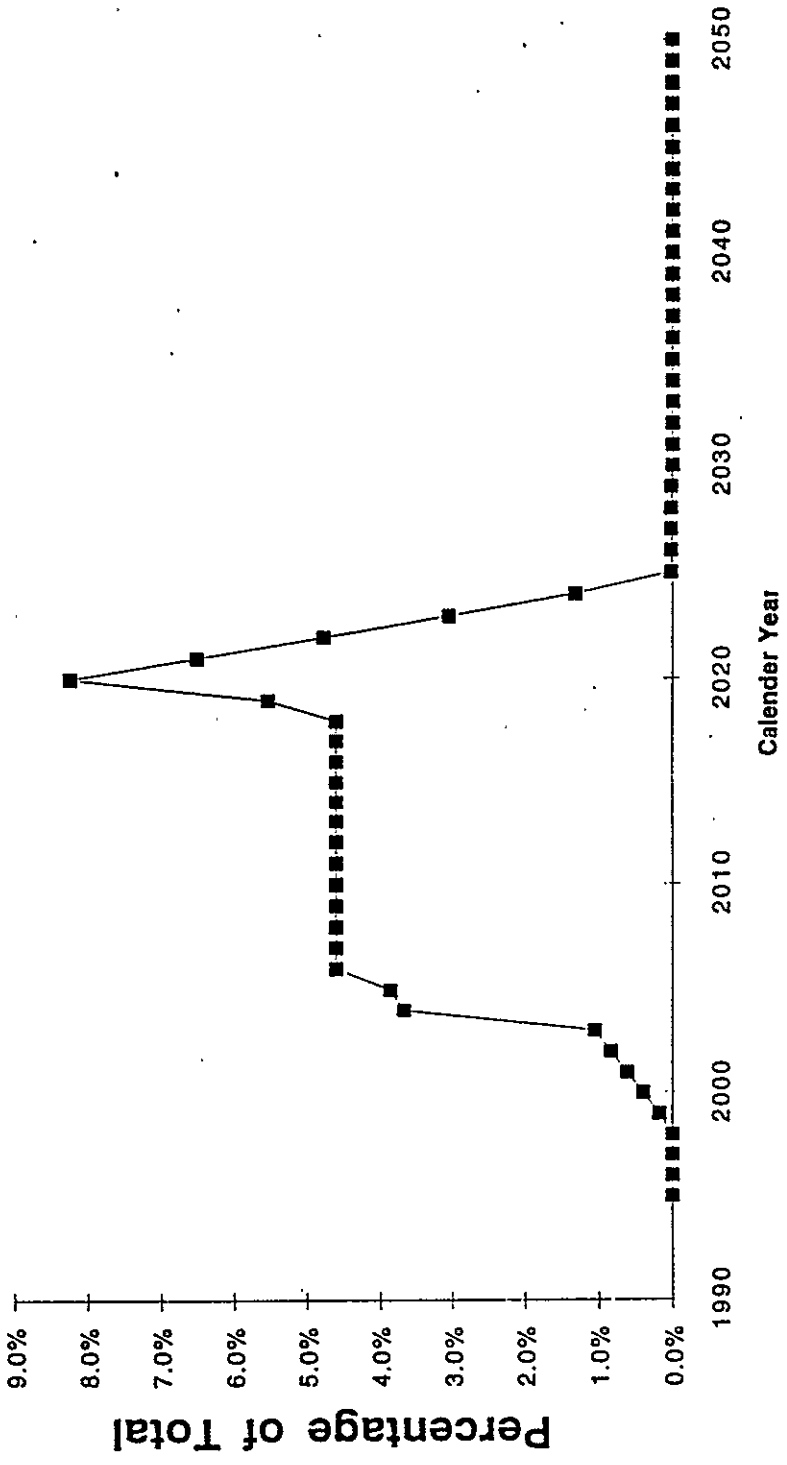
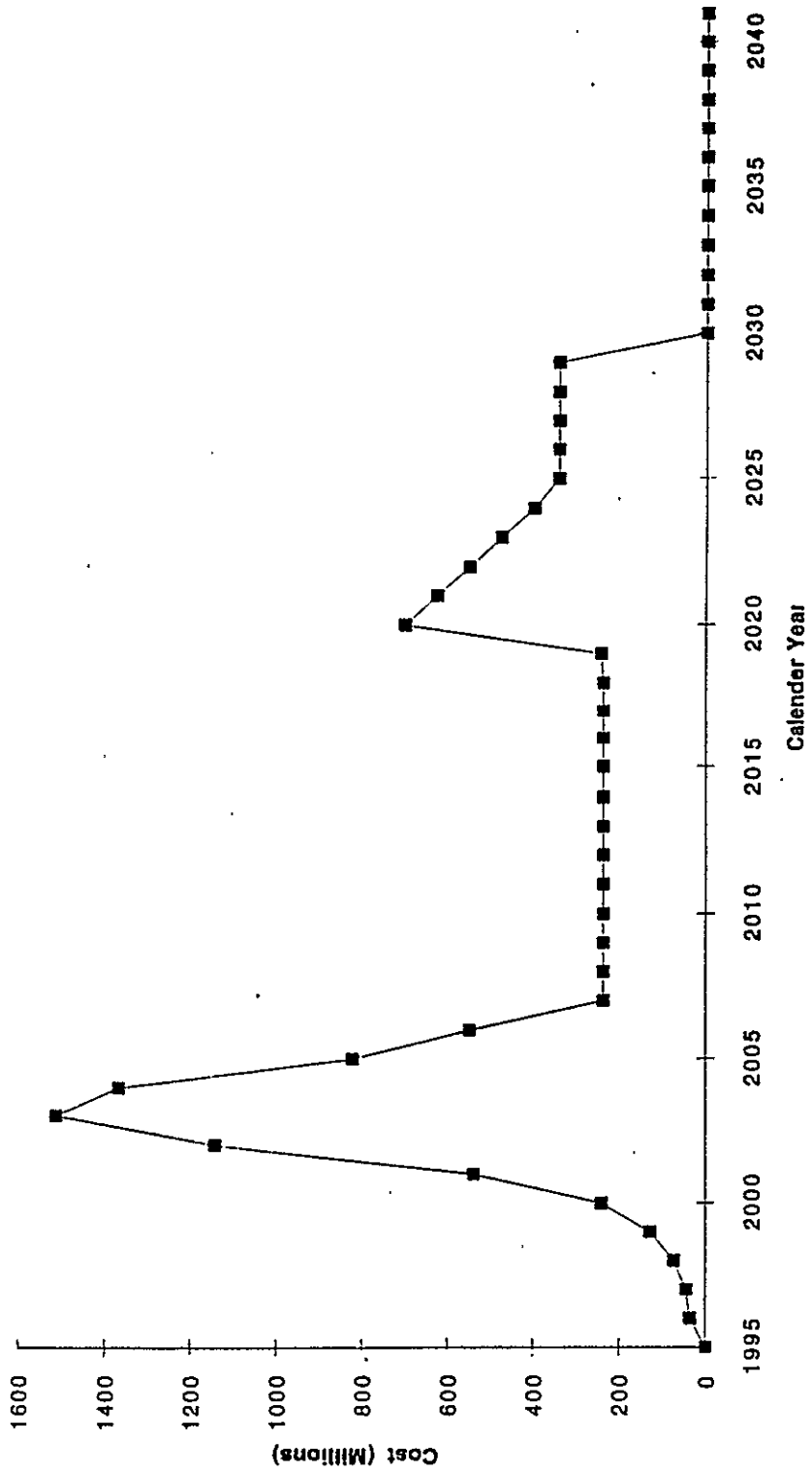


Figure 10-3. Processing Cost Schedule for ESP Alternative.



Yearly Average

Divide the value from the table by 19 (the total processing time). This gives the average value over the entire processing lifetime. If it is known that a data table value corresponds to only one of the processing facilities (Pretreatment/HLW or LLW) then the value should be divided by 14 (the processing time for each plant separately). Care should be taken to ensure that this value is used only during the operational lifetime of the appropriate facility. This is a very simplistic way of calculating the average because it is not accurate if the table value is split between the two facilities. It is recommended that if more accurate year-by-year values are required, the reader employ the data tables and the appendices to calculate it.

Peak

Divide the value from the table by 14. This gives the peak value assuming the yearly needs for each facility are constant over their processing lives. As long as this is true, the value will be valid regardless of how the total value is split between the two facilities.

These methods should be used for data tables 9-4, 9-5, 9-6, and 9-7 (except for HLW canister transportation). The values for yearly average and peak for the HLW canister transportation are identical because both are based on a duration of 5 years.

This page intentionally left blank.

11.0 REFERENCES

40 CFR 260, "Hazardous Waste Management System - General," *Code of Federal Regulations*, as amended, U.S. Environmental Protection Agency, Washington, D.C.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended, U.S. Environmental Protection Agency, Washington, D.C.

Beeman, G. H., 1994, "Executive Summary," Second IPM Technology Selection Meeting, June 27-29, 1994, Salt Lake City, Utah.

Boldt, A. L., 1995, *Other Options and Rejected Alternatives Technical Data Package*, WHC-SD-WM-EV-106, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Boomer, K. D., A. L. Boldt, J. D. Galbraith, J. S. Garfield, C. E. Golberg, B. A. Higley, L. J. Johnson, M. J. Kupfer, R. M. Marusich, R. J. Parazin, A. N. Praga, G. W. Reddick, J. A. Reddick, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. E. Worcester, 1993, *Tank Waste Technical Options Report*, WHC-EP-0616, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Boomer, K. D., J. M. Colby, T. W. Crawford, J. S. Garfield, C. E. Golberg, C. E. Leach, D. E. Mitchell, F. D. Nankani, E. J. Slaathaug, L. M. Swanson, T. L. Waldo, and C. M. Winkler, 1994, *Tank Waste Remediation System Facility Configuration Study*, WHC-SD-WM-ES-295, Westinghouse Hanford Company, Richland, Washington.

Bray, L. A., et al., 1993, *Initial Evaluation of Two Organic Resins and Their Ion Exchange Column Performance for the Recovery of Cesium from Hanford Alkaline Tank Wastes*, TWRSPP-93-055, Pacific Northwest Laboratory, Richland, Washington.

Colby, S. A., C. H. Delegard, J. D. McCormack, S. V.Dighe, and D. F. McLaughlin, 1994, *Calcination/Dissolution Process Development*, WHC-SP-1065, Westinghouse Hanford Company, Richland, Washington.

Cotton, F. A., and F. R. S. Geoffrey, 1972, *Advanced Inorganic Chemistry A Comprehensive Text*, Interscience Publishers (John Wiley), New York, New York.

Delegard, C. H., T. D. Elcan, B. E. Hey, 1993, *Chemistry of Applications of Calcination/Dissolution Process Development 1994*, WHC-EP-0766, Westinghouse Hanford Company, Richland, Washington.

DOE, 1984, *Radioactive Waste Management Guidance Document*, DOE Order 5820.21, U.S. Department of Energy, Washington, D.C.

DOE, 1987, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes*, Hanford Site, Richland, Washington, DOE/EIS-0113, 5 vols., U.S. Department of Energy, Washington, D.C.

DOE, 1991, *Independent Engineering Review of the Hanford Waste Vitrification System*, DOE/EM 0056P, U.S. Department of Energy, Washington, D.C.

DOE, 1993, *Waste Acceptance Product Specifications for Vitrified High-Level Waste Forms*, EH-WAPS, Rev. 0, U.S. Department of Energy, Washington, D.C.

DOE-OCRWM, 1993, *Waste Acceptance System Requirements Document (WA-SRD)*, DOE/RW-0351P, Rev. 0, Office of Civilian Radioactive Waste Management, Washington, D.C.

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

Fredenburg, E. A., 1995, *Waste Retrieval and Transfer Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-EV-097, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Hendrickson, D. W., 1992, *Grout Treatment Facility Waste Feed Acceptance Criteria*, WHC-SD-WM-RD-019, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hendrickson, D. W., 1994, *Preliminary Flowsheet for Plasma Arc Calcination of Selected Hanford Site Tank Wastes*, WHC-SD-WM-TI-577, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hrma, P. R. and G. F. Piepel, 1992, *Property/Composition Relationships for Hanford Waste Vitrification Plant Glasses -- Preliminary Results Through CVS-II Phase 2*, PHTD-92-03.01/K897, Pacific Northwest Laboratory, Richland, Washington.

Kincaid, C. T., J. W. Shade, G. A. Whyatt, M. G. Piepho, K. Rhoads, J. A. Voogd, J. H. Westsik, Jr., M. D. Freshley, K. A. Balanchard, B. G. Lauzon, 1994, *Performance Assessment of Grouted Double-Shell Tank Waste Disposal at Hanford*, WHC-SD-WM-EE-004, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

9513385.0834

Langowski, M. H. 1994, *The Incorporation Of P, S, Cr, F, Cl, I, Mn, Ti, U, And Bi Into Simulated Nuclear Waste Glasses: Literature Study*, T3C-95-111, Pacific Northwest Laboratory, Richland, Washington.

Lokken, R. O., P. F. C. Martin, 1992, *Durability of Double-Shell Slurry Feed Grout: FY-90 Results*, PNL 7838, Pacific Northwest Laboratory, Richland Washington.

Lokken, R. O., C. M. Anderson, P. F. C. Martin, L. C. Morrison, S. E. Palmer, 1993, *Formulation Verification Study Results for 241-AN-106 Waste Grout*, PNL 8626, Pacific Northwest Laboratory, Richland Washington.

McLaughlin, D. F., 1994, *Thermodynamic Simulation of Hanford Complexant Concentrate Waste Under Reducing Condition*, Westinghouse Science and Technology Center Report 94-9TD0-CALCN-R1, Westinghouse Science and Technology Center, Pittsburgh, Pennsylvania.

National Environmental Policy Act of 1969, 42 USC 4321 et. seq.

Nankani, F. D., 1995, *Disposition of Cesium and Strontium Capsules Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-DP-087, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Orme, R. M., 1994, *TWRS Process Flowsheet*, WHC-SD-WM-TI-613, Westinghouse Hanford Company, Richland, Washington.

Penwell, D. L., K. M. Eager, and B. J. Knutson, 1994, *Preliminary Flowsheet: Ion Exchange Process For Separation Of Cesium From Hanford Tank Waste Using Resorcinol-Formaldehyde Resin*, WHC-SD-WM-TI-638, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Plodinec, M. J., 1994, Chemical Engineering News, Letter to the Editor on July 11, 1994,

Rawlins, J. A., 1994, *Impacts Of Disposal System Design Options On Low-Level Glass Waste Disposal System Performance*, WHC-EP-0810, November 1994, Westinghouse Hanford Company, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 USC 6901 et seq.

RHO, 1985, *Hanford Defense Waste Disposal Alternatives: Engineering Support Data for the Hanford Defense Waste - Environmental Impact Statement*, RHO-RE-ST-30P, Rockwell Hanford Operations, Richland, Washington.

Riebling, E. F., and J. G. Fadeff, 1991, *Grout formulation Standard Criteria Document*, WHC-SD-WM-CSD-003, Rev. 0, Westinghouse Hanford Company, Richland Washington.

Scanlon, P. L., H. Hampt, W. A. Skelly, 1995, *Closure Technical Data Package for the Tank Waste Remediation System Environmental Statement*, WHC-SD-WM-EV-107, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Scheetz, B. E., 1993, *Chemistry of Cementitious Waste Forms, ASTM Third International Symposium on Stabilization/Solidification of Hazardous, Radioactive, and Mixed Wastes*, November 1-5, 1993, Williamsburg, Virginia.

Schulz, W. W., 1980, *Removal of Radionuclides from Hanford Defense Waste Solutions*, RHO-SA-51, Rockwell Hanford Operations, Richland, Washington.

Serny, R. J., V. L. LeGore, L. W. Lindenmeir, R. O. Lokken, W. J. Martin, and P. F. C. Marsh, 1989, *Leach and EP Toxity Tests on Grouted Waste from Tank 106-AN*, PNL-6960/UC-512, Pacific Northwest Laboratories, Kirkland, Washington.

Slaathaug, E. J., 1995, *Tri-Party Agreement Alternative Engineering Data Package for the Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-EV-104, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Swanson, J. L., 1993, *Clean Option: An Alternative Strategy for Hanford Tank Waste Remediation*, Volume 2, Detailed Description of First Example Flowsheet, PNL-8388, Pacific Northwest Laboratory, Richland, Washington.

TRW, 1995, *Assessment of Pre-Closure System Cost and Health and Safety Impacts of Hanford High-Level Waste Vitrification Options on the Civilian Radioactive Waste Management System A00000000-01717-5707-00003*, Rev. 0, TRW Environmental Safety Systems, Inc., Vienna, Virginia.

Welsh, T. L., 1993, *Tank 241-AP-102 Characterization Results*, WHC-SD-WM-TRP-168, Rev. 0, 11/4/93, Westinghouse Hanford Company, Richland, Washington.

Wheelwright, E. J., L. A. Bray, H. H. Van Tuyl, and H. T. Fullam, 1974, *Flowsheet for Recovery of Curium from Power Reactor Fuel Reprocessing Waste*, BNFL-1831, Pacific Northwest Laboratory, Richland, Washington.

APPENDIX A

MATERIAL BALANCES

This page intentionally left blank.

APPENDIX A

MATERIAL BALANCES

Table A-1 provides material balances for the integrated extensive separations pretreatment and high-level waste vitrification treatment flowsheet. Tables A-2, A-3, and A-4 are variations of the main flowsheet (Table A-1) that include chromium removal for low-level waste (LLW) to grout (LLW Option B), cesium/strontium capsule blending into the high-level waste melter feedstream, and exclusion of americium/lanthanide separation, respectively. The corollary tables to those main flowsheet results provide material balances for the low-level waste glass sulfur treatment or low-level waste salt grout treatment flowsheets as appropriate. Due to space considerations Tables A-3 through A-4A represent material balance summaries for selected streams. Table A-5 represents a material balance for the LLW salt grout treatment flowsheet based on the main flowsheet without chromium removal. Table A-6 provides a material balance summary of specific high-level waste (HLW), LLW, and offgas streams from all flowsheets for comparison. Stream descriptions are provided at the beginning of Table A-6. Note that the stream values represent totals over the lifetime of the facilities. The process flow diagrams corresponding to these material balance tables are in Appendix C.

This appendix includes the following tables:

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Table A-2. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet with Chromium Removal.

Table A-2A. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Table A-3. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Table A-3A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Table A-4. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation.

Table A-4A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation.

Table A-5. Material Balance for Low-Level Waste Grout Flowsheet Without Chromium Removal.

Table A-6. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

The mass of components cesium, strontium, plutonium, technetium, and americium reported in the mass balance tables are the total inventory. This inventory includes radioactive and nonradioactive portions of these components. The assumptions for calculation of the radioactive portion of these components are listed below.

Radionuclide Isotopic Conversion Data.

Component	Radioactive Isotope	Specific Activity (Ci/gm)	Isotopic % (gm Radioactive/gm total)
Cesium	Cs-137	86.6	94.787
Strontium	Sr-90	278	1.354
Plutonium	Pu-240	0.227	100
Technetium	Tc-99	0.0172	100
Americium	Am-241	3.43	100

The isotopic distribution for the cesium and strontium capsules differ from the above table values. However, to conform to the flowsheet calculation scheme the capsule input mass stream (stream SRCS in Table A-3) was adjusted to preserve the total radionuclide content using the above isotopic distribution. The actual total capsule inventory is discussed in Section 5.16, and shown in Table 5-2.

At the beginning of each flowsheet table a summary of flowsheet variations with respect to the mass balance tables is included.

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet. (294 sheets)

(14-Aug-95, Clean Flowsheet, Caustic Recycle without Chrome Removal, Table A-1, XXX10, Revision 2 07:29:29)

This page intentionally left blank.

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1	2	3	4	5	6	7	8	9	10
Volume, Total Liters	5.84E+08	5.84E+08	6.01E+08	9.55E+07	2.54E+07	6.76E+08	6.76E+08	6.82E+09	1.71E+07	6.81E+09
Specific Gravity	1.21E+00	1.21E+00	1.21E+00	1.00E+00	1.02E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00
Total Mass Flow, (MT)	7.06E+05	7.06E+05	7.26E+05	9.55E+04	2.58E+04	8.00E+05	8.00E+05	8.08E+06	2.02E+04	8.06E+06
Cs and Ba, (MCi)	6.72E+01	6.72E+01	6.90E+01		2.61E-01	6.87E+01	6.87E+01	6.94E+02	1.74E+00	6.92E+02
Sr and Y, (MCi)	1.41E+00	1.41E+00	1.45E+00		5.49E-03	1.44E+00	1.44E+00	1.46E+01	3.64E-02	1.45E+01
Tc, (MCi)	2.61E-02	2.61E-02	2.68E-02		1.02E-04	2.67E-02	2.67E-02	2.70E-01	6.74E-04	2.69E-01
TRU, (MCi)	1.52E-02	1.52E-02	1.55E-02		5.89E-05	1.55E-02	1.55E-02	1.56E-01	3.91E-04	1.56E-01
Total MCi	6.87E+01	6.87E+01	7.05E+01		2.67E-01	7.02E+01	7.02E+01	7.09E+02	1.77E+00	7.07E+02
Ag+, (MT)	3.28E-01	3.28E-01	3.37E-01		1.28E-03	3.35E-01	3.35E-01	3.39E+00	8.46E-03	3.38E+00
Al(OH)4-, (MT)	4.83E+03	4.83E+03	4.96E+03		1.88E+01	4.94E+03	4.94E+03	4.99E+04	1.25E+02	4.97E+04
Al+3, (MT)										
Am+3, (MT)	2.51E-03	2.51E-03	2.58E-03		9.76E-06	2.57E-03	2.57E-03	2.59E-02	6.48E-05	2.59E-02
As+5, (MT)	7.70E-01	7.70E-01	7.90E-01		2.99E-03	7.87E-01	7.87E-01	7.95E+00	1.99E-02	7.93E+00
B+3, (MT)	5.19E-01	5.19E-01	5.32E-01		2.02E-03	5.30E-01	5.30E-01	5.36E+00	1.34E-02	5.34E+00
Ba+2, (MT)	7.91E-01	7.91E-01	8.11E-01		3.07E-03	8.08E-01	8.08E-01	8.16E+00	2.04E-02	8.14E+00
Be+2, (MT)	8.19E-02	8.19E-02	8.40E-02		3.18E-04	8.37E-02	8.37E-02	8.45E-01	2.11E-03	8.43E-01
Bi+3, (MT)	6.76E+01	6.76E+01	6.93E+01		2.63E-01	6.91E+01	6.91E+01	6.97E+02	1.74E+00	6.96E+02
Carbon14, (MT)	7.43E-04	7.43E-04	7.62E-04		2.89E-06	7.59E-04	7.59E-04	7.67E-03	1.92E-05	7.65E-03
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.67E+01	1.67E+01	1.71E+01		6.49E-02	1.71E+01	1.71E+01	1.72E+02	4.31E-01	1.72E+02
Cancrinite, (MT)										
Cd+2, (MT)	2.09E+00	2.09E+00	2.14E+00		8.11E-03	2.13E+00	2.13E+00	2.15E+01	5.38E-02	2.15E+01
Ce+3, (MT)	2.37E+00	2.37E+00	2.43E+00		9.20E-03	2.42E+00	2.42E+00	2.44E+01	6.11E-02	2.44E+01
Cl-, (MT)	3.11E+02	3.11E+02	3.19E+02		1.21E+00	3.18E+02	3.18E+02	3.21E+03	8.02E+00	3.20E+03
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)	3.37E+03	3.37E+03	3.45E+03		1.31E+01	3.44E+03	3.44E+03	3.47E+04	8.68E+01	3.46E+04
Cr(OH)4-, (MT)	1.19E+02	1.19E+02	1.22E+02		4.62E-01	1.21E+02	1.21E+02	1.23E+03	3.07E+00	1.22E+03
Cr+3, (MT)										
Cs+, (MT)	8.19E-01	8.19E-01	8.40E-01		3.18E-03	8.37E-01	8.37E-01	8.45E+00	2.11E-02	8.43E+00
Cu+2, (MT)	1.77E-01	1.77E-01	1.82E-01		6.88E-04	1.81E-01	1.81E-01	1.83E+00	4.57E-03	1.82E+00
DTPA-3, (MT)										
F-, (MT)	1.12E+03	1.12E+03	1.15E+03		4.34E+00	1.14E+03	1.14E+03	1.15E+04	2.88E+01	1.15E+04
F2, (MT)										
Fe+3, (MT)	1.44E+01	1.44E+01	1.47E+01		5.58E-02	1.47E+01	1.47E+01	1.48E+02	3.71E-01	1.48E+02
FeCN6-3, (MT)										
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1	2	3	4	5	6	7	8	9	10
H+, (MT)										
H2, (MT)										
H2O, (MT)	5.07E+05	5.07E+05	5.22E+05	9.55E+04	2.51E+04	5.97E+05	5.97E+05	6.02E+06	1.51E+04	6.01E+06
H2O2, (MT)										
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	9.49E-01	9.49E-01	9.74E-01		3.69E-03	9.70E-01	9.70E-01	9.80E+00	2.45E-02	9.77E+00
Hg2, (MT)										
I-, (MT)	5.46E+02	5.46E+02	5.60E+02		2.12E+00	5.58E+02	5.58E+02	5.63E+03	1.41E+01	5.62E+03
I2, (MT)										
K+, (MT)	2.19E-01	2.19E-01	2.25E-01		8.51E-04	2.24E-01	2.24E-01	2.26E+00	5.65E-03	2.25E+00
La+3, (MT)	2.19E-01	2.19E-01	2.25E-01		8.51E-04	2.24E-01	2.24E-01	2.26E+00	5.65E-03	2.25E+00
Li+, (MT)	5.77E-03	5.77E-03	5.92E-03		2.24E-05	5.90E-03	5.90E-03	5.96E-02	1.49E-04	5.94E-02
Mg+2, (MT)	9.65E-01	9.65E-01	9.90E-01		3.75E-03	9.86E-01	9.86E-01	9.96E+00	2.49E-02	9.93E+00
Mn+4, (MT)										
MnO2, (MT)	2.17E+01	2.17E+01	2.22E+01		8.42E-02	2.22E+01	2.22E+01	2.24E+02	5.59E-01	2.23E+02
Mo+6, (MT)	4.87E+00	4.87E+00	5.00E+00		1.89E-02	4.98E+00	4.98E+00	5.03E+01	1.26E-01	5.01E+01
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)	6.26E+04	6.26E+04	6.42E+04		2.43E+02	6.40E+04	6.40E+04	6.46E+05	1.62E+03	6.45E+05
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)	4.07E+00	4.07E+00	4.18E+00		1.58E-02	4.16E+00	4.16E+00	4.20E+01	1.05E-01	4.19E+01
NO, (MT)										
NO2, (MT)										
NO2-, (MT)	9.54E+03	9.54E+03	9.79E+03		3.71E+01	9.75E+03	9.75E+03	9.84E+04	2.46E+02	9.82E+04
NO3-, (MT)	1.06E+05	1.06E+05	1.09E+05		4.12E+02	1.08E+05	1.08E+05	1.09E+06	2.73E+03	1.09E+06
Np+4, (MT)	1.46E-02	1.46E-02	1.50E-02		5.69E-05	1.50E-02	1.50E-02	1.51E-01	3.78E-04	1.51E-01
O2, (MT)										
OH-, (MT)	4.64E+03	4.64E+03	4.76E+03		1.80E+01	4.74E+03	4.74E+03	4.79E+04	1.20E+02	4.78E+04
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.96E+00	1.96E+00	2.01E+00		7.62E-03	2.00E+00	2.00E+00	2.02E+01	5.06E-02	2.02E+01
PO4-3, (MT)	2.58E+03	2.58E+03	2.65E+03		1.00E+01	2.64E+03	2.64E+03	2.66E+04	6.66E+01	2.66E+04
POLY, (MT)			3.23E-12		1.22E-14			1.29E-09	3.23E-12	1.29E-09

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1	2	3	4	5	6	7	8	9	10
PTA-3, (MT)										
Pu+4, (MT)	2.88E-02	2.88E-02	2.95E-02		1.12E-04	2.94E-02	2.94E-02	2.97E-01	7.42E-04	2.96E-01
Si+4, (MT)	5.65E+00	5.65E+00	5.79E+00		2.20E-02	5.77E+00	5.77E+00	5.83E+01	1.46E-01	5.81E+01
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	2.01E+03	2.01E+03	2.06E+03		7.79E+00	2.05E+03	2.05E+03	2.07E+04	5.17E+01	2.06E+04
Sr+2, (MT)	3.75E-01	3.75E-01	3.85E-01		1.46E-03	3.84E-01	3.84E-01	3.87E+00	9.68E-03	3.86E+00
Sugar, (MT)										
TcO4-, (MT)	2.52E+00	2.52E+00	2.59E+00		9.80E-03	2.58E+00	2.58E+00	2.60E+01	6.51E-02	2.60E+01
Ti+4, (MT)										
Tot Org Carbon, (MT)	1.42E+03	1.42E+03	1.45E+03		5.50E+00	1.45E+03	1.45E+03	1.46E+04	3.65E+01	1.46E+04
UO2+2, (MT)	8.52E+01	8.52E+01	8.74E+01		3.31E-01	8.71E+01	8.71E+01	8.79E+02	2.20E+00	8.77E+02
V+5, (MT)	6.20E-02	6.20E-02	6.36E-02		2.41E-04	6.34E-02	6.34E-02	6.40E-01	1.60E-03	6.38E-01
W+6, (MT)	7.47E-01	7.47E-01	7.66E-01		2.90E-03	7.64E-01	7.64E-01	7.71E+00	1.93E-02	7.69E+00
Zn+2, (MT)	3.59E+00	3.59E+00	3.68E+00		1.40E-02	3.67E+00	3.67E+00	3.71E+01	9.26E-02	3.70E+01
Zr+4, (MT)	4.48E-01	4.48E-01	4.60E-01		1.74E-03	4.58E-01	4.58E-01	4.62E+00	1.16E-02	4.61E+00
ZrO2:2H2O, (MT)	2.15E+01	2.15E+01	2.21E+01		8.36E-02	2.20E+01	2.20E+01	2.22E+02	5.55E-01	2.21E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1	2	3	4	5	6	7	8	9	10
Total Mass Flow, (MT)	2.37E+04	2.37E+04	2.39E+04		2.31E+04	8.00E+02	8.00E+02	8.00E+04	2.00E+02	7.98E+04
Cs and Ba, (MCi)	7.60E+00	7.60E+00	7.66E+00		7.40E+00	2.57E-01	2.57E-01	2.57E+01	6.42E-02	2.56E+01
Sr and Y, (MCi)	1.37E+02	1.37E+02	1.38E+02		1.34E+02	4.63E+00	4.63E+00	4.63E+02	1.16E+00	4.62E+02
Tc, (MCi)	5.89E-03	5.89E-03	5.94E-03		5.74E-03	1.99E-04	1.99E-04	1.99E-02	4.98E-05	1.99E-02
TRU, (MCi)	1.92E-01	1.92E-01	1.94E-01		1.87E-01	6.49E-03	6.49E-03	6.49E-01	1.62E-03	6.48E-01
Total MCi	1.45E+02	1.45E+02	1.46E+02		1.41E+02	4.90E+00	4.90E+00	4.90E+02	1.22E+00	4.89E+02
Ag+, (MT)	1.38E+00	1.38E+00	1.39E+00		1.34E+00	4.65E-02	4.65E-02	4.65E+00	1.16E-02	4.64E+00
Ag2O, (MT)										
Al+3, (MT)	2.37E+03	2.37E+03	2.39E+03		2.31E+03	8.01E+01	8.01E+01	8.01E+03	2.00E+01	7.99E+03
Al2O3, (MT)										
Am+3, (MT)	2.77E-02	2.77E-02	2.80E-02		2.70E-02	9.38E-04	9.38E-04	9.38E-02	2.35E-04	9.36E-02
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)	4.98E-01	4.98E-01	5.02E-01		4.85E-01	1.68E-02	1.68E-02	1.68E+00	4.21E-03	1.68E+00
As2O5, (MT)										
B+3, (MT)	9.94E-01	9.94E-01	1.00E+00		9.69E-01	3.36E-02	3.36E-02	3.36E+00	8.40E-03	3.35E+00
B2O3, (MT)										
Ba+2, (MT)	3.09E+00	3.09E+00	3.12E+00		3.01E+00	1.05E-01	1.05E-01	1.05E+01	2.61E-02	1.04E+01
BaO, (MT)										
Be+2, (MT)	7.61E-03	7.61E-03	7.67E-03		7.42E-03	2.57E-04	2.57E-04	2.57E-02	6.43E-05	2.57E-02
BeO, (MT)										
Bi+3, (MT)	1.96E+02	1.96E+02	1.98E+02		1.91E+02	6.63E+00	6.63E+00	6.63E+02	1.66E+00	6.61E+02
Bi2O3, (MT)										
Carbon14, (MT)	4.53E-04	4.53E-04	4.57E-04		4.41E-04	1.53E-05	1.53E-05	1.53E-03	3.83E-06	1.53E-03
Ca+2, (MT)	1.33E+02	1.33E+02	1.34E+02		1.30E+02	4.51E+00	4.51E+00	4.51E+02	1.13E+00	4.49E+02
Cancrinite, (MT)	2.70E+03	2.70E+03	2.72E+03		2.63E+03	9.13E+01	9.13E+01	9.13E+03	2.28E+01	9.11E+03
CaO, (MT)										
Cd+2, (MT)	7.93E+00	7.93E+00	8.00E+00		7.73E+00	2.68E-01	2.68E-01	2.68E+01	6.70E-02	2.68E+01
CdO, (MT)										
Ce+3, (MT)	2.35E+02	2.35E+02	2.37E+02		2.29E+02	7.96E+00	7.96E+00	7.96E+02	1.99E+00	7.94E+02
Ce2O3, (MT)										
Cl-, (MT)	3.49E+00	3.49E+00	3.52E+00		3.40E+00	1.18E-01	1.18E-01	1.18E+01	2.95E-02	1.18E+01
CO3-2, (MT)	2.25E+02	2.25E+02	2.26E+02		2.19E+02	7.59E+00	7.59E+00	7.59E+02	1.90E+00	7.57E+02
Cr+3, (MT)	1.32E+02	1.32E+02	1.33E+02		1.29E+02	4.47E+00	4.47E+00	4.47E+02	1.12E+00	4.46E+02
Cr2O3, (MT)										
Cs+, (MT)	9.25E-02	9.25E-02	9.33E-02		9.02E-02	3.13E-03	3.13E-03	3.13E-01	7.82E-04	3.12E-01
Cs2O, (MT)										
Cu+2, (MT)	7.46E-01	7.46E-01	7.52E-01		7.27E-01	2.52E-02	2.52E-02	2.52E+00	6.31E-03	2.52E+00
CuO, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1	2	3	4	5	6	7	8	9	10
F-, (MT)	5.97E+01	5.97E+01	6.02E+01		5.82E+01	2.02E+00	2.02E+00	2.02E+02	5.04E-01	2.01E+02
Fe+3, (MT)	7.63E+02	7.63E+02	7.69E+02		7.44E+02	2.58E+01	2.58E+01	2.58E+03	6.45E+00	2.57E+03
Fe2O3, (MT)										
H2O, (MT)										
Hg+2, (MT)	9.00E-03	9.00E-03	9.06E-03		8.77E-03	3.04E-04	3.04E-04	3.04E-02	7.61E-05	3.04E-02
I-, (MT)	2.02E+01	2.02E+01	2.04E+01		1.97E+01	6.83E-01	6.83E-01	6.83E+01	1.71E-01	6.81E+01
K+, (MT)	2.10E+01	2.10E+01	2.12E+01		2.05E+01	7.10E-01	7.10E-01	7.10E+01	1.78E-01	7.08E+01
K2O, (MT)										
La+3, (MT)	2.10E+01	2.10E+01	2.12E+01		2.05E+01	7.10E-01	7.10E-01	7.10E+01	1.78E-01	7.08E+01
La2O3, (MT)										
Li+, (MT)	2.46E-02	2.46E-02	2.48E-02		2.39E-02	8.31E-04	8.31E-04	8.31E-02	2.08E-04	8.29E-02
Li2O, (MT)										
Mg+2, (MT)	1.10E+01	1.10E+01	1.11E+01		1.07E+01	3.72E-01	3.72E-01	3.72E+01	9.30E-02	3.71E+01
MgO, (MT)										
MnO2, (MT)	2.09E+02	2.09E+02	2.11E+02		2.04E+02	7.07E+00	7.07E+00	7.07E+02	1.77E+00	7.05E+02
Mo+6, (MT)	8.01E-01	8.01E-01	8.08E-01		7.81E-01	2.71E-02	2.71E-02	2.71E+00	6.77E-03	2.70E+00
MoO3, (MT)										
Na+, (MT)	3.21E+03	3.21E+03	3.24E+03		3.13E+03	1.09E+02	1.09E+02	1.09E+04	2.71E+01	1.08E+04
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)	6.57E+00	6.57E+00	6.63E+00		6.40E+00	2.22E-01	2.22E-01	2.22E+01	5.55E-02	2.22E+01
Ni2FECN6, (MT)	5.00E+02	5.00E+02	5.04E+02		4.87E+02	1.69E+01	1.69E+01	1.69E+03	4.23E+00	1.69E+03
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)	7.38E+01	7.38E+01	7.44E+01		7.19E+01	2.49E+00	2.49E+00	2.49E+02	6.24E-01	2.49E+02
NO3-, (MT)	1.03E+03	1.03E+03	1.04E+03		1.01E+03	3.49E+01	3.49E+01	3.49E+03	8.73E+00	3.48E+03
Np+4, (MT)	1.32E-01	1.32E-01	1.33E-01		1.28E-01	4.45E-03	4.45E-03	4.45E-01	1.11E-03	4.44E-01
NpO2, (MT)										
OH-, (MT)	6.80E+03	6.80E+03	6.86E+03		6.63E+03	2.30E+02	2.30E+02	2.30E+04	5.75E+01	2.29E+04
P2O5, (MT)										
P2O5:24W, (MT)	5.21E-01	5.21E-01	5.25E-01		5.08E-01	1.76E-02	1.76E-02	1.76E+00	4.40E-03	1.76E+00
Pb+4, (MT)	3.28E+00	3.28E+00	3.31E+00		3.20E+00	1.11E-01	1.11E-01	1.11E+01	2.77E-02	1.11E+01
PbO2, (MT)										
PO4-3, (MT)	2.39E+03	2.39E+03	2.41E+03		2.33E+03	8.08E+01	8.08E+01	8.08E+03	2.02E+01	8.06E+03
POLY, (MT)										
Pu+4, (MT)	4.27E-01	4.27E-01	4.30E-01		4.16E-01	1.44E-02	1.44E-02	1.44E+00	3.61E-03	1.44E+00
PuO2, (MT)										
Si+4, (MT)	7.90E+01	7.90E+01	7.97E+01		7.70E+01	2.67E+00	2.67E+00	2.67E+02	6.68E-01	2.67E+02
SiO2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1	2	3	4	5	6	7	8	9	10
SO3, (MT)										
SO4-2, (MT)	3.97E+01	3.97E+01	4.01E+01		3.87E+01	1.34E+00	1.34E+00	1.33E+02	3.33E-01	1.33E+02
Sr+2, (MT)	3.64E+01	3.64E+01	3.67E+01		3.55E+01	1.23E+00	1.23E+00	1.23E+02	3.08E-01	1.23E+02
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)	5.68E-01	5.68E-01	5.73E-01		5.53E-01	1.92E-02	1.92E-02	1.92E+00	4.80E-03	1.92E+00
TiO2, (MT)										
Tot Org Carbon, (MT)	1.16E+02	1.16E+02	1.17E+02		1.13E+02	3.91E+00	3.91E+00	3.91E+02	9.78E-01	3.90E+02
U3O8, (MT)										
UO2+2, (MT)	1.58E+03	1.58E+03	1.59E+03		1.54E+03	5.34E+01	5.34E+01	5.34E+03	1.34E+01	5.33E+03
UO3, (MT)										
V+5, (MT)	1.88E-01	1.88E-01	1.89E-01		1.83E-01	6.35E-03	6.35E-03	6.35E-01	1.59E-03	6.33E-01
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)	9.45E-01	9.45E-01	9.53E-01		9.21E-01	3.20E-02	3.20E-02	3.20E+00	7.99E-03	3.19E+00
ZnO, (MT)										
Zr+4, (MT)	2.77E+02	2.77E+02	2.79E+02		2.70E+02	9.36E+00	9.36E+00	9.36E+02	2.34E+00	9.34E+02
ZrO2, (MT)										
ZrO2:2H2O, (MT)	4.09E+02	4.09E+02	4.12E+02		3.98E+02	1.38E+01	1.38E+01	1.38E+03	3.45E+00	1.38E+03

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	11	12	13	14	17	18	19	20	21	22
Volume, Total Liters	6.15E+09	8.78E+08	2.20E+08	6.59E+08	3.56E+09	3.56E+09	3.56E+09	3.57E+09	3.57E+09	1.29E+07
Specific Gravity	1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.14E+00	1.14E+00	1.14E+00	1.13E+00	1.13E+00	1.00E+00
Total Mass Flow, (MT)	7.28E+06	1.04E+06	2.60E+05	7.80E+05	4.04E+06	4.04E+06	4.04E+06	4.04E+06	4.04E+06	1.29E+04
Cs and Ba, (MCi)	6.25E+02	8.93E+01	2.23E+01	6.70E+01	7.51E+01	7.51E+01	7.51E+01	7.51E+01	7.51E+01	
Sr and Y, (MCi)	1.31E+01	1.88E+00	4.69E-01	1.41E+00	1.50E+00	1.50E+00	1.50E+00	1.50E-02	1.50E-02	
Tc, (MCi)	2.43E-01	3.47E-02	8.68E-03	2.60E-02	2.61E-02	2.61E-02	2.61E-02	2.61E-02	2.61E-02	
TRU, (MCi)	1.41E-01	2.01E-02	5.03E-03	1.51E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-04	1.53E-04	
Total MCi	6.39E+02	9.12E+01	2.28E+01	6.84E+01	7.66E+01	7.66E+01	7.66E+01	7.51E+01	7.51E+01	
Ag+, (MT)	3.05E+00	4.36E-01	1.09E-01	3.27E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	3.29E-01	
Al(OH)4-, (MT)	4.49E+04	6.42E+03	1.60E+03	4.81E+03	4.83E+03	4.83E+03	4.83E+03	4.83E+03	4.83E+03	
Al+3, (MT)					6.35E+03	6.35E+03	6.35E+03	6.35E+03	6.35E+03	
Am+3, (MT)	2.34E-02	3.34E-03	8.34E-04	2.50E-03	2.53E-03	2.53E-03	2.53E-03	2.53E-05	2.53E-05	
As+5, (MT)	7.16E+00	1.02E+00	2.56E-01	7.67E-01	7.70E-01	7.70E-01	7.70E-01	7.70E-01	7.70E-01	
B+3, (MT)	4.83E+00	6.89E-01	1.72E-01	5.17E-01	5.20E-01	5.20E-01	5.20E-01	5.20E-01	5.20E-01	
Ba+2, (MT)	7.35E+00	1.05E+00	2.63E-01	7.88E-01	7.93E-01	7.93E-01	7.93E-01	7.93E-01	7.93E-01	
Be+2, (MT)	7.61E-01	1.09E-01	2.72E-02	8.16E-02	8.19E-02	8.19E-02	8.19E-02	8.19E-02	8.19E-02	
Bi+3, (MT)	6.28E+02	8.98E+01	2.24E+01	6.73E+01	6.77E+01	6.77E+01	6.77E+01	6.77E+01	6.77E+01	
Carbon14, (MT)	6.91E-03	9.87E-04	2.47E-04	7.40E-04	7.43E-04	7.43E-04	7.43E-04	7.43E-04	7.43E-04	
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.55E+02	2.22E+01	5.55E+00	1.66E+01	1.68E+01	1.68E+01	1.68E+01	1.68E-01	1.68E-01	
Cancrinite, (MT)					2.38E+03	2.38E+03	2.38E+03	2.38E+03	2.38E+03	
Cd+2, (MT)	1.94E+01	2.77E+00	6.93E-01	2.08E+00	2.09E+00	2.09E+00	2.09E+00	2.09E+00	2.09E+00	
Ce+3, (MT)	2.20E+01	3.15E+00	7.86E-01	2.36E+00	2.52E+00	2.52E+00	2.52E+00	2.52E-02	2.52E-02	
Cl-, (MT)	2.89E+03	4.13E+02	1.03E+02	3.10E+02	1.41E+03	1.41E+03	1.41E+03	1.41E+03	1.41E+03	
Cl2, (MT)										
CO, (MT)					8.35E-05	8.35E-05	8.35E-05	8.35E-05	8.35E-05	
CO2, (MT)					9.62E-04	9.62E-04	9.62E-04	5.14E+03	5.14E+03	5.14E+03
CO3-2, (MT)	3.13E+04	4.47E+03	1.12E+03	3.35E+03	3.37E+03	3.37E+03	3.37E+03	3.37E+03	3.37E+03	
Cr(OH)4-, (MT)	1.11E+03	1.58E+02	3.95E+01	1.18E+02	1.19E+02	1.19E+02	1.19E+02	1.19E+02	1.19E+02	
Cr+3, (MT)					4.38E+02	4.38E+02	4.38E+02	4.38E+02	4.38E+02	
Cs+, (MT)	7.62E+00	1.09E+00	2.72E-01	8.16E-01	9.15E-01	9.15E-01	9.15E-01	9.15E-01	9.15E-01	
Cu+2, (MT)	1.65E+00	2.35E-01	5.88E-02	1.76E-01	1.78E-01	1.78E-01	1.78E-01	1.78E-01	1.78E-01	
DTPA-3, (MT)										
F-, (MT)	1.04E+04	1.48E+03	3.71E+02	1.11E+03	1.31E+03	1.31E+03	1.31E+03	1.31E+03	1.31E+03	
F2, (MT)										
Fe+3, (MT)	1.34E+02	1.91E+01	4.77E+00	1.43E+01	1.47E+01	1.47E+01	1.47E+01	1.47E-01	1.47E-01	
FeCN6-3, (MT)					1.43E+03	1.43E+03	1.43E+03	1.43E+03	1.43E+03	
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	11	12	13	14	17	18	19	20	21	22
H+, (MT)										
H2, (MT)					1.23E-03	1.23E-03	1.23E-03	4.71E+01	4.71E+01	
H2O, (MT)	5.43E+06	7.75E+05	1.94E+05	5.82E+05	3.35E+06	3.35E+06	3.35E+06	3.35E+06	3.35E+06	
H2O2, (MT)					2.63E+02	2.63E+02	2.63E+02	2.63E+02	2.63E+02	
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	8.83E+00	1.26E+00	3.15E-01	9.46E-01	9.49E-01	9.49E-01	9.49E-01	9.49E-01	9.49E-01	
Hg2, (MT)					6.68E+00	6.68E+00	6.68E+00	6.68E+00	6.68E+00	
I-, (MT)	5.08E+03	7.25E+02	1.81E+02	5.44E+02	5.46E+02	5.46E+02	5.46E+02	5.46E+02	5.46E+02	
I2, (MT)										
K+, (MT)	2.04E+00	2.91E-01	7.27E-02	2.18E-01	7.07E+01	7.07E+01	7.07E+01	7.07E+01	7.07E+01	
La+3, (MT)	2.04E+00	2.91E-01	7.27E-02	2.18E-01	2.32E-01	2.32E-01	2.32E-01	2.32E-03	2.32E-03	
Li+, (MT)	5.37E-02	7.67E-03	1.92E-03	5.75E-03	1.07E-01	1.07E-01	1.07E-01	1.07E-01	1.07E-01	
Mg+2, (MT)	8.97E+00	1.28E+00	3.20E-01	9.61E-01	9.72E-01	9.72E-01	9.72E-01	9.72E-01	9.72E-01	
Mn+4, (MT)					8.46E-02	8.46E-02	8.46E-02	8.46E-02	8.46E-02	
MnO2, (MT)	2.02E+02	2.88E+01	7.20E+00	2.16E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01	9.60E+01	
Mo+6, (MT)	4.53E+01	6.47E+00	1.62E+00	4.85E+00	4.87E+00	4.87E+00	4.87E+00	4.87E+00	4.87E+00	
MoO4-2, (MT)					8.79E+00	8.79E+00	8.79E+00	8.79E+00	8.79E+00	
N2, (MT)					9.81E-06	9.81E-06	9.81E-06	7.05E+03	7.05E+03	7.05E+03
N2O, (MT)										
Na+, (MT)	5.82E+05	8.32E+04	2.08E+04	6.24E+04	3.09E+05	3.09E+05	3.09E+05	3.09E+05	3.09E+05	
NH2OH, (MT)										
NH3, (MT)					2.92E+01	2.92E+01	2.92E+01	2.92E+01	2.92E+01	
NH4+, (MT)					5.68E-02	5.68E-02	5.68E-02	5.68E-02	5.68E-02	
Ni+3, (MT)	3.78E+01	5.41E+00	1.35E+00	4.05E+00	4.08E+00	4.08E+00	4.08E+00	4.08E-02	4.08E-02	
NO, (MT)										
NO2, (MT)					8.56E-04	8.56E-04	8.56E-04	8.56E-04	8.56E-04	8.56E-04
NO2-, (MT)	8.87E+04	1.27E+04	3.17E+03	9.50E+03	1.06E+04	1.06E+04	1.06E+04	1.06E+04	1.06E+04	
NO3-, (MT)	9.85E+05	1.41E+05	3.52E+04	1.06E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	
Np+4, (MT)	1.36E-01	1.94E-02	4.86E-03	1.46E-02	1.47E-02	1.47E-02	1.47E-02	1.47E-04	1.47E-04	
O2, (MT)					1.55E+03	1.55E+03	1.55E+03	7.01E+02	7.01E+02	7.01E+02
OH-, (MT)	4.31E+04	6.16E+03	1.54E+03	4.62E+03	1.75E+05	1.75E+05	1.75E+05	1.70E+05	1.70E+05	
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.82E+01	2.60E+00	6.51E-01	1.95E+00	1.96E+00	1.96E+00	1.96E+00	1.96E+00	1.96E+00	
PO4-3, (MT)	2.40E+04	3.43E+03	8.57E+02	2.57E+03	4.72E+03	4.72E+03	4.72E+03	4.72E+03	4.72E+03	
POLY, (MT)	1.17E-09	1.85E-10	4.62E-11	1.39E-10	2.44E-01	2.44E-01	2.44E-01	2.44E-01	2.44E-01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	11	12	13	14	17	18	19	20	21	22
PTA-3, (MT)					1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	
Pu+4, (MT)	2.67E-01	3.82E-02	9.55E-03	2.87E-02	2.89E-02	2.89E-02	2.89E-02	2.89E-04	2.89E-04	
Si+4, (MT)	5.25E+01	7.50E+00	1.88E+00	5.63E+00	5.70E+00	5.70E+00	5.70E+00	5.70E+00	5.70E+00	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	1.86E+04	2.66E+03	6.66E+02	2.00E+03	2.80E+04	2.80E+04	2.80E+04	2.80E+04	2.80E+04	
Sr+2, (MT)	3.49E+00	4.99E-01	1.25E-01	3.74E-01	3.99E-01	3.99E-01	3.99E-01	3.99E-03	3.99E-03	
Sugar, (MT)										
TcO4-, (MT)	2.35E+01	3.35E+00	8.37E-01	2.51E+00	2.52E+00	2.52E+00	2.52E+00	2.52E+00	2.52E+00	
Ti+4, (MT)					1.29E-04	1.29E-04	1.29E-04	1.29E-04	1.29E-04	
Tot Org Carbon, (MT)	1.32E+04	1.88E+03	4.70E+02	1.41E+03	1.42E+03	1.42E+03	1.42E+03	1.42E+01	1.42E+01	
UO2+2, (MT)	7.92E+02	1.13E+02	2.83E+01	8.49E+01	8.63E+01	8.63E+01	8.63E+01	8.63E-01	8.63E-01	
V+5, (MT)	5.77E-01	8.24E-02	2.06E-02	6.18E-02	6.21E-02	6.21E-02	6.21E-02	6.21E-02	6.21E-02	
W+6, (MT)	6.95E+00	9.92E-01	2.48E-01	7.44E-01	7.47E-01	7.47E-01	7.47E-01	7.47E-01	7.47E-01	
Zn+2, (MT)	3.34E+01	4.77E+00	1.19E+00	3.58E+00	3.59E+00	3.59E+00	3.59E+00	3.59E+00	3.59E+00	
Zr+4, (MT)	4.17E+00	5.95E-01	1.49E-01	4.46E-01	7.72E-01	7.72E-01	7.72E-01	7.72E-01	7.72E-01	
ZrO2:2H2O, (MT)	2.00E+02	2.86E+01	7.14E+00	2.14E+01	2.15E+01	2.15E+01	2.15E+01	2.15E+01	2.15E+01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	11	12	13	14	17	18	19	20	21	22
Total Mass Flow, (MT)	7.92E+04	8.00E+02	2.00E+02	6.00E+02	7.18E+02	7.18E+02	7.18E+02	8.83E+02	8.83E+02	
Cs and Ba, (MCi)	2.54E+01	2.57E-01	6.42E-02	1.93E-01	2.00E-01	2.00E-01	2.00E-01	2.00E-01	2.00E-01	
Sr and Y, (MCi)	4.59E+02	4.63E+00	1.16E+00	3.48E+00	3.62E+00	3.62E+00	3.62E+00	5.10E+00	5.10E+00	
Tc, (MCi)	1.97E-02	1.99E-04	4.98E-05	1.49E-04	1.55E-04	1.55E-04	1.55E-04	1.55E-04	1.55E-04	
TRU, (MCi)	6.43E-01	6.49E-03	1.62E-03	4.87E-03	5.06E-03	5.06E-03	5.06E-03	2.02E-02	2.02E-02	
Total MCi	4.85E+02	4.90E+00	1.22E+00	3.67E+00	3.82E+00	3.82E+00	3.82E+00	5.32E+00	5.32E+00	
Ag+, (MT)	4.61E+00	4.65E-02	1.16E-02	3.49E-02	3.63E-02	3.63E-02	3.63E-02	3.63E-02	3.63E-02	
Ag2O, (MT)					2.98E-02	2.98E-02	2.98E-02	2.98E-02	2.98E-02	
Al+3, (MT)	7.93E+03	8.01E+01	2.00E+01	6.01E+01	6.03E+01	6.03E+01	6.03E+01	6.03E+01	6.03E+01	
Al2O3, (MT)					3.31E+00	3.31E+00	3.31E+00	3.31E+00	3.31E+00	
Am+3, (MT)	9.29E-02	9.38E-04	2.35E-04	7.03E-04	7.34E-04	7.34E-04	7.34E-04	3.24E-03	3.24E-03	
Am2O3, (MT)										
APM-, (MT)					7.19E-05	7.19E-05	7.19E-05	7.19E-05	7.19E-05	
As+5, (MT)	1.67E+00	1.68E-02	4.21E-03	1.26E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02	
As2O5, (MT)					3.16E-02	3.16E-02	3.16E-02	3.16E-02	3.16E-02	
B+3, (MT)	3.33E+00	3.36E-02	8.40E-03	2.52E-02	2.62E-02	2.62E-02	2.62E-02	2.62E-02	2.62E-02	
B2O3, (MT)					1.08E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03	
Ba+2, (MT)	1.03E+01	1.05E-01	2.61E-02	7.84E-02	8.15E-02	8.15E-02	8.15E-02	8.15E-02	8.15E-02	
BaO, (MT)					1.97E-04	1.97E-04	1.97E-04	1.97E-04	1.97E-04	
Be+2, (MT)	2.55E-02	2.57E-04	6.43E-05	1.93E-04	2.01E-04	2.01E-04	2.01E-04	2.01E-04	2.01E-04	
BeO, (MT)					4.04E-03	4.04E-03	4.04E-03	4.04E-03	4.04E-03	
Bi+3, (MT)	6.56E+02	6.63E+00	1.66E+00	4.97E+00	5.17E+00	5.17E+00	5.17E+00	5.17E+00	5.17E+00	
Bi2O3, (MT)					6.52E-02	6.52E-02	6.52E-02	6.52E-02	6.52E-02	
Carbon14, (MT)	1.52E-03	1.53E-05	3.83E-06	1.15E-05	1.19E-05	1.19E-05	1.19E-05	1.19E-05	1.19E-05	
Ca+2, (MT)	4.46E+02	4.51E+00	1.13E+00	3.38E+00	3.53E+00	3.53E+00	3.53E+00	2.02E+01	2.02E+01	
Cancrinite, (MT)	9.04E+03	9.13E+01	2.28E+01	6.85E+01	7.09E+01	7.09E+01	7.09E+01	7.09E+01	7.09E+01	
CaO, (MT)					4.66E-02	4.66E-02	4.66E-02	4.66E-02	4.66E-02	
Cd+2, (MT)	2.66E+01	2.68E-01	6.70E-02	2.01E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	2.09E-01	
CdO, (MT)					2.54E-03	2.54E-03	2.54E-03	2.54E-03	2.54E-03	
Co+3, (MT)	7.88E+02	7.96E+00	1.99E+00	5.97E+00	6.21E+00	6.21E+00	6.21E+00	8.70E+00	8.70E+00	
Co2O3, (MT)					6.18E-02	6.18E-02	6.18E-02	6.18E-02	6.18E-02	
Cl-, (MT)	1.17E+01	1.18E-01	2.95E-02	8.85E-02	9.21E-02	9.21E-02	9.21E-02	9.21E-02	9.21E-02	
CO3-2, (MT)	7.52E+02	7.59E+00	1.90E+00	5.69E+00	5.92E+00	5.92E+00	5.92E+00	5.92E+00	5.92E+00	
Cr+3, (MT)	4.43E+02	4.47E+00	1.12E+00	3.35E+00	3.49E+00	3.49E+00	3.49E+00	3.49E+00	3.49E+00	
Cr2O3, (MT)					1.87E-02	1.87E-02	1.87E-02	1.87E-02	1.87E-02	
Cs+, (MT)	3.10E-01	3.13E-03	7.82E-04	2.35E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	
Cs2O, (MT)										
Cu+2, (MT)	2.50E+00	2.52E-02	6.31E-03	1.89E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	1.97E-02	
CuO, (MT)					1.88E-02	1.88E-02	1.88E-02	1.88E-02	1.88E-02	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	11	12	13	14	17	18	19	20	21	22
F-, (MT)	2.00E+02	2.02E+00	5.04E-01	1.51E+00	1.57E+00	1.57E+00	1.57E+00	1.57E+00	1.57E+00	
Fe+3, (MT)	2.55E+03	2.58E+01	6.45E+00	1.94E+01	2.02E+01	2.02E+01	2.02E+01	3.47E+01	3.47E+01	
Fe2O3, (MT)					8.13E-01	8.13E-01	8.13E-01	8.13E-01	8.13E-01	
H2O, (MT)					2.18E-02	2.18E-02	2.18E-02	2.18E-02	2.18E-02	
Hg+2, (MT)	3.01E-02	3.04E-04	7.61E-05	2.28E-04	2.37E-04	2.37E-04	2.37E-04	2.37E-04	2.37E-04	
I-, (MT)	6.76E+01	6.83E-01	1.71E-01	5.12E-01	5.33E-01	5.33E-01	5.33E-01	5.33E-01	5.33E-01	
K+, (MT)	7.03E+01	7.10E-01	1.78E-01	5.33E-01	5.54E-01	5.54E-01	5.54E-01	5.54E-01	5.54E-01	
K2O, (MT)					2.20E-04	2.20E-04	2.20E-04	2.20E-04	2.20E-04	
La+3, (MT)	7.03E+01	7.10E-01	1.78E-01	5.33E-01	5.54E-01	5.54E-01	5.54E-01	7.84E-01	7.84E-01	
La2O3, (MT)					5.52E-03	5.52E-03	5.52E-03	5.52E-03	5.52E-03	
Li+, (MT)	8.23E-02	8.31E-04	2.08E-04	6.23E-04	6.48E-04	6.48E-04	6.48E-04	6.48E-04	6.48E-04	
Li2O, (MT)					5.61E-07	5.61E-07	5.61E-07	5.61E-07	5.61E-07	
Mg+2, (MT)	3.68E+01	3.72E-01	9.30E-02	2.79E-01	2.90E-01	2.90E-01	2.90E-01	2.90E-01	2.90E-01	
MgO, (MT)					4.41E-03	4.41E-03	4.41E-03	4.41E-03	4.41E-03	
MnO2, (MT)	7.00E+02	7.07E+00	1.77E+00	5.30E+00	5.52E+00	5.52E+00	5.52E+00	5.52E+00	5.52E+00	
Mo+6, (MT)	2.68E+00	2.71E-02	6.77E-03	2.03E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	
MoO3, (MT)					1.92E-03	1.92E-03	1.92E-03	1.92E-03	1.92E-03	
Na+, (MT)	1.07E+04	1.09E+02	2.71E+01	8.14E+01	8.31E+01	8.31E+01	8.31E+01	8.31E+01	8.31E+01	
Na2O, (MT)					2.43E-01	2.43E-01	2.43E-01	2.43E-01	2.43E-01	
Ni(OH)3, (MT)					3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	
Ni+3, (MT)	2.20E+01	2.22E-01	5.55E-02	1.67E-01	1.77E-01	1.77E-01	1.77E-01	4.22E+00	4.22E+00	
Ni2FECN6, (MT)	1.67E+03	1.69E+01	4.23E+00	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	
Ni2O3, (MT)					5.88E-02	5.88E-02	5.88E-02	5.88E-02	5.88E-02	
NiO, (MT)										
NO2-, (MT)	2.47E+02	2.49E+00	6.24E-01	1.87E+00	1.95E+00	1.95E+00	1.95E+00	1.95E+00	1.95E+00	
NO3-, (MT)	3.46E+03	3.49E+01	8.73E+00	2.62E+01	2.72E+01	2.72E+01	2.72E+01	2.72E+01	2.72E+01	
Np+4, (MT)	4.41E-01	4.45E-03	1.11E-03	3.34E-03	3.49E-03	3.49E-03	3.49E-03	1.80E-02	1.80E-02	
NpO2, (MT)					1.47E-06	1.47E-06	1.47E-06	1.47E-06	1.47E-06	
OH-, (MT)	2.28E+04	2.30E+02	5.75E+01	1.72E+02	2.73E+02	2.73E+02	2.73E+02	3.15E+02	3.15E+02	
P2O5, (MT)					8.26E-01	8.26E-01	8.26E-01	8.26E-01	8.26E-01	
P2O5:24W, (MT)	1.74E+00	1.76E-02	4.40E-03	1.32E-02	1.37E-02	1.37E-02	1.37E-02	1.37E-02	1.37E-02	
Pb+4, (MT)	1.10E+01	1.11E-01	2.77E-02	8.32E-02	8.65E-02	8.65E-02	8.65E-02	8.65E-02	8.65E-02	
PbO2, (MT)					9.84E-02	9.84E-02	9.84E-02	9.84E-02	9.84E-02	
PO4-3, (MT)	8.00E+03	8.08E+01	2.02E+01	6.06E+01	6.09E+01	6.09E+01	6.09E+01	6.09E+01	6.09E+01	
POLY, (MT)										
Pu+4, (MT)	1.43E+00	1.44E-02	3.61E-03	1.08E-02	1.13E-02	1.13E-02	1.13E-02	4.00E-02	4.00E-02	
PuO2, (MT)					1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06	
Si+4, (MT)	2.65E+02	2.67E+00	6.68E-01	2.00E+00	2.08E+00	2.08E+00	2.08E+00	2.08E+00	2.08E+00	
SiO2, (MT)					4.02E-02	4.02E-02	4.02E-02	4.02E-02	4.02E-02	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	11	12	13	14	17	18	19	20	21	22
SO3, (MT)										
SO4-2, (MT)	1.32E+02	1.33E+00	3.33E-01	9.98E-01	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	
Sr+2, (MT)	1.22E+02	1.23E+00	3.08E-01	9.24E-01	9.61E-01	9.61E-01	9.61E-01	1.36E+00	1.36E+00	
SrO, (MT)					9.91E-07	9.91E-07	9.91E-07	9.91E-07	9.91E-07	
Tc2O7, (MT)					3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	
TcO4-, (MT)	1.90E+00	1.92E-02	4.80E-03	1.44E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02	
TiO2, (MT)					7.11E-06	7.11E-06	7.11E-06	7.11E-06	7.11E-06	
Tot Org Carbon, (MT)	3.87E+02	3.91E+00	9.78E-01	2.93E+00	3.05E+00	3.05E+00	3.05E+00	3.05E+00	3.05E+00	
U3O8, (MT)					2.41E-04	2.41E-04	2.41E-04	2.41E-04	2.41E-04	
UO2+2, (MT)	5.29E+03	5.34E+01	1.34E+01	4.00E+01	4.17E+01	4.17E+01	4.17E+01	1.27E+02	1.27E+02	
UO3, (MT)										
V+5, (MT)	6.29E-01	6.35E-03	1.59E-03	4.76E-03	4.95E-03	4.95E-03	4.95E-03	4.95E-03	4.95E-03	
V2O5, (MT)					7.25E-03	7.25E-03	7.25E-03	7.25E-03	7.25E-03	
WO2, (MT)										
WO3, (MT)					1.53E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-02	
Zn+2, (MT)	3.16E+00	3.20E-02	7.99E-03	2.40E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	
ZnO, (MT)					7.12E-03	7.12E-03	7.12E-03	7.12E-03	7.12E-03	
Zr+4, (MT)	9.27E+02	9.36E+00	2.34E+00	7.02E+00	7.30E+00	7.30E+00	7.30E+00	7.30E+00	7.30E+00	
ZrO2, (MT)					1.57E-01	1.57E-01	1.57E-01	1.57E-01	1.57E-01	
ZrO2:2H2O, (MT)	1.37E+03	1.38E+01	3.45E+00	1.04E+01	1.08E+01	1.08E+01	1.08E+01	1.08E+01	1.08E+01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	23	24	25	26	27	28	30	31	32	33
Volume, Total Liters	3.56E+09		1.29E+07	1.29E+07		3.56E+09	3.65E+09	3.53E+06	9.78E+05	3.65E+09
Specific Gravity	1.13E+00		1.00E+00	1.00E+00		1.13E+00	1.13E+00	1.00E+00	1.01E+00	1.13E+00
Total Mass Flow, (MT)	4.03E+06		1.29E+04	1.29E+04		4.03E+06	4.14E+06	3.53E+03	9.90E+02	4.14E+06
Cs and Ba, (MCi)	7.51E+01					7.51E+01	7.70E+01		1.98E-03	7.70E+01
Sr and Y, (MCi)	1.50E-02					1.50E-02	1.54E-02		3.95E-07	1.54E-02
Tc, (MCi)	2.61E-02					2.61E-02	2.68E-02		6.88E-07	2.68E-02
TRU, (MCi)	1.53E-04					1.53E-04	1.57E-04		4.02E-09	1.57E-04
Total MCi	7.51E+01					7.51E+01	7.71E+01		1.98E-03	7.71E+01
Ag+, (MT)	3.29E-01					3.29E-01	3.37E-01		8.65E-06	3.37E-01
Al(OH)4-, (MT)	4.83E+03					4.83E+03	4.96E+03		1.27E-01	4.96E+03
Al+3, (MT)	6.35E+03					6.35E+03	6.51E+03		1.67E-01	6.51E+03
Am+3, (MT)	2.53E-05					2.53E-05	2.60E-05		6.66E-10	2.60E-05
As+5, (MT)	7.70E-01					7.70E-01	7.90E-01		2.03E-05	7.90E-01
B+3, (MT)	5.20E-01					5.20E-01	5.33E-01		1.37E-05	5.33E-01
Ba+2, (MT)	7.93E-01					7.93E-01	8.14E-01		2.09E-05	8.14E-01
Be+2, (MT)	8.19E-02					8.19E-02	8.40E-02		2.16E-06	8.40E-02
Bi+3, (MT)	6.77E+01					6.77E+01	6.95E+01		1.78E-03	6.95E+01
Carbon14, (MT)	7.43E-04					7.43E-04	7.63E-04		1.96E-08	7.63E-04
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.68E-01					1.68E-01	1.72E-01		4.42E-06	1.72E-01
Cancrinite, (MT)	2.38E+03					2.38E+03	2.44E+03		6.27E-02	2.44E+03
Cd+2, (MT)	2.09E+00					2.09E+00	2.15E+00		5.50E-05	2.15E+00
Ce+3, (MT)	2.52E-02					2.52E-02	2.58E-02		6.63E-07	2.58E-02
Cl-, (MT)	1.41E+03					1.41E+03	1.44E+03		3.70E-02	1.44E+03
Cl2, (MT)										
CO, (MT)	8.35E-05					8.35E-05	8.56E-05		2.20E-09	8.56E-05
CO2, (MT)			5.14E+03	5.14E+03						
CO3-2, (MT)	3.37E+03					3.37E+03	3.45E+03		8.86E-02	3.45E+03
Cr(OH)4-, (MT)	1.19E+02					1.19E+02	1.22E+02		3.13E-03	1.22E+02
Cr+3, (MT)	4.38E+02					4.38E+02	4.50E+02		1.15E-02	4.50E+02
Cs+, (MT)	9.15E-01					9.15E-01	9.38E-01		2.41E-05	9.38E-01
Cu+2, (MT)	1.78E-01					1.78E-01	1.82E-01		4.67E-06	1.82E-01
DTPA-3, (MT)										
F-, (MT)	1.31E+03					1.31E+03	1.34E+03		3.44E-02	1.34E+03
F2, (MT)										
Fe+3, (MT)	1.47E-01					1.47E-01	1.50E-01		3.86E-06	1.50E-01
FeCN6-3, (MT)	1.43E+03					1.43E+03	1.47E+03		3.77E-02	1.47E+03
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	23	24	25	26	27	28	30	31	32	33
H+, (MT)										
H2, (MT)	4.71E+01					4.71E+01	4.83E+01		1.24E-03	4.83E+01
H2O, (MT)	3.35E+06					3.35E+06	3.44E+06	3.53E+03	9.73E+02	3.44E+06
H2O2, (MT)	2.63E+02					2.63E+02	2.70E+02		6.92E-03	2.70E+02
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	9.49E-01					9.49E-01	9.74E-01		2.50E-05	9.74E-01
Hg2, (MT)	6.68E+00					6.68E+00	6.85E+00		1.76E-04	6.85E+00
I-, (MT)	5.46E+02					5.46E+02	5.60E+02		1.44E-02	5.60E+02
I2, (MT)										
K+, (MT)	7.07E+01					7.07E+01	7.26E+01		1.86E-03	7.26E+01
La+3, (MT)	2.32E-03					2.32E-03	2.39E-03		6.12E-08	2.39E-03
Li+, (MT)	1.07E-01					1.07E-01	1.09E-01		2.81E-06	1.09E-01
Mg+2, (MT)	9.72E-01					9.72E-01	9.97E-01		2.56E-05	9.97E-01
Mn+4, (MT)	8.46E-02					8.46E-02	8.68E-02		2.23E-06	8.68E-02
MnO2, (MT)	9.60E+01					9.60E+01	9.85E+01		2.53E-03	9.85E+01
Mo+6, (MT)	4.87E+00					4.87E+00	5.00E+00		1.28E-04	5.00E+00
MoO4-2, (MT)	8.79E+00					8.79E+00	9.02E+00		2.31E-04	9.02E+00
N2, (MT)			7.05E+03	7.05E+03						
N2O, (MT)										
Na+, (MT)	3.09E+05					3.09E+05	3.17E+05		8.12E+00	3.17E+05
NH2OH, (MT)										
NH3, (MT)	2.92E+01					2.92E+01	2.99E+01		7.67E-04	2.99E+01
NH4+, (MT)	5.68E-02					5.68E-02	5.83E-02		1.49E-06	5.83E-02
Ni+3, (MT)	4.08E-02					4.08E-02	4.19E-02		1.08E-06	4.19E-02
NO, (MT)										
NO2, (MT)			8.56E-04	8.56E-04						
NO2-, (MT)	1.06E+04					1.06E+04	1.09E+04		2.79E-01	1.09E+04
NO3-, (MT)	1.35E+05					1.35E+05	1.38E+05		3.54E+00	1.38E+05
Np+4, (MT)	1.47E-04					1.47E-04	1.51E-04		3.87E-09	1.51E-04
O2, (MT)			7.01E+02	7.01E+02						
OH-, (MT)	1.70E+05					1.70E+05	1.75E+05		4.48E+00	1.75E+05
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.96E+00					1.96E+00	2.01E+00		5.16E-05	2.01E+00
PO4-3, (MT)	4.72E+03					4.72E+03	4.85E+03		1.24E-01	4.85E+03
POLY, (MT)	2.44E-01					2.44E-01	2.50E-01		6.42E-06	2.52E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	23	24	25	26	27	28	30	31	32	33
PTA-3, (MT)	1.86E+00					1.86E+00	1.90E+00		4.88E-05	1.90E+00
Pu+4, (MT)	2.89E-04					2.89E-04	2.97E-04		7.62E-09	2.97E-04
Si+4, (MT)	5.70E+00					5.70E+00	5.85E+00		1.50E-04	5.85E+00
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	2.80E+04					2.80E+04	2.88E+04		7.38E-01	2.88E+04
Sr+2, (MT)	3.99E-03					3.99E-03	4.09E-03		1.05E-07	4.09E-03
Sugar, (MT)										
TcO4-, (MT)	2.52E+00					2.52E+00	2.59E+00		6.64E-05	2.59E+00
Ti+4, (MT)	1.29E-04					1.29E-04	1.32E-04		3.39E-09	1.32E-04
Tot Org Carbon, (MT)	1.42E+01					1.42E+01	1.45E+01		3.73E-04	1.45E+01
UO2+2, (MT)	8.63E-01					8.63E-01	8.85E-01		2.27E-05	8.85E-01
V+5, (MT)	6.21E-02					6.21E-02	6.38E-02		1.64E-06	6.38E-02
W+6, (MT)	7.47E-01					7.47E-01	7.67E-01		1.97E-05	7.67E-01
Zn+2, (MT)	3.59E+00					3.59E+00	3.68E+00		9.45E-05	3.68E+00
Zr+4, (MT)	7.72E-01					7.72E-01	7.92E-01		2.03E-05	7.92E-01
ZrO2:2H2O, (MT)	2.15E+01					2.15E+01	2.21E+01		5.66E-04	2.21E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	23	24	25	26	27	28	30	31	32	33
Total Mass Flow, (MT)	8.83E+02					8.83E+02	8.84E+02		8.84E+02	8.84E-01
Cs and Ba, (MCi)	2.00E-01					2.00E-01	2.00E-01		2.00E-01	2.00E-04
Sr and Y, (MCi)	5.10E+00					5.10E+00	5.10E+00		5.10E+00	5.10E-03
Tc, (MCi)	1.55E-04					1.55E-04	1.55E-04		1.55E-04	1.55E-07
TRU, (MCi)	2.02E-02					2.02E-02	2.02E-02		2.02E-02	2.02E-05
Total MCi	5.32E+00					5.32E+00	5.32E+00		5.32E+00	5.32E-03
Ag+, (MT)	3.63E-02					3.63E-02	3.63E-02		3.63E-02	3.63E-05
Ag2O, (MT)	2.98E-02					2.98E-02	2.98E-02		2.98E-02	2.98E-05
Al+3, (MT)	6.03E+01					6.03E+01	6.03E+01		6.03E+01	6.03E-02
Al2O3, (MT)	3.31E+00					3.31E+00	3.31E+00		3.30E+00	3.31E-03
Am+3, (MT)	3.24E-03					3.24E-03	3.24E-03		3.24E-03	3.24E-06
Am2O3, (MT)										
APM-, (MT)	7.19E-05					7.19E-05	7.19E-05		7.19E-05	
As+5, (MT)	1.31E-02					1.31E-02	1.31E-02		1.31E-02	1.31E-05
As2O5, (MT)	3.16E-02					3.16E-02	3.17E-02		3.16E-02	3.17E-05
B+3, (MT)	2.62E-02					2.62E-02	2.62E-02		2.62E-02	2.62E-05
B2O3, (MT)	1.08E-03					1.08E-03	1.08E-03		1.08E-03	1.08E-06
Ba+2, (MT)	8.15E-02					8.15E-02	8.15E-02		8.14E-02	8.15E-05
BaO, (MT)	1.97E-04					1.97E-04	1.97E-04		1.97E-04	1.97E-07
Be+2, (MT)	2.01E-04					2.01E-04	2.01E-04		2.01E-04	2.01E-07
BeO, (MT)	4.04E-03					4.04E-03	4.04E-03		4.04E-03	4.04E-06
Bi+3, (MT)	5.17E+00					5.17E+00	5.17E+00		5.16E+00	5.17E-03
Bi2O3, (MT)	6.52E-02					6.52E-02	6.52E-02		6.52E-02	6.52E-05
Carbon14, (MT)	1.19E-05					1.19E-05	1.20E-05		1.19E-05	1.20E-08
Ca+2, (MT)	2.02E+01					2.02E+01	2.02E+01		2.02E+01	2.02E-02
Cancrinite, (MT)	7.09E+01					7.09E+01	7.09E+01		7.08E+01	7.09E-02
CaO, (MT)	4.66E-02					4.66E-02	4.66E-02		4.66E-02	4.66E-05
Cd+2, (MT)	2.09E-01					2.09E-01	2.09E-01		2.09E-01	2.09E-04
CdO, (MT)	2.54E-03					2.54E-03	2.54E-03		2.54E-03	2.54E-06
Ce+3, (MT)	8.70E+00					8.70E+00	8.70E+00		8.70E+00	8.70E-03
Ce2O3, (MT)	6.18E-02					6.18E-02	6.18E-02		6.17E-02	6.18E-05
Cl-, (MT)	9.21E-02					9.21E-02	9.21E-02		9.20E-02	9.21E-05
CO3-2, (MT)	5.92E+00					5.92E+00	5.92E+00		5.92E+00	5.92E-03
Cr+3, (MT)	3.49E+00					3.49E+00	3.49E+00		3.49E+00	3.49E-03
Cr2O3, (MT)	1.87E-02					1.87E-02	1.87E-02		1.87E-02	1.87E-05
Cs+, (MT)	2.44E-03					2.44E-03	2.44E-03		2.44E-03	2.44E-06
Cs2O, (MT)										
Cu+2, (MT)	1.97E-02					1.97E-02	1.97E-02		1.97E-02	1.97E-05
CuO, (MT)	1.88E-02					1.88E-02	1.88E-02		1.88E-02	1.88E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	23	24	25	26	27	28	30	31	32	33
F-, (MT)	1.57E+00					1.57E+00	1.57E+00		1.57E+00	1.57E-03
Fe+3, (MT)	3.47E+01					3.47E+01	3.47E+01		3.47E+01	3.47E-02
Fe2O3, (MT)	8.13E-01					8.13E-01	8.14E-01		8.13E-01	8.14E-04
H2O, (MT)	2.18E-02					2.18E-02	2.18E-02		2.18E-02	2.18E-05
Hg+2, (MT)	2.37E-04					2.37E-04	2.37E-04		2.37E-04	2.37E-07
I-, (MT)	5.33E-01					5.33E-01	5.33E-01		5.32E-01	5.33E-04
K+, (MT)	5.54E-01					5.54E-01	5.54E-01		5.54E-01	5.54E-04
K2O, (MT)	2.20E-04					2.20E-04	2.20E-04		2.19E-04	2.20E-07
La+3, (MT)	7.84E-01					7.84E-01	7.84E-01		7.84E-01	7.84E-04
La2O3, (MT)	5.52E-03					5.52E-03	5.52E-03		5.52E-03	5.52E-06
Li+, (MT)	6.48E-04					6.48E-04	6.48E-04		6.48E-04	6.48E-07
Li2O, (MT)	5.61E-07					5.61E-07	5.61E-07		5.61E-07	
Mg+2, (MT)	2.90E-01					2.90E-01	2.90E-01		2.90E-01	2.90E-04
MgO, (MT)	4.41E-03					4.41E-03	4.41E-03		4.40E-03	4.41E-06
MnO2, (MT)	5.52E+00					5.52E+00	5.52E+00		5.51E+00	5.52E-03
Mo+6, (MT)	2.11E-02					2.11E-02	2.11E-02		2.11E-02	2.11E-05
MoO3, (MT)	1.92E-03					1.92E-03	1.92E-03		1.92E-03	1.92E-06
Na+, (MT)	8.31E+01					8.31E+01	8.32E+01		8.31E+01	8.32E-02
Na2O, (MT)	2.43E-01					2.43E-01	2.43E-01		2.43E-01	2.43E-04
Ni(OH)3, (MT)	3.32E-01					3.32E-01	3.32E-01		3.32E-01	3.32E-04
Ni+3, (MT)	4.22E+00					4.22E+00	4.22E+00		4.22E+00	4.22E-03
Ni2FECN6, (MT)	1.27E+01					1.27E+01	1.27E+01		1.27E+01	1.27E-02
Ni2O3, (MT)	5.88E-02					5.88E-02	5.89E-02		5.88E-02	5.89E-05
NiO, (MT)										
NO2-, (MT)	1.95E+00					1.95E+00	1.95E+00		1.94E+00	1.95E-03
NO3-, (MT)	2.72E+01					2.72E+01	2.72E+01		2.72E+01	2.72E-02
Np+4, (MT)	1.80E-02					1.80E-02	1.80E-02		1.80E-02	1.80E-05
NpO2, (MT)	1.47E-06					1.47E-06	1.47E-06		1.46E-06	
OH-, (MT)	3.15E+02					3.15E+02	3.15E+02		3.15E+02	3.15E-01
P2O5, (MT)	8.26E-01					8.26E-01	8.26E-01		8.25E-01	8.26E-04
P2O5:24W, (MT)	1.37E-02					1.37E-02	1.37E-02		1.37E-02	1.37E-05
Pb+4, (MT)	8.65E-02					8.65E-02	8.65E-02		8.65E-02	8.65E-05
PbO2, (MT)	9.84E-02					9.84E-02	9.84E-02		9.83E-02	9.84E-05
PO4-3, (MT)	6.09E+01					6.09E+01	6.09E+01		6.08E+01	6.09E-02
POLY, (MT)									1.68E+00	
Pu+4, (MT)	4.00E-02					4.00E-02	4.00E-02		3.99E-02	4.00E-05
PuO2, (MT)	1.22E-06					1.22E-06	1.22E-06		1.22E-06	
Si+4, (MT)	2.08E+00					2.08E+00	2.08E+00		2.08E+00	2.08E-03
SiO2, (MT)	4.02E-02					4.02E-02	4.02E-02		4.02E-02	4.02E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	23	24	25	26	27	29	30	31	32	33
SO3, (MT)										
SO4-2, (MT)	1.00E+00					1.00E+00	1.00E+00		1.00E+00	1.00E-03
Sr+2, (MT)	1.36E+00					1.36E+00	1.36E+00		1.35E+00	1.36E-03
SrO, (MT)	9.91E-07					9.91E-07	9.91E-07		9.90E-07	
Tc2O7, (MT)	3.17E-06					3.17E-06	3.17E-06		3.16E-06	
TcO4-, (MT)	1.50E-02					1.50E-02	1.50E-02		1.50E-02	1.50E-05
TiO2, (MT)	7.11E-06					7.11E-06	7.11E-06		7.10E-06	
Tot Org Carbon, (MT)	3.05E+00					3.05E+00	3.05E+00		3.05E+00	3.05E-03
U3O8, (MT)	2.41E-04					2.41E-04	2.41E-04		2.41E-04	2.41E-07
UO2+2, (MT)	1.27E+02					1.27E+02	1.27E+02		1.27E+02	1.27E-01
UO3, (MT)										
V+5, (MT)	4.95E-03					4.95E-03	4.95E-03		4.95E-03	4.95E-06
V2O5, (MT)	7.25E-03					7.25E-03	7.26E-03		7.25E-03	7.26E-06
WO2, (MT)										
WO3, (MT)	1.53E-02					1.53E-02	1.53E-02		1.53E-02	1.53E-05
Zn+2, (MT)	2.49E-02					2.49E-02	2.49E-02		2.49E-02	2.49E-05
ZnO, (MT)	7.12E-03					7.12E-03	7.13E-03		7.12E-03	7.13E-06
Zr+4, (MT)	7.30E+00					7.30E+00	7.30E+00		7.30E+00	7.30E-03
ZrO2, (MT)	1.57E-01					1.57E-01	1.57E-01		1.57E-01	1.57E-04
ZrO2:2H2O, (MT)	1.08E+01					1.08E+01	1.08E+01		1.08E+01	1.08E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	34	35	36	37	38	39	40	41	42	43
Volume, Total Liters	3.65E+09	3.69E+10	9.22E+07	3.68E+10	3.32E+10	4.75E+09	1.19E+09	3.56E+09	4.54E+09	1.34E+07
Specific Gravity	1.13E+00	1.13E+00	1.13E+00	1.13E+00	1.13E+00	1.13E+00	1.13E+00	1.13E+00	1.10E+00	1.00E+00
Total Mass Flow, (MT)	4.14E+06	4.18E+07	1.05E+05	4.17E+07	3.77E+07	5.38E+06	1.35E+06	4.03E+06	5.01E+06	1.34E+04
Cs and Ba, (MCi)	7.70E+01	7.78E+02	1.94E+00	7.76E+02	7.01E+02	1.00E+02	2.50E+01	7.51E+01	7.51E+01	
Sr and Y, (MCi)	1.54E-02	1.55E-01	3.88E-04	1.55E-01	1.40E-01	2.00E-02	5.00E-03	1.50E-02	1.50E-02	
Tc, (MCi)	2.68E-02	2.71E-01	6.77E-04	2.70E-01	2.44E-01	3.49E-02	8.71E-03	2.61E-02	2.61E-02	
TRU, (MCi)	1.57E-04	1.58E-03	3.95E-06	1.58E-03	1.42E-03	2.04E-04	5.09E-05	1.53E-04	1.53E-04	
Total MCi	7.71E+01	7.78E+02	1.95E+00	7.76E+02	7.01E+02	1.00E+02	2.50E+01	7.51E+01	7.51E+01	
Ag+, (MT)	3.37E-01	3.41E+00	8.52E-03	3.40E+00	3.07E+00	4.39E-01	1.10E-01	3.29E-01	3.29E-01	
Al(OH)4-, (MT)	4.96E+03	5.01E+04	1.25E+02	4.99E+04	4.51E+04	6.44E+03	1.61E+03	4.83E+03	4.83E+03	
Al+3, (MT)	6.51E+03	6.57E+04	1.64E+02	6.56E+04	5.92E+04	8.46E+03	2.12E+03	6.35E+03	6.35E+03	
Am+3, (MT)	2.60E-05	2.62E-04	6.55E-07	2.62E-04	2.36E-04	3.37E-05	8.44E-06	2.53E-05	2.53E-05	
As+5, (MT)	7.90E-01	7.98E+00	2.00E-02	7.96E+00	7.19E+00	1.03E+00	2.57E-01	7.70E-01	7.70E-01	
B+3, (MT)	5.33E-01	5.38E+00	1.35E-02	5.37E+00	4.85E+00	6.93E-01	1.73E-01	5.20E-01	5.20E-01	
Ba+2, (MT)	8.14E-01	8.21E+00	2.05E-02	8.19E+00	7.40E+00	1.06E+00	2.64E-01	7.93E-01	7.93E-01	
Be+2, (MT)	8.40E-02	8.49E-01	2.12E-03	8.46E-01	7.64E-01	1.09E-01	2.73E-02	8.19E-02	8.19E-02	
Bi+3, (MT)	6.95E+01	7.01E+02	1.75E+00	7.00E+02	6.32E+02	9.03E+01	2.26E+01	6.77E+01	6.77E+01	
Carbon14, (MT)	7.63E-04	7.70E-03	1.93E-05	7.68E-03	6.94E-03	9.91E-04	2.48E-04	7.43E-04	7.43E-04	
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.72E-01	1.74E+00	4.35E-03	1.74E+00	1.57E+00	2.24E-01	5.60E-02	1.68E-01	1.68E-01	
Cancrinite, (MT)	2.44E+03	2.47E+04	6.17E+01	2.46E+04	2.22E+04	3.17E+03	7.94E+02	2.38E+03	2.38E+03	
Cd+2, (MT)	2.15E+00	2.17E+01	5.42E-02	2.16E+01	1.95E+01	2.79E+00	6.97E-01	2.09E+00	2.09E+00	
Ce+3, (MT)	2.58E-02	2.61E-01	6.52E-04	2.60E-01	2.35E-01	3.36E-02	8.40E-03	2.52E-02	2.52E-02	
Cl-, (MT)	1.44E+03	1.46E+04	3.64E+01	1.45E+04	1.31E+04	1.88E+03	4.69E+02	1.41E+03	1.41E+03	
Cl2, (MT)										
CO, (MT)	8.56E-05	8.65E-04	2.16E-06	8.63E-04	7.79E-04	1.11E-04	2.78E-05	8.35E-05	1.90E+02	
CO2, (MT)									1.61E+00	
CO3-2, (MT)	3.45E+03	3.49E+04	8.72E+01	3.48E+04	3.14E+04	4.49E+03	1.12E+03	3.37E+03	3.76E+03	
Cr(OH)4-, (MT)	1.22E+02	1.23E+03	3.08E+00	1.23E+03	1.11E+03	1.58E+02	3.96E+01	1.19E+02	1.19E+02	
Cr+3, (MT)	4.50E+02	4.54E+03	1.14E+01	4.53E+03	4.09E+03	5.84E+02	1.46E+02	4.38E+02	4.38E+02	
Cs+, (MT)	9.38E-01	9.47E+00	2.37E-02	9.45E+00	8.54E+00	1.22E+00	3.05E-01	9.15E-01	9.15E-01	
Cu+2, (MT)	1.82E-01	1.84E+00	4.60E-03	1.83E+00	1.66E+00	2.37E-01	5.92E-02	1.78E-01	1.78E-01	
DTPA-3, (MT)										
F-, (MT)	1.34E+03	1.35E+04	3.38E+01	1.35E+04	1.22E+04	1.74E+03	4.35E+02	1.31E+03	1.31E+03	
F2, (MT)										
Fe+3, (MT)	1.50E-01	1.52E+00	3.80E-03	1.52E+00	1.37E+00	1.96E-01	4.89E-02	1.47E-01	1.47E-01	
FeCN6-3, (MT)	1.47E+03	1.49E+04	3.71E+01	1.48E+04	1.34E+04	1.91E+03	4.78E+02	1.43E+03	1.43E+03	
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	34	35	36	37	38	39	40	41	42	43
H+, (MT)										4.09E-01
H2, (MT)	4.83E+01	4.88E+02	1.22E+00	4.87E+02	4.39E+02	6.28E+01	1.57E+01	4.71E+01	2.30E+02	
H2O, (MT)	3.44E+06	3.48E+07	8.69E+04	3.47E+07	3.13E+07	4.47E+06	1.12E+06	3.35E+06	3.38E+06	1.34E+04
H2O2, (MT)	2.70E+02	2.72E+03	6.81E+00	2.72E+03	2.45E+03	3.50E+02	8.76E+01	2.63E+02	2.63E+02	3.46E+00
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	9.74E-01	9.84E+00	2.46E-02	9.81E+00	8.86E+00	1.27E+00	3.17E-01	9.49E-01	9.49E-01	
Hg2, (MT)	6.85E+00	6.92E+01	1.73E-01	6.90E+01	6.23E+01	8.90E+00	2.23E+00	6.68E+00	6.68E+00	
I-, (MT)	5.60E+02	5.66E+03	1.41E+01	5.64E+03	5.10E+03	7.28E+02	1.82E+02	5.46E+02	5.46E+02	
I2, (MT)										
K+, (MT)	7.26E+01	7.33E+02	1.83E+00	7.31E+02	6.60E+02	9.43E+01	2.36E+01	7.07E+01	7.07E+01	
La+3, (MT)	2.39E-03	2.41E-02	6.02E-05	2.40E-02	2.17E-02	3.10E-03	7.75E-04	2.32E-03	2.32E-03	
Li+, (MT)	1.09E-01	1.10E+00	2.76E-03	1.10E+00	9.95E-01	1.42E-01	3.55E-02	1.07E-01	1.07E-01	
Mg+2, (MT)	9.97E-01	1.01E+01	2.52E-02	1.00E+01	9.07E+00	1.30E+00	3.24E-01	9.72E-01	9.72E-01	
Mn+4, (MT)	8.68E-02	8.76E-01	2.19E-03	8.74E-01	7.89E-01	1.13E-01	2.82E-02	8.46E-02	8.46E-02	
MnO2, (MT)	9.85E+01	9.95E+02	2.49E+00	9.92E+02	8.96E+02	1.28E+02	3.20E+01	9.60E+01	9.60E+01	
Mo+6, (MT)	5.00E+00	5.05E+01	1.26E-01	5.03E+01	4.55E+01	6.49E+00	1.62E+00	4.87E+00	4.87E+00	
MoO4-2, (MT)	9.02E+00	9.11E+01	2.28E-01	9.09E+01	8.21E+01	1.17E+01	2.93E+00	8.79E+00	8.79E+00	
N2, (MT)									1.76E-02	
N2O, (MT)									2.00E+03	
Na+, (MT)	3.17E+05	3.20E+06	7.99E+03	3.19E+06	2.88E+06	4.11E+05	1.03E+05	3.09E+05	3.09E+05	
NH2OH, (MT)										
NH3, (MT)	2.99E+01	3.02E+02	7.55E-01	3.01E+02	2.72E+02	3.89E+01	9.72E+00	2.92E+01	2.92E+01	
NH4+, (MT)	5.83E-02	5.88E-01	1.47E-03	5.87E-01	5.30E-01	7.57E-02	1.89E-02	5.68E-02	5.68E-02	
Ni+3, (MT)	4.19E-02	4.23E-01	1.06E-03	4.22E-01	3.81E-01	5.45E-02	1.36E-02	4.08E-02	4.08E-02	
NO, (MT)										
NO2, (MT)									1.53E+00	
NO2-, (MT)	1.09E+04	1.10E+05	2.74E+02	1.09E+05	9.88E+04	1.41E+04	3.53E+03	1.06E+04	1.06E+04	
NO3-, (MT)	1.38E+05	1.40E+06	3.49E+03	1.39E+06	1.26E+06	1.80E+05	4.49E+04	1.35E+05	1.35E+05	2.52E+01
Np+4, (MT)	1.51E-04	1.52E-03	3.80E-06	1.52E-03	1.37E-03	1.96E-04	4.90E-05	1.47E-04	1.47E-04	
O2, (MT)									1.09E+02	
OH-, (MT)	1.75E+05	1.76E+06	4.41E+03	1.76E+06	1.59E+06	2.27E+05	5.67E+04	1.70E+05	1.70E+05	
ORGS, (MT)										
ORGT, (MT)									9.49E+05	
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	2.01E+00	2.03E+01	5.08E-02	2.03E+01	1.83E+01	2.62E+00	6.54E-01	1.96E+00	1.96E+00	
PO4-3, (MT)	4.85E+03	4.89E+04	1.22E+02	4.88E+04	4.41E+04	6.30E+03	1.58E+03	4.72E+03	4.72E+03	
POLY, (MT)	2.52E-01	2.55E+00	6.36E-03	2.54E+00	2.29E+00	3.28E-01	8.19E-02	2.46E-01	2.46E-01	2.34E-04

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	34	35	36	37	38	39	40	41	42	43
Total Mass Flow, (MT)	8.84E-01	8.84E+01	2.21E-01	8.81E+01	8.75E+01	8.84E-01	2.21E-01	6.63E-01	6.63E-01	
Cs and Ba, (MCi)	2.00E-04	2.00E-02	5.01E-05	2.00E-02	1.98E-02	2.00E-04	5.01E-05	1.50E-04	1.50E-04	
Sr and Y, (MCi)	5.10E-03	5.10E-01	1.28E-03	5.09E-01	5.05E-01	5.10E-03	1.28E-03	3.83E-03	3.83E-03	
Tc, (MCi)	1.55E-07	1.55E-05	3.88E-08	1.55E-05	1.54E-05	1.55E-07	3.88E-08	1.16E-07	1.16E-07	
TRU, (MCi)	2.02E-05	2.02E-03	5.05E-06	2.02E-03	2.00E-03	2.02E-05	5.05E-06	1.52E-05	1.52E-05	
Total MCi	5.32E-03	5.32E-01	1.33E-03	5.31E-01	5.27E-01	5.32E-03	1.33E-03	3.99E-03	3.99E-03	
Ag+, (MT)	3.63E-05	3.63E-03	9.08E-06	3.62E-03	3.60E-03	3.63E-05	9.08E-06	2.72E-05	2.72E-05	
Ag2O, (MT)	2.98E-05	2.98E-03	7.44E-06	2.97E-03	2.95E-03	2.98E-05	7.44E-06	2.23E-05	2.23E-05	
Al+3, (MT)	6.03E-02	6.03E+00	1.51E-02	6.02E+00	5.97E+00	6.03E-02	1.51E-02	4.52E-02	4.52E-02	
Al2O3, (MT)	3.31E-03	3.31E-01	8.27E-04	3.30E-01	3.28E-01	3.31E-03	8.27E-04	2.48E-03	2.48E-03	
Am+3, (MT)	3.24E-06	3.24E-04	8.10E-07	3.23E-04	3.21E-04	3.24E-06	8.10E-07	2.43E-06	2.43E-06	
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)	1.31E-05	1.31E-03	3.29E-06	1.31E-03	1.30E-03	1.31E-05	3.29E-06	9.85E-06	9.85E-06	
As2O5, (MT)	3.17E-05	3.16E-03	7.91E-06	3.16E-03	3.13E-03	3.16E-05	7.91E-06	2.37E-05	2.37E-05	
B+3, (MT)	2.62E-05	2.62E-03	6.56E-06	2.62E-03	2.60E-03	2.62E-05	6.56E-06	1.97E-05	1.97E-05	
B2O3, (MT)	1.08E-06	1.08E-04	2.71E-07	1.08E-04	1.07E-04	1.08E-06	2.71E-07	8.12E-07	8.12E-07	
Ba+2, (MT)	8.15E-05	8.15E-03	2.04E-05	8.13E-03	8.07E-03	8.15E-05	2.04E-05	6.11E-05	6.11E-05	
BaO, (MT)	1.97E-07	1.97E-05	4.92E-08	1.96E-05	1.95E-05	1.97E-07	4.92E-08	1.48E-07	1.48E-07	
Be+2, (MT)	2.01E-07	2.01E-05	5.02E-08	2.00E-05	1.99E-05	2.01E-07	5.02E-08	1.51E-07	1.51E-07	
BeO, (MT)	4.04E-06	4.04E-04	1.01E-06	4.03E-04	4.00E-04	4.04E-06	1.01E-06	3.03E-06	3.03E-06	
Bi+3, (MT)	5.17E-03	5.17E-01	1.29E-03	5.16E-01	5.12E-01	5.17E-03	1.29E-03	3.88E-03	3.88E-03	
Bi2O3, (MT)	6.52E-05	6.52E-03	1.63E-05	6.50E-03	6.46E-03	6.52E-05	1.63E-05	4.89E-05	4.89E-05	
Carbon14, (MT)	1.20E-08	1.20E-06	2.99E-09	1.19E-06	1.18E-06	1.20E-08	2.99E-09	8.96E-09	8.96E-09	
Ca+2, (MT)	2.02E-02	2.02E+00	5.04E-03	2.01E+00	2.00E+00	2.02E-02	5.04E-03	1.51E-02	1.51E-02	
Cancrinite, (MT)	7.09E-02	7.09E+00	1.77E-02	7.07E+00	7.02E+00	7.09E-02	1.77E-02	5.32E-02	5.32E-02	
CaO, (MT)	4.66E-05	4.66E-03	1.17E-05	4.65E-03	4.62E-03	4.66E-05	1.17E-05	3.50E-05	3.50E-05	
Cd+2, (MT)	2.09E-04	2.09E-02	5.23E-05	2.09E-02	2.07E-02	2.09E-04	5.23E-05	1.57E-04	1.57E-04	
CdO, (MT)	2.54E-06	2.54E-04	6.35E-07	2.54E-04	2.52E-04	2.54E-06	6.35E-07	1.91E-06	1.91E-06	
Co+3, (MT)	8.70E-03	8.70E-01	2.18E-03	8.68E-01	8.62E-01	8.70E-03	2.18E-03	6.53E-03	6.53E-03	
Ce2O3, (MT)	6.18E-05	6.18E-03	1.54E-05	6.16E-03	6.11E-03	6.18E-05	1.54E-05	4.63E-05	4.63E-05	
Cl-, (MT)	9.21E-05	9.21E-03	2.30E-05	9.18E-03	9.12E-03	9.21E-05	2.30E-05	6.91E-05	6.91E-05	
CO3-2, (MT)	5.92E-03	5.92E-01	1.48E-03	5.91E-01	5.86E-01	5.92E-03	1.48E-03	4.44E-03	4.44E-03	
Cr+3, (MT)	3.49E-03	3.49E-01	8.73E-04	3.48E-01	3.46E-01	3.49E-03	8.73E-04	2.62E-03	2.62E-03	
Cr2O3, (MT)	1.87E-05	1.87E-03	4.67E-06	1.86E-03	1.85E-03	1.87E-05	4.67E-06	1.40E-05	1.40E-05	
Cs+, (MT)	2.44E-06	2.44E-04	6.10E-07	2.44E-04	2.42E-04	2.44E-06	6.10E-07	1.83E-06	1.83E-06	
Cs2O, (MT)										
Cu+2, (MT)	1.97E-05	1.97E-03	4.92E-06	1.96E-03	1.95E-03	1.97E-05	4.92E-06	1.48E-05	1.48E-05	
CuO, (MT)	1.88E-05	1.88E-03	4.70E-06	1.88E-03	1.86E-03	1.88E-05	4.70E-06	1.41E-05	1.41E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	34	35	36	37	38	39	40	41	42	43
F-, (MT)	1.57E-03	1.57E-01	3.94E-04	1.57E-01	1.56E-01	1.57E-03	3.94E-04	1.18E-03	1.18E-03	
Fe+3, (MT)	3.47E-02	3.47E+00	8.67E-03	3.46E+00	3.43E+00	3.47E-02	8.67E-03	2.60E-02	2.60E-02	
Fe2O3, (MT)	8.14E-04	8.14E-02	2.03E-04	8.12E-02	8.06E-02	8.14E-04	2.03E-04	6.10E-04	6.10E-04	
H2O, (MT)	2.18E-05	2.18E-03	5.45E-06	2.18E-03	2.16E-03	2.18E-05	5.45E-06	1.64E-05	1.64E-05	
Hg+2, (MT)	2.37E-07	2.37E-05	5.94E-08	2.37E-05	2.35E-05	2.37E-07	5.94E-08	1.78E-07	1.78E-07	
I-, (MT)	5.33E-04	5.33E-02	1.33E-04	5.32E-02	5.28E-02	5.33E-04	1.33E-04	4.00E-04	4.00E-04	
K+, (MT)	5.54E-04	5.54E-02	1.39E-04	5.53E-02	5.49E-02	5.54E-04	1.39E-04	4.16E-04	4.16E-04	
K2O, (MT)	2.20E-07	2.19E-05	5.49E-08	2.19E-05	2.17E-05	2.19E-07	5.48E-08	1.65E-07	1.65E-07	
La+3, (MT)	7.84E-04	7.84E-02	1.96E-04	7.83E-02	7.77E-02	7.84E-04	1.96E-04	5.88E-04	5.88E-04	
La2O3, (MT)	5.52E-06	5.52E-04	1.38E-06	5.51E-04	5.47E-04	5.52E-06	1.38E-06	4.14E-06	4.14E-06	
Li+, (MT)	6.48E-07	6.48E-05	1.62E-07	6.47E-05	6.42E-05	6.48E-07	1.62E-07	4.86E-07	4.86E-07	
Li2O, (MT)		4.56E-21	1.14E-23	4.55E-21	4.51E-21	4.56E-23	1.15E-23	3.42E-23	3.42E-23	
Mg+2, (MT)	2.90E-04	2.90E-02	7.26E-05	2.90E-02	2.87E-02	2.90E-04	7.26E-05	2.18E-04	2.18E-04	
MgO, (MT)	4.41E-06	4.41E-04	1.10E-06	4.40E-04	4.36E-04	4.41E-06	1.10E-06	3.31E-06	3.31E-06	
MnO2, (MT)	5.52E-03	5.52E-01	1.38E-03	5.50E-01	5.46E-01	5.52E-03	1.38E-03	4.14E-03	4.14E-03	
Mo+6, (MT)	2.11E-05	2.11E-03	5.28E-06	2.11E-03	2.09E-03	2.11E-05	5.28E-06	1.59E-05	1.59E-05	
MoO3, (MT)	1.92E-06	1.92E-04	4.80E-07	1.91E-04	1.90E-04	1.92E-06	4.80E-07	1.44E-06	1.44E-06	
Na+, (MT)	8.32E-02	8.32E+00	2.08E-02	8.29E+00	8.23E+00	8.32E-02	2.08E-02	6.24E-02	6.24E-02	
Na2O, (MT)	2.43E-04	2.43E-02	6.08E-05	2.42E-02	2.41E-02	2.43E-04	6.08E-05	1.82E-04	1.82E-04	
Ni(OH)3, (MT)	3.32E-04	3.32E-02	8.30E-05	3.31E-02	3.29E-02	3.32E-04	8.30E-05	2.49E-04	2.49E-04	
Ni+3, (MT)	4.22E-03	4.22E-01	1.06E-03	4.21E-01	4.18E-01	4.22E-03	1.06E-03	3.17E-03	3.17E-03	
Ni2FECN6, (MT)	1.27E-02	1.27E+00	3.19E-03	1.27E+00	1.26E+00	1.27E-02	3.19E-03	9.56E-03	9.56E-03	
Ni2O3, (MT)	5.89E-05	5.89E-03	1.47E-05	5.87E-03	5.83E-03	5.89E-05	1.47E-05	4.42E-05	4.42E-05	
NiO, (MT)										
NO2-, (MT)	1.95E-03	1.95E-01	4.87E-04	1.94E-01	1.93E-01	1.95E-03	4.87E-04	1.46E-03	1.46E-03	
NO3-, (MT)	2.72E-02	2.72E+00	6.81E-03	2.72E+00	2.70E+00	2.72E-02	6.81E-03	2.04E-02	2.04E-02	
Np+4, (MT)	1.80E-05	1.80E-03	4.51E-06	1.80E-03	1.79E-03	1.80E-05	4.51E-06	1.35E-05	1.35E-05	
NpO2, (MT)		6.79E-16	1.70E-18	6.77E-16	6.72E-16	6.79E-18	1.72E-18	5.09E-18	5.09E-18	
OH-, (MT)	3.15E-01	3.15E+01	7.88E-02	3.14E+01	3.12E+01	3.15E-01	7.88E-02	2.36E-01	2.36E-01	
P2O5, (MT)	8.26E-04	8.26E-02	2.07E-04	8.24E-02	8.18E-02	8.26E-04	2.07E-04	6.19E-04	6.19E-04	
P2O5:24W, (MT)	1.37E-05	1.37E-03	3.44E-06	1.37E-03	1.36E-03	1.37E-05	3.44E-06	1.03E-05	1.03E-05	
Pb+4, (MT)	8.65E-05	8.65E-03	2.16E-05	8.63E-03	8.57E-03	8.65E-05	2.16E-05	6.49E-05	6.49E-05	
PbO2, (MT)	9.84E-05	9.84E-03	2.46E-05	9.82E-03	9.74E-03	9.84E-05	2.46E-05	7.38E-05	7.38E-05	
PO4-3, (MT)	6.09E-02	6.09E+00	1.52E-02	6.07E+00	6.03E+00	6.09E-02	1.52E-02	4.57E-02	4.57E-02	
POLY, (MT)										
Pu+4, (MT)	4.00E-05	4.00E-03	9.99E-06	3.99E-03	3.96E-03	4.00E-05	9.99E-06	3.00E-05	3.00E-05	
PuO2, (MT)										
Si+4, (MT)	2.08E-03	2.08E-01	5.21E-04	2.08E-01	2.06E-01	2.08E-03	5.21E-04	1.56E-03	1.56E-03	
SiO2, (MT)	4.02E-05	4.03E-03	1.01E-05	4.02E-03	3.99E-03	4.03E-05	1.01E-05	3.02E-05	3.02E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	34	35	36	37	38	39	40	41	42	43
SO3, (MT)										
SO4-2, (MT)	1.00E-03	1.00E-01	2.50E-04	9.99E-02	9.92E-02	1.00E-03	2.50E-04	7.51E-04	7.51E-04	
Sr+2, (MT)	1.36E-03	1.36E-01	3.39E-04	1.35E-01	1.34E-01	1.36E-03	3.39E-04	1.02E-03	1.02E-03	
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)	1.50E-05	1.50E-03	3.75E-06	1.49E-03	1.48E-03	1.50E-05	3.75E-06	1.12E-05	1.12E-05	
TiO2, (MT)										
Tot Org Carbon, (MT)	3.05E-03	3.05E-01	7.63E-04	3.05E-01	3.02E-01	3.05E-03	7.63E-04	2.29E-03	2.29E-03	
U3O8, (MT)	2.41E-07	2.41E-05	6.03E-08	2.41E-05	2.39E-05	2.41E-07	6.03E-08	1.81E-07	1.81E-07	
UO2+2, (MT)	1.27E-01	1.27E+01	3.18E-02	1.27E+01	1.26E+01	1.27E-01	3.18E-02	9.54E-02	9.54E-02	
UO3, (MT)										
V+5, (MT)	4.95E-06	4.95E-04	1.24E-06	4.94E-04	4.90E-04	4.95E-06	1.24E-06	3.72E-06	3.72E-06	
V2O5, (MT)	7.26E-06	7.25E-04	1.81E-06	7.23E-04	7.18E-04	7.25E-06	1.81E-06	5.44E-06	5.44E-06	
WO2, (MT)										
WO3, (MT)	1.53E-05	1.53E-03	3.83E-06	1.53E-03	1.52E-03	1.53E-05	3.83E-06	1.15E-05	1.15E-05	
Zn+2, (MT)	2.49E-05	2.49E-03	6.23E-06	2.49E-03	2.47E-03	2.49E-05	6.23E-06	1.87E-05	1.87E-05	
ZnO, (MT)	7.13E-06	7.12E-04	1.78E-06	7.10E-04	7.05E-04	7.12E-06	1.78E-06	5.34E-06	5.34E-06	
Zr+4, (MT)	7.30E-03	7.30E-01	1.83E-03	7.29E-01	7.23E-01	7.30E-03	1.83E-03	5.48E-03	5.48E-03	
ZrO2, (MT)	1.57E-04	1.57E-02	3.93E-05	1.57E-02	1.56E-02	1.57E-04	3.93E-05	1.18E-04	1.18E-04	
ZrO2:2H2O, (MT)	1.08E-02	1.08E+00	2.69E-03	1.08E+00	1.07E+00	1.08E-02	2.69E-03	8.08E-03	8.08E-03	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	46	55	57	59	62	63	64	65	66	67
Volume, Total Liters	1.44E+07	1.44E+07	1.82E+06	2.07E+06	2.07E+06	2.07E+06	5.62E+02	2.07E+06	4.49E+06	
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.54E+00	1.00E+00	1.00E+00	
Total Mass Flow, (MT)	1.44E+04	1.44E+04	1.82E+05	2.08E+05	2.08E+05	2.08E+05	8.64E-01	2.08E+05	4.49E+03	
Cs and Ba, (MCi)	1.98E-03	1.98E-03		2.61E-01	2.61E-01	2.61E-01		2.61E-01		
Sr and Y, (MCi)	3.95E-07	3.95E-07		5.49E-03	5.49E-03	5.49E-03		5.49E-03		
Tc, (MCi)	6.88E-07	6.88E-07		1.02E-04	1.02E-04	1.02E-04		1.02E-04		
TRU, (MCi)	4.02E-09	4.02E-09		5.89E-05	5.89E-05	5.89E-05		5.89E-05		
Total MCi	1.98E-03	1.98E-03		2.67E-01	2.67E-01	2.67E-01		2.67E-01		
Ag+, (MT)	8.65E-06	8.65E-06		1.28E-03	1.28E-03	1.28E-03		1.28E-03		
Al(OH)4-, (MT)	1.27E-01	1.27E-01		1.88E+01	1.88E+01	1.88E+01		1.88E+01		
Al+3, (MT)	1.67E-01	1.67E-01								
Am+3, (MT)	6.66E-10	6.66E-10		9.76E-06	9.76E-06	9.76E-06		9.76E-06		
As+5, (MT)	2.03E-05	2.03E-05		2.99E-03	2.99E-03	2.99E-03		2.99E-03		
B+3, (MT)	1.37E-05	1.37E-05		2.02E-03	2.02E-03	2.02E-03		2.02E-03		
Ba+2, (MT)	2.09E-05	2.09E-05		3.07E-03	3.07E-03	3.07E-03		3.07E-03		
Be+2, (MT)	2.16E-06	2.16E-06		3.18E-04	3.18E-04	3.18E-04		3.18E-04		
Bi+3, (MT)	1.78E-03	1.78E-03		2.63E-01	2.63E-01	2.63E-01		2.63E-01		
Carbon14, (MT)	1.96E-08	1.96E-08		2.89E-06	2.89E-06	2.89E-06		2.89E-06		
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	4.42E-06	4.42E-06		6.49E-02	6.49E-02	6.49E-02		6.49E-02		
Cancrinite, (MT)	6.27E-02	6.27E-02								
Cd+2, (MT)	5.50E-05	5.50E-05		8.11E-03	8.11E-03	8.11E-03		8.11E-03		
Ce+3, (MT)	6.63E-07	6.63E-07		9.20E-03	9.20E-03	9.20E-03		9.20E-03		
Cl-, (MT)	3.70E-02	3.70E-02		1.21E+00	1.21E+00	1.21E+00		1.21E+00		
Cl2, (MT)										
CO, (MT)	2.20E-09	2.20E-09								
CO2, (MT)										
CO3-2, (MT)	8.86E-02	8.86E-02		1.31E+01	1.31E+01	1.31E+01		1.31E+01		
Cr(OH)4-, (MT)	3.13E-03	3.13E-03		4.62E-01	4.62E-01	4.62E-01		4.62E-01		
Cr+3, (MT)	1.15E-02	1.15E-02								
Cs+, (MT)	2.41E-05	2.41E-05		3.18E-03	3.18E-03	3.18E-03		3.18E-03		
Cu+2, (MT)	4.67E-06	4.67E-06		6.88E-04	6.88E-04	6.88E-04		6.88E-04		
DTPA-3, (MT)										
F-, (MT)	3.44E-02	3.44E-02		4.34E+00	4.34E+00	4.34E+00		4.34E+00		
F2, (MT)										
Fe+3, (MT)	3.86E-06	3.86E-06		5.58E-02	5.58E-02	5.58E-02		5.58E-02		
FeCN6-3, (MT)	3.77E-02	3.77E-02								
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	46	55	57	60	62	63	64	65	66	67
H+, (MT)	4.09E-01	4.09E-01	5.54E+00	5.54E+00	5.54E+00	5.54E+00		4.48E+00		
H2, (MT)	1.24E-03	1.24E-03								
H2O, (MT)	1.44E+04	1.44E+04	1.81E+05	2.06E+05	2.06E+05	2.06E+05	4.32E-01	2.06E+05	4.49E+03	
H2O2, (MT)	3.47E+00	3.47E+00	4.69E+01	4.69E+01	4.69E+01	4.69E+01		4.69E+01		
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	2.50E-05	2.50E-05		3.69E-03	3.69E-03	3.69E-03		3.69E-03		
Hg2, (MT)	1.76E-04	1.76E-04								
I-, (MT)	1.44E-02	1.44E-02		2.12E+00	2.12E+00	2.12E+00		2.12E+00		
I2, (MT)										
K+, (MT)	1.86E-03	1.86E-03		8.51E-04	8.51E-04	8.51E-04		8.51E-04		
La+3, (MT)	6.12E-08	6.12E-08		8.51E-04	8.51E-04	8.51E-04		8.51E-04		
Li+, (MT)	2.81E-06	2.81E-06		2.24E-05	2.24E-05	2.24E-05		2.24E-05		
Mg+2, (MT)	2.56E-05	2.56E-05		3.75E-03	3.75E-03	3.75E-03		3.75E-03		
Mn+4, (MT)	2.23E-06	2.23E-06								
MnO2, (MT)	2.53E-03	2.53E-03		8.42E-02	8.42E-02	8.42E-02		8.42E-02		
Mo+6, (MT)	1.28E-04	1.28E-04		1.89E-02	1.89E-02	1.89E-02		1.89E-02		
MoO4-2, (MT)	2.31E-04	2.31E-04								
N2, (MT)										
N2O, (MT)										
Na+, (MT)	8.12E+00	8.12E+00		2.43E+02	2.43E+02	2.43E+02	2.48E-01	2.43E+02		
NH2OH, (MT)										
NH3, (MT)	7.67E-04	7.67E-04								
NH4+, (MT)	1.49E-06	1.49E-06								
Ni+3, (MT)	1.08E-06	1.08E-06		1.58E-02	1.58E-02	1.58E-02		1.58E-02		
NO, (MT)										
NO2, (MT)										
NO2-, (MT)	2.79E-01	2.79E-01		3.71E+01	3.71E+01	3.71E+01		3.71E+01		
NO3-, (MT)	2.87E+01	2.87E+01	3.41E+02	7.53E+02	7.53E+02	7.53E+02		7.53E+02		
Np+4, (MT)	3.87E-09	3.87E-09		5.69E-05	5.69E-05	5.69E-05		5.69E-05		
O2, (MT)										
OH-, (MT)	4.48E+00	4.48E+00		1.80E+01	1.80E+01	1.80E+01	1.84E-01			
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	5.16E-05	5.16E-05		7.62E-03	7.62E-03	7.62E-03		7.62E-03		
PO4-3, (MT)	1.24E-01	1.24E-01		1.00E+01	1.00E+01	1.00E+01		1.00E+01		
POLY, (MT)	2.41E-04	2.41E-04	3.18E-03	3.18E-03	3.18E-03	3.18E-03		3.18E-03		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	46	53	57	60	62	63	64	65	66	67
PTA-3, (MT)	4.88E-05	4.88E-05								
Pu+4, (MT)	7.62E-09	7.62E-09		1.12E-04	1.12E-04	1.12E-04		1.12E-04		
Si+4, (MT)	1.50E-04	1.50E-04		2.20E-02	2.20E-02	2.20E-02		2.20E-02		
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	7.38E-01	7.38E-01		7.79E+00	7.79E+00	7.79E+00		7.79E+00		
Sr+2, (MT)	1.05E-07	1.05E-07		1.46E-03	1.46E-03	1.46E-03		1.46E-03		
Sugar, (MT)										
TcO4-, (MT)	6.64E-05	6.64E-05		9.80E-03	9.80E-03	9.80E-03		9.80E-03		
Ti+4, (MT)	3.39E-09	3.39E-09								
Tot Org Carbon, (MT)	3.73E-04	3.73E-04		5.50E+00	5.50E+00	5.50E+00		5.50E+00		
UO2+2, (MT)	2.27E-05	2.27E-05		3.31E-01	3.31E-01	3.31E-01		3.31E-01		
V+5, (MT)	1.64E-06	1.64E-06		2.41E-04	2.41E-04	2.41E-04		2.41E-04		
W+6, (MT)	1.97E-05	1.97E-05		2.90E-03	2.90E-03	2.90E-03		2.90E-03		
Zn+2, (MT)	9.45E-05	9.45E-05		1.40E-02	1.40E-02	1.40E-02		1.40E-02		
Zr+4, (MT)	2.03E-05	2.03E-05		1.74E-03	1.74E-03	1.74E-03		1.74E-03		
ZrO2:2H2O, (MT)	5.66E-04	5.66E-04		8.36E-02	8.36E-02	8.36E-02		8.36E-02		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	46	53	57	60	62	63	64	65	66	67
Total Mass Flow, (MT)	8.84E+02	8.84E+02		2.31E+04	2.31E+04	2.31E+04		2.31E+04		
Cs and Ba, (MCi)	2.00E-01	2.00E-01		7.40E+00	7.40E+00	7.40E+00		7.40E+00		
Sr and Y, (MCi)	5.10E+00	5.10E+00		1.34E+02	1.34E+02	1.34E+02		1.34E+02		
Tc, (MCi)	1.55E-04	1.55E-04		5.74E-03	5.74E-03	5.74E-03		5.74E-03		
TRU, (MCi)	2.02E-02	2.02E-02		1.87E-01	1.87E-01	1.87E-01		1.87E-01		
Total MCi	5.32E+00	5.32E+00		1.41E+02	1.41E+02	1.41E+02		1.41E+02		
Ag+, (MT)	3.63E-02	3.63E-02		1.34E+00	1.34E+00	1.34E+00		1.34E+00		
Ag2O, (MT)	2.98E-02	2.98E-02								
Al+3, (MT)	6.03E+01	6.03E+01		2.31E+03	2.31E+03	2.31E+03		2.31E+03		
Al2O3, (MT)	3.30E+00	3.30E+00								
Am+3, (MT)	3.24E-03	3.24E-03		2.70E-02	2.70E-02	2.70E-02		2.70E-02		
Am2O3, (MT)										
APM-, (MT)	7.19E-05	7.19E-05								
As+5, (MT)	1.31E-02	1.31E-02		4.85E-01	4.85E-01	4.85E-01		4.85E-01		
As2O5, (MT)	3.16E-02	3.16E-02								
B+3, (MT)	2.62E-02	2.62E-02		9.69E-01	9.69E-01	9.69E-01		9.69E-01		
B2O3, (MT)	1.08E-03	1.08E-03								
Ba+2, (MT)	8.14E-02	8.14E-02		3.01E+00	3.01E+00	3.01E+00		3.01E+00		
BaO, (MT)	1.97E-04	1.97E-04								
Be+2, (MT)	2.01E-04	2.01E-04		7.42E-03	7.42E-03	7.42E-03		7.42E-03		
BeO, (MT)	4.04E-03	4.04E-03								
Bi+3, (MT)	5.16E+00	5.16E+00		1.91E+02	1.91E+02	1.91E+02		1.91E+02		
Bi2O3, (MT)	6.52E-02	6.52E-02								
Carbon14, (MT)	1.19E-05	1.19E-05		4.41E-04	4.41E-04	4.41E-04		4.41E-04		
Ca+2, (MT)	2.02E+01	2.02E+01		1.30E+02	1.30E+02	1.30E+02		1.30E+02		
Cancrinite, (MT)	7.08E+01	7.08E+01		2.63E+03	2.63E+03	2.63E+03		2.63E+03		
CaO, (MT)	4.66E-02	4.66E-02								
Cd+2, (MT)	2.09E-01	2.09E-01		7.73E+00	7.73E+00	7.73E+00		7.73E+00		
CdO, (MT)	2.54E-03	2.54E-03								
Ce+3, (MT)	8.70E+00	8.70E+00		2.29E+02	2.29E+02	2.29E+02		2.29E+02		
Ce2O3, (MT)	6.17E-02	6.17E-02								
Cl-, (MT)	9.20E-02	9.20E-02		3.40E+00	3.40E+00	3.40E+00		3.40E+00		
CO3-2, (MT)	5.92E+00	5.92E+00		2.19E+02	2.19E+02	2.19E+02		2.19E+02		
Cr+3, (MT)	3.49E+00	3.49E+00		1.29E+02	1.29E+02	1.29E+02		1.29E+02		
Cr2O3, (MT)	1.87E-02	1.87E-02								
Cs+, (MT)	2.44E-03	2.44E-03		9.02E-02	9.02E-02	9.02E-02		9.02E-02		
Cs2O, (MT)										
Cu+2, (MT)	1.97E-02	1.97E-02		7.27E-01	7.27E-01	7.27E-01		7.27E-01		
CuO, (MT)	1.88E-02	1.88E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	46	53	57	60	62	63	64	65	66	67
F-, (MT)	1.57E+00	1.57E+00		5.82E+01	5.82E+01	5.82E+01		5.82E+01		
Fe+3, (MT)	3.47E+01	3.47E+01		7.44E+02	7.44E+02	7.44E+02		7.44E+02		
Fe2O3, (MT)	8.13E-01	8.13E-01								
H2O, (MT)	2.18E-02	2.18E-02								
Hg+2, (MT)	2.37E-04	2.37E-04		8.77E-03	8.77E-03	8.77E-03		8.77E-03		
I-, (MT)	5.32E-01	5.32E-01		1.97E+01	1.97E+01	1.97E+01		1.97E+01		
K+, (MT)	5.54E-01	5.54E-01		2.05E+01	2.05E+01	2.05E+01		2.05E+01		
K2O, (MT)	2.19E-04	2.19E-04								
La+3, (MT)	7.84E-01	7.84E-01		2.05E+01	2.05E+01	2.05E+01		2.05E+01		
La2O3, (MT)	5.52E-03	5.52E-03								
Li+, (MT)	6.48E-04	6.48E-04		2.39E-02	2.39E-02	2.39E-02		2.39E-02		
Li2O, (MT)	5.61E-07	5.61E-07								
Mg+2, (MT)	2.90E-01	2.90E-01		1.07E+01	1.07E+01	1.07E+01		1.07E+01		
MgO, (MT)	4.40E-03	4.40E-03								
MnO2, (MT)	5.51E+00	5.51E+00		2.04E+02	2.04E+02	2.04E+02		2.04E+02		
Mo+6, (MT)	2.11E-02	2.11E-02		7.81E-01	7.81E-01	7.81E-01		7.81E-01		
MoO3, (MT)	1.92E-03	1.92E-03								
Na+, (MT)	8.31E+01	8.31E+01		3.13E+03	3.13E+03	3.13E+03		3.13E+03		
Na2O, (MT)	2.43E-01	2.43E-01								
Ni(OH)3, (MT)	3.32E-01	3.32E-01								
Ni+3, (MT)	4.22E+00	4.22E+00		6.40E+00	6.40E+00	6.40E+00		6.40E+00		
Ni2FECN6, (MT)	1.27E+01	1.27E+01		4.87E+02	4.87E+02	4.87E+02		4.87E+02		
Ni2O3, (MT)	5.88E-02	5.88E-02								
NiO, (MT)										
NO2-, (MT)	1.94E+00	1.94E+00		7.19E+01	7.19E+01	7.19E+01		7.19E+01		
NO3-, (MT)	2.72E+01	2.72E+01		1.01E+03	1.01E+03	1.01E+03		1.01E+03		
Np+4, (MT)	1.80E-02	1.80E-02		1.28E-01	1.28E-01	1.28E-01		1.28E-01		
NpO2, (MT)	1.46E-06	1.46E-06								
OH-, (MT)	3.15E+02	3.15E+02		6.63E+03	6.63E+03	6.63E+03		6.63E+03		
P2O5, (MT)	8.25E-01	8.25E-01								
P2O5:24W, (MT)	1.37E-02	1.37E-02		5.08E-01	5.08E-01	5.08E-01		5.08E-01		
Pb+4, (MT)	8.65E-02	8.65E-02		3.20E+00	3.20E+00	3.20E+00		3.20E+00		
PbO2, (MT)	9.83E-02	9.83E-02								
PO4-3, (MT)	6.08E+01	6.08E+01		2.33E+03	2.33E+03	2.33E+03		2.33E+03		
POLY, (MT)	1.68E+00	1.68E+00								
Pu+4, (MT)	3.99E-02	3.99E-02		4.16E-01	4.16E-01	4.16E-01		4.16E-01		
PuO2, (MT)	1.22E-06	1.22E-06								
Si+4, (MT)	2.08E+00	2.08E+00		7.70E+01	7.70E+01	7.70E+01		7.70E+01		
SiO2, (MT)	4.02E-02	4.02E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	46	55	57	60	62	63	64	65	66	67
SO3, (MT)										
SO4-2, (MT)	1.00E+00	1.00E+00		3.87E+01	3.87E+01	3.87E+01		3.87E+01		
Sr+2, (MT)	1.35E+00	1.35E+00		3.55E+01	3.55E+01	3.55E+01		3.55E+01		
SrO, (MT)	9.90E-07	9.90E-07								
Tc2O7, (MT)	3.16E-06	3.16E-06								
TcO4-, (MT)	1.50E-02	1.50E-02		5.53E-01	5.53E-01	5.53E-01		5.53E-01		
TiO2, (MT)	7.10E-06	7.10E-06								
Tot Org Carbon, (MT)	3.05E+00	3.05E+00		1.13E+02	1.13E+02	1.13E+02		1.13E+02		
U3O8, (MT)	2.41E-04	2.41E-04								
UO2+2, (MT)	1.27E+02	1.27E+02		1.54E+03	1.54E+03	1.54E+03		1.54E+03		
UO3, (MT)										
V+5, (MT)	4.95E-03	4.95E-03		1.83E-01	1.83E-01	1.83E-01		1.83E-01		
V2O5, (MT)	7.25E-03	7.25E-03								
WO2, (MT)										
WO3, (MT)	1.53E-02	1.53E-02								
Zn+2, (MT)	2.49E-02	2.49E-02		9.21E-01	9.21E-01	9.21E-01		9.21E-01		
ZnO, (MT)	7.12E-03	7.12E-03								
Zr+4, (MT)	7.30E+00	7.30E+00		2.70E+02	2.70E+02	2.70E+02		2.70E+02		
ZrO2, (MT)	1.57E-01	1.57E-01								
ZrO2:2H2O, (MT)	1.08E+01	1.08E+01		3.98E+02	3.98E+02	3.98E+02		3.98E+02		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	68	69	70	71	72	73	100	101	102	103
Volume, Total Liters	4.49E+06	1.66E+05		1.66E+05	9.49E+06	2.50E+09	1.19E+09	1.19E+09	1.19E+09	1.19E+09
Specific Gravity	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.00E+00	1.40E+00	1.40E+00	1.40E+00	1.40E+00
Total Mass Flow, (MT)	4.49E+03	1.66E+02		1.66E+02	9.49E+05	2.50E+06	1.66E+06	1.66E+06	1.66E+06	1.66E+06
Cs and Ba, (MCi)							7.62E+01	7.62E+01	7.62E+01	2.97E-01
Sr and Y, (MCi)							1.50E-02	1.50E-02	1.50E-02	1.50E-02
Tc, (MCi)							2.61E-02	2.61E-02	2.61E-02	2.61E-02
TRU, (MCi)							1.53E-04	1.53E-04	1.53E-04	1.53E-04
Total MCi							7.63E+01	7.63E+01	7.63E+01	3.39E-01
Ag+, (MT)							3.29E-01	3.29E-01	3.29E-01	3.29E-01
Al(OH)4-, (MT)							4.83E+03	4.83E+03	4.83E+03	4.83E+03
Al+3, (MT)							6.35E+03	6.35E+03	6.35E+03	6.35E+03
Am+3, (MT)							2.53E-05	2.53E-05	2.53E-05	2.53E-05
As+5, (MT)							7.70E-01	7.70E-01	7.70E-01	7.70E-01
B+3, (MT)							5.20E-01	5.20E-01	5.20E-01	5.20E-01
Ba+2, (MT)							7.93E-01	7.93E-01	7.93E-01	7.93E-01
Be+2, (MT)							8.19E-02	8.19E-02	8.19E-02	8.19E-02
Bi+3, (MT)							6.77E+01	6.77E+01	6.77E+01	6.77E+01
Carbon14, (MT)							7.43E-04	7.43E-04	7.43E-04	7.43E-04
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)							1.68E-01	1.68E-01	1.68E-01	1.68E-01
Cancrinite, (MT)							2.38E+03	2.38E+03	2.38E+03	2.38E+03
Cd+2, (MT)							2.09E+00	2.09E+00	2.09E+00	2.09E+00
Ce+3, (MT)							2.52E-02	2.52E-02	2.52E-02	2.52E-02
Cl-, (MT)							1.41E+03	1.41E+03	1.41E+03	1.41E+03
Cl2, (MT)										
CO, (MT)						1.90E+02				
CO2, (MT)						1.61E+00				
CO3-2, (MT)							3.76E+03	3.76E+03	3.76E+03	3.76E+03
Cr(OH)4-, (MT)							1.19E+02	1.19E+02	1.19E+02	1.19E+02
Cr+3, (MT)							4.38E+02	4.38E+02	4.38E+02	4.38E+02
Cs+, (MT)							9.29E-01	9.29E-01	9.29E-01	3.62E-03
Cu+2, (MT)							1.78E-01	1.78E-01	1.78E-01	1.78E-01
DTPA-3, (MT)										
F-, (MT)							1.31E+03	1.31E+03	1.31E+03	1.31E+03
F2, (MT)										
Fe+3, (MT)							1.47E-01	1.47E-01	1.47E-01	1.47E-01
FeCN6-3, (MT)							1.43E+03	1.43E+03	1.43E+03	1.43E+03
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Component	68	69	70	71	72	73	100	101	102	103
H+, (MT)							6.70E-03	6.70E-03	6.70E-03	6.70E-03
H2, (MT)						2.30E+02				
H2O, (MT)	4.49E+03	1.66E+02		1.66E+02		2.50E+06	9.80E+05	9.80E+05	9.80E+05	9.80E+05
H2O2, (MT)							2.63E+02	2.63E+02	2.63E+02	2.63E+02
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)							9.49E-01	9.49E-01	9.49E-01	9.49E-01
Hg2, (MT)							6.68E+00	6.68E+00	6.68E+00	6.68E+00
I-, (MT)							5.46E+02	5.46E+02	5.46E+02	5.46E+02
I2, (MT)										
K+, (MT)							7.07E+01	7.07E+01	7.07E+01	7.07E+01
La+3, (MT)							2.32E-03	2.32E-03	2.32E-03	2.32E-03
Li+, (MT)							1.07E-01	1.07E-01	1.07E-01	1.07E-01
Mg+2, (MT)							9.72E-01	9.72E-01	9.72E-01	9.72E-01
Mn+4, (MT)							8.46E-02	8.46E-02	8.46E-02	8.46E-02
MnO2, (MT)							9.60E+01	9.60E+01	9.60E+01	9.60E+01
Mo+6, (MT)							4.87E+00	4.87E+00	4.87E+00	4.87E+00
MoO4-2, (MT)							8.79E+00	8.79E+00	8.79E+00	8.79E+00
N2, (MT)						1.76E-02				
N2O, (MT)						2.00E+03				
Na+, (MT)							3.11E+05	3.11E+05	3.11E+05	3.11E+05
NH2OH, (MT)										
NH3, (MT)							2.92E+01	2.92E+01	2.92E+01	2.92E+01
NH4+, (MT)							5.68E-02	5.68E-02	5.68E-02	5.68E-02
Ni+3, (MT)							4.08E-02	4.08E-02	4.08E-02	4.08E-02
NO, (MT)										
NO2, (MT)						1.53E+00				
NO2-, (MT)							1.06E+04	1.06E+04	1.06E+04	1.06E+04
NO3-, (MT)							1.35E+05	1.35E+05	1.35E+05	1.35E+05
Np+4, (MT)							1.47E-04	1.47E-04	1.47E-04	1.47E-04
O2, (MT)						1.09E+02				
OH-, (MT)							1.72E+05	1.72E+05	1.72E+05	1.72E+05
ORGS, (MT)										
ORGT, (MT)					9.49E+05					
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)							1.96E+00	1.96E+00	1.96E+00	1.96E+00
PO4-3, (MT)							4.72E+03	4.72E+03	4.72E+03	4.72E+03
POLY, (MT)							2.46E-01	2.46E-01	2.46E-01	2.46E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	68	69	70	71	72	73	100	101	102	103
PTA-3, (MT)							1.86E+00	1.86E+00	1.86E+00	1.86E+00
Pu+4, (MT)							2.89E-04	2.89E-04	2.89E-04	2.89E-04
Si+4, (MT)							5.70E+00	5.70E+00	5.70E+00	5.70E+00
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)							2.80E+04	2.80E+04	2.80E+04	2.80E+04
Sr+2, (MT)							3.99E-03	3.99E-03	3.99E-03	3.99E-03
Sugar, (MT)										
TcO4-, (MT)							2.52E+00	2.52E+00	2.52E+00	2.52E+00
Ti+4, (MT)							1.29E-04	1.29E-04	1.29E-04	1.29E-04
Tot Org Carbon, (MT)							1.42E+01	1.42E+01	1.42E+01	1.42E+01
UO2+2, (MT)							8.63E-01	8.63E-01	8.63E-01	8.63E-01
V+5, (MT)							6.21E-02	6.21E-02	6.21E-02	6.21E-02
W+6, (MT)							7.47E-01	7.47E-01	7.47E-01	7.47E-01
Zn+2, (MT)							3.59E+00	3.59E+00	3.59E+00	3.59E+00
Zr+4, (MT)							7.72E-01	7.72E-01	7.72E-01	7.72E-01
ZrO2:2H2O, (MT)							2.15E+01	2.15E+01	2.15E+01	2.15E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	68	69	70	71	72	73	100	101	102	103
Total Mass Flow, (MT)			1.68E+00	1.68E+00			6.63E-01	6.63E-01	6.63E-01	6.62E-04
Cs and Ba, (MCi)							1.50E-04	1.50E-04	1.50E-04	
Sr and Y, (MCi)							3.83E-03	3.83E-03	3.83E-03	3.83E-06
Tc, (MCi)							1.16E-07	1.16E-07	1.16E-07	
TRU, (MCi)							1.52E-05	1.52E-05	1.52E-05	
Total MCi							3.99E-03	3.99E-03	3.99E-03	3.83E-06
Ag+, (MT)							2.72E-05	2.72E-05	2.72E-05	2.72E-08
Ag2O, (MT)							2.23E-05	2.23E-05	2.23E-05	
Al+3, (MT)							4.52E-02	4.52E-02	4.52E-02	4.52E-05
Al2O3, (MT)							2.48E-03	2.48E-03	2.48E-03	2.48E-06
Am+3, (MT)							2.43E-06	2.43E-06	2.43E-06	
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)							9.85E-06	9.85E-06	9.85E-06	
As2O5, (MT)							2.37E-05	2.37E-05	2.37E-05	
B+3, (MT)							1.97E-05	1.97E-05	1.97E-05	1.97E-08
B2O3, (MT)							8.12E-07	8.12E-07	8.12E-07	
Ba+2, (MT)							6.11E-05	6.11E-05	6.11E-05	6.11E-08
BaO, (MT)							1.48E-07	1.48E-07	1.48E-07	
Be+2, (MT)							1.51E-07	1.51E-07	1.51E-07	
BeO, (MT)							3.03E-06	3.03E-06	3.03E-06	
Bi+3, (MT)							3.88E-03	3.88E-03	3.88E-03	3.88E-06
Bi2O3, (MT)							4.89E-05	4.89E-05	4.89E-05	
Carbon14, (MT)							8.96E-09	8.96E-09	8.96E-09	
Ca+2, (MT)							1.51E-02	1.51E-02	1.51E-02	1.51E-05
Cancrinite, (MT)							5.32E-02	5.32E-02	5.32E-02	5.32E-05
CaO, (MT)							3.50E-05	3.50E-05	3.50E-05	3.50E-08
Cd+2, (MT)							1.57E-04	1.57E-04	1.57E-04	1.57E-07
CdO, (MT)							1.91E-06	1.91E-06	1.91E-06	
Ce+3, (MT)							6.53E-03	6.53E-03	6.53E-03	6.53E-06
Ce2O3, (MT)							4.63E-05	4.63E-05	4.63E-05	
Cl-, (MT)							6.91E-05	6.91E-05	6.91E-05	6.91E-08
CO3-2, (MT)							4.44E-03	4.44E-03	4.44E-03	4.44E-06
Cr+3, (MT)							2.62E-03	2.62E-03	2.62E-03	2.62E-06
Cr2O3, (MT)							1.40E-05	1.40E-05	1.40E-05	
Cs+, (MT)							1.83E-06	1.83E-06	1.83E-06	
Cs2O, (MT)										
Cu+2, (MT)							1.48E-05	1.48E-05	1.48E-05	1.48E-08
CuO, (MT)							1.41E-05	1.41E-05	1.41E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	34	35	36	37	38	39	40	41	42	43
PTA-3, (MT)	1.90E+00	1.92E+01	4.81E-02	1.92E+01	1.73E+01	2.48E+00	6.19E-01	1.86E+00	1.86E+00	
Pu+4, (MT)	2.97E-04	3.00E-03	7.50E-06	2.99E-03	2.70E-03	3.86E-04	9.65E-05	2.89E-04	2.89E-04	
Si+4, (MT)	5.85E+00	5.90E+01	1.48E-01	5.89E+01	5.32E+01	7.60E+00	1.90E+00	5.70E+00	5.70E+00	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	2.88E+04	2.90E+05	7.26E+02	2.90E+05	2.62E+05	3.74E+04	9.35E+03	2.80E+04	2.80E+04	
Sr+2, (MT)	4.09E-03	4.13E-02	1.03E-04	4.12E-02	3.72E-02	5.32E-03	1.33E-03	3.99E-03	3.99E-03	
Sugar, (MT)										
TcO4-, (MT)	2.59E+00	2.61E+01	6.53E-02	2.61E+01	2.35E+01	3.36E+00	8.41E-01	2.52E+00	2.52E+00	
Ti+4, (MT)	1.32E-04	1.33E-03	3.33E-06	1.33E-03	1.20E-03	1.72E-04	4.29E-05	1.29E-04	1.29E-04	
Tot Org Carbon, (MT)	1.45E+01	1.47E+02	3.67E-01	1.46E+02	1.32E+02	1.89E+01	4.72E+00	1.42E+01	1.42E+01	
UO2+2, (MT)	8.85E-01	8.94E+00	2.23E-02	8.91E+00	8.05E+00	1.15E+00	2.88E-01	8.63E-01	8.63E-01	
V+5, (MT)	6.38E-02	6.44E-01	1.61E-03	6.42E-01	5.80E-01	8.29E-02	2.07E-02	6.21E-02	6.21E-02	
W+6, (MT)	7.67E-01	7.74E+00	1.94E-02	7.72E+00	6.97E+00	9.96E-01	2.49E-01	7.47E-01	7.47E-01	
Zn+2, (MT)	3.68E+00	3.72E+01	9.30E-02	3.71E+01	3.35E+01	4.79E+00	1.20E+00	3.59E+00	3.59E+00	
Zr+4, (MT)	7.92E-01	7.99E+00	2.00E-02	7.97E+00	7.20E+00	1.03E+00	2.57E-01	7.72E-01	7.72E-01	
ZrO2:2H2O, (MT)	2.21E+01	2.23E+02	5.57E-01	2.22E+02	2.01E+02	2.87E+01	7.17E+00	2.15E+01	2.15E+01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	68	69	70	71	72	73	100	101	102	103
F-, (MT)							1.18E-03	1.18E-03	1.18E-03	1.18E-06
Fe+3, (MT)							2.60E-02	2.60E-02	2.60E-02	2.60E-05
Fe2O3, (MT)							6.10E-04	6.10E-04	6.10E-04	6.10E-07
H2O, (MT)							1.64E-05	1.64E-05	1.64E-05	1.64E-08
Hg+2, (MT)							1.78E-07	1.78E-07	1.78E-07	
I-, (MT)							4.00E-04	4.00E-04	4.00E-04	4.00E-07
K+, (MT)							4.16E-04	4.16E-04	4.16E-04	4.16E-07
K2O, (MT)							1.65E-07	1.65E-07	1.65E-07	
La+3, (MT)							5.88E-04	5.88E-04	5.88E-04	5.88E-07
La2O3, (MT)							4.14E-06	4.14E-06	4.14E-06	
Li+, (MT)							4.86E-07	4.86E-07	4.86E-07	
Li2O, (MT)										
Mg+2, (MT)							2.18E-04	2.18E-04	2.18E-04	2.18E-07
MgO, (MT)							3.31E-06	3.31E-06	3.31E-06	
MnO2, (MT)							4.14E-03	4.14E-03	4.14E-03	4.14E-06
Mo+6, (MT)							1.59E-05	1.59E-05	1.59E-05	
MoO3, (MT)							1.44E-06	1.44E-06	1.44E-06	
Na+, (MT)							6.24E-02	6.24E-02	6.24E-02	6.24E-05
Na2O, (MT)							1.82E-04	1.82E-04	1.82E-04	1.82E-07
Ni(OH)3, (MT)							2.49E-04	2.49E-04	2.49E-04	2.49E-07
Ni+3, (MT)							3.17E-03	3.17E-03	3.17E-03	3.17E-06
Ni2FECN6, (MT)							9.56E-03	9.56E-03	9.56E-03	9.56E-06
Ni2O3, (MT)							4.42E-05	4.42E-05	4.42E-05	4.42E-08
NiO, (MT)										
NO2-, (MT)							1.46E-03	1.46E-03	1.46E-03	1.46E-06
NO3-, (MT)							2.04E-02	2.04E-02	2.04E-02	2.04E-05
Np+4, (MT)							1.35E-05	1.35E-05	1.35E-05	
NpO2, (MT)										
OH-, (MT)							2.36E-01	2.36E-01	2.36E-01	2.36E-04
P2O5, (MT)							6.19E-04	6.19E-04	6.19E-04	6.19E-07
P2O5:24W, (MT)							1.03E-05	1.03E-05	1.03E-05	
Pb+4, (MT)							6.49E-05	6.49E-05	6.49E-05	6.49E-08
PbO2, (MT)							7.38E-05	7.38E-05	7.38E-05	7.38E-08
PO4-3, (MT)							4.57E-02	4.57E-02	4.57E-02	4.57E-05
POLY, (MT)			1.68E+00	1.68E+00						
Pu+4, (MT)							3.00E-05	3.00E-05	3.00E-05	
PuO2, (MT)										
Si+4, (MT)							1.56E-03	1.56E-03	1.56E-03	1.56E-06
SiO2, (MT)							3.02E-05	3.02E-05	3.02E-05	3.02E-08

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	68	69	70	71	72	79	100	101	102	103
SO3, (MT)										
SO4-2, (MT)							7.51E-04	7.51E-04	7.51E-04	7.51E-07
Sr+2, (MT)							1.02E-03	1.02E-03	1.02E-03	1.02E-06
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)							1.12E-05	1.12E-05	1.12E-05	
TiO2, (MT)										
Tot Org Carbon, (MT)							2.29E-03	2.29E-03	2.29E-03	2.29E-06
U3O8, (MT)							1.81E-07	1.81E-07	1.81E-07	
UO2+2, (MT)							9.54E-02	9.54E-02	9.54E-02	9.54E-05
UO3, (MT)										
V+5, (MT)							3.72E-06	3.72E-06	3.72E-06	
V2O5, (MT)							5.44E-06	5.44E-06	5.44E-06	
WO2, (MT)										
WO3, (MT)							1.15E-05	1.15E-05	1.15E-05	
Zn+2, (MT)							1.87E-05	1.87E-05	1.87E-05	1.87E-08
ZnO, (MT)							5.34E-06	5.34E-06	5.34E-06	
Zr+4, (MT)							5.48E-03	5.48E-03	5.48E-03	5.48E-06
ZrO2, (MT)							1.18E-04	1.18E-04	1.18E-04	1.18E-07
ZrO2:2H2O, (MT)							8.08E-03	8.08E-03	8.08E-03	8.08E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	105	107	108	109	110	111	113	115	117	119
Volume, Total Liters	1.98E+07	3.96E+07	1.29E+08	1.29E+08	3.96E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07	1.98E+07
Specific Gravity	1.06E+00	1.00E+00	1.03E+00	1.03E+00	1.00E+00	1.00E+00	1.06E+00	1.06E+00	1.00E+00	1.06E+00
Total Mass Flow, (MT)	2.09E+04	3.96E+04	1.33E+05	1.33E+05	3.96E+04	1.98E+04	2.09E+04	2.09E+04	1.98E+04	2.09E+04
Cs and Ba, (MCi)	7.71E-04			7.48E+01						1.16E+00
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi	7.71E-04			7.48E+01						1.16E+00
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)	9.39E-06			9.11E-01						1.41E-02
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Component	105	107	108	109	110	111	113	115	117	119
H+, (MT)			1.29E+02	1.29E+02						6.70E-03
H2, (MT)										
H2O, (MT)	1.94E+04	3.96E+04	1.28E+05	1.28E+05	3.96E+04	1.98E+04	1.94E+04	1.94E+04	1.98E+04	1.94E+04
H2O2, (MT)										
HCOO-, (MT)			5.74E+03	5.74E+03						
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)										
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)	8.89E+02	1.58E+00					8.91E+02	8.91E+02		8.90E+02
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
O2, (MT)										
OH-, (MT)	6.58E+02	1.17E+00					6.59E+02	6.59E+02		6.59E+02
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	105	107	108	109	110	111	113	115	117	119
PTA-3, (MT)										
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	105	107	108	109	110	111	113	115	117	119
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	105	107	108	109	110	111	113	115	117	119
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	105	107	108	109	110	111	113	115	117	119
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	126	127	129	200	201	202	203	204	205	206
Volume, Total Liters	1.29E+08	2.19E-02	1.19E+09	2.54E+09	2.54E+09	4.70E+08	1.24E+07	2.90E+09	9.27E+08	1.06E+09
Specific Gravity	1.03E+00	1.00E+00	1.40E+00	1.14E+00	1.14E+00	1.00E+00	1.14E+00	1.12E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.33E+05	2.19E-05	1.66E+06	2.90E+06	2.90E+06	4.71E+05	1.41E+04	3.26E+06	9.28E+05	1.06E+06
Cs and Ba, (MCi)	7.48E+01		2.97E-01	8.12E+00	8.12E+00		3.94E-02	8.08E+00		3.94E-02
Sr and Y, (MCi)			1.50E-02	9.37E-02	9.37E-02		4.54E-04	9.33E-02		4.54E-04
Tc, (MCi)			2.61E-02	1.06E-04	1.06E-04		5.14E-07	1.06E-04		5.14E-07
TRU, (MCi)			1.53E-04	1.65E-04	1.65E-04		7.99E-07	1.64E-04		7.99E-07
Total MCi	7.48E+01		3.39E-01	8.22E+00	8.22E+00		3.98E-02	8.18E+00		3.98E-02
Ag+, (MT)			3.29E-01	2.16E-03	2.16E-03		1.05E-05	2.15E-03		1.05E-05
Al(OH)4-, (MT)			4.83E+03	1.89E+01	1.89E+01		9.16E-02	1.88E+01		9.16E-02
Al+3, (MT)			6.35E+03	6.38E+03	6.38E+03		3.09E+01	6.35E+03		3.09E+01
Am+3, (MT)			2.53E-05	2.90E-05	2.90E-05		1.41E-07	2.89E-05		1.41E-07
As+5, (MT)			7.70E-01	3.33E-03	3.33E-03		1.61E-05	3.31E-03		1.61E-05
B+3, (MT)			5.20E-01	2.66E-03	2.66E-03		1.29E-05	2.65E-03		1.29E-05
Ba+2, (MT)			7.93E-01	5.06E-03	5.06E-03		2.45E-05	5.04E-03		2.45E-05
Be+2, (MT)			8.19E-02	3.25E-04	3.25E-04		1.58E-06	3.24E-04		1.58E-06
Bi+3, (MT)			6.77E+01	3.89E-01	3.89E-01		1.89E-03	3.87E-01		1.89E-03
Carbon14, (MT)			7.43E-04	3.20E-06	3.20E-06		1.55E-08	3.18E-06		1.55E-08
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)			1.68E-01	1.60E-01	1.60E-01		7.77E-04	1.60E-01		7.77E-04
Cancrinite, (MT)			2.38E+03	2.39E+03	2.39E+03		1.16E+01	2.38E+03		1.16E+01
Cd+2, (MT)			2.09E+00	1.32E-02	1.32E-02		6.40E-05	1.31E-02		6.40E-05
Ce+3, (MT)			2.52E-02	1.61E-01	1.61E-01		7.78E-04	1.60E-01		7.78E-04
Cl-, (MT)			1.41E+03	1.10E+03	1.10E+03		5.34E+00	1.10E+03		5.34E+00
Cl2, (MT)										
CO, (MT)				8.39E-05	8.39E-05		4.07E-07	8.35E-05		4.07E-07
CO2, (MT)				9.67E-04	9.67E-04		4.69E-06	9.62E-04		4.69E-06
CO3-2, (MT)			3.76E+03	1.32E+01	1.32E+01		6.38E-02	1.31E+01		6.38E-02
Cr(OH)4-, (MT)			1.19E+02	4.65E-01	4.65E-01		2.25E-03	4.63E-01		2.25E-03
Cr+3, (MT)			4.38E+02	4.40E+02	4.40E+02		2.13E+00	4.38E+02		2.13E+00
Cs+, (MT)	9.11E-01		3.62E-03	9.90E-02	9.90E-02		4.80E-04	9.85E-02		4.80E-04
Cu+2, (MT)			1.78E-01	1.17E-03	1.17E-03		5.66E-06	1.16E-03		5.66E-06
DTPA-3, (MT)										
F-, (MT)			1.31E+03	1.94E+02	1.94E+02		9.42E-01	1.93E+02		9.42E-01
F2, (MT)										
Fe+3, (MT)			1.47E-01	3.57E-01	3.57E-01		1.73E-03	3.55E-01		1.73E-03
FeCN6-3, (MT)			1.43E+03	1.44E+03	1.44E+03		6.98E+00	1.43E+03		6.98E+00
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	126	127	129	200	201	202	203	204	205	206
H+, (MT)	1.29E+02			6.45E+01	6.45E+01	1.44E+01	3.13E-01	7.50E+01	2.83E+01	3.22E+01
H2, (MT)				1.24E-03	1.24E-03		6.00E-06	1.23E-03		6.00E-06
H2O, (MT)	1.28E+05	2.19E-05	9.80E+05	2.40E+06	2.40E+06	4.70E+05	1.18E+04	2.77E+06	9.26E+05	1.06E+06
H2O2, (MT)			2.63E+02	1.73E+02	1.73E+02	1.21E+02	8.37E-01	2.63E+02	2.39E+02	2.71E+02
HCOO-, (MT)	5.74E+03									
Hg, (MT)										
Hg+2, (MT)			9.49E-01	3.72E-03	3.72E-03		1.80E-05	3.70E-03		1.80E-05
Hg2, (MT)			6.68E+00	6.71E+00	6.71E+00		3.25E-02	6.68E+00		3.25E-02
I-, (MT)			5.46E+02	2.15E+00	2.15E+00		1.04E-02	2.14E+00		1.04E-02
I2, (MT)										
K+, (MT)			7.07E+01	7.09E+01	7.09E+01		3.43E-01	7.05E+01		3.43E-01
La+3, (MT)			2.32E-03	1.44E-02	1.44E-02		6.96E-05	1.43E-02		6.96E-05
Li+, (MT)			1.07E-01	1.01E-01	1.01E-01		4.91E-04	1.01E-01		4.91E-04
Mg+2, (MT)			9.72E-01	1.08E-02	1.08E-02		5.22E-05	1.07E-02		5.22E-05
Mn+4, (MT)			8.46E-02	8.50E-02	8.50E-02		4.12E-04	8.46E-02		4.12E-04
MnO2, (MT)			9.60E+01	7.48E+01	7.48E+01		3.63E-01	7.44E+01		3.63E-01
Mo+6, (MT)			4.87E+00	1.96E-02	1.96E-02		9.48E-05	1.95E-02		9.48E-05
MoO4-2, (MT)			8.79E+00	8.84E+00	8.84E+00		4.28E-02	8.79E+00		4.28E-02
N2, (MT)				9.86E-06	9.86E-06		4.78E-08	9.81E-06		4.78E-08
N2O, (MT)										
Na+, (MT)			3.11E+05	2.47E+05	2.47E+05		1.20E+03	2.46E+05		1.20E+03
NH2OH, (MT)										
NH3, (MT)			2.92E+01	2.93E+01	2.93E+01		1.42E-01	2.92E+01		1.42E-01
NH4+, (MT)			5.68E-02	5.71E-02	5.71E-02		2.77E-04	5.68E-02		2.77E-04
Ni+3, (MT)			4.08E-02	3.05E-02	3.05E-02		1.48E-04	3.03E-02		1.48E-04
NO, (MT)										
NO2, (MT)				8.60E-04	8.60E-04		4.17E-06	8.56E-04		4.17E-06
NO2-, (MT)			1.06E+04	1.09E+03	1.09E+03		5.28E+00	1.08E+03		5.28E+00
NO3-, (MT)			1.35E+05	2.85E+04	2.85E+04	8.83E+02	1.38E+02	2.91E+04	1.74E+03	2.10E+03
Np+4, (MT)			1.47E-04	1.13E-04	1.13E-04		5.50E-07	1.13E-04		5.50E-07
O2, (MT)				1.56E+03	1.56E+03		7.54E+00	1.55E+03		7.54E+00
OH-, (MT)			1.72E+05	1.72E+05	1.72E+05		8.36E+02	1.72E+05		8.36E+02
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)			1.96E+00	9.76E-03	9.76E-03		4.73E-05	9.71E-03		4.73E-05
PO4-3, (MT)			4.72E+03	2.16E+03	2.16E+03		1.05E+01	2.15E+03		1.05E+01
POLY, (MT)			2.46E-01	1.16E-02	1.16E-02	8.23E-03	5.62E-05	2.44E-01	1.62E-02	1.83E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	126	127	129	200	201	202	203	204	205	206
PTA-3, (MT)			1.86E+00	1.87E+00	1.87E+00		9.04E-03	1.86E+00		9.04E-03
Pu+4, (MT)			2.89E-04	2.88E-04	2.88E-04		1.40E-06	2.87E-04		1.40E-06
Si+4, (MT)			5.70E+00	7.25E-02	7.25E-02		3.51E-04	7.22E-02		3.51E-04
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)			2.80E+04	2.62E+04	2.62E+04		1.27E+02	2.60E+04		1.27E+02
Sr+2, (MT)			3.99E-03	2.49E-02	2.49E-02		1.21E-04	2.48E-02		1.21E-04
Sugar, (MT)										
TcO4-, (MT)			2.52E+00	1.02E-02	1.02E-02		4.96E-05	1.02E-02		4.96E-05
Ti+4, (MT)			1.29E-04	1.29E-04	1.29E-04		6.27E-07	1.29E-04		6.27E-07
Tot Org Carbon, (MT)			1.42E+01	6.54E+00	6.54E+00		3.17E-02	6.50E+00		3.17E-02
UO2+2, (MT)			8.63E-01	1.39E+00	1.39E+00		6.74E-03	1.38E+00		6.74E-03
V+5, (MT)			6.21E-02	3.62E-04	3.62E-04		1.76E-06	3.60E-04		1.76E-06
W+6, (MT)			7.47E-01	2.92E-03	2.92E-03		1.42E-05	2.91E-03		1.42E-05
Zn+2, (MT)			3.59E+00	1.47E-02	1.47E-02		7.10E-05	1.46E-02		7.10E-05
Zr+4, (MT)			7.72E-01	3.27E-01	3.27E-01		1.58E-03	3.25E-01		1.58E-03
ZrO2:2H2O, (MT)			2.15E+01	8.41E-02	8.41E-02		4.08E-04	8.37E-02		4.08E-04

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	126	127	129	200	201	202	203	204	205	206
Total Mass Flow, (MT)			6.62E-04	1.18E+05	1.18E+05		1.18E+05	1.18E+02		1.18E+05
Cs and Ba, (MCi)				7.69E+00	7.69E+00		7.68E+00	7.69E-03		7.68E+00
Sr and Y, (MCi)			3.83E-06	1.40E+02	1.40E+02		1.40E+02	1.40E-01		1.40E+02
Tc, (MCi)				5.99E-03	5.99E-03		5.99E-03	5.99E-06		5.99E-03
TRU, (MCi)				2.14E-01	2.14E-01		2.14E-01	2.14E-04		2.14E-01
Total MCi			3.83E-06	1.48E+02	1.48E+02		1.48E+02	1.48E-01		1.48E+02
Ag+, (MT)			2.72E-06	1.39E+00	1.39E+00		1.39E+00	1.39E-03		1.39E+00
Ag2O, (MT)				2.98E+01	2.98E+01		2.97E+01	2.98E-02		2.97E+01
Al+3, (MT)			4.52E-05	2.43E+02	2.43E+02		2.42E+02	2.43E-01		2.42E+02
Al2O3, (MT)			2.48E-06	3.31E+03	3.31E+03		3.30E+03	3.31E+00		3.30E+03
Am+3, (MT)				3.06E-02	3.06E-02		3.06E-02	3.06E-05		3.06E-02
Am2O3, (MT)				2.54E-06	2.54E-06		2.54E-06			2.54E-06
APM-, (MT)				7.19E-02	7.19E-02		7.19E-02	7.19E-05		7.19E-02
As+5, (MT)				5.04E-01	5.04E-01		5.04E-01	5.04E-04		5.04E-01
As2O5, (MT)				3.16E+01	3.16E+01		3.16E+01	3.16E-02		3.16E+01
B+3, (MT)			1.97E-08	1.01E+00	1.01E+00		1.01E+00	1.01E-03		1.01E+00
B2O3, (MT)				1.08E+00	1.08E+00		1.08E+00	1.08E-03		1.08E+00
Ba+2, (MT)			6.11E-08	3.13E+00	3.13E+00		3.13E+00	3.13E-03		3.13E+00
BaO, (MT)				1.97E-01	1.97E-01		1.97E-01	1.97E-04		1.97E-01
Be+2, (MT)				7.71E-03	7.71E-03		7.70E-03	7.71E-06		7.70E-03
BeO, (MT)				4.04E+00	4.04E+00		4.04E+00	4.04E-03		4.04E+00
Bi+3, (MT)			3.88E-06	1.98E+02	1.98E+02		1.98E+02	1.98E-01		1.98E+02
Bi2O3, (MT)				6.52E+01	6.52E+01		6.52E+01	6.52E-02		6.52E+01
Carbon14, (MT)				4.59E-04	4.59E-04		4.58E-04	4.59E-07		4.58E-04
Ca+2, (MT)			1.51E-05	1.52E+02	1.52E+02		1.52E+02	1.52E-01		1.52E+02
Cancrinite, (MT)			5.32E-05	2.39E+03	2.39E+03		2.39E+03	2.39E+00		2.39E+03
CaO, (MT)			3.50E-08	4.66E+01	4.66E+01		4.66E+01	4.66E-02		4.66E+01
Cd+2, (MT)			1.57E-07	8.03E+00	8.03E+00		8.02E+00	8.03E-03		8.02E+00
CdO, (MT)				2.54E+00	2.54E+00		2.54E+00	2.54E-03		2.54E+00
Ce+3, (MT)			6.53E-06	2.41E+02	2.41E+02		2.41E+02	2.41E-01		2.41E+02
Ce2O3, (MT)				6.18E+01	6.18E+01		6.17E+01	6.18E-02		6.17E+01
Cl-, (MT)			6.91E-08	3.53E+00	3.53E+00		3.53E+00	3.53E-03		3.53E+00
CO3-2, (MT)			4.44E-06	2.27E+02	2.27E+02		2.27E+02	2.27E-01		2.27E+02
Cr+3, (MT)			2.62E-06	1.39E+02	1.39E+02		1.39E+02	1.39E-01		1.39E+02
Cr2O3, (MT)				1.87E+01	1.87E+01		1.87E+01	1.87E-02		1.87E+01
Cs+, (MT)				9.37E-02	9.37E-02		9.36E-02	9.37E-05		9.36E-02
Cs2O, (MT)				7.37E-06	7.37E-06		7.36E-06			7.36E-06
Cu+2, (MT)			1.48E-08	7.55E-01	7.55E-01		7.55E-01	7.55E-04		7.55E-01
CuO, (MT)				1.88E+01	1.88E+01		1.88E+01	1.88E-02		1.88E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	126	127	129	200	201	202	203	204	205	206
F-, (MT)			1.18E-06	6.04E+01	6.04E+01		6.04E+01	6.04E-02		6.04E+01
Fe+3, (MT)			2.60E-05	8.18E+02	8.18E+02		8.17E+02	8.18E-01		8.17E+02
Fe2O3, (MT)			6.10E-07	8.13E+02	8.13E+02		8.13E+02	8.13E-01		8.13E+02
H2O, (MT)			1.64E-08	2.18E+01	2.18E+01		2.18E+01	2.18E-02		2.18E+01
Hg+2, (MT)				9.11E-03	9.11E-03		9.10E-03	9.11E-06		9.10E-03
I-, (MT)			4.00E-07	2.05E+01	2.05E+01		2.04E+01	2.05E-02		2.04E+01
K+, (MT)			4.16E-07	2.13E+01	2.13E+01		2.12E+01	2.13E-02		2.12E+01
K2O, (MT)				2.20E-01	2.20E-01		2.19E-01	2.20E-04		2.19E-01
La+3, (MT)			5.88E-07	2.15E+01	2.15E+01		2.15E+01	2.15E-02		2.15E+01
La2O3, (MT)				5.52E+00	5.52E+00		5.52E+00	5.52E-03		5.52E+00
Li+, (MT)				2.49E-02	2.49E-02		2.49E-02	2.49E-05		2.49E-02
Li2O, (MT)				5.61E-04	5.61E-04		5.61E-04	5.61E-07		5.61E-04
Mg+2, (MT)			2.18E-07	1.11E+01	1.11E+01		1.11E+01	1.11E-02		1.11E+01
MgO, (MT)				4.41E+00	4.41E+00		4.40E+00	4.41E-03		4.40E+00
MnO2, (MT)			4.14E-06	2.14E+02	2.14E+02		2.14E+02	2.14E-01		2.14E+02
Mo+6, (MT)				8.11E-01	8.11E-01		8.10E-01	8.11E-04		8.10E-01
MoO3, (MT)				1.92E+00	1.92E+00		1.92E+00	1.92E-03		1.92E+00
Na+, (MT)			6.24E-05	1.73E+03	1.73E+03		1.73E+03	1.73E+00		1.73E+03
Na2O, (MT)			1.82E-07	2.43E+02	2.43E+02		2.43E+02	2.43E-01		2.43E+02
Ni(OH)3, (MT)			2.49E-07	3.32E+02	3.32E+02		3.31E+02	3.32E-01		3.31E+02
Ni+3, (MT)			3.17E-06	1.08E+01	1.08E+01		1.07E+01	1.08E-02		1.07E+01
Ni2FECN6, (MT)			9.56E-06	5.53E+01	5.53E+01		5.52E+01	5.53E-02		5.52E+01
Ni2O3, (MT)			4.42E-08	5.88E+01	5.88E+01		5.88E+01	5.88E-02		5.88E+01
NiO, (MT)										
NO2-, (MT)			1.46E-06	7.47E+01	7.47E+01		7.46E+01	7.47E-02		7.46E+01
NO3-, (MT)			2.04E-05	1.03E+03	1.03E+03		1.03E+03	1.03E+00		1.03E+03
Np+4, (MT)				1.54E-01	1.54E-01		1.54E-01	1.54E-04		1.54E-01
NpO2, (MT)				1.47E-03	1.47E-03		1.46E-03	1.47E-06		1.46E-03
OH-, (MT)			2.36E-04	1.01E+05	1.01E+05		1.01E+05	1.01E+02		1.01E+05
P2O5, (MT)			6.19E-07	8.26E+02	8.26E+02		8.25E+02	8.26E-01		8.25E+02
P2O5:24W, (MT)				5.27E-01	5.27E-01		5.27E-01	5.27E-04		5.27E-01
Pb+4, (MT)			6.49E-08	3.32E+00	3.32E+00		3.32E+00	3.32E-03		3.32E+00
PbO2, (MT)			7.38E-08	9.84E+01	9.84E+01		9.83E+01	9.84E-02		9.83E+01
PO4-3, (MT)			4.57E-05	2.39E+02	2.39E+02		2.39E+02	2.39E-01		2.39E+02
POLY, (MT)				2.70E+00	2.70E+00		2.26E+02			2.26E+02
Pu+4, (MT)				4.79E-01	4.79E-01		4.78E-01	4.79E-04		4.78E-01
PuO2, (MT)				1.22E-03	1.22E-03		1.22E-03	1.22E-06		1.22E-03
Si+4, (MT)			1.56E-06	8.00E+01	8.00E+01		7.99E+01	8.00E-02		7.99E+01
SiO2, (MT)			3.02E-08	4.02E+01	4.02E+01		4.02E+01	4.02E-02		4.02E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	126	127	129	200	201	202	203	204	205	206
SO3, (MT)										
SO4-2, (MT)			7.51E-07	3.98E+00	3.98E+00		3.97E+00	3.98E-03		3.97E+00
Sr+2, (MT)			1.02E-06	3.73E+01	3.73E+01		3.72E+01	3.73E-02		3.72E+01
SrO, (MT)				9.91E-04	9.91E-04		9.90E-04	9.91E-07		9.90E-04
Tc2O7, (MT)				3.17E-03	3.17E-03		3.16E-03	3.17E-06		3.16E-03
TcO4-, (MT)				5.75E-01	5.75E-01		5.74E-01	5.75E-04		5.74E-01
TiO2, (MT)				7.11E-03	7.11E-03		7.10E-03	7.11E-06		7.10E-03
Tot Org Carbon, (MT)			2.29E-06	1.17E+02	1.17E+02		1.17E+02	1.17E-01		1.17E+02
U3O8, (MT)				2.41E-01	2.41E-01		2.41E-01	2.41E-04		2.41E-01
UO2+2, (MT)			9.54E-05	1.69E+03	1.69E+03		1.68E+03	1.69E+00		1.68E+03
UO3, (MT)										
V+5, (MT)				1.90E-01	1.90E-01		1.90E-01	1.90E-04		1.90E-01
V2O5, (MT)				7.25E+00	7.25E+00		7.25E+00	7.25E-03		7.25E+00
WO2, (MT)										
WO3, (MT)				1.53E+01	1.53E+01		1.53E+01	1.53E-02		1.53E+01
Zn+2, (MT)			1.87E-08	9.57E-01	9.57E-01		9.56E-01	9.57E-04		9.56E-01
ZnO, (MT)				7.12E+00	7.12E+00		7.12E+00	7.12E-03		7.12E+00
Zr+4, (MT)			5.48E-06	2.80E+02	2.80E+02		2.80E+02	2.80E-01		2.80E+02
ZrO2, (MT)			1.18E-07	1.57E+02	1.57E+02		1.57E+02	1.57E-01		1.57E+02
ZrO2:2H2O, (MT)			8.08E-06	4.14E+02	4.14E+02		4.13E+02	4.14E-01		4.13E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	207	208	209	210	211	212	213	216	217	218
Volume, Total Liters	1.06E+09	2.90E+09	2.21E+07		2.21E+07	4.75E+08	1.98E+07	2.19E+03	3.86E+07	7.56E+06
Specific Gravity	1.00E+00	1.12E+00	1.00E+00		1.00E+00	1.39E+00	3.16E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.06E+06	3.26E+06	2.21E+04		2.21E+04	6.60E+05	6.25E+04	2.19E+00	3.86E+04	7.59E+03
Cs and Ba, (MCi)	3.94E-02	8.08E+00								
Sr and Y, (MCi)	4.54E-04	9.33E-02								
Tc, (MCi)	5.14E-07	1.06E-04								
TRU, (MCi)	7.99E-07	1.64E-04								
Total MCi	3.98E-02	8.18E+00								
Ag+, (MT)	1.05E-05	2.15E-03								
Al(OH)4-, (MT)	9.16E-02	1.88E+01								
Al+3, (MT)	3.09E+01	6.35E+03								
Am+3, (MT)	1.41E-07	2.89E-05								
As+5, (MT)	1.61E-05	3.31E-03								
B+3, (MT)	1.29E-05	2.65E-03								
Ba+2, (MT)	2.45E-05	5.04E-03								
Be+2, (MT)	1.58E-06	3.24E-04								
Bi+3, (MT)	1.89E-03	3.87E-01								
Carbon14, (MT)	1.55E-08	3.18E-06								
C2H4O3, (MT)										
C2O4-2, (MT)							3.06E+04			
Ca+2, (MT)	7.77E-04	1.60E-01								
Cancrinite, (MT)	1.16E+01	2.38E+03								
Cd+2, (MT)	6.40E-05	1.31E-02								
Ce+3, (MT)	7.78E-04	1.60E-01								
Cl-, (MT)	5.34E+00	1.10E+03								
Cl2, (MT)										
CO, (MT)	4.07E-07	8.35E-05							1.95E+04	
CO2, (MT)	4.69E-06	9.62E-04							1.50E+02	
CO3-2, (MT)	6.38E-02	1.31E+01								
Cr(OH)4-, (MT)	2.25E-03	4.63E-01								
Cr+3, (MT)	2.13E+00	4.38E+02								
Cs+, (MT)	4.80E-04	9.85E-02								
Cu+2, (MT)	5.66E-06	1.16E-03								
DTPA-3, (MT)										
F-, (MT)	9.42E-01	1.93E+02								
F2, (MT)										
Fe+3, (MT)	1.73E-03	3.55E-01								
FeCN6-3, (MT)	6.98E+00	1.43E+03								
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	207	208	209	210	211	212	215	216	217	218
H+, (MT)	3.22E+01					6.02E+03	7.00E+02	6.69E-05		1.05E+00
H2, (MT)	6.00E-06	1.23E-03							6.00E-06	
H2O, (MT)	1.06E+06	2.77E+06	2.21E+04		2.21E+04	2.84E+05	3.13E+04	2.19E+00	7.54E+03	7.53E+03
H2O2, (MT)	2.71E+02	2.63E+02						5.65E-04		
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	1.80E-05	3.70E-03								
Hg2, (MT)	3.25E-02	6.68E+00								
I-, (MT)	1.04E-02	2.14E+00								
I2, (MT)										
K+, (MT)	3.43E-01	7.05E+01								
La+3, (MT)	6.96E-05	1.43E-02								
Li+, (MT)	4.91E-04	1.01E-01								
Mg+2, (MT)	5.22E-05	1.07E-02								
Mn+4, (MT)	4.12E-04	8.46E-02								
MnO2, (MT)	3.63E-01	7.44E+01								
Mo+6, (MT)	9.48E-05	1.95E-02								
MoO4-2, (MT)	4.28E-02	8.79E+00								
N2, (MT)	4.78E-08	9.81E-06							1.65E+00	
N2O, (MT)										
Na+, (MT)	1.20E+03	2.46E+05								
NH2OH, (MT)										
NH3, (MT)	1.42E-01	2.92E+01								
NH4+, (MT)	2.77E-04	5.68E-02								
Ni+3, (MT)	1.48E-04	3.03E-02								
NO, (MT)										
NO2, (MT)	4.17E-06	8.56E-04							1.44E+02	
NO2-, (MT)	5.28E+00	1.08E+03								
NO3-, (MT)	2.10E+03	2.91E+04				3.70E+05		4.11E-03		6.46E+01
Np+4, (MT)	5.50E-07	1.13E-04								
O2, (MT)	7.54E+00	1.55E+03							1.11E+04	
OH-, (MT)	8.36E+02	1.70E+05								
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	4.73E-05	9.71E-03								
PO4-3, (MT)	1.05E+01	2.15E+03								
POLY, (MT)	1.83E-02	2.44E-01						3.83E-08	2.26E+02	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	207	208	209	210	211	212	215	216	217	218
PTA-3, (MT)	9.04E-03	1.86E+00								
Pu+4, (MT)	1.40E-06	2.87E-04								
Si+4, (MT)	3.51E-04	7.22E-02								
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	1.27E+02	2.60E+04								
Sr+2, (MT)	1.21E-04	2.48E-02								
Sugar, (MT)										
TcO4-, (MT)	4.96E-05	1.02E-02								
Ti+4, (MT)	6.27E-07	1.29E-04								
Tot Org Carbon, (MT)	3.17E-02	6.50E+00								
UO2+2, (MT)	6.74E-03	1.38E+00								
V+5, (MT)	1.76E-06	3.60E-04								
W+6, (MT)	1.42E-05	2.91E-03								
Zn+2, (MT)	7.10E-05	1.46E-02								
Zr+4, (MT)	1.58E-03	3.25E-01								
ZrO2:2H2O, (MT)	4.08E-04	8.37E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	207	208	209	210	211	212	213	216	217	218
Total Mass Flow, (MT)	1.18E+05	1.18E+02		2.24E+02	2.24E+02				1.10E-01	
Cs and Ba, (MCi)	7.68E+00	7.69E-03								
Sr and Y, (MCi)	1.40E+02	1.40E-01								
Tc, (MCi)	5.99E-03	5.99E-06								
TRU, (MCi)	2.14E-01	2.14E-04								
Total MCi	1.48E+02	1.48E-01								
Ag+, (MT)	1.39E+00	1.39E-03								
Ag2O, (MT)	2.97E+01	2.98E-02								
Al+3, (MT)	2.42E+02	2.43E-01								
Al2O3, (MT)	3.30E+03	3.31E+00								
Am+3, (MT)	3.06E-02	3.06E-05								
Am2O3, (MT)	2.54E-06									
APM-, (MT)	7.19E-02	7.19E-05								
As+5, (MT)	5.04E-01	5.04E-04								
As2O5, (MT)	3.16E+01	3.16E-02								
B+3, (MT)	1.01E+00	1.01E-03								
B2O3, (MT)	1.08E+00	1.08E-03								
Ba+2, (MT)	3.13E+00	3.13E-03								
BaO, (MT)	1.97E-01	1.97E-04								
Be+2, (MT)	7.70E-03	7.71E-06								
BeO, (MT)	4.04E+00	4.04E-03								
Bi+3, (MT)	1.98E+02	1.98E-01								
Bi2O3, (MT)	6.52E+01	6.52E-02								
Carbon14, (MT)	4.58E-04	4.59E-07								
Ca+2, (MT)	1.52E+02	1.52E-01								
Cancrinite, (MT)	2.39E+03	2.39E+00								
CaO, (MT)	4.66E+01	4.66E-02								
Cd+2, (MT)	8.02E+00	8.03E-03								
CdO, (MT)	2.54E+00	2.54E-03								
Ce+3, (MT)	2.41E+02	2.41E-01								
Ce2O3, (MT)	6.17E+01	6.18E-02								
Cl-, (MT)	3.53E+00	3.53E-03								
CO3-2, (MT)	2.27E+02	2.27E-01								
Cr+3, (MT)	1.39E+02	1.39E-01								
Cr2O3, (MT)	1.87E+01	1.87E-02								
Cs+, (MT)	9.36E-02	9.37E-05								
Cs2O, (MT)	7.36E-06									
Cu+2, (MT)	7.55E-01	7.55E-04								
CuO, (MT)	1.88E+01	1.88E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	207	208	209	210	211	212	213	214	217	218
F-, (MT)	6.04E+01	6.04E-02								
Fe+3, (MT)	8.17E+02	8.18E-01								
Fe2O3, (MT)	8.13E+02	8.13E-01								
H2O, (MT)	2.18E+01	2.18E-02							1.10E-01	
Hg+2, (MT)	9.10E-03	9.11E-06								
I-, (MT)	2.04E+01	2.05E-02								
K+, (MT)	2.12E+01	2.13E-02								
K2O, (MT)	2.19E-01	2.20E-04								
La+3, (MT)	2.15E+01	2.15E-02								
La2O3, (MT)	5.52E+00	5.52E-03								
Li+, (MT)	2.49E-02	2.49E-05								
Li2O, (MT)	5.61E-04	5.61E-07								
Mg+2, (MT)	1.11E+01	1.11E-02								
MgO, (MT)	4.40E+00	4.41E-03								
MnO2, (MT)	2.14E+02	2.14E-01								
Mo+6, (MT)	8.10E-01	8.11E-04								
MoO3, (MT)	1.92E+00	1.92E-03								
Na+, (MT)	1.73E+03	1.73E+00								
Na2O, (MT)	2.43E+02	2.43E-01								
Ni(OH)3, (MT)	3.31E+02	3.32E-01								
Ni+3, (MT)	1.07E+01	1.08E-02								
Ni2FECN6, (MT)	5.52E+01	5.53E-02								
Ni2O3, (MT)	5.88E+01	5.88E-02								
NiO, (MT)										
NO2-, (MT)	7.46E+01	7.47E-02								
NO3-, (MT)	1.03E+03	1.03E+00								
Np+4, (MT)	1.54E-01	1.54E-04								
NpO2, (MT)	1.46E-03	1.47E-06								
OH-, (MT)	1.01E+05	1.01E+02								
P2O5, (MT)	8.25E+02	8.26E-01								
P2O5:24W, (MT)	5.27E-01	5.27E-04								
Pb+4, (MT)	3.32E+00	3.32E-03								
PbO2, (MT)	9.83E+01	9.84E-02								
PO4-3, (MT)	2.39E+02	2.39E-01								
POLY, (MT)	2.26E+02			2.24E+02	2.24E+02					
Pu+4, (MT)	4.78E-01	4.79E-04								
PuO2, (MT)	1.22E-03	1.22E-06								
Si+4, (MT)	7.99E+01	8.00E-02								
SiO2, (MT)	4.02E+01	4.02E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	207	208	209	210	211	212	215	216	217	218
SO3, (MT)										
SO4-2, (MT)	3.97E+00	3.98E-03								
Sr+2, (MT)	3.72E+01	3.73E-02								
SrO, (MT)	9.90E-04	9.91E-07								
Tc2O7, (MT)	3.16E-03	3.17E-06								
TcO4-, (MT)	5.74E-01	5.75E-04								
TiO2, (MT)	7.10E-03	7.11E-06								
Tot Org Carbon, (MT)	1.17E+02	1.17E-01								
U3O8, (MT)	2.41E-01	2.41E-04								
UO2+2, (MT)	1.68E+03	1.69E+00								
UO3, (MT)										
V+5, (MT)	1.90E-01	1.90E-04								
V2O5, (MT)	7.25E+00	7.25E-03								
WO2, (MT)										
WO3, (MT)	1.53E+01	1.53E-02								
Zn+2, (MT)	9.56E-01	9.57E-04								
ZnO, (MT)	7.12E+00	7.12E-03								
Zr+4, (MT)	2.80E+02	2.80E-01								
ZrO2, (MT)	1.57E+02	1.57E-01								
ZrO2:2H2O, (MT)	4.13E+02	4.14E-01								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	219	220	221	222	223	224	225	226	227	228
Volume, Total Liters	3.13E+07	1.34E+07	3.08E+07	1.38E+07		1.38E+07	1.72E+09	2.06E+07		2.06E+07
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.01E+00		1.01E+00	1.14E+00	1.00E+00		1.00E+00
Total Mass Flow, (MT)	3.13E+04	1.34E+04	3.08E+04	1.38E+04		1.38E+04	1.96E+06	2.06E+04		2.06E+04
Cs and Ba, (MCi)							8.01E+00			
Sr and Y, (MCi)							1.29E+02			
Tc, (MCi)							5.50E-03			
TRU, (MCi)							1.97E-01			
Total MCi							1.38E+02			
Ag+, (MT)							1.29E+00			
Al(OH)4-, (MT)							9.40E-02			
Al+3, (MT)							1.57E+02			
Am+3, (MT)							2.83E-02			
As+5, (MT)							4.65E-01			
B+3, (MT)							9.29E-01			
Ba+2, (MT)							2.89E+00			
Be+2, (MT)							7.11E-03			
Bi+3, (MT)							1.83E+02			
Carbon14, (MT)							4.23E-04			
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)							1.40E+02			
Cancrinite, (MT)							1.19E+01			
Cd+2, (MT)							7.41E+00			
Ce+3, (MT)							2.22E+02			
Cl-, (MT)							8.74E+00			
Cl2, (MT)										
CO, (MT)	1.95E+04		1.93E+04	1.95E+02		1.95E+02	1.97E+02			
CO2, (MT)	1.50E+02		1.49E+02	1.50E+00		1.50E+00	1.52E+00			
CO3-2, (MT)										
Cr(OH)4-, (MT)							2.31E-03			
Cr+3, (MT)							1.31E+02			
Cs+, (MT)							9.75E-02			
Cu+2, (MT)							6.97E-01			
DTPA-3, (MT)										
F-, (MT)							5.67E+01			
F2, (MT)										
Fe+3, (MT)							7.55E+02			
FeCN6-3, (MT)							7.16E+00			
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	219	220	221	222	223	224	225	226	227	228
H+, (MT)		4.09E-01		2.20E+00		2.20E+00	7.79E+03			
H2, (MT)	6.00E-06		5.94E-06	6.00E-08		6.00E-08	6.07E-08			
H2O, (MT)		1.34E+04		1.34E+04		1.34E+04	1.50E+06	2.06E+04		2.06E+04
H2O2, (MT)		3.46E+00		3.46E+00		3.46E+00	2.81E+02			
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)							8.43E-03			
Hg2, (MT)							3.33E-02			
I-, (MT)							1.89E+01			
I2, (MT)										
K+, (MT)							2.00E+01			
La+3, (MT)							1.98E+01			
Li+, (MT)							2.35E-02			
Mg+2, (MT)							1.03E+01			
Mn+4, (MT)							1.25E+02			
MnO2, (MT)							3.63E-02			
Mo+6, (MT)							8.38E-01			
MoO4-2, (MT)							4.39E-02			
N2, (MT)	1.66E+02		1.65E+02	1.66E+00		1.66E+00	1.67E-02			
N2O, (MT)										
Na+, (MT)							2.05E+03			
NH2OH, (MT)										
NH3, (MT)							1.46E-01			
NH4+, (MT)							3.07E-03			
Ni+3, (MT)							1.92E+02			
NO, (MT)										
NO2, (MT)	9.60E+01		1.43E+01	1.44E-01		1.44E-01	1.45E+00			
NO2-, (MT)										
NO3-, (MT)		2.52E+01		1.35E+02		1.35E+02	4.49E+05			
Np+4, (MT)							1.42E-01			
O2, (MT)	1.12E+04		1.10E+04	1.12E+02		1.12E+02	1.12E+02			
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)							3.07E+00			
PO4-3, (MT)							2.32E+02			
POLY, (MT)	2.26E+02	2.34E-04	2.24E+02	2.26E+00		2.26E+00	2.28E+00			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	219	220	221	222	223	224	225	226	227	228
PTA-3, (MT)							5.08E-01			
Pu+4, (MT)							4.42E-01			
Si+4, (MT)							7.38E+01			
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)							1.34E+02			
Sr+2, (MT)							3.44E+01			
Sugar, (MT)										
TcO4-, (MT)							5.31E-01			
Ti+4, (MT)							6.43E-07			
Tot Org Carbon, (MT)							1.08E+02			
UO2+2, (MT)							1.56E+03			
V+5, (MT)							1.76E-01			
W+6, (MT)							1.45E-05			
Zn+2, (MT)							8.83E-01			
Zr+4, (MT)							4.77E+02			
ZrO2:2H2O, (MT)							4.09E-05			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	219	220	221	222	223	224	225	226	227	228
Total Mass Flow, (MT)	1.10E-01			1.10E-01		1.10E-01	1.10E+05		2.19E-05	2.19E-05
Cs and Ba, (MCi)							7.70E-01			
Sr and Y, (MCi)							1.40E+01			
Tc, (MCi)							6.30E-04			
TRU, (MCi)							2.16E-02			
Total MCi							1.48E+01			
Ag+, (MT)							1.39E-01			
Ag2O, (MT)							3.00E+01			
Al+3, (MT)							1.22E+02			
Al2O3, (MT)							3.33E+03			
Am+3, (MT)							3.06E-03			
Am2O3, (MT)							2.55E-06			
APM-, (MT)							7.24E-02			
As+5, (MT)							5.04E-02			
As2O5, (MT)							3.19E+01			
B+3, (MT)							1.01E-01			
B2O3, (MT)							1.09E+00			
Ba+2, (MT)							3.13E-01			
BaO, (MT)							1.98E-01			
Be+2, (MT)							7.70E-04			
BeO, (MT)							4.07E+00			
Bi+3, (MT)							1.98E+01			
Bi2O3, (MT)							6.57E+01			
Carbon14, (MT)							4.59E-05			
Ca+2, (MT)							1.52E+01			
Cancrinite, (MT)							2.41E+03			
CaO, (MT)							4.69E+01			
Cd+2, (MT)							8.03E-01			
CdO, (MT)							2.56E+00			
Ce+3, (MT)							2.41E+01			
Ce2O3, (MT)							6.22E+01			
Cl-, (MT)							3.53E-01			
CO3-2, (MT)							2.27E+01			
Cr+3, (MT)							1.39E+01			
Cr2O3, (MT)							1.88E+01			
Cs+, (MT)							9.37E-03			
Cs2O, (MT)							7.42E-06			
Cu+2, (MT)							7.55E-02			
CuO, (MT)							1.89E+01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	219	220	221	222	223	224	225	226	227	228
F-, (MT)							6.04E+00			
Fe+3, (MT)							8.17E+01			
Fe2O3, (MT)							8.19E+02			
H2O, (MT)	1.10E-01			1.10E-01		1.10E-01	2.19E+01			
Hg+2, (MT)							9.11E-04			
I-, (MT)							2.05E+00			
K+, (MT)							2.13E+00			
K2O, (MT)							2.21E-01			
La+3, (MT)							2.15E+00			
La2O3, (MT)							5.56E+00			
Li+, (MT)							2.49E-03			
Li2O, (MT)							5.65E-04			
Mg+2, (MT)							1.11E+00			
MgO, (MT)							4.44E+00			
MnO2, (MT)							2.14E+01			
Mo+6, (MT)							8.11E-02			
MoO3, (MT)							1.93E+00			
Na+, (MT)							9.36E+02			
Na2O, (MT)							2.45E+02			
Ni(OH)3, (MT)										
Ni+3, (MT)							1.07E+00			
Ni2FECN6, (MT)							5.56E+01			
Ni2O3, (MT)							5.92E+01			
NiO, (MT)										
NO2-, (MT)							7.47E+00			
NO3-, (MT)										
Np+4, (MT)							1.54E-02			
NpO2, (MT)							1.48E-03			
OH-, (MT)							9.97E+04			
P2O5, (MT)							8.31E+02			
P2O5:24W, (MT)							5.27E-02			
Pb+4, (MT)							3.32E-01			
PbO2, (MT)							9.91E+01			
PO4-3, (MT)							2.39E+01			
POLY, (MT)									2.19E-05	2.19E-05
Pu+4, (MT)							4.79E-02			
PuO2, (MT)							1.23E-03			
Si+4, (MT)							8.00E+00			
SiO2, (MT)							4.05E+01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	219	220	221	222	223	224	225	226	227	228
SO3, (MT)										
SO4-2, (MT)							3.98E-01			
Sr+2, (MT)							3.73E+00			
SrO, (MT)							9.98E-04			
Tc2O7, (MT)							3.19E-03			
TcO4-, (MT)							5.75E-02			
TiO2, (MT)							7.16E-03			
Tot Org Carbon, (MT)							1.17E+01			
U3O8, (MT)							2.43E-01			
UO2+2, (MT)							1.69E+02			
UO3, (MT)										
V+5, (MT)							1.90E-02			
V2O5, (MT)							7.30E+00			
WO2, (MT)										
WO3, (MT)							1.54E+01			
Za+2, (MT)							9.57E-02			
ZnO, (MT)							7.17E+00			
Zr+4, (MT)							2.80E+01			
ZrO2, (MT)							1.58E+02			
ZrO2:2H2O, (MT)							4.14E+01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name → Liquid Components	229	230	231	232	233	234	235	236	237	238
Volume, Total Liters	4.39E+08	1.21E+08	2.06E+09	8.43E+08	9.64E+08	2.06E+09	2.09E+10	5.21E+07	2.08E+10	2.69E+09
Specific Gravity	1.00E+00	1.01E+00	1.12E+00	1.00E+00	1.00E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00	1.12E+00
Total Mass Flow, (MT)	4.39E+05	1.23E+05	2.30E+06	8.44E+05	9.66E+05	2.30E+06	2.33E+07	5.83E+04	2.33E+07	3.00E+06
Cs and Ba, (MCi)		5.20E-02	7.95E+00		5.20E-02	7.95E+00	8.03E+01	2.01E-01	8.01E+01	1.03E+01
Sr and Y, (MCi)		8.41E-01	1.29E+02		8.41E-01	1.29E+02	1.30E+03	3.25E+00	1.30E+03	1.67E+02
Tc, (MCi)		3.57E-05	5.47E-03		3.57E-05	5.47E-03	5.52E-02	1.38E-04	5.51E-02	7.10E-03
TRU, (MCi)		1.28E-03	1.96E-01		1.28E-03	1.96E-01	1.98E+00	4.95E-03	1.98E+00	2.55E-01
Total MCi		8.94E-01	1.37E+02		8.94E-01	1.37E+02	1.38E+03	3.45E+00	1.38E+03	1.78E+02
Ag+, (MT)		8.35E-03	1.28E+00		8.35E-03	1.28E+00	1.29E+01	3.23E-02	1.29E+01	1.66E+00
Al(OH)4-, (MT)		6.10E-04	9.34E-02		6.10E-04	9.34E-02	9.43E-01	2.36E-03	9.40E-01	1.21E-01
Al+3, (MT)		1.02E+00	1.56E+02		1.02E+00	1.56E+02	1.57E+03	3.93E+00	1.57E+03	2.02E+02
Am+3, (MT)		1.84E-04	2.81E-02		1.84E-04	2.81E-02	2.84E-01	7.09E-04	2.83E-01	3.65E-02
As+5, (MT)		3.02E-03	4.62E-01		3.02E-03	4.62E-01	4.67E+00	1.17E-02	4.66E+00	6.01E-01
B+3, (MT)		6.03E-03	9.23E-01		6.03E-03	9.23E-01	9.32E+00	2.33E-02	9.30E+00	1.20E+00
Ba+2, (MT)		1.88E-02	2.87E+00		1.88E-02	2.87E+00	2.90E+01	7.24E-02	2.89E+01	3.73E+00
Be+2, (MT)		4.62E-05	7.07E-03		4.62E-05	7.07E-03	7.14E-02	1.78E-04	7.12E-02	9.19E-03
Bi+3, (MT)		1.19E+00	1.82E+02		1.19E+00	1.82E+02	1.84E+03	4.59E+00	1.83E+03	2.37E+02
Carbon14, (MT)		2.75E-06	4.21E-04		2.75E-06	4.21E-04	4.25E-03	1.06E-05	4.24E-03	5.47E-04
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)		9.10E-01	1.39E+02		9.10E-01	1.39E+02	1.41E+03	3.51E+00	1.40E+03	1.81E+02
Cancrinite, (MT)		7.72E-02	1.18E+01		7.72E-02	1.18E+01	1.19E+02	2.98E-01	1.19E+02	1.54E+01
Cd+2, (MT)		4.81E-02	7.36E+00		4.81E-02	7.36E+00	7.44E+01	1.86E-01	7.42E+01	9.57E+00
Ce+3, (MT)		1.44E+00	2.21E+02		1.44E+00	2.21E+02	2.23E+03	5.57E+00	2.22E+03	2.87E+02
Cl-, (MT)		5.68E-02	8.68E+00		5.68E-02	8.68E+00	8.77E+01	2.19E-01	8.75E+01	1.13E+01
Cl2, (MT)										
CO, (MT)		1.28E+00	1.95E+02		1.28E+00	1.95E+02	1.97E+03	4.93E+00	1.97E+03	2.54E+02
CO2, (MT)		9.84E-03	1.51E+00		9.84E-03	1.51E+00	1.52E+01	3.80E-02	1.52E+01	1.96E+00
CO3-2, (MT)										
Cr(OH)4-, (MT)		1.50E-05	2.30E-03		1.50E-05	2.30E-03	2.32E-02	5.80E-05	2.31E-02	2.98E-03
Cr+3, (MT)		8.48E-01	1.30E+02		8.48E-01	1.30E+02	1.31E+03	3.27E+00	1.31E+03	1.69E+02
Cs+, (MT)		6.34E-04	9.69E-02		6.34E-04	9.69E-02	9.79E-01	2.45E-03	9.76E-01	1.26E-01
Cu+2, (MT)		4.53E-03	6.93E-01		4.53E-03	6.93E-01	7.00E+00	1.75E-02	6.98E+00	9.00E-01
DTPA-3, (MT)										
F-, (MT)		3.68E-01	5.64E+01		3.68E-01	5.64E+01	5.69E+02	1.42E+00	5.68E+02	7.33E+01
F2, (MT)										
Fe+3, (MT)		4.90E+00	7.50E+02		4.90E+00	7.50E+02	7.57E+03	1.89E+01	7.55E+03	9.74E+02
FeCN6-3, (MT)		4.65E-02	7.11E+00		4.65E-02	7.11E+00	7.18E+01	1.80E-01	7.17E+01	9.25E+00
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	229	230	231	232	233	234	235	236	237	238
H+, (MT)		5.06E+01	7.74E+03	2.57E+01	7.63E+01	7.74E+03	7.82E+04	1.95E+02	7.80E+04	1.01E+04
H2, (MT)		3.94E-10	6.03E-08		3.94E-10	6.03E-08	6.09E-07	1.52E-09	6.07E-07	7.83E-08
H2O, (MT)	4.39E+05	1.20E+05	1.84E+06	8.42E+05	9.62E+05	1.84E+06	1.87E+07	4.67E+04	1.86E+07	2.40E+06
H2O2, (MT)		1.83E+00	2.79E+02	2.18E+02	2.20E+02	2.79E+02	2.84E+03	7.11E+00	2.84E+03	3.66E+02
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)		5.48E-05	8.38E-03		5.48E-05	8.38E-03	8.46E-02	2.11E-04	8.44E-02	1.09E-02
Hg2, (MT)		2.17E-04	3.31E-02		2.17E-04	3.31E-02	3.35E-01	8.36E-04	3.34E-01	4.31E-02
I-, (MT)		1.23E-01	1.88E+01		1.23E-01	1.88E+01	1.90E+02	4.74E-01	1.89E+02	2.44E+01
I2, (MT)										
K+, (MT)		1.30E-01	1.99E+01		1.30E-01	1.99E+01	2.00E+02	5.01E-01	2.00E+02	2.58E+01
La+3, (MT)		1.29E-01	1.97E+01		1.29E-01	1.97E+01	1.99E+02	4.98E-01	1.99E+02	2.56E+01
Li+, (MT)		1.52E-04	2.33E-02		1.52E-04	2.33E-02	2.35E-01	5.89E-04	2.35E-01	3.03E-02
Mg+2, (MT)		6.68E-02	1.02E+01		6.68E-02	1.02E+01	1.03E+02	2.58E-01	1.03E+02	1.33E+01
Mn+4, (MT)		8.12E-01	1.24E+02		8.12E-01	1.24E+02	1.25E+03	3.13E+00	1.25E+03	1.61E+02
MnO2, (MT)		2.36E-04	3.61E-02		2.36E-04	3.61E-02	3.65E-01	9.12E-04	3.64E-01	4.69E-02
Mo+6, (MT)		5.44E-03	8.32E-01		5.44E-03	8.32E-01	8.40E+00	2.10E-02	8.38E+00	1.08E+00
MoO4-2, (MT)		2.85E-04	4.36E-02		2.85E-04	4.36E-02	4.41E-01	1.10E-03	4.40E-01	5.67E-02
N2, (MT)		1.08E-04	1.65E-02		1.08E-04	1.65E-02	1.67E-01	4.18E-04	1.67E-01	2.15E-02
N2O, (MT)										
Na+, (MT)		1.33E+01	2.04E+03		1.33E+01	2.04E+03	2.06E+04	5.15E+01	2.05E+04	2.65E+03
NH2OH, (MT)										
NH3, (MT)		9.46E-04	1.45E-01		9.46E-04	1.45E-01	1.46E+00	3.65E-03	1.46E+00	1.88E-01
NH4+, (MT)		1.99E-05	3.05E-03		1.99E-05	3.05E-03	3.08E-02	7.70E-05	3.07E-02	3.96E-03
Ni+3, (MT)		1.25E+00	1.91E+02		1.25E+00	1.91E+02	1.92E+03	4.81E+00	1.92E+03	2.48E+02
NO, (MT)										
NO2, (MT)		9.44E-03	1.44E+00		9.44E-03	1.44E+00	1.46E+01	3.65E-02	1.45E+01	1.88E+00
NO2-, (MT)										
NO3-, (MT)		2.91E+03	4.46E+05	1.58E+03	4.50E+03	4.46E+05	4.50E+06	1.13E+04	4.49E+06	5.79E+05
Np+4, (MT)		9.22E-04	1.41E-01		9.22E-04	1.41E-01	1.42E+00	3.56E-03	1.42E+00	1.83E-01
O2, (MT)		7.29E-01	1.12E+02		7.29E-01	1.12E+02	1.13E+03	2.82E+00	1.12E+03	1.45E+02
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)		1.99E-02	3.05E+00		1.99E-02	3.05E+00	3.08E+01	7.69E-02	3.07E+01	3.96E+00
PO4-3, (MT)		1.50E+00	2.30E+02		1.50E+00	2.30E+02	2.32E+03	5.81E+00	2.32E+03	2.99E+02
POLY, (MT)		1.48E-02	2.27E+00	1.48E-02	2.96E-02	2.27E+00	2.29E+01	5.73E-02	2.29E+01	2.95E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	229	230	231	232	233	234	235	236	237	238
PTA-3, (MT)		3.30E-03	5.04E-01		3.30E-03	5.04E-01	5.09E+00	1.27E-02	5.08E+00	6.55E-01
Pu+4, (MT)		2.87E-03	4.39E-01		2.87E-03	4.39E-01	4.43E+00	1.11E-02	4.42E+00	5.71E-01
Si+4, (MT)		4.80E-01	7.34E+01		4.80E-01	7.34E+01	7.41E+02	1.85E+00	7.39E+02	9.53E+01
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)		8.69E-01	1.33E+02		8.69E-01	1.33E+02	1.34E+03	3.35E+00	1.34E+03	1.73E+02
Sr+2, (MT)		2.23E-01	3.42E+01		2.23E-01	3.42E+01	3.45E+02	8.63E-01	3.44E+02	4.44E+01
Sugar, (MT)										
TcO4-, (MT)		3.45E-03	5.27E-01		3.45E-03	5.27E-01	5.32E+00	1.33E-02	5.31E+00	6.85E-01
Ti+4, (MT)		4.17E-09	6.38E-07		4.17E-09	6.38E-07	6.45E-06	1.61E-08	6.43E-06	8.30E-07
Tot Org Carbon, (MT)		7.03E-01	1.08E+02		7.03E-01	1.08E+02	1.09E+03	2.71E+00	1.08E+03	1.40E+02
UO2+2, (MT)		1.01E+01	1.55E+03		1.01E+01	1.55E+03	1.56E+04	3.90E+01	1.56E+04	2.01E+03
V+5, (MT)		1.14E-03	1.74E-01		1.14E-03	1.74E-01	1.76E+00	4.40E-03	1.76E+00	2.27E-01
W+6, (MT)		9.44E-08	1.44E-05		9.44E-08	1.44E-05	1.46E-04	3.64E-07	1.45E-04	1.88E-05
Zn+2, (MT)		5.74E-03	8.78E-01		5.74E-03	8.78E-01	8.86E+00	2.22E-02	8.84E+00	1.14E+00
Zr+4, (MT)		3.10E+00	4.74E+02		3.10E+00	4.74E+02	4.79E+03	1.20E+01	4.78E+03	6.17E+02
ZrO2:2H2O, (MT)		2.65E-07	4.06E-05		2.65E-07	4.06E-05	4.10E-04	1.03E-06	4.09E-04	5.28E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	229	230	231	232	233	234	235	236	237	238
Total Mass Flow, (MT)		1.07E+05	2.26E+03		1.07E+05	2.26E+03	3.34E+05	8.35E+02	3.33E+05	3.34E+03
Cs and Ba, (MCi)		7.54E-01	1.59E-02		7.54E-01	1.59E-02	2.34E+00	5.86E-03	2.34E+00	2.34E-02
Sr and Y, (MCi)		1.37E+01	2.90E-01		1.37E+01	2.90E-01	4.27E+01	1.07E-01	4.26E+01	4.27E-01
Tc, (MCi)		6.17E-04	1.30E-05		6.17E-04	1.30E-05	1.92E-03	4.80E-06	1.92E-03	1.92E-05
TRU, (MCi)		2.12E-02	4.47E-04		2.12E-02	4.47E-04	6.59E-02	1.65E-04	6.57E-02	6.59E-04
Total MCi		1.45E+01	3.06E-01		1.45E+01	3.06E-01	4.51E+01	1.13E-01	4.50E+01	4.51E-01
Ag+, (MT)		1.37E-01	2.88E-03		1.37E-01	2.88E-03	4.24E-01	1.06E-03	4.23E-01	4.24E-03
Ag2O, (MT)		2.94E+01	6.19E-01		2.94E+01	6.19E-01	9.13E+01	2.28E-01	9.11E+01	9.13E-01
Al+3, (MT)		1.19E+02	2.51E+00		1.19E+02	2.51E+00	3.71E+02	9.27E-01	3.70E+02	3.71E+00
Al2O3, (MT)		3.26E+03	6.87E+01		3.26E+03	6.87E+01	1.01E+04	2.54E+01	1.01E+04	1.01E+02
Am+3, (MT)		3.00E-03	6.32E-05		3.00E-03	6.32E-05	9.33E-03	2.33E-05	9.30E-03	9.33E-05
Am2O3, (MT)		2.49E-06			2.49E-06		2.49E-06	6.23E-09	2.48E-06	2.49E-08
APM-, (MT)		7.09E-02	1.50E-03		7.09E-02	1.50E-03	2.21E-01	5.51E-04	2.20E-01	2.21E-03
As+5, (MT)		4.94E-02	1.04E-03		4.94E-02	1.04E-03	1.54E-01	3.84E-04	1.53E-01	1.54E-03
As2O5, (MT)		3.12E+01	6.58E-01		3.12E+01	6.58E-01	9.70E+01	2.43E-01	9.68E+01	9.70E-01
B+3, (MT)		9.86E-02	2.08E-03		9.86E-02	2.08E-03	3.07E-01	7.66E-04	3.06E-01	3.07E-03
B2O3, (MT)		1.07E+00	2.25E-02		1.07E+00	2.25E-02	3.32E+00	8.30E-03	3.31E+00	3.32E-02
Ba+2, (MT)		3.06E-01	6.46E-03		3.06E-01	6.46E-03	9.53E-01	2.38E-03	9.51E-01	9.53E-03
BaO, (MT)		1.94E-01	4.09E-03		1.94E-01	4.09E-03	6.04E-01	1.51E-03	6.02E-01	6.04E-03
Be+2, (MT)		7.55E-04	1.59E-05		7.55E-04	1.59E-05	2.35E-03	5.87E-06	2.34E-03	2.35E-05
BeO, (MT)		3.99E+00	8.40E-02		3.99E+00	8.40E-02	1.24E+01	3.10E-02	1.24E+01	1.24E-01
Bi+3, (MT)		1.94E+01	4.10E-01		1.94E+01	4.10E-01	6.04E+01	1.51E-01	6.03E+01	6.04E-01
Bi2O3, (MT)		6.43E+01	1.36E+00		6.43E+01	1.36E+00	2.00E+02	5.00E-01	2.00E+02	2.00E+00
Carbon14, (MT)		4.49E-05	9.47E-07		4.49E-05	9.47E-07	1.40E-04	3.50E-07	1.39E-04	1.40E-06
Ca+2, (MT)		1.49E+01	3.13E-01		1.49E+01	3.13E-01	4.62E+01	1.16E-01	4.61E+01	4.62E-01
Cancrinite, (MT)		2.36E+03	4.97E+01		2.36E+03	4.97E+01	7.33E+03	1.83E+01	7.31E+03	7.33E+01
CaO, (MT)		4.59E+01	9.69E-01		4.59E+01	9.69E-01	1.43E+02	3.57E-01	1.43E+02	1.43E+00
Cd+2, (MT)		7.86E-01	1.66E-02		7.86E-01	1.66E-02	2.45E+00	6.11E-03	2.44E+00	2.45E-02
CdO, (MT)		2.51E+00	5.28E-02		2.51E+00	5.28E-02	7.80E+00	1.95E-02	7.78E+00	7.80E-02
Ce+3, (MT)		2.36E+01	4.97E-01		2.36E+01	4.97E-01	7.33E+01	1.83E-01	7.31E+01	7.33E-01
Ce2O3, (MT)		6.09E+01	1.28E+00		6.09E+01	1.28E+00	1.89E+02	4.74E-01	1.89E+02	1.89E+00
Cl-, (MT)		3.46E-01	7.30E-03		3.46E-01	7.30E-03	1.08E+00	2.69E-03	1.07E+00	1.08E-02
CO3-2, (MT)		2.23E+01	4.69E-01		2.23E+01	4.69E-01	6.92E+01	1.73E-01	6.90E+01	6.92E-01
Cr+3, (MT)		1.36E+01	2.87E-01		1.36E+01	2.87E-01	4.23E+01	1.06E-01	4.22E+01	4.23E-01
Cr2O3, (MT)		1.84E+01	3.88E-01		1.84E+01	3.88E-01	5.73E+01	1.43E-01	5.71E+01	5.73E-01
Cs+, (MT)		9.17E-03	1.93E-04		9.17E-03	1.93E-04	2.85E-02	7.13E-05	2.85E-02	2.85E-04
Cs2O, (MT)		7.27E-06	1.53E-07		7.27E-06	1.53E-07	2.25E-05	5.62E-08	2.24E-05	2.25E-07
Cu+2, (MT)		7.40E-02	1.56E-03		7.40E-02	1.56E-03	2.30E-01	5.75E-04	2.30E-01	2.30E-03
CuO, (MT)		1.85E+01	3.91E-01		1.85E+01	3.91E-01	5.76E+01	1.44E-01	5.75E+01	5.76E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	229	230	231	232	233	234	235	236	237	238
F-, (MT)		5.92E+00	1.25E-01		5.92E+00	1.25E-01	1.84E+01	4.60E-02	1.84E+01	1.84E-01
Fe+3, (MT)		8.01E+01	1.69E+00		8.01E+01	1.69E+00	2.49E+02	6.22E-01	2.48E+02	2.49E+00
Fe2O3, (MT)		8.02E+02	1.69E+01		8.02E+02	1.69E+01	2.50E+03	6.24E+00	2.49E+03	2.50E+01
H2O, (MT)		2.15E+01	4.53E-01		2.15E+01	4.53E-01	6.68E+01	1.67E-01	6.67E+01	6.68E-01
Hg+2, (MT)		8.92E-04	1.88E-05		8.92E-04	1.88E-05	2.78E-03	6.94E-06	2.77E-03	2.78E-05
I-, (MT)		2.00E+00	4.22E-02		2.00E+00	4.22E-02	6.23E+00	1.56E-02	6.21E+00	6.23E-02
K+, (MT)		2.08E+00	4.39E-02		2.08E+00	4.39E-02	6.48E+00	1.62E-02	6.46E+00	6.48E-02
K2O, (MT)		2.17E-01	4.57E-03		2.17E-01	4.57E-03	6.74E-01	1.68E-03	6.72E-01	6.74E-03
La+3, (MT)		2.11E+00	4.44E-02		2.11E+00	4.44E-02	6.55E+00	1.64E-02	6.53E+00	6.55E-02
La2O3, (MT)		5.44E+00	1.15E-01		5.44E+00	1.15E-01	1.69E+01	4.23E-02	1.69E+01	1.69E-01
Li+, (MT)		2.44E-03	5.14E-05		2.44E-03	5.14E-05	7.58E-03	1.89E-05	7.56E-03	7.58E-05
Li2O, (MT)		5.53E-04	1.17E-05		5.53E-04	1.17E-05	1.72E-03	4.30E-06	1.72E-03	1.72E-05
Mg+2, (MT)		1.09E+00	2.30E-02		1.09E+00	2.30E-02	3.39E+00	8.48E-03	3.38E+00	3.39E-02
MgO, (MT)		4.35E+00	9.16E-02		4.35E+00	9.16E-02	1.35E+01	3.38E-02	1.35E+01	1.35E-01
MnO2, (MT)		2.09E+01	4.42E-01		2.09E+01	4.42E-01	6.51E+01	1.63E-01	6.50E+01	6.51E-01
Mo+6, (MT)		7.94E-02	1.68E-03		7.94E-02	1.68E-03	2.47E-01	6.18E-04	2.46E-01	2.47E-03
MoO3, (MT)		1.89E+00	3.99E-02		1.89E+00	3.99E-02	5.89E+00	1.47E-02	5.87E+00	5.89E-02
Na+, (MT)		9.17E+02	1.93E+01		9.17E+02	1.93E+01	2.85E+03	7.13E+00	2.85E+03	2.85E+01
Na2O, (MT)		2.40E+02	5.05E+00		2.40E+02	5.05E+00	7.45E+02	1.86E+00	7.43E+02	7.45E+00
Ni(OH)3, (MT)										
Ni+3, (MT)		1.05E+00	2.22E-02		1.05E+00	2.22E-02	3.27E+00	8.18E-03	3.27E+00	3.27E-02
Ni2FECN6, (MT)		5.45E+01	1.15E+00		5.45E+01	1.15E+00	1.69E+02	4.24E-01	1.69E+02	1.69E+00
Ni2O3, (MT)		5.80E+01	1.22E+00		5.80E+01	1.22E+00	1.81E+02	4.51E-01	1.80E+02	1.81E+00
NiO, (MT)										
NO2-, (MT)		7.31E+00	1.54E-01		7.31E+00	1.54E-01	2.28E+01	5.69E-02	2.27E+01	2.28E-01
NO3-, (MT)										
Np+4, (MT)		1.51E-02	3.18E-04		1.51E-02	3.18E-04	4.68E-02	1.17E-04	4.67E-02	4.68E-04
NpO2, (MT)		1.44E-03	3.05E-05		1.44E-03	3.05E-05	4.50E-03	1.12E-05	4.49E-03	4.50E-05
OH-, (MT)		9.76E+04	2.06E+03		9.76E+04	2.06E+03	3.04E+05	7.59E+02	3.03E+05	3.04E+03
P2O5, (MT)		8.14E+02	1.72E+01		8.14E+02	1.72E+01	2.53E+03	6.33E+00	2.53E+03	2.53E+01
P2O5:24W, (MT)		5.16E-02	1.09E-03		5.16E-02	1.09E-03	1.61E-01	4.02E-04	1.60E-01	1.61E-03
Pb+4, (MT)		3.25E-01	6.86E-03		3.25E-01	6.86E-03	1.01E+00	2.53E-03	1.01E+00	1.01E-02
PbO2, (MT)		9.70E+01	2.05E+00		9.70E+01	2.05E+00	3.02E+02	7.55E-01	3.01E+02	3.02E+00
PO4-3, (MT)		2.34E+01	4.94E-01		2.34E+01	4.94E-01	7.29E+01	1.82E-01	7.27E+01	7.29E-01
POLY, (MT)		2.15E-05			2.15E-05		2.15E-05	5.37E-08	2.14E-05	2.15E-07
Pu+4, (MT)		4.69E-02	9.88E-04		4.69E-02	9.88E-04	1.46E-01	3.64E-04	1.45E-01	1.46E-03
PuO2, (MT)		1.20E-03	2.53E-05		1.20E-03	2.53E-05	3.74E-03	9.35E-06	3.73E-03	3.74E-05
Si+4, (MT)		7.83E+00	1.65E-01		7.83E+00	1.65E-01	2.44E+01	6.09E-02	2.43E+01	2.44E-01
SiO2, (MT)		3.97E+01	8.36E-01		3.97E+01	8.36E-01	1.23E+02	3.09E-01	1.23E+02	1.23E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	229	230	231	232	233	234	235	236	237	238
SO3, (MT)										
SO4-2, (MT)		3.89E-01	8.21E-03		3.89E-01	8.21E-03	1.21E+00	3.03E-03	1.21E+00	1.21E-02
Sr+2, (MT)		3.65E+00	7.70E-02		3.65E+00	7.70E-02	1.14E+01	2.84E-02	1.13E+01	1.14E-01
SrO, (MT)		9.77E-04	2.06E-05		9.77E-04	2.06E-05	3.04E-03	7.60E-06	3.03E-03	3.04E-05
Tc2O7, (MT)		3.12E-03	6.58E-05		3.12E-03	6.58E-05	9.72E-03	2.43E-05	9.69E-03	9.72E-05
TcO4-, (MT)		5.63E-02	1.19E-03		5.63E-02	1.19E-03	1.75E-01	4.38E-04	1.75E-01	1.75E-03
TiO2, (MT)		7.01E-03	1.48E-04		7.01E-03	1.48E-04	2.18E-02	5.45E-05	2.17E-02	2.18E-04
Tot Org Carbon, (MT)		1.15E+01	2.42E-01		1.15E+01	2.42E-01	3.57E+01	8.92E-02	3.56E+01	3.57E-01
U3O8, (MT)		2.38E-01	5.02E-03		2.38E-01	5.02E-03	7.40E-01	1.85E-03	7.39E-01	7.40E-03
UO2+2, (MT)		1.65E+02	3.48E+00		1.65E+02	3.48E+00	5.13E+02	1.28E+00	5.12E+02	5.13E+00
UO3, (MT)										
V+5, (MT)		1.86E-02	3.93E-04		1.86E-02	3.93E-04	5.79E-02	1.45E-04	5.78E-02	5.79E-04
V2O5, (MT)		7.15E+00	1.51E-01		7.15E+00	1.51E-01	2.23E+01	5.56E-02	2.22E+01	2.23E-01
WO2, (MT)										
WO3, (MT)		1.51E+01	3.19E-01		1.51E+01	3.19E-01	4.70E+01	1.18E-01	4.69E+01	4.70E-01
Zn+2, (MT)		9.37E-02	1.98E-03		9.37E-02	1.98E-03	2.91E-01	7.29E-04	2.91E-01	2.91E-03
ZnO, (MT)		7.02E+00	1.48E-01		7.02E+00	1.48E-01	2.19E+01	5.46E-02	2.18E+01	2.19E-01
Zr+4, (MT)		2.75E+01	5.79E-01		2.75E+01	5.79E-01	8.54E+01	2.13E-01	8.52E+01	8.54E-01
ZrO2, (MT)		1.55E+02	3.26E+00		1.55E+02	3.26E+00	4.81E+02	1.20E+00	4.80E+02	4.81E+00
ZrO2:2H2O, (MT)		4.05E+01	8.54E-01		4.05E+01	8.54E-01	1.26E+02	3.15E-01	1.26E+02	1.26E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	239	240	241	243	245	248	249	250	251	252
Volume, Total Liters	1.88E+10	6.71E+08	2.01E+09	9.34E+08	9.64E+06	9.54E+08	4.83E+08	2.90E+07	2.19E+03	7.12E+06
Specific Gravity	1.12E+00	1.12E+00	1.12E+00	1.00E+00	1.00E+00	1.00E+00	1.33E+00	4.11E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.10E+07	7.51E+05	2.25E+06	9.57E+05	9.66E+03	9.57E+05	6.41E+05	1.19E+05	2.19E+00	7.12E+03
Cs and Ba, (MCi)	7.24E+01	2.59E+00	7.75E+00	5.15E-02	5.20E-04	5.15E-02				
Sr and Y, (MCi)	1.17E+03	4.18E+01	1.25E+02	8.32E-01	8.41E-03	8.32E-01				
Tc, (MCi)	4.97E-02	1.78E-03	5.33E-03	3.54E-05	3.57E-07	3.54E-05				
TRU, (MCi)	1.78E+00	6.37E-02	1.91E-01	1.27E-03	1.28E-05	1.27E-03				
Total MCi	1.24E+03	4.44E+01	1.33E+02	8.85E-01	8.94E-03	8.85E-01				
Ag+, (MT)	1.16E+01	4.15E-01	1.25E+00	8.27E-03	8.35E-05	8.27E-03				
Al(OH)4-, (MT)	8.49E-01	3.03E-02	9.10E-02	6.04E-04	6.10E-06	6.04E-04				
Al+3, (MT)	1.42E+03	5.05E+01	1.52E+02	1.01E+00	1.02E-02	1.01E+00				
Am+3, (MT)	2.56E-01	9.12E-03	2.74E-02	1.82E-04	1.84E-06	1.82E-04				
As+5, (MT)	4.21E+00	1.50E-01	4.51E-01	2.99E-03	3.02E-05	2.99E-03				
B+3, (MT)	8.40E+00	3.00E-01	9.00E-01	5.97E-03	6.03E-05	5.97E-03				
Ba+2, (MT)	2.61E+01	9.32E-01	2.80E+00	1.86E-02	1.88E-04	1.86E-02				
Be+2, (MT)	6.43E-02	2.30E-03	6.89E-03	4.57E-05	4.62E-07	4.57E-05				
Bi+3, (MT)	1.66E+03	5.91E+01	1.77E+02	1.18E+00	1.19E-02	1.18E+00				
Carbon14, (MT)	3.83E-03	1.37E-04	4.10E-04	2.72E-06	2.75E-08	2.72E-06				
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.27E+03	4.52E+01	1.36E+02	9.01E-01	9.10E-03	9.01E-01				
Cancrinite, (MT)	1.08E+02	3.84E+00	1.15E+01	7.65E-02	7.72E-04	7.65E-02				
Cd+2, (MT)	6.70E+01	2.39E+00	7.18E+00	4.77E-02	4.81E-04	4.77E-02				
Ce+3, (MT)	2.01E+03	7.17E+01	2.15E+02	1.43E+00	1.44E-02	1.43E+00				
Cl-, (MT)	7.90E+01	2.82E+00	8.46E+00	5.62E-02	5.68E-04	5.62E-02				
Cl2, (MT)										
CO, (MT)	1.78E+03	6.34E+01	1.90E+02	1.26E+00	1.28E-02	1.26E+00				1.26E+00
CO2, (MT)	1.37E+01	4.89E-01	1.47E+00	9.75E-03	9.84E-05	9.75E-03				1.46E+01
CO3-2, (MT)										
Cr(OH)4-, (MT)	2.09E-02	7.46E-04	2.24E-03	1.49E-05	1.50E-07	1.49E-05				
Cr+3, (MT)	1.18E+03	4.21E+01	1.26E+02	8.39E-01	8.48E-03	8.39E-01				
Cs+, (MT)	8.82E-01	3.15E-02	9.45E-02	6.27E-04	6.34E-06	6.27E-04				
Cu+2, (MT)	6.30E+00	2.25E-01	6.75E-01	4.48E-03	4.53E-05	4.48E-03				
DTPA-3, (MT)										
F-, (MT)	5.13E+02	1.83E+01	5.49E+01	3.65E-01	3.68E-03	3.65E-01		2.82E+04		
F2, (MT)										
Fe+3, (MT)	6.82E+03	2.44E+02	7.31E+02	4.85E+00	4.90E-02	4.85E+00				
FeCN6-3, (MT)	6.47E+01	2.31E+00	6.93E+00	4.60E-02	4.65E-04	4.60E-02				
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	239	240	241	243	245	248	249	250	251	252
H+, (MT)	7.04E+04	2.52E+03	7.55E+03	7.56E+01	7.63E-01	7.56E+01	5.09E+03	1.58E+03	6.69E-05	
H2, (MT)	5.48E-07	1.96E-08	5.87E-08	3.90E-10	3.94E-12	3.90E-10				3.90E-10
H2O, (MT)	1.68E+07	6.01E+05	1.80E+06	9.52E+05	9.62E+03	9.52E+05	3.20E+05	8.92E+04	2.19E+00	7.09E+03
H2O2, (MT)	2.56E+03	9.15E+01	2.74E+02	2.17E+02	2.20E+00	2.17E+02			5.65E-04	
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	7.62E-02	2.72E-03	8.16E-03	5.42E-05	5.48E-07	5.42E-05				
Hg2, (MT)	3.01E-01	1.08E-02	3.23E-02	2.14E-04	2.17E-06	2.14E-04				
I-, (MT)	1.71E+02	6.10E+00	1.83E+01	1.22E-01	1.23E-03	1.22E-01				
I2, (MT)										
K+, (MT)	1.81E+02	6.45E+00	1.94E+01	1.29E-01	1.30E-03	1.29E-01				
La+3, (MT)	1.79E+02	6.41E+00	1.92E+01	1.28E-01	1.29E-03	1.28E-01				
Li+, (MT)	2.12E-01	7.58E-03	2.27E-02	1.51E-04	1.52E-06	1.51E-04				
Mg+2, (MT)	9.29E+01	3.32E+00	9.96E+00	6.61E-02	6.68E-04	6.61E-02				
Mn+4, (MT)	1.13E+03	4.03E+01	1.21E+02	8.04E-01	8.12E-03	8.04E-01				
MnO2, (MT)	3.29E-01	1.17E-02	3.52E-02	2.34E-04	2.36E-06	2.34E-04				
Mo+6, (MT)	7.57E+00	2.70E-01	8.11E-01	5.39E-03	5.44E-05	5.39E-03				
MoO4-2, (MT)	3.97E-01	1.42E-02	4.25E-02	2.82E-04	2.85E-06	2.82E-04				
N2, (MT)	1.51E-01	5.37E-03	1.61E-02	1.07E-04	1.08E-06	1.07E-04				1.49E-01
N2O, (MT)										
Na+, (MT)	1.86E+04	6.63E+02	1.99E+03	1.32E+01	1.33E-01	1.32E+01				
NH2OH, (MT)										
NH3, (MT)	1.32E+00	4.70E-02	1.41E-01	9.37E-04	9.46E-06	9.37E-04				
NH4+, (MT)	2.77E-02	9.91E-04	2.97E-03	1.97E-05	1.99E-07	1.97E-05				
Ni+3, (MT)	1.73E+03	6.19E+01	1.86E+02	1.23E+00	1.25E-02	1.23E+00				
NO, (MT)										
NO2, (MT)	1.31E+01	4.69E-01	1.41E+00	9.34E-03	9.44E-05	9.34E-03				1.30E+01
NO2-, (MT)										
NO3-, (MT)	4.06E+06	1.45E+05	4.35E+05	4.45E+03	4.50E+01	4.45E+03	3.15E+05		4.11E-03	
Np+4, (MT)	1.28E+00	4.58E-02	1.38E-01	9.13E-04	9.22E-06	9.13E-04				
O2, (MT)	1.02E+03	3.63E+01	1.09E+02	7.22E-01	7.29E-03	7.22E-01				7.47E-01
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	2.77E+01	9.90E-01	2.97E+00	1.97E-02	1.99E-04	1.97E-02				
PO4-3, (MT)	2.09E+03	7.48E+01	2.24E+02	1.49E+00	1.50E-02	1.49E+00				
POLY, (MT)	2.07E+01	7.37E-01	2.21E+00	2.93E-02	2.96E-04	2.93E-02			3.83E-08	3.25E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	239	240	241	243	245	248	249	250	251	252
PTA-3, (MT)	4.59E+00	1.64E-01	4.92E-01	3.26E-03	3.30E-05	3.26E-03				
Pu+4, (MT)	3.99E+00	1.43E-01	4.28E-01	2.84E-03	2.87E-05	2.84E-03				
Si+4, (MT)	6.67E+02	2.38E+01	7.15E+01	4.75E-01	4.80E-03	4.75E-01				
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	1.21E+03	4.32E+01	1.30E+02	8.60E-01	8.69E-03	8.60E-01				
Sr+2, (MT)	3.11E+02	1.11E+01	3.33E+01	2.21E-01	2.23E-03	2.21E-01				
Sugar, (MT)										
TcO4-, (MT)	4.80E+00	1.71E-01	5.14E-01	3.41E-03	3.45E-05	3.41E-03				
Ti+4, (MT)	5.81E-06	2.08E-07	6.23E-07	4.13E-09	4.17E-11	4.13E-09				
Tot Org Carbon, (MT)	9.78E+02	3.49E+01	1.05E+02	6.96E-01	7.03E-03	6.96E-01				
UO2+2, (MT)	1.41E+04	5.02E+02	1.51E+03	1.00E+01	1.01E-01	1.00E+01				
V+5, (MT)	1.59E+00	5.67E-02	1.70E-01	1.13E-03	1.14E-05	1.13E-03				
W+6, (MT)	1.31E-04	4.69E-06	1.41E-05	9.34E-08	9.44E-10	9.34E-08				
Zn+2, (MT)	7.98E+00	2.85E-01	8.55E-01	5.68E-03	5.74E-05	5.68E-03				
Zr+4, (MT)	4.32E+03	1.54E+02	4.62E+02	3.07E+00	3.10E-02	3.07E+00				
ZrO2:2H2O, (MT)	3.69E-04	1.32E-05	3.96E-05	2.63E-07	2.65E-09	2.63E-07				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	239	240	241	243	245	248	249	250	251	252
Total Mass Flow, (MT)	3.31E+05	8.35E+02	2.51E+03	1.06E+05	1.07E+03	1.06E+05				1.08E-01
Cs and Ba, (MCi)	2.32E+00	5.86E-03	1.76E-02	7.46E-01	7.54E-03	7.46E-01				
Sr and Y, (MCi)	4.23E+01	1.07E-01	3.20E-01	1.36E+01	1.37E-01	1.36E+01				
Tc, (MCi)	1.90E-03	4.80E-06	1.44E-05	6.11E-04	6.17E-06	6.11E-04				
TRU, (MCi)	6.52E-02	1.65E-04	4.94E-04	2.10E-02	2.12E-04	2.10E-02				
Total MCi	4.47E+01	1.13E-01	3.39E-01	1.44E+01	1.45E-01	1.44E+01				
Ag+, (MT)	4.20E-01	1.06E-03	3.18E-03	1.35E-01	1.37E-03	1.35E-01				
Ag2O, (MT)	9.04E+01	2.28E-01	6.85E-01	2.91E+01	2.94E-01	2.91E+01				
Al+3, (MT)	3.67E+02	9.27E-01	2.78E+00	1.18E+02	1.19E+00	1.18E+02				
Al2O3, (MT)	1.00E+04	2.54E+01	7.61E+01	3.23E+03	3.26E+01	3.23E+03				
Am+3, (MT)	9.23E-03	2.33E-05	6.99E-05	2.97E-03	3.00E-05	2.97E-03				
Am2O3, (MT)	2.47E-06	6.23E-09	1.87E-08	2.47E-06	2.49E-08	2.47E-06				
APM-, (MT)	2.18E-01	5.51E-04	1.65E-03	7.02E-02	7.09E-04	7.02E-02				
As+5, (MT)	1.52E-01	3.84E-04	1.15E-03	4.89E-02	4.94E-04	4.89E-02				
As2O5, (MT)	9.61E+01	2.43E-01	7.28E-01	3.09E+01	3.12E-01	3.09E+01				
B+3, (MT)	3.03E-01	7.66E-04	2.30E-03	9.76E-02	9.86E-04	9.76E-02				
B2O3, (MT)	3.29E+00	8.30E-03	2.49E-02	1.06E+00	1.07E-02	1.06E+00				
Ba+2, (MT)	9.43E-01	2.38E-03	7.15E-03	3.03E-01	3.06E-03	3.03E-01				
BaO, (MT)	5.98E-01	1.51E-03	4.53E-03	1.92E-01	1.94E-03	1.92E-01				
Be+2, (MT)	2.32E-03	5.87E-06	1.76E-05	7.47E-04	7.55E-06	7.47E-04				
BeO, (MT)	1.23E+01	3.10E-02	9.30E-02	3.95E+00	3.99E-02	3.95E+00				
Bi+3, (MT)	5.98E+01	1.51E-01	4.53E-01	1.92E+01	1.94E-01	1.92E+01				
Bi2O3, (MT)	1.98E+02	5.00E-01	1.50E+00	6.37E+01	6.43E-01	6.37E+01				
Carbon14, (MT)	1.38E-04	3.50E-07	1.05E-06	4.45E-05	4.49E-07	4.45E-05				
Ca+2, (MT)	4.58E+01	1.16E-01	3.47E-01	1.47E+01	1.49E-01	1.47E+01				
Cancrinite, (MT)	7.26E+03	1.83E+01	5.50E+01	2.33E+03	2.36E+01	2.33E+03				
CaO, (MT)	1.42E+02	3.57E-01	1.07E+00	4.55E+01	4.59E-01	4.55E+01				
Cd+2, (MT)	2.42E+00	6.11E-03	1.83E-02	7.78E-01	7.86E-03	7.78E-01				
CdO, (MT)	7.72E+00	1.95E-02	5.85E-02	2.48E+00	2.51E-02	2.48E+00				
Ce+3, (MT)	7.26E+01	1.83E-01	5.50E-01	2.33E+01	2.36E-01	2.33E+01				
Ce2O3, (MT)	1.88E+02	4.74E-01	1.42E+00	6.03E+01	6.09E-01	6.03E+01				
Cl-, (MT)	1.07E+00	2.69E-03	8.07E-03	3.43E-01	3.46E-03	3.43E-01				
CO3-2, (MT)	6.85E+01	1.73E-01	5.19E-01	2.20E+01	2.23E-01	2.20E+01				
Cr+3, (MT)	4.19E+01	1.06E-01	3.18E-01	1.35E+01	1.36E-01	1.35E+01				
Cr2O3, (MT)	5.67E+01	1.43E-01	4.30E-01	1.82E+01	1.84E-01	1.82E+01				
Cs+, (MT)	2.83E-02	7.13E-05	2.14E-04	9.08E-03	9.17E-05	9.08E-03				
Cs2O, (MT)	2.22E-05	5.62E-08	1.69E-07	7.19E-06	7.27E-08	7.19E-06				
Cu+2, (MT)	2.28E-01	5.75E-04	1.73E-03	7.32E-02	7.40E-04	7.32E-02				
CuO, (MT)	5.71E+01	1.44E-01	4.32E-01	1.83E+01	1.85E-01	1.83E+01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	239	240	241	243	245	248	249	250	251	252
F-, (MT)	1.82E+01	4.60E-02	1.38E-01	5.86E+00	5.92E-02	5.86E+00				
Fe+3, (MT)	2.47E+02	6.22E-01	1.87E+00	7.93E+01	8.01E-01	7.93E+01				
Fe2O3, (MT)	2.47E+03	6.24E+00	1.87E+01	7.94E+02	8.02E+00	7.94E+02				
H2O, (MT)	6.62E+01	1.67E-01	5.01E-01	2.13E+01	2.15E-01	2.13E+01				1.08E-01
Hg+2, (MT)	2.75E-03	6.94E-06	2.08E-05	8.83E-04	8.92E-06	8.83E-04				
I-, (MT)	6.17E+00	1.56E-02	4.67E-02	1.98E+00	2.00E-02	1.98E+00				
K+, (MT)	6.41E+00	1.62E-02	4.86E-02	2.06E+00	2.08E-02	2.06E+00				
K2O, (MT)	6.67E-01	1.68E-03	5.05E-03	2.14E-01	2.17E-03	2.14E-01				
La+3, (MT)	6.48E+00	1.64E-02	4.91E-02	2.08E+00	2.11E-02	2.08E+00				
La2O3, (MT)	1.68E+01	4.23E-02	1.27E-01	5.39E+00	5.44E-02	5.39E+00				
Li+, (MT)	7.50E-03	1.89E-05	5.68E-05	2.41E-03	2.44E-05	2.41E-03				
Li2O, (MT)	1.70E-03	4.30E-06	1.29E-05	5.48E-04	5.53E-06	5.48E-04				
Mg+2, (MT)	3.36E+00	8.48E-03	2.54E-02	1.08E+00	1.09E-02	1.08E+00				
MgO, (MT)	1.34E+01	3.38E-02	1.01E-01	4.30E+00	4.35E-02	4.30E+00				
MnO2, (MT)	6.45E+01	1.63E-01	4.89E-01	2.07E+01	2.09E-01	2.07E+01				
Mo+6, (MT)	2.45E-01	6.18E-04	1.85E-03	7.86E-02	7.94E-04	7.86E-02				
MoO3, (MT)	5.83E+00	1.47E-02	4.42E-02	1.87E+00	1.89E-02	1.87E+00				
Na+, (MT)	2.82E+03	7.13E+00	2.14E+01	9.08E+02	9.17E+00	9.08E+02				
Na2O, (MT)	7.38E+02	1.86E+00	5.59E+00	2.37E+02	2.40E+00	2.37E+02				
Ni(OH)3, (MT)										
Ni+3, (MT)	3.24E+00	8.18E-03	2.46E-02	1.04E+00	1.05E-02	1.04E+00				
Ni2FECN6, (MT)	1.68E+02	4.24E-01	1.27E+00	5.39E+01	5.45E-01	5.39E+01				
Ni2O3, (MT)	1.79E+02	4.51E-01	1.35E+00	5.74E+01	5.80E-01	5.74E+01				
NiO, (MT)										
NO2-, (MT)	2.25E+01	5.69E-02	1.71E-01	7.24E+00	7.31E-02	7.24E+00				
NO3-, (MT)										
Np+4, (MT)	4.64E-02	1.17E-04	3.51E-04	1.49E-02	1.51E-04	1.49E-02				
NpO2, (MT)	4.45E-03	1.12E-05	3.37E-05	1.43E-03	1.44E-05	1.43E-03				
OH-, (MT)	3.01E+05	7.59E+02	2.28E+03	9.67E+04	9.76E+02	9.67E+04				
P2O5, (MT)	2.51E+03	6.33E+00	1.90E+01	8.06E+02	8.14E+00	8.06E+02				
P2O5:24W, (MT)	1.59E-01	4.02E-04	1.21E-03	5.11E-02	5.16E-04	5.11E-02				
Pb+4, (MT)	1.00E+00	2.53E-03	7.59E-03	3.22E-01	3.25E-03	3.22E-01				
PbO2, (MT)	2.99E+02	7.55E-01	2.26E+00	9.60E+01	9.70E-01	9.60E+01				
PO4-3, (MT)	7.21E+01	1.82E-01	5.47E-01	2.32E+01	2.34E-01	2.32E+01				
POLY, (MT)	2.13E-05	5.37E-08	1.61E-07	2.13E-05	2.15E-07	2.13E-05				
Pu+4, (MT)	1.44E-01	3.65E-04	1.09E-03	4.64E-02	4.69E-04	4.64E-02				
PuO2, (MT)	3.70E-03	9.35E-06	2.81E-05	1.19E-03	1.20E-05	1.19E-03				
Si+4, (MT)	2.41E+01	6.09E-02	1.83E-01	7.75E+00	7.83E-02	7.75E+00				
SiO2, (MT)	1.22E+02	3.09E-01	9.26E-01	3.93E+01	3.97E-01	3.93E+01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	239	240	241	243	245	248	249	250	251	252
SO3, (MT)										
SO4-2, (MT)	1.20E+00	3.03E-03	9.08E-03	3.85E-01	3.89E-03	3.85E-01				
Sr+2, (MT)	1.12E+01	2.84E-02	8.51E-02	3.61E+00	3.65E-02	3.61E+00				
SrO, (MT)	3.01E-03	7.60E-06	2.28E-05	9.68E-04	9.77E-06	9.68E-04				
Tc2O7, (MT)	9.62E-03	2.43E-05	7.29E-05	3.09E-03	3.12E-05	3.09E-03				
TcO4-, (MT)	1.73E-01	4.38E-04	1.31E-03	5.57E-02	5.63E-04	5.57E-02				
TiO2, (MT)	2.16E-02	5.45E-05	1.64E-04	6.94E-03	7.01E-05	6.94E-03				
Tot Org Carbon, (MT)	3.53E+01	8.92E-02	2.68E-01	1.14E+01	1.15E-01	1.14E+01				
U3O8, (MT)	7.33E-01	1.85E-03	5.55E-03	2.36E-01	2.38E-03	2.36E-01				
UO2+2, (MT)	5.08E+02	1.28E+00	3.85E+00	1.63E+02	1.65E+00	1.63E+02				
UO3, (MT)										
V+5, (MT)	5.73E-02	1.45E-04	4.34E-04	1.84E-02	1.86E-04	1.84E-02				
V2O5, (MT)	2.20E+01	5.56E-02	1.67E-01	7.08E+00	7.15E-02	7.08E+00				
WO2, (MT)										
WO3, (MT)	4.66E+01	1.18E-01	3.53E-01	1.50E+01	1.51E-01	1.50E+01				
Zn+2, (MT)	2.89E-01	7.29E-04	2.19E-03	9.28E-02	9.37E-04	9.28E-02				
ZnO, (MT)	2.16E+01	5.46E-02	1.64E-01	6.95E+00	7.02E-02	6.95E+00				
Zr+4, (MT)	8.45E+01	2.13E-01	6.40E-01	2.72E+01	2.75E-01	2.72E+01				
ZrO2, (MT)	4.77E+02	1.20E+00	3.61E+00	1.53E+02	1.55E+00	1.53E+02				
ZrO2:2H2O, (MT)	1.25E+02	3.15E-01	9.45E-01	4.01E+01	4.05E-01	4.01E+01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	253	254	255	256	257	258	259	260	263	264
Volume, Total Liters	7.09E+06	4.40E+04	1.34E+07	1.02E+05		1.33E+07	1.33E+07	1.52E+09		4.21E+08
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.17E+00		1.00E+00
Total Mass Flow, (MT)	7.10E+03	4.40E+01	1.34E+04	1.02E+02		1.34E+04	1.34E+04	1.78E+06		4.21E+05
Cs and Ba, (MCi)								7.41E-01		
Sr and Y, (MCi)								1.34E+01		
Tc, (MCi)								5.70E-04		
TRU, (MCi)								1.61E-02		
Total MCi								1.42E+01		
Ag+, (MT)								1.33E-01		
Al(OH)4-, (MT)								6.20E-04		
Al+3, (MT)								6.17E+01		
Am+3, (MT)								2.93E-03		
As+5, (MT)								4.82E-02		
B+3, (MT)								9.63E-02		
Ba+2, (MT)								2.99E-01		
Be+2, (MT)								7.37E-04		
Bi+3, (MT)								1.90E+01		
Carbon14, (MT)								4.39E-05		
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)								1.45E+01		
Cancrinite, (MT)								2.41E+02		
Cd+2, (MT)								7.68E-01		
Ce+3, (MT)								2.30E+01		
Cl-, (MT)								3.74E-01		
Cl2, (MT)										
CO, (MT)		1.26E+00		1.25E+00		1.26E-02	1.26E-02	1.28E-02		
CO2, (MT)		1.46E+01		1.44E+01		1.46E-01	1.46E-01	1.47E-01		
CO3-2, (MT)										
Cr(OH)4-, (MT)								1.52E-05		
Cr+3, (MT)								7.80E+00		
Cs+, (MT)								9.03E-03		
Cu+2, (MT)								7.22E-02		
DTPA-3, (MT)										
F-, (MT)								2.89E+04		
F2, (MT)										
Fe+3, (MT)								4.58E+01		
FeCN6-3, (MT)								4.72E-02		
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Component	253	254	255	256	257	258	259	260	263	264
H+, (MT)	9.45E-02		4.09E-01			5.70E-01	5.70E-01	6.90E+03		
H2, (MT)		3.90E-10		3.86E-10		3.90E-12	3.90E-12	3.94E-12		
H2O, (MT)	7.09E+03		1.34E+04	6.69E+01		1.33E+04	1.33E+04	1.41E+06		4.21E+05
H2O2, (MT)			3.46E+00			3.46E+00	3.46E+00	2.27E+02		
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)								8.72E-04		
Hg2, (MT)								2.20E-04		
I-, (MT)								1.96E+00		
I2, (MT)										
K+, (MT)								2.04E+00		
La+3, (MT)								2.06E+00		
Li+, (MT)								2.38E-03		
Mg+2, (MT)								1.07E+00		
Mn+4, (MT)								1.29E+01		
MnO2, (MT)								2.34E-05		
Mo+6, (MT)								7.82E-02		
MoO4-2, (MT)								2.90E-04		
N2, (MT)		1.50E+01		1.48E+01		1.50E-01	1.50E-01	1.50E-03		
N2O, (MT)										
Na+, (MT)								8.56E+02		
NH2OH, (MT)										
NH3, (MT)								9.61E-04		
NH4+, (MT)								2.02E-05		
Ni+3, (MT)								2.23E+00		
NO, (MT)										
NO2, (MT)		8.64E+00		1.28E+00		1.30E-02	1.30E-02	1.31E-01		
NO2-, (MT)										
NO3-, (MT)	5.81E+00		2.52E+01			3.51E+01	3.51E+01	3.28E+05		
Np+4, (MT)								8.61E-03		
O2, (MT)		4.50E+00		3.19E+00		3.23E-02	3.23E-02	7.55E-03		
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)								3.18E-01		
PO4-3, (MT)								2.30E+01		
POLY, (MT)		3.25E-02	2.34E-04	3.24E-02		3.27E-04	3.27E-04	3.28E-04		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	253	254	255	256	257	258	259	260	263	264
PTA-3, (MT)								5.17E-02		
Pu+4, (MT)								2.68E-02		
Si+4, (MT)								7.67E+00		
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)								1.24E+00		
Sr+2, (MT)								3.57E+00		
Sugar, (MT)										
TcO4-, (MT)								5.50E-02		
Ti+4, (MT)								1.97E-02		
Tot Org Carbon, (MT)								1.12E+01		
UO2+2, (MT)								1.61E+02		
V+5, (MT)								1.82E-02		
W+6, (MT)								9.58E-06		
Zn+2, (MT)								9.15E-02		
Zr+4, (MT)								4.95E+01		
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	253	254	255	256	257	258	259	260	263	264
Total Mass Flow, (MT)		1.08E-01		5.38E-04		1.07E-01	1.07E-01	1.05E+05	2.19E+00	
Cs and Ba, (MCi)								7.52E-02		
Sr and Y, (MCi)								1.36E+00		
Tc, (MCi)								9.15E-05		
TRU, (MCi)								6.56E-03		
Total MCi								1.45E+00		
Ag+, (MT)								1.35E-02		
Ag2O, (MT)								2.93E+01		
Al+3, (MT)								5.92E+01		
Al2O3, (MT)								3.25E+03		
Am+3, (MT)								2.97E-04		
Am2O3, (MT)								2.47E-06		
APM-, (MT)								7.07E-02		
As+5, (MT)								4.89E-03		
As2O5, (MT)								3.11E+01		
B+3, (MT)								9.76E-03		
B2O3, (MT)								1.06E+00		
Ba+2, (MT)								3.04E-02		
BaO, (MT)								1.93E-01		
Be+2, (MT)								7.47E-05		
BeO, (MT)								3.97E+00		
Bi+3, (MT)								1.93E+00		
Bi2O3, (MT)								6.41E+01		
Carbon14, (MT)								4.45E-06		
Ca+2, (MT)								1.47E+00		
Cancrinite, (MT)								2.11E+03		
CaO, (MT)								4.58E+01		
Cd+2, (MT)								7.79E-02		
CdO, (MT)								2.50E+00		
Ce+3, (MT)								2.34E+00		
Ce2O3, (MT)								6.07E+01		
Cl-, (MT)								3.43E-02		
CO3-2, (MT)								2.21E+00		
Cr+3, (MT)								6.76E+00		
Cr2O3, (MT)								1.84E+01		
Cs+, (MT)								9.09E-04		
Cs2O, (MT)								7.24E-06		
Cu+2, (MT)								7.33E-03		
CuO, (MT)								1.85E+01		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	253	254	255	256	257	258	259	260	263	264
F-, (MT)								5.86E-01		
Fe+3, (MT)								3.98E+01		
Fe2O3, (MT)								7.99E+02		
H2O, (MT)		1.08E-01		5.38E-04		1.07E-01	1.07E-01	2.14E+01	1.10E+00	
Hg+2, (MT)								8.84E-05		
I-, (MT)								1.98E-01		
K+, (MT)								2.06E-01		
K2O, (MT)								2.16E-01		
La+3, (MT)								2.09E-01		
La2O3, (MT)								5.43E+00		
Li+, (MT)								2.41E-04		
Li2O, (MT)								5.51E-04		
Mg+2, (MT)								1.08E-01		
MgO, (MT)								4.33E+00		
MnO2, (MT)								2.08E+00		
Mo+6, (MT)								7.87E-03		
MoO3, (MT)								1.89E+00		
Na+, (MT)								8.68E+01		
Na2O, (MT)								2.39E+02		
Ni(OH)3, (MT)										
Ni+3, (MT)								1.04E-01		
Ni2FECN6, (MT)								5.43E+01		
Ni2O3, (MT)								5.78E+01		
NiO, (MT)										
NO2-, (MT)								7.25E-01		
NO3-, (MT)										
Np+4, (MT)								7.48E-03		
NpO2, (MT)								1.44E-03		
OH-, (MT)								9.71E+04		
P2O5, (MT)								8.11E+02		
P2O5:24W, (MT)								5.12E-03		
Pb+4, (MT)								3.22E-02		
PbO2, (MT)								9.67E+01		
PO4-3, (MT)								2.32E+00		
POLY, (MT)									1.10E+00	
Pu+4, (MT)								2.33E-02		
PuO2, (MT)								1.20E-03		
Si+4, (MT)								7.76E-01		
SiO2, (MT)								3.95E+01		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	253	254	255	256	257	258	259	260	263	264
SO3, (MT)										
SO4-2, (MT)								3.86E-02		
Sr+2, (MT)								3.62E-01		
SrO, (MT)								9.74E-04		
Tc2O7, (MT)								3.11E-03		
TcO4-, (MT)								5.58E-03		
TiO2, (MT)								6.98E-03		
Tot Org Carbon, (MT)								1.14E+00		
U3O8, (MT)								2.37E-01		
UO2+2, (MT)								1.63E+01		
UO3, (MT)										
V+5, (MT)								1.84E-03		
V2O5, (MT)								7.13E+00		
WO2, (MT)										
WO3, (MT)								1.51E+01		
Zn+2, (MT)								9.28E-03		
ZnO, (MT)								7.00E+00		
Zr+4, (MT)								2.72E+00		
ZrO2, (MT)								1.54E+02		
ZrO2:2H2O, (MT)								4.01E+00		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	265	266	267	268	269	270	271	272	273	274
Volume, Total Liters	4.32E+08	1.51E+09	4.98E+08	9.29E+08	1.51E+09	1.53E+10	3.84E+07	1.53E+10	1.98E+09	1.38E+10
Specific Gravity	1.00E+00	1.17E+00	1.00E+00	1.00E+00	1.17E+00	1.17E+00	1.17E+00	1.17E+00	1.17E+00	1.17E+00
Total Mass Flow, (MT)	4.33E+05	1.76E+06	4.98E+05	9.31E+05	1.76E+06	1.79E+07	4.48E+04	1.79E+07	2.31E+06	1.61E+07
Cs and Ba, (MCi)	5.18E-03	7.36E-01		5.18E-03	7.36E-01	7.44E+00	1.86E-02	7.42E+00	9.57E-01	6.70E+00
Sr and Y, (MCi)	9.38E-02	1.33E+01		9.38E-02	1.33E+01	1.35E+02	3.37E-01	1.34E+02	1.73E+01	1.21E+02
Tc, (MCi)	3.98E-06	5.66E-04		3.98E-06	5.66E-04	5.72E-03	1.43E-05	5.70E-03	7.36E-04	5.15E-03
TRU, (MCi)	1.13E-04	1.60E-02		1.13E-04	1.60E-02	1.62E-01	4.04E-04	1.61E-01	2.08E-02	1.46E-01
Total MCi	9.91E-02	1.41E+01		9.91E-02	1.41E+01	1.42E+02	3.56E-01	1.42E+02	1.83E+01	1.28E+02
Ag+, (MT)	9.31E-04	1.32E-01		9.31E-04	1.32E-01	1.34E+00	3.34E-03	1.33E+00	1.72E-01	1.20E+00
Al(OH)4-, (MT)	4.33E-06	6.15E-04		4.33E-06	6.15E-04	6.22E-03	1.55E-05	6.20E-03	8.00E-04	5.60E-03
Al+3, (MT)	4.32E-01	6.13E+01		4.32E-01	6.13E+01	6.19E+02	1.55E+00	6.18E+02	7.97E+01	5.58E+02
Am+3, (MT)	2.05E-05	2.91E-03		2.05E-05	2.91E-03	2.94E-02	7.34E-05	2.93E-02	3.78E-03	2.65E-02
As+5, (MT)	3.37E-04	4.79E-02		3.37E-04	4.79E-02	4.84E-01	1.21E-03	4.82E-01	6.22E-02	4.36E-01
B+3, (MT)	6.73E-04	9.56E-02		6.73E-04	9.56E-02	9.65E-01	2.41E-03	9.63E-01	1.24E-01	8.70E-01
Ba+2, (MT)	2.09E-03	2.97E-01		2.09E-03	2.97E-01	3.00E+00	7.50E-03	2.99E+00	3.86E-01	2.70E+00
Be+2, (MT)	5.15E-06	7.32E-04		5.15E-06	7.32E-04	7.39E-03	1.85E-05	7.37E-03	9.51E-04	6.66E-03
Bi+3, (MT)	1.33E-01	1.88E+01		1.33E-01	1.88E+01	1.90E+02	4.76E-01	1.90E+02	2.45E+01	1.71E+02
Carbon14, (MT)	3.07E-07	4.36E-05		3.07E-07	4.36E-05	4.40E-04	1.10E-06	4.39E-04	5.66E-05	3.96E-04
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.01E-01	1.44E+01		1.01E-01	1.44E+01	1.46E+02	3.64E-01	1.45E+02	1.87E+01	1.31E+02
Cancrinite, (MT)	1.68E+00	2.39E+02		1.68E+00	2.39E+02	2.42E+03	6.04E+00	2.41E+03	3.11E+02	2.18E+03
Cd+2, (MT)	5.37E-03	7.63E-01		5.37E-03	7.63E-01	7.70E+00	1.93E-02	7.68E+00	9.91E-01	6.94E+00
Ce+3, (MT)	1.61E-01	2.29E+01		1.61E-01	2.29E+01	2.31E+02	5.77E-01	2.30E+02	2.97E+01	2.08E+02
Cl-, (MT)	2.61E-03	3.72E-01		2.61E-03	3.72E-01	3.75E+00	9.38E-03	3.74E+00	4.83E-01	3.38E+00
Cl2, (MT)										
CO, (MT)	8.92E-05	1.27E-02		8.92E-05	1.27E-02	1.28E-01	3.20E-04	1.28E-01	1.65E-02	1.15E-01
CO2, (MT)	1.03E-03	1.46E-01		1.03E-03	1.46E-01	1.48E+00	3.69E-03	1.47E+00	1.90E-01	1.33E+00
CO3-2, (MT)										
Cr(OH)4-, (MT)	1.07E-07	1.51E-05		1.07E-07	1.51E-05	1.53E-04	3.82E-07	1.52E-04	1.97E-05	1.38E-04
Cr+3, (MT)	5.45E-02	7.74E+00		5.45E-02	7.74E+00	7.82E+01	1.95E-01	7.80E+01	1.01E+01	7.04E+01
Cs+, (MT)	6.31E-05	8.97E-03		6.31E-05	8.97E-03	9.06E-02	2.26E-04	9.04E-02	1.17E-02	8.16E-02
Cu+2, (MT)	5.05E-04	7.17E-02		5.05E-04	7.17E-02	7.24E-01	1.81E-03	7.23E-01	9.32E-02	6.53E-01
DTPA-3, (MT)										
F-, (MT)	2.02E+02	2.87E+04		2.02E+02	2.87E+04	2.90E+05	7.25E+02	2.89E+05	3.73E+04	2.61E+05
F2, (MT)										
Fe+3, (MT)	3.20E-01	4.54E+01		3.20E-01	4.54E+01	4.59E+02	1.15E+00	4.58E+02	5.91E+01	4.13E+02
FeCN6-3, (MT)	3.30E-04	4.69E-02		3.30E-04	4.69E-02	4.74E-01	1.18E-03	4.72E-01	6.09E-02	4.27E-01
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	265	266	267	268	269	270	271	272	273	274
H+, (MT)	4.82E+01	6.85E+03	1.52E+01	6.34E+01	6.85E+03	6.92E+04	1.73E+02	6.90E+04	8.90E+03	6.23E+04
H2, (MT)	2.75E-14			2.75E-14		2.78E-15	6.95E-18	2.77E-15	3.58E-16	2.50E-15
H2O, (MT)	4.31E+05	1.40E+06	4.97E+05	9.28E+05	1.40E+06	1.42E+07	3.56E+04	1.42E+07	1.83E+06	1.28E+07
H2O2, (MT)	1.58E+00	2.25E+02	1.28E+02	1.30E+02	2.25E+02	2.28E+03	5.71E+00	2.28E+03	2.94E+02	2.06E+03
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	6.09E-06	8.66E-04		6.09E-06	8.66E-04	8.74E-03	2.19E-05	8.72E-03	1.13E-03	7.88E-03
Hg2, (MT)	1.54E-06	2.18E-04		1.54E-06	2.18E-04	2.21E-03	5.52E-06	2.20E-03	2.84E-04	1.99E-03
I-, (MT)	1.37E-02	1.94E+00		1.37E-02	1.94E+00	1.96E+01	4.90E-02	1.96E+01	2.53E+00	1.77E+01
I2, (MT)										
K+, (MT)	1.42E-02	2.02E+00		1.42E-02	2.02E+00	2.04E+01	5.10E-02	2.04E+01	2.63E+00	1.84E+01
La+3, (MT)	1.44E-02	2.04E+00		1.44E-02	2.04E+00	2.06E+01	5.15E-02	2.06E+01	2.65E+00	1.86E+01
Li+, (MT)	1.67E-05	2.37E-03		1.67E-05	2.37E-03	2.39E-02	5.97E-05	2.38E-02	3.08E-03	2.15E-02
Mg+2, (MT)	7.44E-03	1.06E+00		7.44E-03	1.06E+00	1.07E+01	2.67E-02	1.07E+01	1.38E+00	9.62E+00
Mn+4, (MT)	9.03E-02	1.28E+01		9.03E-02	1.28E+01	1.30E+02	3.24E-01	1.29E+02	1.67E+01	1.17E+02
MnO2, (MT)	1.64E-07	2.33E-05		1.64E-07	2.33E-05	2.35E-04	5.87E-07	2.34E-04	3.02E-05	2.12E-04
Mo+6, (MT)	5.46E-04	7.76E-02		5.46E-04	7.76E-02	7.84E-01	1.96E-03	7.82E-01	1.01E-01	7.06E-01
MoO4-2, (MT)	2.02E-06	2.88E-04		2.02E-06	2.88E-04	2.91E-03	7.26E-06	2.90E-03	3.74E-04	2.62E-03
N2, (MT)	1.05E-05	1.49E-03		1.05E-05	1.49E-03	1.50E-02	3.76E-05	1.50E-02	1.94E-03	1.36E-02
N2O, (MT)										
Na+, (MT)	5.98E+00	8.50E+02		5.98E+00	8.50E+02	8.59E+03	2.15E+01	8.57E+03	1.11E+03	7.74E+03
NH2OH, (MT)										
NH3, (MT)	6.71E-06	9.54E-04		6.71E-06	9.54E-04	9.63E-03	2.41E-05	9.61E-03	1.24E-03	8.68E-03
NH4+, (MT)	1.41E-07	2.01E-05		1.41E-07	2.01E-05	2.03E-04	5.07E-07	2.02E-04	2.61E-05	1.83E-04
Ni+3, (MT)	1.56E-02	2.21E+00		1.56E-02	2.21E+00	2.23E+01	5.58E-02	2.23E+01	2.88E+00	2.01E+01
NO, (MT)										
NO2, (MT)	9.14E-04	1.30E-01		9.14E-04	1.30E-01	1.31E+00	3.28E-03	1.31E+00	1.69E-01	1.18E+00
NO2-, (MT)										
NO3-, (MT)	2.29E+03	3.26E+05	9.34E+02	3.23E+03	3.26E+05	3.29E+06	8.23E+03	3.28E+06	4.23E+05	2.96E+06
Np+4, (MT)	6.02E-05	8.55E-03		6.02E-05	8.55E-03	8.63E-02	2.16E-04	8.61E-02	1.11E-02	7.78E-02
O2, (MT)	5.27E-05	7.49E-03		5.27E-05	7.49E-03	7.57E-02	1.89E-04	7.55E-02	9.74E-03	6.82E-02
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	2.22E-03	3.15E-01		2.22E-03	3.15E-01	3.19E+00	7.96E-03	3.18E+00	4.10E-01	2.87E+00
PO4-3, (MT)	1.60E-01	2.28E+01		1.60E-01	2.28E+01	2.30E+02	5.75E-01	2.30E+02	2.96E+01	2.07E+02
POLY, (MT)	2.29E-06	1.87E-02	8.70E-03	8.71E-03	1.87E-02	1.90E-01	4.74E-04	1.89E-01	2.44E-02	1.71E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	265	266	267	268	269	270	271	272	273	274
PTA-3, (MT)	3.61E-04	5.13E-02		3.61E-04	5.13E-02	5.18E-01	1.30E-03	5.17E-01	6.67E-02	4.67E-01
Pu+4, (MT)	1.87E-04	2.66E-02		1.87E-04	2.66E-02	2.69E-01	6.72E-04	2.68E-01	3.46E-02	2.42E-01
Si+4, (MT)	5.36E-02	7.62E+00		5.36E-02	7.62E+00	7.69E+01	1.92E-01	7.67E+01	9.90E+00	6.93E+01
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	8.65E-03	1.23E+00		8.65E-03	1.23E+00	1.24E+01	3.10E-02	1.24E+01	1.60E+00	1.12E+01
Sr+2, (MT)	2.49E-02	3.54E+00		2.49E-02	3.54E+00	3.58E+01	8.95E-02	3.57E+01	4.61E+00	3.22E+01
Sugar, (MT)										
TcO4-, (MT)	3.84E-04	5.46E-02		3.84E-04	5.46E-02	5.51E-01	1.38E-03	5.50E-01	7.10E-02	4.97E-01
Ti+4, (MT)	1.38E-04	1.95E-02		1.38E-04	1.95E-02	1.97E-01	4.93E-04	1.97E-01	2.54E-02	1.78E-01
Tot Org Carbon, (MT)	7.83E-02	1.11E+01		7.83E-02	1.11E+01	1.12E+02	2.81E-01	1.12E+02	1.45E+01	1.01E+02
UO2+2, (MT)	1.13E+00	1.60E+02		1.13E+00	1.60E+02	1.62E+03	4.04E+00	1.61E+03	2.08E+02	1.46E+03
V+5, (MT)	1.27E-04	1.81E-02		1.27E-04	1.81E-02	1.82E-01	4.56E-04	1.82E-01	2.35E-02	1.64E-01
W+6, (MT)	6.70E-10	9.52E-08		6.70E-10	9.52E-08	9.61E-07	2.40E-09	9.59E-07	1.24E-07	8.66E-07
Zn+2, (MT)	6.40E-04	9.09E-02		6.40E-04	9.09E-02	9.18E-01	2.29E-03	9.15E-01	1.18E-01	8.27E-01
Zr+4, (MT)	3.46E-01	4.91E+01		3.46E-01	4.91E+01	4.96E+02	1.24E+00	4.95E+02	6.38E+01	4.47E+02
ZrO2:2H2O, (MT)						4.60E-36	1.15E-38	4.59E-36	6.57E-37	4.16E-36

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	265	266	267	268	269	270	271	272	273	274
Total Mass Flow, (MT)	1.04E+05	1.76E+03		1.04E+05	1.76E+03	2.80E+05	7.00E+02	2.79E+05	2.80E+03	2.77E+05
Cs and Ba, (MCi)	7.39E-02	1.26E-03		7.39E-02	1.26E-03	2.00E-01	4.99E-04	1.99E-01	2.00E-03	1.98E-01
Sr and Y, (MCi)	1.34E+00	2.29E-02		1.34E+00	2.29E-02	3.63E+00	9.06E-03	3.62E+00	3.63E-02	3.59E+00
Tc, (MCi)	9.00E-05	1.53E-06		9.00E-05	1.53E-06	2.43E-04	6.08E-07	2.43E-04	2.43E-06	2.41E-04
TRU, (MCi)	6.45E-03	1.10E-04		6.45E-03	1.10E-04	1.74E-02	4.36E-05	1.74E-02	1.74E-04	1.72E-02
Total MCi	1.42E+00	2.42E-02		1.42E+00	2.42E-02	3.84E+00	9.61E-03	3.83E+00	3.84E-02	3.81E+00
Ag+, (MT)	1.33E-02	2.27E-04		1.33E-02	2.27E-04	3.60E-02	8.99E-05	3.59E-02	3.60E-04	3.56E-02
Ag2O, (MT)	2.88E+01	4.90E-01		2.88E+01	4.90E-01	7.78E+01	1.95E-01	7.76E+01	7.78E-01	7.70E+01
Al+3, (MT)	5.82E+01	9.92E-01		5.82E+01	9.92E-01	1.57E+02	3.94E-01	1.57E+02	1.57E+00	1.56E+02
Al2O3, (MT)	3.19E+03	5.45E+01		3.19E+03	5.45E+01	8.64E+03	2.16E+01	8.62E+03	8.64E+01	8.55E+03
Am+3, (MT)	2.92E-04	4.98E-06		2.92E-04	4.98E-06	7.90E-04	1.97E-06	7.88E-04	7.90E-06	7.82E-04
Am2O3, (MT)	2.43E-06			2.43E-06		2.43E-06	6.08E-09	2.42E-06	2.43E-08	2.41E-06
APM-, (MT)	6.95E-02	1.19E-03		6.95E-02	1.19E-03	1.88E-01	4.70E-04	1.87E-01	1.88E-03	1.86E-01
As+5, (MT)	4.81E-03	8.20E-05		4.81E-03	8.20E-05	1.30E-02	3.25E-05	1.30E-02	1.30E-04	1.29E-02
As2O5, (MT)	3.06E+01	5.21E-01		3.06E+01	5.21E-01	8.27E+01	2.07E-01	8.25E+01	8.27E-01	8.19E+01
B+3, (MT)	9.60E-03	1.64E-04		9.60E-03	1.64E-04	2.60E-02	6.49E-05	2.59E-02	2.60E-04	2.57E-02
B2O3, (MT)	1.05E+00	1.78E-02		1.05E+00	1.78E-02	2.83E+00	7.07E-03	2.82E+00	2.83E-02	2.80E+00
Ba+2, (MT)	2.98E-02	5.09E-04		2.98E-02	5.09E-04	8.07E-02	2.02E-04	8.05E-02	8.07E-04	7.99E-02
BaO, (MT)	1.90E-01	3.24E-03		1.90E-01	3.24E-03	5.14E-01	1.29E-03	5.13E-01	5.14E-03	5.09E-01
Be+2, (MT)	7.35E-05	1.25E-06		7.35E-05	1.25E-06	1.99E-04	4.97E-07	1.98E-04	1.99E-06	1.97E-04
BeO, (MT)	3.91E+00	6.66E-02		3.91E+00	6.66E-02	1.06E+01	2.64E-02	1.05E+01	1.06E-01	1.05E+01
Bi+3, (MT)	1.89E+00	3.23E-02		1.89E+00	3.23E-02	5.12E+00	1.28E-02	5.11E+00	5.12E-02	5.07E+00
Bi2O3, (MT)	6.30E+01	1.07E+00		6.30E+01	1.07E+00	1.70E+02	4.26E-01	1.70E+02	1.70E+00	1.69E+02
Carbon14, (MT)	4.37E-06	7.46E-08		4.37E-06	7.46E-08	1.18E-05	2.96E-08	1.18E-05	1.18E-07	1.17E-05
Ca+2, (MT)	1.45E+00	2.47E-02		1.45E+00	2.47E-02	3.91E+00	9.79E-03	3.91E+00	3.91E-02	3.88E+00
Cancrinite, (MT)	2.08E+03	3.54E+01		2.08E+03	3.54E+01	5.62E+03	1.41E+01	5.60E+03	5.62E+01	5.56E+03
CaO, (MT)	4.50E+01	7.68E-01		4.50E+01	7.68E-01	1.22E+02	3.05E-01	1.22E+02	1.22E+00	1.21E+02
Cd+2, (MT)	7.66E-02	1.31E-03		7.66E-02	1.31E-03	2.07E-01	5.18E-04	2.07E-01	2.07E-03	2.05E-01
CdO, (MT)	2.46E+00	4.19E-02		2.46E+00	4.19E-02	6.64E+00	1.66E-02	6.63E+00	6.64E-02	6.58E+00
Ce+3, (MT)	2.30E+00	3.91E-02		2.30E+00	3.91E-02	6.21E+00	1.55E-02	6.20E+00	6.21E-02	6.15E+00
Ce2O3, (MT)	5.97E+01	1.02E+00		5.97E+01	1.02E+00	1.61E+02	4.04E-01	1.61E+02	1.61E+00	1.60E+02
Cl-, (MT)	3.37E-02	5.75E-04		3.37E-02	5.75E-04	9.12E-02	2.28E-04	9.09E-02	9.12E-04	9.02E-02
CO3-2, (MT)	2.17E+00	3.70E-02		2.17E+00	3.70E-02	5.86E+00	1.47E-02	5.85E+00	5.86E-02	5.80E+00
Cr+3, (MT)	6.65E+00	1.13E-01		6.65E+00	1.13E-01	1.80E+01	4.50E-02	1.79E+01	1.80E-01	1.78E+01
Cr2O3, (MT)	1.80E+01	3.08E-01		1.80E+01	3.08E-01	4.88E+01	1.22E-01	4.87E+01	4.88E-01	4.83E+01
Cs+, (MT)	8.94E-04	1.52E-05		8.94E-04	1.52E-05	2.42E-03	6.04E-06	2.41E-03	2.42E-05	2.39E-03
Cs2O, (MT)	7.12E-06	1.21E-07		7.12E-06	1.21E-07	1.91E-05	4.77E-08	1.91E-05	1.91E-07	1.89E-05
Cu+2, (MT)	7.20E-03	1.23E-04		7.20E-03	1.23E-04	1.95E-02	4.87E-05	1.94E-02	1.95E-04	1.93E-02
CuO, (MT)	1.82E+01	3.10E-01		1.82E+01	3.10E-01	4.91E+01	1.23E-01	4.90E+01	4.91E-01	4.86E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	265	266	267	268	269	270	271	272	273	274
F-, (MT)	5.76E-01	9.82E-03		5.76E-01	9.82E-03	1.56E+00	3.90E-03	1.55E+00	1.56E-02	1.54E+00
Fe+3, (MT)	3.91E+01	6.66E-01		3.91E+01	6.66E-01	1.06E+02	2.64E-01	1.06E+02	1.06E+00	1.05E+02
Fe2O3, (MT)	7.86E+02	1.34E+01		7.86E+02	1.34E+01	2.13E+03	5.31E+00	2.12E+03	2.13E+01	2.10E+03
H2O, (MT)	2.21E+01	3.77E-01		2.21E+01	3.77E-01	5.99E+01	1.50E-01	5.97E+01	5.99E-01	5.93E+01
Hg+2, (MT)	8.69E-05	1.48E-06		8.69E-05	1.48E-06	2.35E-04	5.88E-07	2.34E-04	2.35E-06	2.33E-04
I-, (MT)	1.95E-01	3.33E-03		1.95E-01	3.33E-03	5.28E-01	1.32E-03	5.26E-01	5.28E-03	5.22E-01
K+, (MT)	2.03E-01	3.46E-03		2.03E-01	3.46E-03	5.49E-01	1.37E-03	5.47E-01	5.49E-03	5.43E-01
K2O, (MT)	2.12E-01	3.62E-03		2.12E-01	3.62E-03	5.74E-01	1.44E-03	5.72E-01	5.74E-03	5.68E-01
La+3, (MT)	2.05E-01	3.50E-03		2.05E-01	3.50E-03	5.55E-01	1.39E-03	5.53E-01	5.55E-03	5.49E-01
La2O3, (MT)	5.33E+00	9.09E-02		5.33E+00	9.09E-02	1.44E+01	3.61E-02	1.44E+01	1.44E-01	1.43E+01
Li+, (MT)	2.37E-04	4.05E-06		2.37E-04	4.05E-06	6.42E-04	1.60E-06	6.40E-04	6.42E-06	6.35E-04
Li2O, (MT)	5.42E-04	9.24E-06		5.42E-04	9.24E-06	1.47E-03	3.67E-06	1.46E-03	1.47E-05	1.45E-03
Mg+2, (MT)	1.06E-01	1.81E-03		1.06E-01	1.81E-03	2.87E-01	7.18E-04	2.87E-01	2.87E-03	2.84E-01
MgO, (MT)	4.26E+00	7.26E-02		4.26E+00	7.26E-02	1.15E+01	2.88E-02	1.15E+01	1.15E-01	1.14E+01
MnO2, (MT)	2.04E+00	3.48E-02		2.04E+00	3.48E-02	5.52E+00	1.38E-02	5.50E+00	5.52E-02	5.46E+00
Mo+6, (MT)	7.74E-03	1.32E-04		7.74E-03	1.32E-04	2.09E-02	5.23E-05	2.09E-02	2.09E-04	2.07E-02
MoO3, (MT)	1.86E+00	3.16E-02		1.86E+00	3.16E-02	5.02E+00	1.25E-02	5.00E+00	5.02E-02	4.97E+00
Na+, (MT)	8.53E+01	1.45E+00		8.53E+01	1.45E+00	2.31E+02	5.77E-01	2.30E+02	2.31E+00	2.28E+02
Na2O, (MT)	2.35E+02	4.00E+00		2.35E+02	4.00E+00	6.35E+02	1.59E+00	6.33E+02	6.35E+00	6.28E+02
Ni(OH)3, (MT)										
Ni+3, (MT)	1.03E-01	1.75E-03		1.03E-01	1.75E-03	2.77E-01	6.93E-04	2.77E-01	2.77E-03	2.74E-01
Ni2FECN6, (MT)	5.34E+01	9.10E-01		5.34E+01	9.10E-01	1.44E+02	3.61E-01	1.44E+02	1.44E+00	1.43E+02
Ni2O3, (MT)	5.69E+01	9.69E-01		5.69E+01	9.69E-01	1.54E+02	3.84E-01	1.53E+02	1.54E+00	1.52E+02
NiO, (MT)										
NO2-, (MT)	7.12E-01	1.21E-02		7.12E-01	1.21E-02	1.93E+00	4.82E-03	1.92E+00	1.93E-02	1.91E+00
NO3-, (MT)										
Np+4, (MT)	7.35E-03	1.25E-04		7.35E-03	1.25E-04	1.99E-02	4.97E-05	1.98E-02	1.99E-04	1.97E-02
NpO2, (MT)	1.42E-03	2.41E-05		1.42E-03	2.41E-05	3.82E-03	9.55E-06	3.81E-03	3.82E-05	3.78E-03
OH-, (MT)	9.54E+04	1.63E+03		9.54E+04	1.63E+03	2.58E+05	6.45E+02	2.58E+05	2.58E+03	2.56E+05
P2O5, (MT)	7.98E+02	1.36E+01		7.98E+02	1.36E+01	2.16E+03	5.39E+00	2.15E+03	2.16E+01	2.14E+03
P2O5:24W, (MT)	5.03E-03	8.58E-05		5.03E-03	8.58E-05	1.36E-02	3.40E-05	1.36E-02	1.36E-04	1.35E-02
Pb+4, (MT)	3.17E-02	5.40E-04		3.17E-02	5.40E-04	8.57E-02	2.14E-04	8.55E-02	8.57E-04	8.48E-02
PbO2, (MT)	9.51E+01	1.62E+00		9.51E+01	1.62E+00	2.57E+02	6.43E-01	2.57E+02	2.57E+00	2.55E+02
PO4-3, (MT)	2.28E+00	3.89E-02		2.28E+00	3.89E-02	6.17E+00	1.54E-02	6.16E+00	6.17E-02	6.11E+00
POLY, (MT)	1.08E+00			1.08E+00		1.08E+00	2.69E-03	1.08E+00	1.08E-02	1.07E+00
Pu+4, (MT)	2.29E-02	3.90E-04		2.29E-02	3.90E-04	6.19E-02	1.55E-04	6.17E-02	6.19E-04	6.13E-02
PuO2, (MT)	1.18E-03	2.01E-05		1.18E-03	2.01E-05	3.18E-03	7.94E-06	3.17E-03	3.18E-05	3.14E-03
Si+4, (MT)	7.63E-01	1.30E-02		7.63E-01	1.30E-02	2.06E+00	5.16E-03	2.06E+00	2.06E-02	2.04E+00
SiO2, (MT)	3.89E+01	6.63E-01		3.89E+01	6.63E-01	1.05E+02	2.63E-01	1.05E+02	1.05E+00	1.04E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	265	266	267	268	269	270	271	272	273	274
SO3, (MT)										
SO4-2, (MT)	3.79E-02	6.46E-04		3.79E-02	6.46E-04	1.03E-01	2.56E-04	1.02E-01	1.03E-03	1.02E-01
Sr+2, (MT)	3.56E-01	6.06E-03		3.56E-01	6.06E-03	9.61E-01	2.40E-03	9.59E-01	9.61E-03	9.52E-01
SrO, (MT)	9.58E-04	1.63E-05		9.58E-04	1.63E-05	2.59E-03	6.47E-06	2.58E-03	2.59E-05	2.56E-03
Tc2O7, (MT)	3.06E-03	5.22E-05		3.06E-03	5.22E-05	8.27E-03	2.07E-05	8.25E-03	8.27E-05	8.19E-03
TcO4-, (MT)	5.48E-03	9.35E-05		5.48E-03	9.35E-05	1.48E-02	3.71E-05	1.48E-02	1.48E-04	1.47E-02
TiO2, (MT)	6.87E-03	1.17E-04		6.87E-03	1.17E-04	1.86E-02	4.64E-05	1.85E-02	1.86E-04	1.84E-02
Tot Org Carbon, (MT)	1.12E+00	1.91E-02		1.12E+00	1.91E-02	3.02E+00	7.56E-03	3.01E+00	3.02E-02	2.99E+00
U3O8, (MT)	2.33E-01	3.98E-03		2.33E-01	3.98E-03	6.31E-01	1.58E-03	6.29E-01	6.31E-03	6.25E-01
UO2+2, (MT)	1.61E+01	2.74E-01		1.61E+01	2.74E-01	4.35E+01	1.09E-01	4.34E+01	4.35E-01	4.30E+01
UO3, (MT)										
V+5, (MT)	1.81E-03	3.09E-05		1.81E-03	3.09E-05	4.90E-03	1.23E-05	4.89E-03	4.90E-05	4.86E-03
V2O5, (MT)	7.01E+00	1.20E-01		7.01E+00	1.20E-01	1.90E+01	4.74E-02	1.89E+01	1.90E-01	1.88E+01
WO2, (MT)										
WO3, (MT)	1.48E+01	2.53E-01		1.48E+01	2.53E-01	4.01E+01	1.00E-01	4.00E+01	4.01E-01	3.97E+01
Za+2, (MT)	9.13E-03	1.56E-04		9.13E-03	1.56E-04	2.47E-02	6.17E-05	2.46E-02	2.47E-04	2.44E-02
ZnO, (MT)	6.88E+00	1.17E-01		6.88E+00	1.17E-01	1.86E+01	4.65E-02	1.86E+01	1.86E-01	1.84E+01
Zr+4, (MT)	2.67E+00	4.56E-02		2.67E+00	4.56E-02	7.23E+00	1.81E-02	7.21E+00	7.23E-02	7.16E+00
ZrO2, (MT)	1.52E+02	2.59E+00		1.52E+02	2.59E+00	4.10E+02	1.03E+00	4.09E+02	4.10E+00	4.06E+02
ZrO2:2H2O, (MT)	3.95E+00	6.73E-02		3.95E+00	6.73E-02	1.07E+01	2.67E-02	1.06E+01	1.07E-01	1.06E+01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	275	276	278	279	280	281	282	283	284	318
Volume, Total Liters	4.94E+08	1.48E+09	9.20E+08	9.29E+06	9.20E+08	9.20E+08	8.74E+08	4.60E+07	3.50E+09	2.45E+07
Specific Gravity	1.17E+00	1.17E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.14E+00	1.04E+00
Total Mass Flow, (MT)	5.76E+05	1.73E+06	9.22E+05	9.31E+03	9.22E+05	9.22E+05	8.76E+05	4.61E+04	3.98E+06	2.54E+04
Cs and Ba, (MCi)	2.39E-01	7.18E-01	5.13E-03	5.18E-05	5.13E-03	5.13E-03	4.87E-03	2.57E-04	8.47E+00	
Sr and Y, (MCi)	4.33E+00	1.30E+01	9.29E-02	9.38E-04	9.29E-02	9.29E-02	8.83E-02	4.65E-03	1.38E+02	
Tc, (MCi)	1.84E-04	5.52E-04	3.94E-06	3.98E-08	3.94E-06	3.94E-06	3.75E-06	1.97E-07	5.88E-03	2.94E-06
TRU, (MCi)	5.21E-03	1.56E-02	1.12E-04	1.13E-06	1.12E-04	1.12E-04	1.06E-04	5.58E-06	2.07E-01	1.02E-05
Total MCi	4.58E+00	1.37E+01	9.81E-02	9.91E-04	9.81E-02	9.81E-02	9.32E-02	4.91E-03	1.47E+02	1.32E-05
Ag+, (MT)	4.30E-02	1.29E-01	9.22E-04	9.31E-06	9.22E-04	9.22E-04	8.76E-04	4.61E-05	1.38E+00	
Al(OH)4-, (MT)	2.00E-04	6.00E-04	4.29E-06	4.33E-08	4.29E-06	4.29E-06	4.07E-06	2.14E-07	9.16E-02	
Al+3, (MT)	1.99E+01	5.98E+01	4.27E-01	4.32E-03	4.27E-01	4.27E-01	4.06E-01	2.14E-02	2.11E+02	
Am+3, (MT)	9.45E-04	2.84E-03	2.03E-05	2.05E-07	2.03E-05	2.03E-05	1.93E-05	1.01E-06	3.02E-02	
As+5, (MT)	1.56E-02	4.67E-02	3.34E-04	3.37E-06	3.34E-04	3.34E-04	3.17E-04	1.67E-05	4.97E-01	
B+3, (MT)	3.11E-02	9.32E-02	6.66E-04	6.73E-06	6.66E-04	6.66E-04	6.33E-04	3.33E-05	9.93E-01	
Ba+2, (MT)	9.66E-02	2.90E-01	2.07E-03	2.09E-05	2.07E-03	2.07E-03	1.97E-03	1.04E-04	3.09E+00	
Be+2, (MT)	2.38E-04	7.13E-04	5.10E-06	5.15E-08	5.10E-06	5.10E-06	4.84E-06	2.55E-07	7.60E-03	
Bi+3, (MT)	6.12E+00	1.84E+01	1.31E-01	1.33E-03	1.31E-01	1.31E-01	1.25E-01	6.56E-03	1.96E+02	1.96E-04
Carbon14, (MT)	1.42E-05	4.25E-05	3.03E-07	3.07E-09	3.03E-07	3.03E-07	2.88E-07	1.52E-08	4.52E-04	
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	4.68E+00	1.41E+01	1.00E-01	1.01E-03	1.00E-01	1.00E-01	9.54E-02	5.02E-03	1.50E+02	
Cancrinite, (MT)	7.77E+01	2.33E+02	1.67E+00	1.68E-02	1.67E+00	1.67E+00	1.58E+00	8.33E-02	2.45E+02	
Cd+2, (MT)	2.48E-01	7.43E-01	5.31E-03	5.37E-05	5.31E-03	5.31E-03	5.05E-03	2.66E-04	7.92E+00	
Ce+3, (MT)	7.43E+00	2.23E+01	1.59E-01	1.61E-03	1.59E-01	1.59E-01	1.51E-01	7.96E-03	2.38E+02	2.38E-06
Cl-, (MT)	1.21E-01	3.62E-01	2.59E-03	2.61E-05	2.59E-03	2.59E-03	2.46E-03	1.29E-04	8.83E+00	
Cl2, (MT)										
CO, (MT)	4.12E-03	1.24E-02	8.83E-05	8.92E-07	8.83E-05	8.83E-05	8.39E-05	4.41E-06	1.90E+02	
CO2, (MT)	4.75E-02	1.42E-01	1.02E-03	1.03E-05	1.02E-03	1.02E-03	9.67E-04	5.09E-05	1.61E+00	
CO3-2, (MT)										
Cr(OH)4-, (MT)	4.92E-06	1.48E-05	1.05E-07	1.07E-09	1.05E-07	1.05E-07	1.00E-07	5.27E-09	2.25E-03	
Cr+3, (MT)	2.52E+00	7.55E+00	5.39E-02	5.45E-04	5.39E-02	5.39E-02	5.12E-02	2.70E-03	1.34E+02	
Cs+, (MT)	2.92E-03	8.74E-03	6.25E-05	6.31E-07	6.25E-05	6.25E-05	5.94E-05	3.12E-06	1.03E-01	
Cu+2, (MT)	2.33E-02	6.99E-02	5.00E-04	5.05E-06	5.00E-04	5.00E-04	4.75E-04	2.50E-05	7.45E-01	
DTPA-3, (MT)										
F-, (MT)	9.33E+03	2.80E+04	2.00E+02	2.02E+00	2.00E+02	2.00E+02	1.90E+02	1.00E+01	2.80E+04	2.65E-01
F2, (MT)										
Fe+3, (MT)	1.48E+01	4.43E+01	3.17E-01	3.20E-03	3.17E-01	3.17E-01	3.01E-01	1.58E-02	7.75E+02	
FeCN6-3, (MT)	1.52E-02	4.57E-02	3.27E-04	3.30E-06	3.27E-04	3.27E-04	3.10E-04	1.63E-05	6.98E+00	
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	275	276	278	279	280	281	282	283	284	318
H+, (MT)	2.23E+03	6.68E+03	6.28E+01	6.34E-01	6.28E+01	6.28E+01	5.96E+01	3.14E+00	1.42E+04	2.66E+01
H2, (MT)	8.95E-17	2.68E-16	2.73E-14	2.75E-16	2.73E-14	2.73E-14	2.59E-14	1.36E-15	5.87E-08	
H2O, (MT)	4.58E+05	1.38E+06	9.18E+05	9.28E+03	9.18E+05	9.18E+05	8.73E+05	4.59E+04	3.18E+06	2.33E+04
H2O2, (MT)	7.35E+01	2.21E+02	1.29E+02	1.30E+00	1.29E+02	1.29E+02	1.22E+02	6.44E+00	4.95E+02	
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	2.81E-04	8.44E-04	6.03E-06	6.09E-08	6.03E-06	6.03E-06	5.73E-06	3.02E-07	9.01E-03	
Hg2, (MT)	7.10E-05	2.13E-04	1.52E-06	1.54E-08	1.52E-06	1.52E-06	1.45E-06	7.61E-08	3.25E-02	
I-, (MT)	6.31E-01	1.89E+00	1.35E-02	1.37E-04	1.35E-02	1.35E-02	1.29E-02	6.77E-04	2.02E+01	
I2, (MT)										
K+, (MT)	6.57E-01	1.97E+00	1.41E-02	1.42E-04	1.41E-02	1.41E-02	1.34E-02	7.04E-04	2.13E+01	
La+3, (MT)	6.63E-01	1.99E+00	1.42E-02	1.44E-04	1.42E-02	1.42E-02	1.35E-02	7.11E-04	2.12E+01	2.12E-07
Li+, (MT)	7.69E-04	2.31E-03	1.65E-05	1.67E-07	1.65E-05	1.65E-05	1.57E-05	8.24E-07	2.50E-02	
Mg+2, (MT)	3.44E-01	1.03E+00	7.37E-03	7.44E-05	7.37E-03	7.37E-03	7.00E-03	3.69E-04	1.10E+01	
Mn+4, (MT)	4.17E+00	1.25E+01	8.94E-02	9.03E-04	8.94E-02	8.94E-02	8.50E-02	4.47E-03	1.34E+02	
MnO2, (MT)	7.56E-06	2.27E-05	1.62E-07	1.64E-09	1.62E-07	1.62E-07	1.54E-07	8.10E-09	3.52E-02	
Mo+6, (MT)	2.52E-02	7.57E-02	5.41E-04	5.46E-06	5.41E-04	5.41E-04	5.14E-04	2.70E-05	8.87E-01	
MoO4-2, (MT)	9.35E-05	2.81E-04	2.00E-06	2.02E-08	2.00E-06	2.00E-06	1.90E-06	1.00E-07	4.28E-02	
N2, (MT)	4.84E-04	1.45E-03	1.04E-05	1.05E-07	1.04E-05	1.04E-05	9.86E-06	5.19E-07	1.76E-02	
N2O, (MT)										
Na+, (MT)	2.76E+02	8.29E+02	5.92E+00	5.98E-02	5.92E+00	5.92E+00	5.63E+00	2.96E-01	2.82E+03	
NH2OH, (MT)										1.82E+00
NH3, (MT)	3.10E-04	9.30E-04	6.65E-06	6.71E-08	6.65E-06	6.65E-06	6.31E-06	3.32E-07	1.42E-01	
NH4+, (MT)	6.53E-06	1.96E-05	1.40E-07	1.41E-09	1.40E-07	1.40E-07	1.33E-07	7.00E-09	2.99E-03	
Ni+3, (MT)	7.19E-01	2.16E+00	1.54E-02	1.56E-04	1.54E-02	1.54E-02	1.46E-02	7.70E-04	1.88E+02	
NO, (MT)										
NO2, (MT)	4.22E-02	1.27E-01	9.05E-04	9.14E-06	9.05E-04	9.05E-04	8.60E-04	4.53E-05	1.53E+00	
NO2-, (MT)										
NO3-, (MT)	1.06E+05	3.18E+05	3.20E+03	3.23E+01	3.20E+03	3.20E+03	3.04E+03	1.60E+02	7.52E+05	1.68E+03
Np+4, (MT)	2.78E-03	8.33E-03	5.96E-05	6.02E-07	5.96E-05	5.96E-05	5.66E-05	2.98E-06	1.46E-01	1.46E-05
O2, (MT)	2.44E-03	7.30E-03	5.22E-05	5.27E-07	5.22E-05	5.22E-05	4.96E-05	2.61E-06	1.09E+02	
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										2.80E+02
P2O5, (MT)										
Pb+4, (MT)	1.03E-01	3.08E-01	2.20E-03	2.22E-05	2.20E-03	2.20E-03	2.09E-03	1.10E-04	3.28E+00	
PO4-3, (MT)	7.41E+00	2.22E+01	1.59E-01	1.60E-03	1.59E-01	1.59E-01	1.51E-01	7.94E-03	2.47E+02	
POLY, (MT)	6.10E-03	1.83E-02	8.62E-03	8.71E-05	8.62E-03	8.62E-03	8.19E-03	4.31E-04	2.23E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	275	276	278	279	280	281	282	283	284	318
PTA-3, (MT)	1.67E-02	5.00E-02	3.58E-04	3.61E-06	3.58E-04	3.58E-04	3.40E-04	1.79E-05	5.42E-01	
Pu+4, (MT)	8.64E-03	2.59E-02	1.85E-04	1.87E-06	1.85E-04	1.85E-04	1.76E-04	9.27E-06	4.54E-01	4.49E-05
Si+4, (MT)	2.48E+00	7.43E+00	5.31E-02	5.36E-04	5.31E-02	5.31E-02	5.04E-02	2.65E-03	7.89E+01	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	4.00E-01	1.20E+00	8.56E-03	8.65E-05	8.56E-03	8.56E-03	8.14E-03	4.28E-04	1.31E+02	
Sr+2, (MT)	1.15E+00	3.45E+00	2.47E-02	2.49E-04	2.47E-02	2.47E-02	2.35E-02	1.23E-03	3.68E+01	
Sugar, (MT)										
TcO4-, (MT)	1.77E-02	5.32E-02	3.80E-04	3.84E-06	3.80E-04	3.80E-04	3.61E-04	1.90E-05	5.67E-01	2.84E-04
Ti+4, (MT)	6.35E-03	1.90E-02	1.36E-04	1.38E-06	1.36E-04	1.36E-04	1.29E-04	6.80E-06	1.90E-02	
Tot Org Carbon, (MT)	3.62E+00	1.09E+01	7.75E-02	7.83E-04	7.75E-02	7.75E-02	7.36E-02	3.88E-03	1.16E+02	
UO2+2, (MT)	5.20E+01	1.56E+02	1.12E+00	1.13E-02	1.12E+00	1.12E+00	1.06E+00	5.57E-02	1.66E+03	1.00E+02
V+5, (MT)	5.87E-03	1.76E-02	1.26E-04	1.27E-06	1.26E-04	1.26E-04	1.20E-04	6.29E-06	1.88E-01	
W+6, (MT)	3.09E-08	9.28E-08	6.63E-10	6.70E-12	6.63E-10	6.63E-10	6.30E-10	3.32E-11	1.42E-05	
Zn+2, (MT)	2.95E-02	8.86E-02	6.33E-04	6.40E-06	6.33E-04	6.33E-04	6.01E-04	3.17E-05	9.44E-01	
Zr+4, (MT)	1.60E+01	4.79E+01	3.42E-01	3.46E-03	3.42E-01	3.42E-01	3.25E-01	1.71E-02	5.10E+02	
ZrO2:2H2O, (MT)	1.64E-37	4.93E-37							3.96E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	275	276	278	279	280	281	282	283	284	315
Total Mass Flow, (MT)	7.00E+02	2.10E+03	1.02E+05	1.04E+03	1.02E+05	1.02E+05	9.73E+04	5.12E+03	4.61E+03	
Cs and Ba, (MCi)	4.99E-04	1.50E-03	7.32E-02	7.39E-04	7.32E-02	7.32E-02	6.95E-02	3.66E-03	1.91E-02	
Sr and Y, (MCi)	9.06E-03	2.72E-02	1.33E+00	1.34E-02	1.33E+00	1.33E+00	1.26E+00	6.64E-02	3.48E-01	
Tc, (MCi)	6.08E-07	1.82E-06	8.91E-05	9.00E-07	8.91E-05	8.91E-05	8.46E-05	4.45E-06	1.62E-05	
TRU, (MCi)	4.36E-05	1.31E-04	6.38E-03	6.45E-05	6.38E-03	6.38E-03	6.06E-03	3.19E-04	6.25E-04	
Total MCi	9.61E-03	2.88E-02	1.41E+00	1.42E-02	1.41E+00	1.41E+00	1.34E+00	7.03E-02	3.67E-01	
Ag+, (MT)	8.99E-05	2.70E-04	1.32E-02	1.33E-04	1.32E-02	1.32E-02	1.25E-02	6.58E-04	3.45E-03	
Ag2O, (MT)	1.95E-01	5.84E-01	2.85E+01	2.88E-01	2.85E+01	2.85E+01	2.71E+01	1.42E+00	1.27E+00	
Al+3, (MT)	3.94E-01	1.18E+00	5.76E+01	5.82E-01	5.76E+01	5.76E+01	5.47E+01	2.88E+00	3.96E+00	
Al2O3, (MT)	2.16E+01	6.48E+01	3.16E+03	3.19E+01	3.16E+03	3.16E+03	3.00E+03	1.58E+02	1.41E+02	
Am+3, (MT)	1.97E-06	5.92E-06	2.89E-04	2.92E-06	2.89E-04	2.89E-04	2.75E-04	1.45E-05	7.59E-05	
Am2O3, (MT)	6.08E-09	1.82E-08	2.41E-06	2.43E-08	2.41E-06	2.41E-06	2.29E-06	1.20E-07	3.69E-08	
APM-, (MT)	4.70E-04	1.41E-03	6.88E-02	6.95E-04	6.88E-02	6.88E-02	6.54E-02	3.44E-03	3.06E-03	
As+5, (MT)	3.25E-05	9.76E-05	4.76E-03	4.81E-05	4.76E-03	4.76E-03	4.52E-03	2.38E-04	1.25E-03	
As2O5, (MT)	2.07E-01	6.20E-01	3.03E+01	3.06E-01	3.03E+01	3.03E+01	2.88E+01	1.51E+00	1.35E+00	
B+3, (MT)	6.49E-05	1.95E-04	9.50E-03	9.60E-05	9.50E-03	9.50E-03	9.03E-03	4.75E-04	2.49E-03	
B2O3, (MT)	7.07E-03	2.12E-02	1.04E+00	1.05E-02	1.04E+00	1.04E+00	9.84E-01	5.18E-02	4.61E-02	
Ba+2, (MT)	2.02E-04	6.05E-04	2.95E-02	2.98E-04	2.95E-02	2.95E-02	2.81E-02	1.48E-03	7.75E-03	
BaO, (MT)	1.29E-03	3.86E-03	1.88E-01	1.90E-03	1.88E-01	1.88E-01	1.79E-01	9.41E-03	8.39E-03	
Be+2, (MT)	4.97E-07	1.49E-06	7.28E-05	7.35E-07	7.28E-05	7.28E-05	6.91E-05	3.64E-06	1.91E-05	
BeO, (MT)	2.64E-02	7.92E-02	3.87E+00	3.91E-02	3.87E+00	3.87E+00	3.67E+00	1.93E-01	1.72E-01	
Bi+3, (MT)	1.28E-02	3.84E-02	1.87E+00	1.89E-02	1.87E+00	1.87E+00	1.78E+00	9.37E-02	4.92E-01	
Bi2O3, (MT)	4.26E-01	1.28E+00	6.24E+01	6.30E-01	6.24E+01	6.24E+01	5.93E+01	3.12E+00	2.78E+00	
Carbon14, (MT)	2.96E-08	8.87E-08	4.33E-06	4.37E-08	4.33E-06	4.33E-06	4.11E-06	2.17E-07	1.14E-06	
Ca+2, (MT)	9.79E-03	2.94E-02	1.43E+00	1.45E-02	1.43E+00	1.43E+00	1.36E+00	7.16E-02	3.76E-01	
Cancrinite, (MT)	1.41E+01	4.21E+01	2.06E+03	2.08E+01	2.06E+03	2.06E+03	1.95E+03	1.03E+02	9.71E+01	
CaO, (MT)	3.05E-01	9.13E-01	4.46E+01	4.50E-01	4.46E+01	4.46E+01	4.23E+01	2.23E+00	1.99E+00	
Cd+2, (MT)	5.18E-04	1.55E-03	7.58E-02	7.66E-04	7.58E-02	7.58E-02	7.20E-02	3.79E-03	1.99E-02	
CdO, (MT)	1.66E-02	4.98E-02	2.43E+00	2.46E-02	2.43E+00	2.43E+00	2.31E+00	1.22E-01	1.08E-01	
Ce+3, (MT)	1.55E-02	4.66E-02	2.27E+00	2.30E-02	2.27E+00	2.27E+00	2.16E+00	1.14E-01	5.97E-01	
Ce2O3, (MT)	4.04E-01	1.21E+00	5.91E+01	5.97E-01	5.91E+01	5.91E+01	5.61E+01	2.95E+00	2.63E+00	
Cl-, (MT)	2.28E-04	6.84E-04	3.34E-02	3.37E-04	3.34E-02	3.34E-02	3.17E-02	1.67E-03	8.76E-03	
CO3-2, (MT)	1.47E-02	4.40E-02	2.15E+00	2.17E-02	2.15E+00	2.15E+00	2.04E+00	1.07E-01	5.63E-01	
Cr+3, (MT)	4.50E-02	1.35E-01	6.58E+00	6.65E-02	6.58E+00	6.58E+00	6.25E+00	3.29E-01	4.52E-01	
Cr2O3, (MT)	1.22E-01	3.66E-01	1.79E+01	1.80E-01	1.79E+01	1.79E+01	1.70E+01	8.93E-01	7.96E-01	
Cs+, (MT)	6.04E-06	1.81E-05	8.85E-04	8.94E-06	8.85E-04	8.85E-04	8.40E-04	4.42E-05	2.32E-04	
Cs2O, (MT)	4.77E-08	1.43E-07	7.05E-06	7.12E-08	7.05E-06	7.05E-06	6.70E-06	3.52E-07	3.12E-07	
Cu+2, (MT)	4.87E-05	1.46E-04	7.13E-03	7.20E-05	7.13E-03	7.13E-03	6.78E-03	3.57E-04	1.87E-03	
CuO, (MT)	1.23E-01	3.68E-01	1.80E+01	1.82E-01	1.80E+01	1.80E+01	1.71E+01	8.99E-01	8.01E-01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	275	276	278	279	280	281	282	283	284	318
F-, (MT)	3.90E-03	1.17E-02	5.70E-01	5.76E-03	5.70E-01	5.70E-01	5.42E-01	2.85E-02	1.50E-01	
Fe+3, (MT)	2.64E-01	7.93E-01	3.87E+01	3.91E-01	3.87E+01	3.87E+01	3.68E+01	1.94E+00	2.66E+00	
Fe2O3, (MT)	5.31E+00	1.59E+01	7.78E+02	7.86E+00	7.78E+02	7.78E+02	7.39E+02	3.89E+01	3.47E+01	
H2O, (MT)	1.50E-01	4.49E-01	2.19E+01	2.21E-01	2.19E+01	2.19E+01	2.08E+01	1.10E+00	9.51E-01	
Hg+2, (MT)	5.88E-07	1.76E-06	8.61E-05	8.69E-07	8.61E-05	8.61E-05	8.17E-05	4.30E-06	2.26E-05	
I-, (MT)	1.32E-03	3.96E-03	1.93E-01	1.95E-03	1.93E-01	1.93E-01	1.84E-01	9.66E-03	5.07E-02	
K+, (MT)	1.37E-03	4.11E-03	2.01E-01	2.03E-03	2.01E-01	2.01E-01	1.91E-01	1.00E-02	5.27E-02	
K2O, (MT)	1.44E-03	4.30E-03	2.10E-01	2.12E-03	2.10E-01	2.10E-01	2.00E-01	1.05E-02	9.36E-03	
La+3, (MT)	1.39E-03	4.16E-03	2.03E-01	2.05E-03	2.03E-01	2.03E-01	1.93E-01	1.02E-02	5.33E-02	
La2O3, (MT)	3.61E-02	1.08E-01	5.28E+00	5.33E-02	5.28E+00	5.28E+00	5.02E+00	2.64E-01	2.35E-01	
Li+, (MT)	1.60E-06	4.81E-06	2.35E-04	2.37E-06	2.35E-04	2.35E-04	2.23E-04	1.17E-05	6.16E-05	
Li2O, (MT)	3.67E-06	1.10E-05	5.37E-04	5.42E-06	5.37E-04	5.37E-04	5.10E-04	2.68E-05	2.39E-05	
Mg+2, (MT)	7.18E-04	2.16E-03	1.05E-01	1.06E-03	1.05E-01	1.05E-01	9.99E-02	5.26E-03	2.76E-02	
MgO, (MT)	2.88E-02	8.64E-02	4.22E+00	4.26E-02	4.22E+00	4.22E+00	4.01E+00	2.11E-01	1.88E-01	
MnO2, (MT)	1.38E-02	4.14E-02	2.02E+00	2.04E-02	2.02E+00	2.02E+00	1.92E+00	1.01E-01	5.30E-01	
Mo+6, (MT)	5.23E-05	1.57E-04	7.66E-03	7.74E-05	7.66E-03	7.66E-03	7.28E-03	3.83E-04	2.01E-03	
MoO3, (MT)	1.25E-02	3.76E-02	1.84E+00	1.86E-02	1.84E+00	1.84E+00	1.74E+00	9.18E-02	8.18E-02	
Na+, (MT)	5.77E-01	1.73E+00	8.45E+01	8.53E-01	8.45E+01	8.45E+01	8.02E+01	4.22E+00	2.31E+01	
Na2O, (MT)	1.59E+00	4.76E+00	2.32E+02	2.35E+00	2.32E+02	2.32E+02	2.21E+02	1.16E+01	1.04E+01	
Ni(OH)3, (MT)										
Ni+3, (MT)	6.93E-04	2.08E-03	1.02E-01	1.03E-03	1.02E-01	1.02E-01	9.64E-02	5.07E-03	2.66E-02	
Ni2FECN6, (MT)	3.61E-01	1.08E+00	5.29E+01	5.34E-01	5.29E+01	5.29E+01	5.02E+01	2.64E+00	2.35E+00	
Ni2O3, (MT)	3.84E-01	1.15E+00	5.63E+01	5.69E-01	5.63E+01	5.63E+01	5.35E+01	2.81E+00	2.51E+00	
NiO, (MT)										
NO2-, (MT)	4.82E-03	1.45E-02	7.05E-01	7.12E-03	7.05E-01	7.05E-01	6.70E-01	3.53E-02	1.85E-01	
NO3-, (MT)										
Np+4, (MT)	4.97E-05	1.49E-04	7.28E-03	7.35E-05	7.28E-03	7.28E-03	6.92E-03	3.64E-04	5.01E-04	
NpO2, (MT)	9.55E-06	2.87E-05	1.40E-03	1.42E-05	1.40E-03	1.40E-03	1.33E-03	7.01E-05	6.24E-05	
OH-, (MT)	6.45E+02	1.94E+03	9.45E+04	9.54E+02	9.45E+04	9.45E+04	8.98E+04	4.72E+03	4.21E+03	
P2O5, (MT)	5.39E+00	1.62E+01	7.90E+02	7.98E+00	7.90E+02	7.90E+02	7.50E+02	3.95E+01	3.52E+01	
P2O5:24W, (MT)	3.40E-05	1.02E-04	4.98E-03	5.03E-05	4.98E-03	4.98E-03	4.73E-03	2.49E-04	1.31E-03	
Pb+4, (MT)	2.14E-04	6.43E-04	3.14E-02	3.17E-04	3.14E-02	3.14E-02	2.98E-02	1.57E-03	8.23E-03	
PbO2, (MT)	6.43E-01	1.93E+00	9.41E+01	9.51E-01	9.41E+01	9.41E+01	8.94E+01	4.71E+00	4.19E+00	
PO4-3, (MT)	1.54E-02	4.63E-02	2.26E+00	2.28E-02	2.26E+00	2.26E+00	2.15E+00	1.13E-01	5.93E-01	
POLY, (MT)	2.69E-03	8.08E-03	1.07E+00	1.08E-02	1.07E+00	1.07E+00	1.01E+00	5.33E-02	8.08E-03	
Pu+4, (MT)	1.55E-04	4.64E-04	2.27E-02	2.29E-04	2.27E-02	2.27E-02	2.15E-02	1.13E-03	1.56E-03	
PuO2, (MT)	7.94E-06	2.38E-05	1.16E-03	1.18E-05	1.16E-03	1.16E-03	1.11E-03	5.82E-05	5.19E-05	
Si+4, (MT)	5.16E-03	1.55E-02	7.55E-01	7.63E-03	7.55E-01	7.55E-01	7.18E-01	3.78E-02	1.98E-01	
SiO2, (MT)	2.63E-01	7.89E-01	3.85E+01	3.89E-01	3.85E+01	3.85E+01	3.66E+01	1.92E+00	1.71E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	275	276	278	279	280	281	282	283	284	318
SO3, (MT)										
SO4-2, (MT)	2.56E-04	7.69E-04	3.75E-02	3.79E-04	3.75E-02	3.75E-02	3.57E-02	1.88E-03	9.85E-03	
Sr+2, (MT)	2.40E-03	7.21E-03	3.52E-01	3.56E-03	3.52E-01	3.52E-01	3.34E-01	1.76E-02	9.23E-02	
SrO, (MT)	6.47E-06	1.94E-05	9.48E-04	9.58E-06	9.48E-04	9.48E-04	9.01E-04	4.74E-05	4.22E-05	
Tc2O7, (MT)	2.07E-05	6.20E-05	3.03E-03	3.06E-05	3.03E-03	3.03E-03	2.88E-03	1.51E-04	1.35E-04	
TcO4-, (MT)	3.71E-05	1.11E-04	5.43E-03	5.48E-05	5.43E-03	5.43E-03	5.16E-03	2.71E-04	1.42E-03	
TiO2, (MT)	4.64E-05	1.39E-04	6.80E-03	6.87E-05	6.80E-03	6.80E-03	6.46E-03	3.40E-04	3.03E-04	
Tot Org Carbon, (MT)	7.56E-03	2.27E-02	1.11E+00	1.12E-02	1.11E+00	1.11E+00	1.05E+00	5.53E-02	2.90E-01	
U3O8, (MT)	1.58E-03	4.73E-03	2.31E-01	2.33E-03	2.31E-01	2.31E-01	2.19E-01	1.15E-02	1.03E-02	
UO2+2, (MT)	1.09E-01	3.26E-01	1.59E+01	1.61E-01	1.59E+01	1.59E+01	1.51E+01	7.96E-01	4.18E+00	
UO3, (MT)										
V+5, (MT)	1.23E-05	3.68E-05	1.80E-03	1.81E-05	1.80E-03	1.80E-03	1.71E-03	8.98E-05	4.71E-04	
V2O5, (MT)	4.74E-02	1.42E-01	6.94E+00	7.01E-02	6.94E+00	6.94E+00	6.59E+00	3.47E-01	3.09E-01	
WO2, (MT)										
WO3, (MT)	1.00E-01	3.01E-01	1.47E+01	1.48E-01	1.47E+01	1.47E+01	1.39E+01	7.33E-01	6.53E-01	
Zn+2, (MT)	6.17E-05	1.85E-04	9.04E-03	9.13E-05	9.04E-03	9.04E-03	8.58E-03	4.52E-04	2.37E-03	
ZnO, (MT)	4.65E-02	1.40E-01	6.81E+00	6.88E-02	6.81E+00	6.81E+00	6.47E+00	3.41E-01	3.04E-01	
Zr+4, (MT)	1.81E-02	5.42E-02	2.65E+00	2.67E-02	2.65E+00	2.65E+00	2.51E+00	1.32E-01	6.94E-01	
ZrO2, (MT)	1.03E+00	3.08E+00	1.50E+02	1.52E+00	1.50E+02	1.50E+02	1.43E+02	7.51E+00	6.69E+00	
ZrO2:2H2O, (MT)	2.67E-02	8.00E-02	3.91E+00	3.95E-02	3.91E+00	3.91E+00	3.71E+00	1.95E-01	1.03E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	322	323	324	325	326	327	328	329	330	331
Volume, Total Liters	6.44E+06	5.60E+07	9.81E+10	1.82E+09	9.63E+10	9.63E+10	1.11E+04	9.63E+10	4.21E+06	1.78E+09
Specific Gravity	1.00E+00	1.05E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.33E+00	1.00E+00
Total Mass Flow, (MT)	6.46E+03	5.86E+04	9.81E+07	1.82E+06	9.63E+07	9.63E+07	1.11E+01	9.63E+07	5.59E+03	1.78E+06
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Caocrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	322	323	324	325	326	327	328	329	330	331
H+, (MT)	6.46E-01		9.88E+02		9.88E+02	8.89E+02		8.89E+02	4.47E+01	5.42E+01
H2, (MT)										
H2O, (MT)	6.42E+03	4.76E+02	9.80E+07	1.77E+06	9.63E+07	9.63E+07		9.63E+07	2.79E+03	1.77E+06
H2O2, (MT)			4.58E+02		4.58E+02					4.58E+02
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)										
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)										
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	4.00E+01	7.63E+02	6.08E+04	7.63E-04	6.15E+04	5.47E+04		5.47E+04	2.75E+03	3.33E+03
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)		5.57E+04		5.56E+04	1.11E+01	1.11E+01	1.11E+01			
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)			3.11E-02		3.11E-02					3.11E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	322	323	324	325	326	327	328	329	330	331
PTA-3, (MT)										
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)		1.66E+03		1.66E-03	1.66E+03					
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	322	323	324	325	326	327	328	329	330	331
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	322	323	324	325	326	327	328	329	330	331
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	322	323	324	325	326	327	328	329	330	331
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	332	334	338	339	340	343	344	347	348	349
Volume, Total Liters	1.88E+07	1.88E+07	2.45E+07	1.43E+07		2.99E+05	5.59E+07	4.45E+04	5.60E+07	1.78E+09
Specific Gravity	1.30E+00	1.30E+00	1.04E+00	1.00E+00		1.04E+00	1.00E+00	1.39E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.45E+04	2.45E+04	2.55E+04	1.43E+04		3.11E+02	5.59E+04	6.19E+01	5.60E+04	1.78E+06
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)			2.94E-06							
TRU, (MCi)			1.02E-05							
Total MCi			1.32E-05							
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)			1.96E-04							
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)			2.38E-06							
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)						5.55E+00				5.55E+00
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)			2.65E-01							
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	332	334	338	339	340	343	344	347	348	349
H+, (MT)	9.88E+01	9.88E+01	2.66E+01			9.33E-02		5.64E-01	5.64E-01	9.33E-02
H2, (MT)										
H2O, (MT)	1.54E+04	1.54E+04	2.34E+04			3.03E+02		2.66E+01	2.66E+01	1.77E+06
H2O2, (MT)	4.58E+02	4.58E+02								
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)			2.12E-07							
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)						2.13E+00				2.13E+00
NH2OH, (MT)			1.82E+00							
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	6.84E+03	6.84E+03	1.68E+03					3.47E+01	3.47E+01	7.63E-04
Np+4, (MT)			1.46E-05							
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)			2.80E+02	1.43E+04			5.59E+04		5.59E+04	1.40E+04
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)	3.11E-02	3.11E-02								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	332	334	338	339	340	343	344	347	348	349
PTA-3, (MT)										
Pu+4, (MT)			4.49E-05							
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										
TcO4-, (MT)			2.84E-04							
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)	1.66E+03	1.66E+03	1.00E+02							1.66E-03
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	332	334	338	339	340	343	344	347	348	349
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Bc+2, (MT)										
BcO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Num: Solid Components	332	334	338	339	340	343	344	347	348	349
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	332	334	338	339	340	343	344	347	348	349
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	350	351	352	353	354	355	356	357	400	401
Volume, Total Liters	9.33E+05	1.78E+09	2.20E+07	2.81E+05	1.96E+07	2.18E+06	2.44E+06	2.44E+06	3.60E+08	1.84E+09
Specific Gravity	1.54E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.40E+00	1.40E+00	1.40E+00	1.21E+00
Total Mass Flow, (MT)	1.44E+03	1.78E+06	2.20E+04	2.81E+02	1.96E+04	2.18E+03	3.41E+03	3.41E+03	5.04E+05	2.22E+06
Cs and Ba, (MCi)									8.47E+00	
Sr and Y, (MCi)									1.38E+02	
Tc, (MCi)							2.94E-06	2.94E-06	5.87E-03	
TRU, (MCi)							1.02E-05	1.02E-05	1.05E-05	
Total MCi							1.32E-05	1.32E-05	1.47E+02	
Ag+, (MT)									1.38E+00	
Al(OH)4-, (MT)									9.16E-02	
Al+3, (MT)									2.35E+02	
Am+3, (MT)									3.02E-06	
As+5, (MT)									4.97E-01	
B+3, (MT)									9.93E-01	
Ba+2, (MT)									3.09E+00	
Be+2, (MT)									7.60E-03	
Bi+3, (MT)							1.96E-04	1.96E-04	9.78E-01	
Carbon14, (MT)									4.52E-04	
C2H4O3, (MT)										
C2O4-2, (MT)									2.16E+04	
Ca+2, (MT)									1.50E+02	
Cancrinite, (MT)									2.45E+02	
Cd+2, (MT)									7.92E+00	
Ce+3, (MT)							2.38E-06	2.38E-06	2.38E-02	
Cl-, (MT)									8.83E+00	
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)		5.55E+00								
Cr(OH)4-, (MT)									2.25E-03	
Cr+3, (MT)									1.34E+02	
Cs+, (MT)									1.03E-01	
Cu+2, (MT)									7.45E-01	
DTPA-3, (MT)										
F-, (MT)							2.65E-01	2.65E-01	2.79E+04	
F2, (MT)										
Fe+3, (MT)									7.75E+02	
FeCN6-3, (MT)									6.98E+00	
FESA, (MT)									7.92E+03	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	350	351	352	353	354	355	356	357	400	401
H+, (MT)							2.66E+01	2.66E+01	2.51E+03	1.23E+04
H2, (MT)			1.11E-01	1.11E-01						
H2O, (MT)	7.18E+02	1.77E+06	2.18E+04		1.96E+04	2.18E+03	1.60E+03	1.60E+03	4.38E+05	1.45E+06
H2O2, (MT)									4.95E+02	
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)									9.01E-03	
Hg2, (MT)									3.25E-02	
I-, (MT)									2.02E+01	
I2, (MT)										
K+, (MT)									2.13E+01	
La+3, (MT)							2.12E-07	2.12E-07	2.12E-03	
Li+, (MT)									2.50E-02	
Mg+2, (MT)									1.10E+01	
Mn+4, (MT)									1.34E+02	
MnO2, (MT)									3.52E-02	
Mo+6, (MT)									8.87E-01	
MoO4-2, (MT)									4.28E-02	
N2, (MT)										
N2O, (MT)			1.22E+00	1.22E+00						
Na+, (MT)	4.13E+02	4.15E+02							2.82E+03	
NH2OH, (MT)										
NH3, (MT)									1.42E-01	
NH4+, (MT)									2.99E-03	
Ni+3, (MT)									1.88E+02	
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)		7.63E-04					1.68E+03	1.68E+03		7.58E+05
Np+4, (MT)							1.46E-05	1.46E-05		
O2, (MT)										
OH-, (MT)	3.05E+02	3.03E+02								
ORGS, (MT)										
ORGT, (MT)										2.65E+03
ORGU, (MT)		1.40E+04	2.80E+02	2.80E+02						
P2O5, (MT)										
Pb+4, (MT)									3.28E+00	
PO4-3, (MT)									2.47E+02	
POLY, (MT)									2.23E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	350	351	352	353	354	355	356	357	400	401
PTA-3, (MT)									5.42E-01	
Pu+4, (MT)							4.49E-05	4.49E-05	4.54E-07	
Si+4, (MT)									7.89E+01	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)									1.31E+02	
Sr+2, (MT)									3.68E+01	
Sugar, (MT)										
TcO4-, (MT)							2.84E-04	2.84E-04	5.66E-01	
Ti+4, (MT)									1.90E-02	
Tot Org Carbon, (MT)									1.16E+02	
UO2+2, (MT)		1.66E-03					1.00E+02	1.00E+02	1.76E-05	
V+5, (MT)									1.88E-01	
W+6, (MT)									1.42E-05	
Zn+2, (MT)									9.44E-01	
Zr+4, (MT)									5.09E+02	
ZrO2:2H2O, (MT)									3.96E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	350	351	352	353	354	355	356	357	400	401
Total Mass Flow, (MT)									4.61E+03	
Cs and Ba, (MCi)									1.91E-02	
Sr and Y, (MCi)									3.48E-01	
Tc, (MCi)									1.62E-05	
TRU, (MCi)									6.25E-04	
Total MCi									3.67E-01	
Ag+, (MT)									3.45E-03	
Ag2O, (MT)									1.27E+00	
Al+3, (MT)									3.96E+00	
Al2O3, (MT)									1.41E+02	
Am+3, (MT)									7.59E-05	
Am2O3, (MT)										
APM-, (MT)									3.06E-03	
As+5, (MT)									1.25E-03	
As2O5, (MT)									1.35E+00	
B+3, (MT)									2.49E-03	
B2O3, (MT)									4.61E-02	
Ba+2, (MT)									7.75E-03	
BaO, (MT)									8.39E-03	
Be+2, (MT)									1.91E-05	
BeO, (MT)									1.72E-01	
Bi+3, (MT)									4.92E-01	
Bi2O3, (MT)									2.78E+00	
Carbon14, (MT)									1.14E-06	
Ca+2, (MT)									3.76E-01	
Cancrinite, (MT)									9.71E+01	
CaO, (MT)									1.99E+00	
Cd+2, (MT)									1.99E-02	
CdO, (MT)									1.08E-01	
Ce+3, (MT)									5.97E-01	
Ce2O3, (MT)									2.63E+00	
Cl-, (MT)									8.76E-03	
CO3-2, (MT)									5.63E-01	
Cr+3, (MT)									4.52E-01	
Cr2O3, (MT)									7.96E-01	
Cs+, (MT)									2.32E-04	
Cs2O, (MT)									3.12E-07	
Cu+2, (MT)									1.87E-03	
CuO, (MT)									8.01E-01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	350	351	352	353	354	355	356	357	400	401
F-, (MT)									1.50E-01	
Fe+3, (MT)									2.66E+00	
Fe2O3, (MT)									3.47E+01	
H2O, (MT)									9.51E-01	
Hg+2, (MT)									2.26E-05	
I-, (MT)									5.07E-02	
K+, (MT)									5.27E-02	
K2O, (MT)									9.36E-03	
La+3, (MT)									5.33E-02	
La2O3, (MT)									2.35E-01	
Li+, (MT)									6.16E-05	
Li2O, (MT)									2.39E-05	
Mg+2, (MT)									2.76E-02	
MgO, (MT)									1.88E-01	
MnO2, (MT)									5.30E-01	
Mo+6, (MT)									2.01E-03	
MoO3, (MT)									8.18E-02	
Na+, (MT)									2.31E+01	
Na2O, (MT)									1.04E+01	
Ni(OH)3, (MT)										
Ni+3, (MT)									2.66E-02	
Ni2FECN6, (MT)									2.35E+00	
Ni2O3, (MT)									2.51E+00	
NiO, (MT)										
NO2-, (MT)									1.85E-01	
NO3-, (MT)										
Np+4, (MT)									5.01E-04	
NpO2, (MT)									6.24E-05	
OH-, (MT)									4.21E+03	
P2O5, (MT)									3.52E+01	
P2O5:24W, (MT)									1.31E-03	
Pb+4, (MT)									8.23E-03	
PbO2, (MT)									4.19E+00	
PO4-3, (MT)									5.93E-01	
POLY, (MT)									8.08E-03	
Pu+4, (MT)									1.56E-03	
PuO2, (MT)									5.19E-05	
Si+4, (MT)									1.98E-01	
SiO2, (MT)									1.71E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	350	351	352	353	354	355	356	357	400	401
SO3, (MT)										
SO4-2, (MT)									9.85E-03	
Sr+2, (MT)									9.23E-02	
SrO, (MT)									4.22E-05	
Tc2O7, (MT)									1.35E-04	
TcO4-, (MT)									1.42E-03	
TiO2, (MT)									3.03E-04	
Tot Org Carbon, (MT)									2.90E-01	
U3O8, (MT)									1.03E-02	
UO2+2, (MT)									4.18E+00	
UO3, (MT)										
V+5, (MT)									4.71E-04	
V2O5, (MT)									3.09E-01	
WO2, (MT)										
WO3, (MT)									6.53E-01	
Zn+2, (MT)									2.37E-03	
ZnO, (MT)									3.04E-01	
Zr+4, (MT)									6.94E-01	
ZrO2, (MT)									6.69E+00	
ZrO2:2H2O, (MT)									1.03E+00	

Table A-1. Material Balance for Integrated-Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	402	403	404	405	410	411	412	413	416	417
Volume, Total Liters	3.92E+08	2.65E+06	1.45E+09	3.60E+08	7.06E+07	2.88E+06	4.30E+08	2.89E+08	9.43E+07	2.87E+06
Specific Gravity	1.97E+00	1.00E+00	1.00E+00	1.40E+00	1.00E+00	1.00E+00	1.34E+00	1.00E+00	1.02E+00	1.00E+00
Total Mass Flow, (MT)	7.71E+05	2.65E+03	1.45E+06	5.04E+05	7.06E+04	2.88E+05	5.74E+05	2.89E+05	9.58E+04	2.87E+05
Cs and Ba, (MCi)				8.47E+00			8.47E+00			
Sr and Y, (MCi)				1.38E+02			1.38E-02	1.38E+02		
Tc, (MCi)				5.87E-03			5.87E-07	5.87E-03		
TRU, (MCi)				1.05E-05			1.05E-05			
Total MCi				1.47E+02			8.49E+00	1.38E+02		
Ag+, (MT)				1.38E+00			1.38E+00			
Al(OH)4-, (MT)				9.16E-02			9.16E-02			
Al+3, (MT)				2.35E+02			2.35E+02			
Am+3, (MT)				3.02E-06			3.02E-06			
As+5, (MT)				4.97E-01			4.97E-01			
B+3, (MT)				9.93E-01			9.93E-01			
Ba+2, (MT)				3.09E+00			3.09E-04	3.09E+00		
Be+2, (MT)				7.60E-03			7.60E-03			
Bi+3, (MT)				9.78E-01			9.78E-01			
Carbon14, (MT)				4.52E-04			4.52E-04			
C2H4O3, (MT)										
C2O4-2, (MT)				2.16E+04			2.16E+04			
Ca+2, (MT)				1.50E+02			1.50E+02			
Cancrinite, (MT)				2.45E+02			2.45E+02			
Cd+2, (MT)				7.92E+00			7.92E+00			
Ce+3, (MT)				2.38E-02			2.38E-02			
Cl-, (MT)				8.83E+00			8.83E+00			
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)				2.25E-03			2.25E-03			
Cr+3, (MT)				1.34E+02			1.34E+02			
Cs+, (MT)				1.03E-01			1.03E-01			
Cu+2, (MT)				7.45E-01			7.45E-01			
DTPA-3, (MT)										
F-, (MT)				2.79E+04			2.79E+04			
F2, (MT)										
Fe+3, (MT)				7.75E+02			7.75E+02			
FeCN6-3, (MT)				6.98E+00			6.98E+00			
FESA, (MT)				7.92E+03			7.92E+03			
H+, (MT)	1.23E+04			2.51E+03	1.41E+00	2.90E+00	2.52E+03		4.89E+01	
H2, (MT)										
H2O, (MT)			1.45E+06	4.38E+05	7.05E+04	1.37E+02	5.06E+05	2.54E+03	9.27E+04	9.53E+02
H2O2, (MT)				4.95E+02			4.95E+02			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	402	403	404	405	410	411	412	413	416	417
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)				9.01E-03			9.01E-03			
Hg2, (MT)				3.25E-02			3.25E-02			
I-, (MT)				2.02E+01			2.02E+01			
I2, (MT)										
K+, (MT)				2.13E+01			2.13E+01			
La+3, (MT)				2.12E-03			2.12E-03			
Li+, (MT)				2.50E-02			2.50E-02			
Mg+2, (MT)				1.10E+01			1.10E+01			
Mn+4, (MT)				1.34E+02			1.34E+02			
MnO2, (MT)				3.52E-02			3.52E-02			
Mo+6, (MT)				8.87E-01			8.87E-01			
MoO4-2, (MT)				4.28E-02			4.28E-02			
N2, (MT)										
N2O, (MT)										
Na+, (MT)				2.82E+03			2.82E+03	7.99E-02		
NH2OH, (MT)										
NH3, (MT)				1.42E-01			1.42E-01			
NH4+, (MT)				2.99E-03			2.99E-03			
Ni+3, (MT)				1.88E+02			1.88E+02			
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	7.58E+05				6.92E+01	1.79E+02	1.94E+02	5.35E+01	3.02E+03	
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)						2.87E+05	1.44E+03	2.86E+05		2.86E+05
ORGT, (MT)		2.65E+03								
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)				3.28E+00			3.28E+00			
PO4-3, (MT)				2.47E+02			2.47E+02			
POLY, (MT)				2.23E+00			2.23E+00			
PTA-3, (MT)				5.42E-01			5.42E-01			
Pu+4, (MT)				4.54E-07			4.54E-07			
Si+4, (MT)				7.89E+01			7.89E+01			
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)				1.31E+02			1.31E+02			
Sr+2, (MT)				3.68E+01			3.68E-03	3.68E+01		
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	402	403	404	405	410	411	412	415	416	417
TcO4-, (MT)				5.66E-01			5.66E-05	5.66E-01		
Ti+4, (MT)				1.90E-02			1.90E-02			
Tot Org Carbon, (MT)				1.16E+02			1.16E+02			
UO2+2, (MT)				1.76E-05			1.76E-05			
V+5, (MT)				1.88E-01			1.88E-01			
W+6, (MT)				1.42E-05			1.42E-05			
Zn+2, (MT)				9.44E-01			9.44E-01			
Zr+4, (MT)				5.09E+02			5.09E+02			
ZrO2:2H2O, (MT)				3.96E-05			3.96E-05			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	402	403	404	405	410	411	412	413	416	417
Total Mass Flow, (MT)				4.61E+03			4.61E+03			
Cs and Ba, (MCi)				1.91E-02			1.91E-02			
Sr and Y, (MCi)				3.48E-01			3.48E-01			
Tc, (MCi)				1.62E-05			1.62E-05			
TRU, (MCi)				6.25E-04			6.25E-04			
Total MCi				3.67E-01			3.67E-01			
Ag+, (MT)				3.45E-03			3.45E-03			
Ag2O, (MT)				1.27E+00			1.27E+00			
Al+3, (MT)				3.96E+00			3.96E+00			
Al2O3, (MT)				1.41E+02			1.41E+02			
Am+3, (MT)				7.59E-05			7.59E-05			
Am2O3, (MT)										
APM-, (MT)				3.06E-03			3.06E-03			
As+5, (MT)				1.25E-03			1.25E-03			
As2O5, (MT)				1.35E+00			1.35E+00			
B+3, (MT)				2.49E-03			2.49E-03			
B2O3, (MT)				4.61E-02			4.61E-02			
Ba+2, (MT)				7.75E-03			7.75E-03			
BaO, (MT)				8.39E-03			8.39E-03			
Be+2, (MT)				1.91E-05			1.91E-05			
BeO, (MT)				1.72E-01			1.72E-01			
Bi+3, (MT)				4.92E-01			4.92E-01			
Bi2O3, (MT)				2.78E+00			2.78E+00			
Carbon14, (MT)				1.14E-06			1.14E-06			
Ca+2, (MT)				3.76E-01			3.76E-01			
Cancrinite, (MT)				9.71E+01			9.71E+01			
CaO, (MT)				1.99E+00			1.99E+00			
Cd+2, (MT)				1.99E-02			1.99E-02			
CdO, (MT)				1.08E-01			1.08E-01			
Ce+3, (MT)				5.97E-01			5.97E-01			
Ce2O3, (MT)				2.63E+00			2.63E+00			
Cl-, (MT)				8.76E-03			8.76E-03			
CO3-2, (MT)				5.63E-01			5.63E-01			
Cr+3, (MT)				4.52E-01			4.52E-01			
Cr2O3, (MT)				7.96E-01			7.96E-01			
Cs+, (MT)				2.32E-04			2.32E-04			
Cs2O, (MT)				3.12E-07			3.12E-07			
Cu+2, (MT)				1.87E-03			1.87E-03			
CuO, (MT)				8.01E-01			8.01E-01			
F-, (MT)				1.50E-01			1.50E-01			
Fe+3, (MT)				2.66E+00			2.66E+00			
Fe2O3, (MT)				3.47E+01			3.47E+01			
H2O, (MT)				9.51E-01			9.51E-01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	402	403	404	405	410	411	412	413	416	417
Hg+2, (MT)				2.26E-05			2.26E-05			
I-, (MT)				5.07E-02			5.07E-02			
K+, (MT)				5.27E-02			5.27E-02			
K2O, (MT)				9.36E-03			9.36E-03			
La+3, (MT)				5.33E-02			5.33E-02			
La2O3, (MT)				2.35E-01			2.35E-01			
Li+, (MT)				6.16E-05			6.16E-05			
Li2O, (MT)				2.39E-05			2.39E-05			
Mg+2, (MT)				2.76E-02			2.76E-02			
MgO, (MT)				1.88E-01			1.88E-01			
MnO2, (MT)				5.30E-01			5.30E-01			
Mo+6, (MT)				2.01E-03			2.01E-03			
MoO3, (MT)				8.18E-02			8.18E-02			
Na+, (MT)				2.31E+01			2.31E+01			
Na2O, (MT)				1.04E+01			1.04E+01			
Ni(OH)3, (MT)										
Ni+3, (MT)				2.66E-02			2.66E-02			
Ni2FECN6, (MT)				2.35E+00			2.35E+00			
Ni2O3, (MT)				2.51E+00			2.51E+00			
NiO, (MT)										
NO2-, (MT)				1.85E-01			1.85E-01			
NO3-, (MT)										
Np+4, (MT)				5.01E-04			5.01E-04			
NpO2, (MT)				6.24E-05			6.24E-05			
OH-, (MT)				4.21E+03			4.21E+03			
P2O5, (MT)				3.52E+01			3.52E+01			
P2O5:24W, (MT)				1.31E-03			1.31E-03			
Pb+4, (MT)				8.23E-03			8.23E-03			
PbO2, (MT)				4.19E+00			4.19E+00			
PO4-3, (MT)				5.93E-01			5.93E-01			
POLY, (MT)				8.08E-03			8.08E-03			
Pu+4, (MT)				1.56E-03			1.56E-03			
PuO2, (MT)				5.19E-05			5.19E-05			
Si+4, (MT)				1.98E-01			1.98E-01			
SiO2, (MT)				1.71E+00			1.71E+00			
SO3, (MT)										
SO4-2, (MT)				9.85E-03			9.85E-03			
Sr+2, (MT)				9.23E-02			9.23E-02			
SrO, (MT)				4.22E-05			4.22E-05			
Tc2O7, (MT)				1.35E-04			1.35E-04			
TcO4-, (MT)				1.42E-03			1.42E-03			
TiO2, (MT)				3.03E-04			3.03E-04			
Tot Org Carbon, (MT)				2.90E-01			2.90E-01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	402	403	404	405	410	411	412	415	416	417
U3O8, (MT)				1.03E-02			1.03E-02			
UO2+2, (MT)				4.18E+00			4.18E+00			
UO3, (MT)										
V+5, (MT)				4.71E-04			4.71E-04			
V2O5, (MT)				3.09E-01			3.09E-01			
WO2, (MT)										
WO3, (MT)				6.53E-01			6.53E-01			
Zn+2, (MT)				2.37E-03			2.37E-03			
ZnO, (MT)				3.04E-01			3.04E-01			
Zr+4, (MT)				6.94E-01			6.94E-01			
ZrO2, (MT)				6.69E+00			6.69E+00			
ZrO2:2H2O, (MT)				1.03E+00			1.03E+00			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	418	419	420	421	422	423	426	427	428	429
Volume, Total Liters	9.62E+07	9.62E+07	8.80E+07		8.77E+07	2.86E+05	8.73E+05	5.93E+07	5.93E+07	2.30E+08
Specific Gravity	1.02E+00	1.02E+00	1.00E+00		1.00E+00	1.00E+00	1.04E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	9.78E+04	9.78E+04	8.80E+04		8.77E+04	2.86E+02	9.08E+02	5.93E+04	5.93E+04	2.30E+05
Cs and Ba, (MCi)										
Sr and Y, (MCi)	1.38E+02	1.38E+02								
Tc, (MCi)	5.87E-03	5.87E-03								
TRU, (MCi)										
Total MCi	1.38E+02	1.38E+02								
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)	3.09E+00	3.09E+00								
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)							1.62E+01	1.62E+01	1.62E+01	
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	4.89E+01	4.89E+01					2.72E-01	2.72E-01	2.72E-01	
H2, (MT)										
H2O, (MT)	9.43E+04	9.43E+04	8.77E+04		8.77E+04		8.85E+02	1.84E+03	1.84E+03	
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	418	419	420	421	422	423	426	427	428	429
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)										
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)	7.99E-02	7.99E-02					6.22E+00	6.22E+00	6.22E+00	
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	3.07E+03	3.07E+03								
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)	2.86E+02	2.86E+02	2.86E+02			2.86E+02		5.75E+04	5.75E+04	2.30E+05
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)	3.68E+01	3.68E+01								
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	418	419	420	421	422	423	426	427	428	429
TcO4-, (MT)	5.66E-01	5.66E-01								
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	418	419	420	421	422	423	426	427	428	429
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	418	419	420	421	422	423	426	427	428	429
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	418	419	420	421	422	423	426	427	428	429
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	430	431	434	435	436	437	438	439	440	459
Volume, Total Liters	2.29E+05	2.30E+06	5.75E+07	7.03E+07		6.88E+07	1.44E+06	3.60E+08	3.60E+08	8.25E+06
Specific Gravity	1.39E+00	1.00E+00	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.40E+00	1.40E+00	1.19E+00
Total Mass Flow, (MT)	3.18E+02	2.30E+05	5.75E+04	7.03E+04		6.88E+04	1.44E+03	5.04E+05	5.04E+05	9.81E+03
Cs and Ba, (MCi)								8.47E+00	8.47E+00	
Sr and Y, (MCi)								1.38E-02	1.38E-02	1.38E+02
Tc, (MCi)								5.87E-07	5.87E-07	5.87E-03
TRU, (MCi)								1.05E-05	1.05E-05	
Total MCi								8.49E+00	8.49E+00	1.38E+02
Ag+, (MT)								1.38E+00	1.38E+00	
Al(OH)4-, (MT)								9.16E-02	9.16E-02	
Al+3, (MT)								2.35E+02	2.35E+02	
Am+3, (MT)								3.02E-06	3.02E-06	
As+5, (MT)								4.97E-01	4.97E-01	
B+3, (MT)								9.93E-01	9.93E-01	
Ba+2, (MT)								3.09E-04	3.09E-04	3.09E+00
Be+2, (MT)								7.60E-03	7.60E-03	
Bi+3, (MT)								9.78E-01	9.78E-01	
Carbon14, (MT)								4.52E-04	4.52E-04	
C2H4O3, (MT)										
C2O4-2, (MT)								2.16E+04	2.16E+04	
Ca+2, (MT)								1.50E+02	1.50E+02	
Cancrinite, (MT)								2.45E+02	2.45E+02	
Cd+2, (MT)								7.92E+00	7.92E+00	
Ce+3, (MT)								2.38E-02	2.38E-02	
Cl-, (MT)								8.83E+00	8.83E+00	
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)								2.25E-03	2.25E-03	
Cr+3, (MT)								1.34E+02	1.34E+02	
Cs+, (MT)								1.03E-01	1.03E-01	
Cu+2, (MT)								7.45E-01	7.45E-01	
DTPA-3, (MT)										
F-, (MT)								2.79E+04	2.79E+04	
F2, (MT)										
Fe+3, (MT)								7.75E+02	7.75E+02	
FeCN6-3, (MT)								6.98E+00	6.98E+00	
FESA, (MT)								7.92E+03	7.92E+03	
H+, (MT)	2.90E+00	2.90E+00						2.52E+03	2.52E+03	4.89E+01
H2, (MT)										
H2O, (MT)	1.37E+02	1.37E+02		6.88E+04		6.88E+04		4.37E+05	4.37E+05	6.65E+03
H2O2, (MT)								4.95E+02	4.95E+02	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	430	431	434	435	436	437	438	439	440	459
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)								9.01E-03	9.01E-03	
Hg2, (MT)								3.25E-02	3.25E-02	
I-, (MT)								2.02E+01	2.02E+01	
I2, (MT)										
K+, (MT)								2.13E+01	2.13E+01	
La+3, (MT)								2.12E-03	2.12E-03	
Li+, (MT)								2.50E-02	2.50E-02	
Mg+2, (MT)								1.10E+01	1.10E+01	
Mn+4, (MT)								1.34E+02	1.34E+02	
MnO2, (MT)								3.52E-02	3.52E-02	
Mo+6, (MT)								8.87E-01	8.87E-01	
MoO4-2, (MT)								4.28E-02	4.28E-02	
N2, (MT)										
N2O, (MT)										
Na+, (MT)								2.82E+03	2.82E+03	7.99E-02
NH2OH, (MT)										
NH3, (MT)								1.42E-01	1.42E-01	
NH4+, (MT)								2.99E-03	2.99E-03	
Ni+3, (MT)								1.88E+02	1.88E+02	
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	1.79E+02	1.79E+02						1.94E+02	1.94E+02	3.07E+03
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)		2.30E+05	5.75E+04	1.44E+03			1.44E+03			
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)								3.28E+00	3.28E+00	
PO4-3, (MT)								2.47E+02	2.47E+02	
POLY, (MT)								2.23E+00	2.23E+00	
PTA-3, (MT)								5.42E-01	5.42E-01	
Pu+4, (MT)								4.54E-07	4.54E-07	
Si+4, (MT)								7.89E+01	7.89E+01	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)								1.31E+02	1.31E+02	
Sr+2, (MT)								3.68E-03	3.68E-03	3.68E+01
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	430	431	434	435	436	437	438	439	440	459
TcO4-, (MT)								5.66E-05	5.66E-05	5.66E-01
Ti+4, (MT)								1.90E-02	1.90E-02	
Tot Org Carbon, (MT)								1.16E+02	1.16E+02	
UO2+2, (MT)								1.76E-05	1.76E-05	
V+5, (MT)								1.88E-01	1.88E-01	
W+6, (MT)								1.42E-05	1.42E-05	
Zn+2, (MT)								9.44E-01	9.44E-01	
Zr+4, (MT)								5.09E+02	5.09E+02	
ZrO2:2H2O, (MT)								3.96E-05	3.96E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	430	431	434	435	436	437	438	439	440	459
Total Mass Flow, (MT)								4.61E+03	4.61E+03	
Cs and Ba, (MCi)								1.91E-02	1.91E-02	
Sr and Y, (MCi)								3.48E-01	3.48E-01	
Tc, (MCi)								1.62E-05	1.62E-05	
TRU, (MCi)								6.25E-04	6.25E-04	
Total MCi								3.67E-01	3.67E-01	
Ag+, (MT)								3.45E-03	3.45E-03	
Ag2O, (MT)								1.27E+00	1.27E+00	
Al+3, (MT)								3.96E+00	3.96E+00	
Al2O3, (MT)								1.41E+02	1.41E+02	
Am+3, (MT)								7.59E-05	7.59E-05	
Am2O3, (MT)										
APM-, (MT)								3.06E-03	3.06E-03	
As+5, (MT)								1.25E-03	1.25E-03	
As2O5, (MT)								1.35E+00	1.35E+00	
B+3, (MT)								2.49E-03	2.49E-03	
B2O3, (MT)								4.61E-02	4.61E-02	
Ba+2, (MT)								7.75E-03	7.75E-03	
BaO, (MT)								8.39E-03	8.39E-03	
Be+2, (MT)								1.91E-05	1.91E-05	
BeO, (MT)								1.72E-01	1.72E-01	
Bi+3, (MT)								4.92E-01	4.92E-01	
Bi2O3, (MT)								2.78E+00	2.78E+00	
Carbon14, (MT)								1.14E-06	1.14E-06	
Ca+2, (MT)								3.76E-01	3.76E-01	
Cancrinite, (MT)								9.71E+01	9.71E+01	
CaO, (MT)								1.99E+00	1.99E+00	
Cd+2, (MT)								1.99E-02	1.99E-02	
CdO, (MT)								1.08E-01	1.08E-01	
Ce+3, (MT)								5.97E-01	5.97E-01	
Ce2O3, (MT)								2.63E+00	2.63E+00	
Cl-, (MT)								8.76E-03	8.76E-03	
CO3-2, (MT)								5.63E-01	5.63E-01	
Cr+3, (MT)								4.52E-01	4.52E-01	
Cr2O3, (MT)								7.96E-01	7.96E-01	
Cs+, (MT)								2.32E-04	2.32E-04	
Cs2O, (MT)								3.12E-07	3.12E-07	
Cu+2, (MT)								1.87E-03	1.87E-03	
CuO, (MT)								8.01E-01	8.01E-01	
F-, (MT)								1.50E-01	1.50E-01	
Fe+3, (MT)								2.66E+00	2.66E+00	
Fe2O3, (MT)								3.47E+01	3.47E+01	
H2O, (MT)								9.51E-01	9.51E-01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	430	431	434	435	436	437	438	439	440	459
Hg+2, (MT)								2.26E-05	2.26E-05	
I-, (MT)								5.07E-02	5.07E-02	
K+, (MT)								5.27E-02	5.27E-02	
K2O, (MT)								9.36E-03	9.36E-03	
La+3, (MT)								5.33E-02	5.33E-02	
La2O3, (MT)								2.35E-01	2.35E-01	
Li+, (MT)								6.16E-05	6.16E-05	
Li2O, (MT)								2.39E-05	2.39E-05	
Mg+2, (MT)								2.76E-02	2.76E-02	
MgO, (MT)								1.88E-01	1.88E-01	
MnO2, (MT)								5.30E-01	5.30E-01	
Mo+6, (MT)								2.01E-03	2.01E-03	
MoO3, (MT)								8.18E-02	8.18E-02	
Na+, (MT)								2.31E+01	2.31E+01	
Na2O, (MT)								1.04E+01	1.04E+01	
Ni(OH)3, (MT)										
Ni+3, (MT)								2.66E-02	2.66E-02	
Ni2FECN6, (MT)								2.35E+00	2.35E+00	
Ni2O3, (MT)								2.51E+00	2.51E+00	
NiO, (MT)										
NO2-, (MT)								1.85E-01	1.85E-01	
NO3-, (MT)										
Np+4, (MT)								5.01E-04	5.01E-04	
NpO2, (MT)								6.24E-05	6.24E-05	
OH-, (MT)								4.21E+03	4.21E+03	
P2O5, (MT)								3.52E+01	3.52E+01	
P2O5:24W, (MT)								1.31E-03	1.31E-03	
Pb+4, (MT)								8.23E-03	8.23E-03	
PbO2, (MT)								4.19E+00	4.19E+00	
PO4-3, (MT)								5.93E-01	5.93E-01	
POLY, (MT)								8.08E-03	8.08E-03	
Pu+4, (MT)								1.56E-03	1.56E-03	
PuO2, (MT)								5.19E-05	5.19E-05	
Si+4, (MT)								1.98E-01	1.98E-01	
SiO2, (MT)								1.71E+00	1.71E+00	
SO3, (MT)										
SO4-2, (MT)								9.85E-03	9.85E-03	
Sr+2, (MT)								9.23E-02	9.23E-02	
SrO, (MT)								4.22E-05	4.22E-05	
Tc2O7, (MT)								1.35E-04	1.35E-04	
TcO4-, (MT)								1.42E-03	1.42E-03	
TiO2, (MT)								3.03E-04	3.03E-04	
Tot Org Carbon, (MT)								2.90E-01	2.90E-01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	430	431	434	435	436	437	438	439	440	459
U3O8, (MT)								1.03E-02	1.03E-02	
UO2+2, (MT)								4.18E+00	4.18E+00	
UO3, (MT)										
V+5, (MT)								4.71E-04	4.71E-04	
V2O5, (MT)								3.09E-01	3.09E-01	
WO2, (MT)										
WO3, (MT)								6.53E-01	6.53E-01	
Zn+2, (MT)								2.37E-03	2.37E-03	
ZnO, (MT)								3.04E-01	3.04E-01	
Zr+4, (MT)								6.94E-01	6.94E-01	
ZrO2, (MT)								6.69E+00	6.69E+00	
ZrO2:2H2O, (MT)								1.03E+00	1.03E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	460	500	501	504	504-H2O	504-OH	505	507	508	509
Volume, Total Liters	8.25E+06	2.01E+09	1.99E+09	2.61E+08	2.12E+08	4.91E+07	2.61E+08	3.01E+08	2.76E+08	8.18E+08
Specific Gravity	1.19E+00	1.25E+00	1.25E+00	1.04E+00	1.00E+00	1.23E+00	1.04E+00	1.00E+00	1.00E+00	1.03E+00
Total Mass Flow, (MT)	9.81E+03	2.51E+06	2.48E+06	2.72E+05	2.12E+05	6.05E+04	2.72E+05	3.01E+05	2.76E+05	8.46E+05
Cs and Ba, (MCi)		3.16E-01	3.13E-01	7.78E-03		7.78E-03	7.78E-03			1.87E-02
Sr and Y, (MCi)	1.38E+02	6.06E-05	6.00E-05							6.06E-07
Tc, (MCi)	5.87E-03	3.01E-02	1.49E-04				3.92E-03			3.92E-03
TRU, (MCi)		1.54E-04	1.53E-04							1.54E-06
Total MCi	1.38E+02	3.46E-01	3.13E-01	7.78E-03		7.78E-03	1.17E-02			2.26E-02
Ag+, (MT)		3.32E-01	3.29E-01							3.32E-03
Al(OH)4-, (MT)		4.88E+03	4.83E+03							4.88E+01
Al+3, (MT)		6.58E+03	6.51E+03	8.28E+01		8.28E+01	8.28E+01			2.31E+02
Am+3, (MT)		2.56E-05	2.53E-05							2.56E-07
As+5, (MT)		7.78E-01	7.70E-01							7.78E-03
B+3, (MT)		5.25E-01	5.20E-01							5.25E-03
Ba+2, (MT)	3.09E+00	8.01E-01	7.93E-01							8.01E-03
Be+2, (MT)		8.27E-02	8.19E-02							8.27E-04
Bi+3, (MT)		6.84E+01	6.77E+01							6.84E-01
Carbon14, (MT)		7.51E-04	7.43E-04							7.51E-06
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)		1.70E-01	1.68E-01							1.70E-03
Cancrinite, (MT)		2.41E+03	2.38E+03							2.41E+01
Cd+2, (MT)		2.11E+00	2.09E+00							2.11E-02
Ce+3, (MT)		2.54E-02	2.52E-02							2.54E-04
Cl-, (MT)		1.50E+03	1.48E+03	3.73E+01		3.73E+01	3.73E+01			8.96E+01
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)		3.80E+03	3.76E+03							3.80E+01
Cr(OH)4-, (MT)		1.20E+02	1.19E+02							1.20E+00
Cr+3, (MT)		4.73E+02	4.68E+02	1.49E+01		1.49E+01	1.49E+01			3.46E+01
Cs+, (MT)		3.85E-03	3.81E-03	9.47E-05		9.47E-05	9.47E-05			2.28E-04
Cu+2, (MT)		1.79E-01	1.78E-01							1.79E-03
DTPA-3, (MT)										
F-, (MT)		1.32E+03	1.31E+03							1.32E+01
F2, (MT)										
Fe+3, (MT)		1.48E-01	1.47E-01							1.48E-03
FeCN6-3, (MT)		1.52E+03	1.51E+03	3.80E+01		3.80E+01	3.80E+01			9.12E+01
FESA, (MT)										
H+, (MT)	4.89E+01									
H2, (MT)										
H2O, (MT)	6.65E+03	1.79E+06	1.77E+06	2.56E+05	2.12E+05	4.44E+04	2.56E+05	3.01E+05	2.76E+05	8.06E+05
H2O2, (MT)		2.66E+02	2.63E+02							2.66E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	460	500	501	504	504-H2O	504-OH	505	507	508	509
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)		9.59E-01	9.49E-01							9.59E-03
Hg2, (MT)		7.20E+00	7.13E+00	2.27E-01		2.27E-01	2.27E-01			5.27E-01
I-, (MT)		5.52E+02	5.46E+02							5.52E+00
I2, (MT)										
K+, (MT)		7.63E+01	7.55E+01	2.40E+00		2.40E+00	2.40E+00			5.57E+00
La+3, (MT)		2.35E-03	2.32E-03							2.35E-05
Li+, (MT)		1.15E-01	1.14E-01	3.43E-03		3.43E-03	3.43E-03			8.01E-03
Mg+2, (MT)		9.82E-01	9.72E-01							9.82E-03
Mn+4, (MT)		8.54E-02	8.46E-02							8.54E-04
MnO2, (MT)		1.02E+02	1.01E+02	2.53E+00		2.53E+00	2.53E+00			6.09E+00
Mo+6, (MT)		4.92E+00	4.87E+00							4.92E-02
MoO4-2, (MT)		9.35E+00	9.26E+00	2.33E-01		2.33E-01	2.33E-01			5.59E-01
N2, (MT)										
N2O, (MT)										
Na+, (MT)	7.99E-02	3.31E+05	3.27E+05	8.32E+03		8.32E+03	8.32E+03			2.00E+04
NH2OH, (MT)										
NH3, (MT)		3.15E+01	3.12E+01	9.92E-01		9.92E-01	9.92E-01			2.30E+00
NH4+, (MT)		6.13E-02	6.07E-02	1.93E-03		1.93E-03	1.93E-03			4.48E-03
Ni+3, (MT)		4.13E-02	4.08E-02							4.13E-04
NO, (MT)										
NO2, (MT)										
NO2-, (MT)		1.08E+04	1.07E+04	3.57E+01		3.57E+01	3.57E+01			1.79E+02
NO3-, (MT)	3.07E+03	1.38E+05	1.36E+05	8.38E+02		8.38E+02	8.38E+02			3.05E+03
Np+4, (MT)		1.48E-04	1.47E-04							1.48E-06
O2, (MT)										
OH-, (MT)		1.85E+05	1.83E+05	5.85E+03		5.85E+03	5.85E+03			1.36E+04
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)		1.98E+00	1.96E+00							1.98E-02
PO4-3, (MT)		4.77E+03	4.72E+03							4.77E+01
POLY, (MT)		2.48E-01	2.46E-01							2.48E-03
PTA-3, (MT)		2.00E+00	1.98E+00	6.32E-02		6.32E-02	6.32E-02			1.47E-01
Pu+4, (MT)		2.92E-04	2.89E-04							2.92E-06
Si+4, (MT)		5.76E+00	5.70E+00							5.76E-02
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)		3.01E+04	2.98E+04	8.85E+02		8.85E+02	8.85E+02			2.07E+03
Sr+2, (MT)	3.68E+01	1.61E-05	1.59E-05							1.61E-07
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	460	500	501	504	504-H2O	504-OH	505	507	508	509
TcO4-, (MT)	5.66E-01	2.90E+00	1.44E-02				3.78E-01			3.78E-01
Ti+4, (MT)		1.30E-04	1.29E-04							1.30E-06
Tot Org Carbon, (MT)		1.44E+01	1.42E+01	3.25E-02		3.25E-02	3.25E-02			2.09E-01
UO2+2, (MT)		8.71E-01	8.63E-01							8.71E-03
V+5, (MT)		6.28E-02	6.21E-02							6.28E-04
W+6, (MT)		7.55E-01	7.47E-01							7.55E-03
Zn+2, (MT)		3.63E+00	3.59E+00							3.63E-02
Zr+4, (MT)		7.79E-01	7.72E-01							7.79E-03
ZrO2:2H2O, (MT)		2.17E+01	2.15E+01							2.17E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	460	500	501	504	504-H2O	504-OH	505	507	508	509
Total Mass Flow, (MT)		2.46E+02	2.44E+02	1.22E+02		1.22E+02	1.22E+02			2.46E+02
Cs and Ba, (MCi)				9.53E-07		9.53E-07				
Sr and Y, (MCi)		1.42E-05	1.40E-05	5.10E-06		5.10E-06	5.10E-06			1.03E-05
Tc, (MCi)		1.12E-07	1.11E-07	5.56E-08		5.56E-08	5.56E-08			1.12E-07
TRU, (MCi)		8.01E-07	7.93E-07	4.23E-07		4.23E-07	3.97E-07			8.01E-07
Total MCi		1.51E-05	1.49E-05	6.53E-06		6.53E-06	5.55E-06			1.13E-05
Ag+, (MT)		2.75E-08	2.72E-08							2.75E-10
Ag2O, (MT)		9.75E-02	9.65E-02	4.83E-02		4.83E-02	4.83E-02			9.75E-02
Al+3, (MT)		4.57E-05	4.52E-05							4.57E-07
Al2O3, (MT)		2.36E+02	2.34E+02	1.17E+02		1.17E+02	1.17E+02			2.36E+02
Am+3, (MT)										
Am2O3, (MT)				8.61E-09		8.61E-09				
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)		1.04E-01	1.03E-01	5.13E-02		5.13E-02	5.13E-02			1.04E-01
B+3, (MT)		1.99E-08	1.97E-08							1.99E-10
B2O3, (MT)		3.55E-03	3.51E-03	1.76E-03		1.76E-03	1.76E-03			3.55E-03
Ba+2, (MT)		6.18E-08	6.11E-08							6.18E-10
BaO, (MT)		6.45E-04	6.38E-04	3.19E-04		3.19E-04	3.19E-04			6.45E-04
Be+2, (MT)										
BeO, (MT)		1.32E-02	1.31E-02	6.55E-03		6.55E-03	6.55E-03			1.32E-02
Bi+3, (MT)		3.92E-06	3.88E-06							3.92E-08
Bi2O3, (MT)		2.14E-01	2.12E-01	1.06E-01		1.06E-01	1.06E-01			2.14E-01
Carbon14, (MT)										
Ca+2, (MT)		1.53E-05	1.51E-05							1.53E-07
Cancrinite, (MT)		1.91E+00	1.89E+00	9.46E-01		9.46E-01	9.46E-01			1.91E+00
CaO, (MT)		1.53E-01	1.51E-01	7.56E-02		7.56E-02	7.56E-02			1.53E-01
Cd+2, (MT)		1.59E-07	1.57E-07							1.59E-09
CdO, (MT)		8.33E-03	8.24E-03	4.12E-03		4.12E-03	4.12E-03			8.33E-03
Ce+3, (MT)		6.59E-06	6.53E-06							6.59E-08
Ce2O3, (MT)		2.02E-01	2.00E-01	1.00E-01		1.00E-01	1.00E-01			2.02E-01
Cl-, (MT)		6.98E-08	6.91E-08							6.98E-10
CO3-2, (MT)		4.49E-06	4.44E-06							4.49E-08
Cr+3, (MT)		2.65E-06	2.62E-06							2.65E-08
Cr2O3, (MT)		6.12E-02	6.06E-02	3.03E-02		3.03E-02	3.03E-02			6.12E-02
Cs+, (MT)										
Cs2O, (MT)				1.23E-08		1.23E-08				
Cu+2, (MT)		1.49E-08	1.48E-08							1.49E-10
CuO, (MT)		6.16E-02	6.09E-02	3.05E-02		3.05E-02	3.05E-02			6.16E-02
F-, (MT)		1.19E-06	1.18E-06							1.19E-08
Fe+3, (MT)		2.63E-05	2.60E-05							2.63E-07
Fe2O3, (MT)		2.66E+00	2.64E+00	1.32E+00		1.32E+00	1.32E+00			2.66E+00
H2O, (MT)		5.06E-05	5.01E-05	2.51E-05		2.51E-05	2.51E-05			5.06E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	460	500	501	504	504:H2O	504:OH	505	507	508	509
Hg+2, (MT)										
I-, (MT)		4.04E-07	4.00E-07							4.04E-09
K+, (MT)		4.20E-07	4.16E-07							4.20E-09
K2O, (MT)		7.19E-04	7.12E-04	3.56E-04		3.56E-04	3.56E-04			7.19E-04
La+3, (MT)		5.94E-07	5.88E-07							5.94E-09
La2O3, (MT)		1.81E-02	1.79E-02	8.95E-03		8.95E-03	8.95E-03			1.81E-02
Li+, (MT)										
Li2O, (MT)		1.84E-06	1.82E-06	9.10E-07		9.10E-07	9.10E-07			1.84E-06
Mg+2, (MT)		2.20E-07	2.18E-07							2.20E-09
MgO, (MT)		1.44E-02	1.43E-02	7.15E-03		7.15E-03	7.15E-03			1.44E-02
MnO2, (MT)		1.54E-01	1.52E-01	7.62E-02		7.62E-02	7.62E-02			1.54E-01
Mo+6, (MT)										
MoO3, (MT)		6.29E-03	6.22E-03	3.11E-03		3.11E-03	3.11E-03			6.29E-03
Na+, (MT)		6.30E-05	6.24E-05							6.30E-07
Na2O, (MT)		7.96E-01	7.88E-01	3.94E-01		3.94E-01	3.94E-01			7.96E-01
Ni(OH)3, (MT)		2.51E-07	2.49E-07	6.23E-09		6.23E-09				2.51E-09
Ni+3, (MT)		3.20E-06	3.17E-06							3.20E-08
Ni2FECN6, (MT)		1.14E-05	1.13E-05	8.51E-07		8.51E-07	8.51E-07			1.82E-06
Ni2O3, (MT)		1.93E-01	1.91E-01	9.54E-02		9.54E-02	9.54E-02			1.93E-01
NiO, (MT)										
NO2-, (MT)		1.47E-06	1.46E-06							1.47E-08
NO3-, (MT)		2.06E-05	2.04E-05							2.06E-07
Np+4, (MT)										
NpO2, (MT)		4.80E-06	4.75E-06	2.38E-06		2.38E-06	2.38E-06			4.80E-06
OH-, (MT)		2.39E-04	2.36E-04							2.39E-06
P2O5, (MT)		2.70E+00	2.68E+00	1.34E+00		1.34E+00	1.34E+00			2.70E+00
P2O5:24W, (MT)										
Pb+4, (MT)		6.56E-08	6.49E-08							6.56E-10
PbO2, (MT)		3.22E-01	3.19E-01	1.60E-01		1.60E-01	1.60E-01			3.22E-01
PO4-3, (MT)		4.61E-05	4.57E-05							4.61E-07
POLY, (MT)		4.30E-07	4.26E-07	2.13E-07		2.13E-07	2.13E-07			4.30E-07
Pu+4, (MT)										
PuO2, (MT)		3.99E-06	3.95E-06	1.97E-06		1.97E-06	1.97E-06			3.99E-06
Si+4, (MT)		1.58E-06	1.56E-06							1.58E-08
SiO2, (MT)		1.32E-01	1.31E-01	6.52E-02		6.52E-02	6.52E-02			1.32E-01
SO3, (MT)										
SO4-2, (MT)		7.59E-07	7.51E-07							7.59E-09
Sr+2, (MT)		1.03E-06	1.02E-06							1.03E-08
SrO, (MT)		3.25E-06	3.21E-06	1.61E-06		1.61E-06	1.61E-06			3.25E-06
Tc2O7, (MT)		1.04E-05	1.03E-05	5.13E-06		5.13E-06	5.13E-06			1.04E-05
TcO4-, (MT)										
TiO2, (MT)		2.33E-05	2.30E-05	1.15E-05		1.15E-05	1.15E-05			2.33E-05
Tot Org Carbon, (MT)		2.31E-06	2.29E-06	1.05E-09		1.05E-09				2.31E-08

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	460	500	501	504	504-H2O	504-OH	505	507	508	509
U3O8, (MT)		7.91E-04	7.83E-04	3.91E-04		3.91E-04	3.91E-04			7.91E-04
UO2+2, (MT)		9.63E-05	9.54E-05							9.63E-07
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)		2.38E-02	2.35E-02	1.18E-02		1.18E-02	1.18E-02			2.38E-02
WO2, (MT)										
WO3, (MT)		5.02E-02	4.97E-02	2.49E-02		2.49E-02	2.49E-02			5.02E-02
Zn+2, (MT)		1.89E-08	1.87E-08							1.89E-10
ZnO, (MT)		2.33E-02	2.31E-02	1.16E-02		1.16E-02	1.16E-02			2.33E-02
Zr+4, (MT)		5.53E-06	5.48E-06							5.53E-08
ZrO2, (MT)		5.14E-01	5.09E-01	2.55E-01		2.55E-01	2.55E-01			5.14E-01
ZrO2:2H2O, (MT)		8.16E-06	8.08E-06							8.16E-08

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	S13	S14	S15	S16	S18	S19	S21	S22	S25	S30
Volume, Total Liters	1.49E+08	5.71E+08	5.46E+08	1.50E+08	1.51E+08	1.51E+08	8.71E+08	7.68E+08	1.45E+09	2.52E+08
Specific Gravity	1.01E+00	1.14E+00	1.15E+00	1.01E+00	1.00E+00	1.00E+00	1.10E+00	1.08E+00	1.01E+00	1.32E+00
Total Mass Flow, (MT)	1.51E+05	6.52E+05	6.27E+05	1.51E+05	1.51E+05	1.51E+05	9.53E+05	8.30E+05	1.46E+06	3.34E+05
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)		2.60E-02					2.60E-02			
TRU, (MCi)										
Total MCi		2.60E-02					2.60E-02			
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	3.74E+01	2.65E+03	2.64E+03	3.12E+01			2.68E+03	2.01E+03	4.09E+02	2.64E+03
H2, (MT)										
H2O, (MT)	1.48E+05	4.87E+05	4.62E+05	1.49E+05	1.51E+05	1.51E+05	7.86E+05	7.04E+05	1.44E+06	1.68E+05
H2O2, (MT)									7.46E+01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	S13	S14	S15	S16	S18	S19	S21	S22	S25	S30
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)										
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)										
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	2.30E+03	1.63E+05	1.63E+05	1.92E+03			1.65E+05	1.24E+05	2.52E+04	1.63E+05
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	513	514	515	516	518	519	521	522	525	530
TcO4-, (MT)		2.51E+00					2.51E+00			
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	S13	S14	S15	S16	S18	S19	S21	S22	S25	S30
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CsO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	513	514	515	516	518	519	521	522	525	530
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	513	514	515	516	518	519	521	522	525	530
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	S31	S32	S35	S33-H2O	S33-OH	S34	S35	S36	S37	S54
Volume, Total Liters	1.03E+08	1.03E+08	2.61E+08	2.12E+08	4.91E+07	2.61E+08		1.99E+09	1.99E+09	
Specific Gravity	1.20E+00	1.20E+00	1.04E+00	1.00E+00	1.23E+00	1.04E+00		1.25E+00	1.25E+00	
Total Mass Flow, (MT)	1.24E+05	1.24E+05	2.72E+05	2.12E+05	6.05E+04	2.72E+05		2.48E+06	2.48E+06	
Cs and Ba, (MCi)			7.78E-03		7.78E-03	7.78E-03		3.13E-01	3.13E-01	
Sr and Y, (MCi)								6.00E-05	6.00E-05	
Tc, (MCi)	2.60E-02	2.60E-02						1.49E-04	1.49E-04	
TRU, (MCi)								1.53E-04	1.53E-04	
Total MCi	2.60E-02	2.60E-02	7.78E-03		7.78E-03	7.78E-03		3.13E-01	3.13E-01	
Ag+, (MT)								3.29E-01	3.29E-01	
Al(OH)4-, (MT)								4.83E+03	4.83E+03	
Al+3, (MT)			8.28E+01		8.28E+01	8.28E+01		6.51E+03	6.51E+03	
Am+3, (MT)								2.53E-05	2.53E-05	
As+5, (MT)								7.70E-01	7.70E-01	
B+3, (MT)								5.20E-01	5.20E-01	
Ba+2, (MT)								7.93E-01	7.93E-01	
Be+2, (MT)								8.19E-02	8.19E-02	
Bi+3, (MT)								6.77E+01	6.77E+01	
Carbon14, (MT)								7.43E-04	7.43E-04	
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)								1.68E-01	1.68E-01	
Cancrinite, (MT)								2.38E+03	2.38E+03	
Cd+2, (MT)								2.09E+00	2.09E+00	
Ce+3, (MT)								2.52E-02	2.52E-02	
Cl-, (MT)			3.73E+01		3.73E+01	3.73E+01		1.48E+03	1.48E+03	
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)								3.76E+03	3.76E+03	
Cr(OH)4-, (MT)								1.19E+02	1.19E+02	
Cr+3, (MT)			1.49E+01		1.49E+01	1.49E+01		4.68E+02	4.68E+02	
Cs+, (MT)			9.47E-05		9.47E-05	9.47E-05		3.81E-03	3.81E-03	
Cu+2, (MT)								1.78E-01	1.78E-01	
DTPA-3, (MT)										
F-, (MT)								1.31E+03	1.31E+03	
F2, (MT)										
Fe+3, (MT)								1.47E-01	1.47E-01	
FeCN6-3, (MT)			3.80E+01		3.80E+01	3.80E+01		1.51E+03	1.51E+03	
FESA, (MT)										
H+, (MT)	6.70E+02	6.70E+02								
H2, (MT)										
H2O, (MT)	8.16E+04	8.16E+04	2.56E+05	2.12E+05	4.44E+04	2.56E+05		1.77E+06	1.77E+06	
H2O2, (MT)								2.63E+02	2.63E+02	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	531	532	533	533-H2O	533-Oil	534	535	536	537	554
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)								9.49E-01	9.49E-01	
Hg2, (MT)			2.27E-01		2.27E-01	2.27E-01		7.13E+00	7.13E+00	
I-, (MT)								5.46E+02	5.46E+02	
I2, (MT)										
K+, (MT)			2.40E+00		2.40E+00	2.40E+00		7.55E+01	7.55E+01	
La+3, (MT)								2.32E-03	2.32E-03	
Li+, (MT)			3.43E-03		3.43E-03	3.43E-03		1.14E-01	1.14E-01	
Mg+2, (MT)								9.72E-01	9.72E-01	
Mn+4, (MT)								8.46E-02	8.46E-02	
MnO2, (MT)			2.53E+00		2.53E+00	2.53E+00		1.01E+02	1.01E+02	
Mo+6, (MT)								4.87E+00	4.87E+00	
MoO4-2, (MT)			2.33E-01		2.33E-01	2.33E-01		9.26E+00	9.26E+00	
N2, (MT)										
N2O, (MT)										
Na+, (MT)			8.32E+03		8.32E+03	8.32E+03		3.27E+05	3.27E+05	
NH2OH, (MT)										
NH3, (MT)			9.92E-01		9.92E-01	9.92E-01		3.12E+01	3.12E+01	
NH4+, (MT)			1.93E-03		1.93E-03	1.93E-03		6.07E-02	6.07E-02	
Ni+3, (MT)								4.08E-02	4.08E-02	
NO, (MT)										
NO2, (MT)										
NO2-, (MT)			3.57E+01		3.57E+01	3.57E+01		1.07E+04	1.07E+04	
NO3-, (MT)	4.12E+04	4.12E+04	8.38E+02		8.38E+02	8.39E+02		1.36E+05	1.36E+05	
Np+4, (MT)								1.47E-04	1.47E-04	
O2, (MT)										
OH-, (MT)			5.85E+03		5.85E+03	5.85E+03		1.83E+05	1.83E+05	
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)								1.96E+00	1.96E+00	
PO4-3, (MT)								4.72E+03	4.72E+03	
POLY, (MT)								2.46E-01	2.46E-01	
PTA-3, (MT)			6.32E-02		6.32E-02	6.32E-02		1.98E+00	1.98E+00	
Pu+4, (MT)								2.89E-04	2.89E-04	
Si+4, (MT)								5.70E+00	5.70E+00	
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)			8.85E+02		8.85E+02	8.85E+02		2.98E+04	2.98E+04	
Sr+2, (MT)								1.59E-05	1.59E-05	
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	S31	S32	S33	S33-H2O	S33-Off	S34	S35	S36	S37	S54
TcO4-, (MT)	2.51E+00	2.51E+00						1.44E-02	1.44E-02	
Ti+4, (MT)								1.29E-04	1.29E-04	
Tot Org Carbon, (MT)			3.25E-02		3.25E-02	3.25E-02		1.42E+01	1.42E+01	
UO2+2, (MT)								8.63E-01	8.63E-01	
V+5, (MT)								6.21E-02	6.21E-02	
W+6, (MT)								7.47E-01	7.47E-01	
Zn+2, (MT)								3.59E+00	3.59E+00	
Zr+4, (MT)								7.72E-01	7.72E-01	
ZrO2:2H2O, (MT)								2.15E+01	2.15E+01	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	531	532	533	533-H2O	533-OH	534	535	536	537	554
Total Mass Flow, (MT)			1.22E+02		1.22E+02	1.22E+02		2.44E+02	2.44E+02	
Cs and Ba, (MCi)			9.53E-07		9.53E-07					
Sr and Y, (MCi)			5.10E-06		5.10E-06	5.10E-06		1.40E-05	1.40E-05	
Tc, (MCi)			5.56E-08		5.56E-08	5.56E-08		1.11E-07	1.11E-07	
TRU, (MCi)			4.23E-07		4.23E-07	3.97E-07		7.93E-07	7.93E-07	
Total MCi			6.53E-06		6.53E-06	5.55E-06		1.49E-05	1.49E-05	
Ag+, (MT)								2.72E-08	2.72E-08	
Ag2O, (MT)			4.83E-02		4.83E-02	4.83E-02		9.65E-02	9.65E-02	
Al+3, (MT)								4.52E-05	4.52E-05	
Al2O3, (MT)			1.17E+02		1.17E+02	1.17E+02		2.34E+02	2.34E+02	
Am+3, (MT)										
Am2O3, (MT)			8.61E-09		8.61E-09					
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)			5.13E-02		5.13E-02	5.13E-02		1.03E-01	1.03E-01	
B+3, (MT)								1.97E-08	1.97E-08	
B2O3, (MT)			1.76E-03		1.76E-03	1.76E-03		3.51E-03	3.51E-03	
Ba+2, (MT)								6.11E-08	6.11E-08	
BaO, (MT)			3.19E-04		3.19E-04	3.19E-04		6.38E-04	6.38E-04	
Be+2, (MT)										
BeO, (MT)			6.55E-03		6.55E-03	6.55E-03		1.31E-02	1.31E-02	
Bi+3, (MT)								3.88E-06	3.88E-06	
Bi2O3, (MT)			1.06E-01		1.06E-01	1.06E-01		2.12E-01	2.12E-01	
Carbon14, (MT)										
Ca+2, (MT)								1.51E-05	1.51E-05	
Cancrinite, (MT)			9.46E-01		9.46E-01	9.46E-01		1.89E+00	1.89E+00	
CaO, (MT)			7.56E-02		7.56E-02	7.56E-02		1.51E-01	1.51E-01	
Cd+2, (MT)								1.57E-07	1.57E-07	
CdO, (MT)			4.12E-03		4.12E-03	4.12E-03		8.24E-03	8.24E-03	
Ce+3, (MT)								6.53E-06	6.53E-06	
Ce2O3, (MT)			1.00E-01		1.00E-01	1.00E-01		2.00E-01	2.00E-01	
Cl-, (MT)								6.91E-08	6.91E-08	
CO3-2, (MT)								4.44E-06	4.44E-06	
Cr+3, (MT)								2.62E-06	2.62E-06	
Cr2O3, (MT)			3.03E-02		3.03E-02	3.03E-02		6.06E-02	6.06E-02	
Cs+, (MT)										
Cs2O, (MT)			1.23E-08		1.23E-08					
Cu+2, (MT)								1.48E-08	1.48E-08	
CuO, (MT)			3.05E-02		3.05E-02	3.05E-02		6.09E-02	6.09E-02	
F-, (MT)								1.18E-06	1.18E-06	
Fe+3, (MT)								2.60E-05	2.60E-05	
Fe2O3, (MT)			1.32E+00		1.32E+00	1.32E+00		2.64E+00	2.64E+00	
H2O, (MT)			2.51E-05		2.51E-05	2.51E-05		5.01E-05	5.01E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	S31	S32	S33	S33-H2O	S33-Oil	S34	S35	S36	S37	S54
Hg+2, (MT)										
I-, (MT)								4.00E-07	4.00E-07	
K+, (MT)								4.16E-07	4.16E-07	
K2O, (MT)			3.56E-04		3.56E-04	3.56E-04		7.12E-04	7.12E-04	
La+3, (MT)								5.88E-07	5.88E-07	
La2O3, (MT)			8.95E-03		8.95E-03	8.95E-03		1.79E-02	1.79E-02	
Li+, (MT)										
Li2O, (MT)			9.10E-07		9.10E-07	9.10E-07		1.82E-06	1.82E-06	
Mg+2, (MT)								2.18E-07	2.18E-07	
MgO, (MT)			7.15E-03		7.15E-03	7.15E-03		1.43E-02	1.43E-02	
MnO2, (MT)			7.62E-02		7.62E-02	7.62E-02		1.52E-01	1.52E-01	
Mo+6, (MT)										
MoO3, (MT)			3.11E-03		3.11E-03	3.11E-03		6.22E-03	6.22E-03	
Na+, (MT)								6.24E-05	6.24E-05	
Na2O, (MT)			3.94E-01		3.94E-01	3.94E-01		7.88E-01	7.88E-01	
Ni(OH)3, (MT)			6.23E-09		6.23E-09			2.49E-07	2.49E-07	
Ni+3, (MT)								3.17E-06	3.17E-06	
Ni2FECN6, (MT)			8.51E-07		8.51E-07	8.51E-07		1.13E-05	1.13E-05	
Ni2O3, (MT)			9.54E-02		9.54E-02	9.54E-02		1.91E-01	1.91E-01	
NiO, (MT)										
NO2-, (MT)								1.46E-06	1.46E-06	
NO3-, (MT)								2.04E-05	2.04E-05	
Np+4, (MT)										
NpO2, (MT)			2.38E-06		2.38E-06	2.38E-06		4.75E-06	4.75E-06	
OH-, (MT)								2.36E-04	2.36E-04	
P2O5, (MT)			1.34E+00		1.34E+00	1.34E+00		2.68E+00	2.68E+00	
P2O5:24W, (MT)										
Pb+4, (MT)								6.49E-08	6.49E-08	
PbO2, (MT)			1.60E-01		1.60E-01	1.60E-01		3.19E-01	3.19E-01	
PO4-3, (MT)								4.57E-05	4.57E-05	
POLY, (MT)			2.13E-07		2.13E-07	2.13E-07		4.26E-07	4.26E-07	
Pu+4, (MT)										
PuO2, (MT)			1.97E-06		1.97E-06	1.97E-06		3.95E-06	3.95E-06	
Si+4, (MT)								1.56E-06	1.56E-06	
SiO2, (MT)			6.52E-02		6.52E-02	6.52E-02		1.31E-01	1.31E-01	
SO3, (MT)										
SO4-2, (MT)								7.51E-07	7.51E-07	
Sr+2, (MT)								1.02E-06	1.02E-06	
SrO, (MT)			1.61E-06		1.61E-06	1.61E-06		3.21E-06	3.21E-06	
Tc2O7, (MT)			5.13E-06		5.13E-06	5.13E-06		1.03E-05	1.03E-05	
TcO4-, (MT)										
TiO2, (MT)			1.15E-05		1.15E-05	1.15E-05		2.30E-05	2.30E-05	
Tot Org Carbon, (MT)			1.05E-09		1.05E-09			2.29E-06	2.29E-06	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	S31	S32	S33	S33-H2O	S33-OH	S34	S35	S36	S37	S54
U3O8, (MT)			3.91E-04		3.91E-04	3.91E-04		7.83E-04	7.83E-04	
UO2+2, (MT)								9.54E-05	9.54E-05	
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)			1.18E-02		1.18E-02	1.18E-02		2.35E-02	2.35E-02	
WO2, (MT)										
WO3, (MT)			2.49E-02		2.49E-02	2.49E-02		4.97E-02	4.97E-02	
Zn+2, (MT)								1.87E-08	1.87E-08	
ZnO, (MT)			1.16E-02		1.16E-02	1.16E-02		2.31E-02	2.31E-02	
Zr+4, (MT)								5.48E-06	5.48E-06	
ZrO2, (MT)			2.55E-01		2.55E-01	2.55E-01		5.09E-01	5.09E-01	
ZrO2:2H2O, (MT)								8.08E-06	8.08E-06	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	334:H2O	601	602	605	604	606	609	612	613	615
Volume, Total Liters	2.94E+08	9.74E+06	1.09E+05	1.41E+07	1.24E+09	2.20E+09	8.79E+07	8.82E+08	5.26E+08	4.41E+08
Specific Gravity	1.00E+00	1.56E+00	1.01E+00	3.16E+00	1.42E+00	1.24E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.94E+05	1.52E+04	1.10E+02	4.47E+04	1.77E+06	2.73E+06	8.82E+04	8.82E+05	5.27E+05	4.41E+05
Cs and Ba, (MCi)					8.47E+00	8.47E+00				
Sr and Y, (MCi)					1.38E+02	1.38E+02				
Tc, (MCi)					5.88E-03	5.87E-03			5.88E-06	
TRU, (MCi)					1.05E-01	1.05E-05			1.05E-01	
Total MCi					1.47E+02	1.47E+02			1.05E-01	
Ag+, (MT)					1.38E+00	1.38E+00				
Al(OH)4-, (MT)					9.16E-02	9.16E-02				
Al+3, (MT)					2.11E+02	2.35E+02	2.38E+01			
Am+3, (MT)					3.02E-02	3.02E-06			3.02E-02	
As+5, (MT)					4.97E-01	4.97E-01				
B+3, (MT)					9.93E-01	9.93E-01				
Ba+2, (MT)					3.09E+00	3.09E+00				
Be+2, (MT)					7.60E-03	7.60E-03				
Bi+3, (MT)					1.96E+02	9.78E-01			1.95E+02	
Carbon14, (MT)					4.52E-04	4.52E-04				
C2H4O3, (MT)										
C2O4-2, (MT)				2.19E+04	2.19E+04	2.16E+04			3.06E+02	3.88E+02
Ca+2, (MT)					1.50E+02	1.50E+02				
Cancrinite, (MT)					2.45E+02	2.45E+02				
Cd+2, (MT)					7.92E+00	7.92E+00				
Ce+3, (MT)					2.38E+02	2.38E-02			2.38E+02	
Cl-, (MT)					8.83E+00	8.83E+00				
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)					2.25E-03	2.25E-03				
Cr+3, (MT)					1.34E+02	1.34E+02				
Cs+, (MT)					1.03E-01	1.03E-01				
Cu+2, (MT)					7.45E-01	7.45E-01				
DTPA-3, (MT)										
F-, (MT)			2.15E-01		2.80E+04	2.79E+04			5.29E+01	
F2, (MT)										
Fe+3, (MT)					7.75E+02	7.75E+02			7.75E-02	
FeCN6-3, (MT)					6.98E+00	6.98E+00				
FESA, (MT)		7.92E+03			7.92E+03	7.92E+03				
H+, (MT)			1.14E-02	5.02E+02	1.48E+04	1.48E+04	8.82E-01	8.82E+00	9.82E+00	1.32E+01
H2, (MT)										
H2O, (MT)	2.94E+05	7.31E+03	1.09E+02	2.24E+04	9.27E+05	1.89E+06	8.80E+04	8.82E+05	9.30E+03	4.41E+05
H2O2, (MT)					4.95E+02	4.95E+02				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	554-H2O	601	602	603	604	606	609	612	613	615
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)					9.01E-03	9.01E-03				
Hg2, (MT)					3.25E-02	3.25E-02				
I-, (MT)					2.02E+01	2.02E+01				
I2, (MT)										
K+, (MT)					2.13E+01	2.13E+01				
La+3, (MT)					2.12E+01	2.12E-03			2.12E+01	
Li+, (MT)					2.50E-02	2.50E-02				
Mg+2, (MT)					1.10E+01	1.10E+01				
Mn+4, (MT)					1.34E+02	1.34E+02				
MnO2, (MT)					3.52E-02	3.52E-02				
Mo+6, (MT)					8.87E-01	8.87E-01				
MoO4-2, (MT)					4.28E-02	4.28E-02				
N2, (MT)										
N2O, (MT)										
Na+, (MT)					2.82E+03	2.82E+03				
NH2OH, (MT)										
NH3, (MT)					1.42E-01	1.42E-01				
NH4+, (MT)					2.99E-03	2.99E-03				
Ni+3, (MT)					1.88E+02	1.88E+02				
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)					7.58E+05	7.58E+05	2.21E+02	5.47E+02	5.19E+02	2.74E+02
Np+4, (MT)					1.46E-05				5.66E-03	
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)						2.65E+03			5.16E+05	
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)					3.28E+00	3.28E+00				
PO4-3, (MT)					2.47E+02	2.47E+02				
POLY, (MT)					2.23E+00	2.23E+00				
PTA-3, (MT)					5.42E-01	5.42E-01				
Pu+4, (MT)					4.54E-03	4.54E-07			4.54E-03	
Si+4, (MT)					7.89E+01	7.89E+01				
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)					1.31E+02	1.31E+02				
Sr+2, (MT)					3.68E+01	3.68E+01				
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	554-H2O	601	602	605	604	606	609	612	613	615
TcO4-, (MT)					5.67E-01	5.66E-01			5.67E-04	
Ti+4, (MT)					1.90E-02	1.90E-02				
Tot Org Carbon, (MT)					1.16E+02	1.16E+02				
UO2+2, (MT)					1.76E-01	1.76E-05			1.76E-01	
V+5, (MT)					1.88E-01	1.88E-01				
W+6, (MT)					1.42E-05	1.42E-05				
Zn+2, (MT)					9.44E-01	9.44E-01				
Zr+4, (MT)					5.10E+02	5.09E+02			5.10E-01	
ZrO2:2H2O, (MT)					3.96E-05	3.96E-05				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	254-H2O	601	602	605	604	606	609	612	613	615
Total Mass Flow, (MT)					4.61E+03	4.61E+03				
Cs and Ba, (MCi)					1.91E-02	1.91E-02				
Sr and Y, (MCi)					3.48E-01	3.48E-01				
Tc, (MCi)					1.62E-05	1.62E-05				
TRU, (MCi)					6.25E-04	6.25E-04				
Total MCi					3.67E-01	3.67E-01				
Ag+, (MT)					3.45E-03	3.45E-03				
Ag2O, (MT)					1.27E+00	1.27E+00				
Al+3, (MT)					3.96E+00	3.96E+00				
Al2O3, (MT)					1.41E+02	1.41E+02				
Am+3, (MT)					7.59E-05	7.59E-05				
Am2O3, (MT)										
APM-, (MT)					3.06E-03	3.06E-03				
As+5, (MT)					1.25E-03	1.25E-03				
As2O5, (MT)					1.35E+00	1.35E+00				
B+3, (MT)					2.49E-03	2.49E-03				
B2O3, (MT)					4.61E-02	4.61E-02				
Ba+2, (MT)					7.75E-03	7.75E-03				
BaO, (MT)					8.39E-03	8.39E-03				
Be+2, (MT)					1.91E-05	1.91E-05				
BeO, (MT)					1.72E-01	1.72E-01				
Bi+3, (MT)					4.92E-01	4.92E-01				
Bi2O3, (MT)					2.78E+00	2.78E+00				
Carbon14, (MT)					1.14E-06	1.14E-06				
Ca+2, (MT)					3.76E-01	3.76E-01				
Cancrinite, (MT)					9.71E+01	9.71E+01				
CaO, (MT)					1.99E+00	1.99E+00				
Cd+2, (MT)					1.99E-02	1.99E-02				
CdO, (MT)					1.08E-01	1.08E-01				
Ce+3, (MT)					5.97E-01	5.97E-01				
Ce2O3, (MT)					2.63E+00	2.63E+00				
Cl-, (MT)					8.76E-03	8.76E-03				
CO3-2, (MT)					5.63E-01	5.63E-01				
Cr+3, (MT)					4.52E-01	4.52E-01				
Cr2O3, (MT)					7.96E-01	7.96E-01				
Cs+, (MT)					2.32E-04	2.32E-04				
Cs2O, (MT)					3.12E-07	3.12E-07				
Cu+2, (MT)					1.87E-03	1.87E-03				
CuO, (MT)					8.01E-01	8.01E-01				
F-, (MT)					1.50E-01	1.50E-01				
Fe+3, (MT)					2.66E+00	2.66E+00				
Fe2O3, (MT)					3.47E+01	3.47E+01				
H2O, (MT)					9.51E-01	9.51E-01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	554-H2O	601	602	605	604	606	609	612	613	615
Hg+2, (MT)					2.26E-05	2.26E-05				
I-, (MT)					5.07E-02	5.07E-02				
K+, (MT)					5.27E-02	5.27E-02				
K2O, (MT)					9.36E-03	9.36E-03				
La+3, (MT)					5.33E-02	5.33E-02				
La2O3, (MT)					2.35E-01	2.35E-01				
Li+, (MT)					6.16E-05	6.16E-05				
Li2O, (MT)					2.39E-05	2.39E-05				
Mg+2, (MT)					2.76E-02	2.76E-02				
MgO, (MT)					1.88E-01	1.88E-01				
MnO2, (MT)					5.30E-01	5.30E-01				
Mo+6, (MT)					2.01E-03	2.01E-03				
MoO3, (MT)					8.18E-02	8.18E-02				
Na+, (MT)					2.31E+01	2.31E+01				
Na2O, (MT)					1.04E+01	1.04E+01				
Ni(OH)3, (MT)										
Ni+3, (MT)					2.66E-02	2.66E-02				
Ni2FECN6, (MT)					2.35E+00	2.35E+00				
Ni2O3, (MT)					2.51E+00	2.51E+00				
NiO, (MT)										
NO2-, (MT)					1.85E-01	1.85E-01				
NO3-, (MT)										
Np+4, (MT)					5.01E-04	5.01E-04				
NpO2, (MT)					6.24E-05	6.24E-05				
OH-, (MT)					4.21E+03	4.21E+03				
P2O5, (MT)					3.52E+01	3.52E+01				
P2O5:24W, (MT)					1.31E-03	1.31E-03				
Pb+4, (MT)					8.23E-03	8.23E-03				
PbO2, (MT)					4.19E+00	4.19E+00				
PO4-3, (MT)					5.93E-01	5.93E-01				
POLY, (MT)					8.08E-03	8.08E-03				
Pu+4, (MT)					1.56E-03	1.56E-03				
PuO2, (MT)					5.19E-05	5.19E-05				
Si+4, (MT)					1.98E-01	1.98E-01				
SiO2, (MT)					1.71E+00	1.71E+00				
SO3, (MT)										
SO4-2, (MT)					9.85E-03	9.85E-03				
Sr+2, (MT)					9.23E-02	9.23E-02				
SrO, (MT)					4.22E-05	4.22E-05				
Tc2O7, (MT)					1.35E-04	1.35E-04				
TcO4-, (MT)					1.42E-03	1.42E-03				
TiO2, (MT)					3.03E-04	3.03E-04				
Tot Org Carbon, (MT)					2.90E-01	2.90E-01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	554-H2O	601	602	605	604	606	609	612	613	615
U3O8, (MT)					1.03E-02	1.03E-02				
UO2+2, (MT)					4.18E+00	4.18E+00				
UO3, (MT)										
V+5, (MT)					4.71E-04	4.71E-04				
V2O5, (MT)					3.09E-01	3.09E-01				
WO2, (MT)										
WO3, (MT)					6.53E-01	6.53E-01				
Zn+2, (MT)					2.37E-03	2.37E-03				
ZnO, (MT)					3.04E-01	3.04E-01				
Zr+4, (MT)					6.94E-01	6.94E-01				
ZrO2, (MT)					6.69E+00	6.69E+00				
ZrO2:2H2O, (MT)					1.03E+00	1.03E+00				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Component	618	619	620	621	622	623	624	625	626	627
Volume, Total Liters	1.76E+09	5.37E+08	2.19E+09	1.33E+07	2.18E+09		2.18E+09	1.33E+06	1.33E+07	
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.30E+00	1.00E+00		1.00E+00	1.00E+00	1.30E+00	
Total Mass Flow, (MT)	1.77E+06	5.37E+05	2.20E+06	1.72E+04	2.18E+06		2.18E+06	1.33E+03	1.72E+04	
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)			5.88E-06	5.88E-06					5.88E-06	
TRU, (MCi)			1.05E-01	1.05E-01					1.05E-01	
Total MCi			1.05E-01	1.05E-01					1.05E-01	
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)			3.02E-02	3.02E-02					3.02E-02	
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Bo+2, (MT)										
Bi+3, (MT)		1.94E+02	9.73E-01	9.73E-01					9.73E-01	
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)	1.55E+03		2.25E+03	2.25E+03					2.25E+03	
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)			2.38E+02	2.38E+02					2.38E+02	
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)			5.29E+01	5.29E+01					5.29E+01	
F2, (MT)										
Fe+3, (MT)			7.75E-02	7.75E-02					7.75E-02	
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	5.29E+01		7.60E+01	7.60E+01					7.60E+01	
H2, (MT)										
H2O, (MT)	1.76E+06	2.15E+04	2.19E+06	1.29E+04	2.18E+06		2.18E+06		1.29E+04	
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	618	619	620	621	622	623	624	625	626	627
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)			2.12E+01	2.12E+01					2.12E+01	
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)										
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	1.09E+03	1.72E+02	1.71E+03	1.71E+03					1.71E+03	
Np+4, (MT)			5.66E-03	5.66E-03					5.66E-03	
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)		5.15E+05	1.33E+03		1.33E+03			1.33E+03		
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)			4.54E-03	4.54E-03					4.54E-03	
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	618	619	620	621	622	623	624	625	626	627
TcO4-, (MT)			5.67E-04	5.67E-04					5.67E-04	
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)			1.76E-01	1.76E-01					1.76E-01	
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)			5.10E-01	5.10E-01					5.10E-01	
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	618	619	620	621	622	623	624	625	626	627
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	618	619	620	621	622	623	624	625	626	627
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	618	619	620	621	622	623	624	625	626	627
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Za+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	628	631	632	633	634	635	640	641	657	700
Volume, Total Liters	1.33E+07	3.76E+06	5.02E+06	4.15E+06	5.02E+06	4.15E+06	1.04E+06	5.19E+06	2.50E+05	3.50E+09
Specific Gravity	1.30E+00	1.04E+00	1.03E+00	1.00E+00	1.03E+00	1.00E+00	1.00E+00	1.00E+00	1.39E+00	1.14E+00
Total Mass Flow, (MT)	1.72E+04	3.91E+05	5.17E+05	4.15E+05	5.17E+05	4.16E+05	1.04E+05	5.19E+05	3.47E+02	3.98E+06
Cs and Ba, (MCi)										8.47E+00
Sr and Y, (MCi)										1.38E+02
Tc, (MCi)	5.88E-06									5.88E-03
TRU, (MCi)	1.05E-01									2.07E-01
Total MCi	1.05E-01									1.47E+02
Ag+, (MT)										1.38E+00
Al(OH)4-, (MT)										9.16E-02
Al+3, (MT)										2.11E+02
Am+3, (MT)	3.02E-02									3.02E-02
As+5, (MT)										4.97E-01
B+3, (MT)										9.93E-01
Ba+2, (MT)										3.09E+00
Be+2, (MT)										7.60E-03
Bi+3, (MT)	9.73E-01		1.94E+02		1.94E+02					1.96E+02
Carbon14, (MT)										4.52E-04
C2H4O3, (MT)										
C2O4-2, (MT)	2.25E+03									
Ca+2, (MT)										1.50E+02
Cancrinite, (MT)										2.45E+02
Cd+2, (MT)										7.92E+00
Ce+3, (MT)	2.38E+02									2.38E+02
Cl-, (MT)										8.83E+00
Cl2, (MT)										
CO, (MT)										1.90E+02
CO2, (MT)										1.61E+00
CO3-2, (MT)		6.98E+03	6.98E+03		6.98E+03					
Cr(OH)4-, (MT)										2.25E-03
Cr+3, (MT)										1.34E+02
Cs+, (MT)										1.03E-01
Cu+2, (MT)										7.45E-01
DTPA-3, (MT)										
F-, (MT)	5.29E+01									2.80E+04
F2, (MT)										
Fe+3, (MT)	7.75E-02									7.75E+02
FeCN6-3, (MT)										6.98E+00
FESA, (MT)										
H+, (MT)	7.60E+01	1.17E+02	1.17E+02		1.17E+02	3.17E+00		3.17E+00	3.17E+00	1.43E+04
H2, (MT)										5.87E-08
H2O, (MT)	1.29E+04	3.81E+05	4.03E+05		4.03E+05	1.49E+02		1.49E+02	1.49E+02	3.18E+06
H2O2, (MT)										4.95E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	628	631	632	633	634	635	640	641	657	700
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										9.01E-03
Hg2, (MT)										3.25E-02
I-, (MT)										2.02E+01
I2, (MT)										
K+, (MT)										2.13E+01
La+3, (MT)	2.12E+01									2.12E+01
Li+, (MT)										2.50E-02
Mg+2, (MT)										1.10E+01
Mn+4, (MT)										1.34E+02
MnO2, (MT)										3.52E-02
Mo+6, (MT)										8.87E-01
MoO4-2, (MT)										4.28E-02
N2, (MT)										1.76E-02
N2O, (MT)										
Na+, (MT)		2.68E+03	2.68E+03		2.68E+03					2.82E+03
NH2OH, (MT)										
NH3, (MT)										1.42E-01
NH4+, (MT)										2.99E-03
Ni+3, (MT)										1.88E+02
NO, (MT)										
NO2, (MT)										1.53E+00
NO2-, (MT)										
NO3-, (MT)	1.71E+03		1.72E+02		1.72E+02	1.95E+02		1.95E+02	1.95E+02	7.54E+05
Np+4, (MT)	5.66E-03									1.46E-01
O2, (MT)										1.09E+02
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)			1.04E+05	4.15E+05	1.04E+05	4.15E+05	1.04E+05	5.19E+05		
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										3.28E+00
PO4-3, (MT)										2.47E+02
POLY, (MT)										2.23E+00
PTA-3, (MT)										5.42E-01
Pu+4, (MT)	4.54E-03									4.54E-01
Si+4, (MT)										7.89E+01
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										1.31E+02
Sr+2, (MT)										3.68E+01
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	628	631	632	633	634	635	640	641	652	700
TcO4-, (MT)	5.67E-04									5.68E-01
Ti+4, (MT)										1.90E-02
Tot Org Carbon, (MT)										1.16E+02
UO2+2, (MT)	1.76E-01									1.76E+03
V+5, (MT)										1.88E-01
W+6, (MT)										1.42E-05
Zn+2, (MT)										9.44E-01
Zr+4, (MT)	5.10E-01									5.10E+02
ZrO2:2H2O, (MT)										3.96E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	628	641	632	635	634	625	640	641	652	700
Total Mass Flow, (MT)										4.61E+03
Cs and Ba, (MCi)										1.91E-02
Sr and Y, (MCi)										3.48E-01
Tc, (MCi)										1.62E-05
TRU, (MCi)										6.25E-04
Total MCi										3.67E-01
Ag+, (MT)										3.45E-03
Ag2O, (MT)										1.27E+00
Al+3, (MT)										3.96E+00
Al2O3, (MT)										1.41E+02
Am+3, (MT)										7.59E-05
Am2O3, (MT)										3.69E-08
APM-, (MT)										3.06E-03
As+5, (MT)										1.25E-03
As2O5, (MT)										1.35E+00
B+3, (MT)										2.49E-03
B2O3, (MT)										4.61E-02
Ba+2, (MT)										7.75E-03
BaO, (MT)										8.39E-03
Be+2, (MT)										1.91E-05
BeO, (MT)										1.72E-01
Bi+3, (MT)										4.92E-01
Bi2O3, (MT)										2.78E+00
Carbon14, (MT)										1.14E-06
Ca+2, (MT)										3.76E-01
Cancrinite, (MT)										9.71E+01
CaO, (MT)										1.99E+00
Cd+2, (MT)										1.99E-02
CdO, (MT)										1.08E-01
Ce+3, (MT)										5.97E-01
Ce2O3, (MT)										2.63E+00
Cl-, (MT)										8.76E-03
CO3-2, (MT)										5.63E-01
Cr+3, (MT)										4.52E-01
Cr2O3, (MT)										7.96E-01
Cs+, (MT)										2.32E-04
Cs2O, (MT)										3.12E-07
Cu+2, (MT)										1.87E-03
CuO, (MT)										8.01E-01
F-, (MT)										1.50E-01
Fe+3, (MT)										2.66E+00
Fe2O3, (MT)										3.47E+01
H2O, (MT)										9.51E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	628	631	632	633	634	635	640	641	657	700
Hg+2, (MT)										2.26E-05
I-, (MT)										5.07E-02
K+, (MT)										5.27E-02
K2O, (MT)										9.36E-03
La+3, (MT)										5.33E-02
La2O3, (MT)										2.35E-01
Li+, (MT)										6.16E-05
Li2O, (MT)										2.39E-05
Mg+2, (MT)										2.76E-02
MgO, (MT)										1.88E-01
MnO2, (MT)										5.30E-01
Mo+6, (MT)										2.01E-03
MoO3, (MT)										8.18E-02
Na+, (MT)										2.31E+01
Na2O, (MT)										1.04E+01
Ni(OH)3, (MT)										
Ni+3, (MT)										2.66E-02
Ni2FECN6, (MT)										2.35E+00
Ni2O3, (MT)										2.51E+00
NiO, (MT)										
NO2-, (MT)										1.85E-01
NO3-, (MT)										
Np+4, (MT)										5.01E-04
NpO2, (MT)										6.24E-05
OH-, (MT)										4.21E+03
P2O5, (MT)										3.52E+01
P2O5:24W, (MT)										1.31E-03
Pb+4, (MT)										8.23E-03
PbO2, (MT)										4.19E+00
PO4-3, (MT)										5.93E-01
POLY, (MT)										8.08E-03
Pu+4, (MT)										1.56E-03
PuO2, (MT)										5.19E-05
Si+4, (MT)										1.98E-01
SiO2, (MT)										1.71E+00
SO3, (MT)										
SO4-2, (MT)										9.85E-03
Sr+2, (MT)										9.23E-02
SrO, (MT)										4.22E-05
Tc2O7, (MT)										1.35E-04
TcO4-, (MT)										1.42E-03
TiO2, (MT)										3.03E-04
Tot Org Carbon, (MT)										2.90E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	628	631	632	633	634	635	640	641	657	700
U3O8, (MT)										1.03E-02
UO2+2, (MT)										4.18E+00
UO3, (MT)										
V+5, (MT)										4.71E-04
V2O5, (MT)										3.09E-01
WO2, (MT)										
WO3, (MT)										6.53E-01
Zn+2, (MT)										2.37E-03
ZnO, (MT)										3.04E-01
Zr+4, (MT)										6.94E-01
ZrO2, (MT)										6.69E+00
ZrO2:2H2O, (MT)										1.03E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	701	702	703	707	708	709	712	713	714	715
Volume, Total Liters	3.50E+09	3.81E+09	3.81E+09	9.49E+08	3.04E+09	3.98E+09	1.57E+08	4.02E+09	3.54E+08	7.59E+08
Specific Gravity	1.14E+00	1.13E+00	1.13E+00	1.00E+00	1.00E+00	1.00E+00	1.02E+00	1.01E+00	1.13E+00	1.00E+00
Total Mass Flow, (MT)	3.98E+06	4.30E+06	4.30E+06	9.49E+05	3.04E+06	3.98E+06	1.60E+05	4.07E+06	3.98E+05	7.59E+05
Cs and Ba, (MCi)	8.47E+00	8.47E+00	8.47E+00							
Sr and Y, (MCi)	1.38E+02	1.38E+02	1.38E+02							
Tc, (MCi)	5.88E-03	5.88E-03	5.88E-03				2.94E-06	5.88E-06		
TRU, (MCi)	2.07E-01	1.05E-01	1.05E-01				1.02E-05	1.02E-01		
Total MCi	1.47E+02	1.47E+02	1.47E+02				1.32E-05	1.02E-01		
Ag+, (MT)	1.38E+00	1.38E+00	1.38E+00							
Al(OH)4-, (MT)	9.16E-02	9.16E-02	9.16E-02							
Al+3, (MT)	2.11E+02	2.11E+02	2.11E+02							
Am+3, (MT)	3.02E-02	3.02E-02	3.02E-02					3.02E-06		
As+5, (MT)	4.97E-01	4.97E-01	4.97E-01							
B+3, (MT)	9.93E-01	9.93E-01	9.93E-01							
Ba+2, (MT)	3.09E+00	3.09E+00	3.09E+00							
Be+2, (MT)	7.60E-03	7.60E-03	7.60E-03							
Bi+3, (MT)	1.96E+02	1.96E+02	1.96E+02				1.96E-04	1.96E-01		
Carbon14, (MT)	4.52E-04	4.52E-04	4.52E-04							
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	1.50E+02	1.50E+02	1.50E+02							
Cancrinite, (MT)	2.45E+02	2.45E+02	2.45E+02							
Cd+2, (MT)	7.92E+00	7.92E+00	7.92E+00							
Ce+3, (MT)	2.38E+02	2.38E+02	2.38E+02				2.38E-06	2.38E-02		
Cl-, (MT)	8.83E+00	8.83E+00	8.83E+00							
Cl2, (MT)										
CO, (MT)	1.90E+02	1.90E+02	1.90E+02							
CO2, (MT)	1.61E+00	1.61E+00	1.61E+00							
CO3-2, (MT)										
Cr(OH)4-, (MT)	2.25E-03	2.25E-03	2.25E-03							
Cr+3, (MT)	1.34E+02	1.34E+02	1.34E+02							
Cs+, (MT)	1.03E-01	1.03E-01	1.03E-01							
Cu+2, (MT)	7.45E-01	7.45E-01	7.45E-01							
DTPA-3, (MT)										
F-, (MT)	2.80E+04	2.80E+04	2.80E+04				2.65E-01	5.30E+01		
F2, (MT)										
Fe+3, (MT)	7.75E+02	7.75E+02	7.75E+02					7.75E-02		
FeCN6-3, (MT)	6.98E+00	6.98E+00	6.98E+00							
FESA, (MT)										
H+, (MT)	1.43E+04	1.43E+04	1.43E+04		2.53E+00	2.53E+00	4.89E+00	1.35E+03	1.43E+03	6.34E-01
H2, (MT)	5.87E-08	5.87E-08	5.87E-08							
H2O, (MT)	3.18E+06	3.47E+06	3.47E+06		1.20E+02	1.20E+02	1.51E+05	1.71E+04	3.09E+05	2.99E+01
H2O2, (MT)	4.95E+02	4.95E+02	4.95E+02							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	701	702	705	707	708	709	712	713	714	715
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	9.01E-03	9.01E-03	9.01E-03							
Hg2, (MT)	3.25E-02	3.25E-02	3.25E-02							
I-, (MT)	2.02E+01	2.02E+01	2.02E+01							
I2, (MT)										
K+, (MT)	2.13E+01	2.13E+01	2.13E+01							
La+3, (MT)	2.12E+01	2.12E+01	2.12E+01				2.12E-07	2.12E-03		
Li+, (MT)	2.50E-02	2.50E-02	2.50E-02							
Mg+2, (MT)	1.10E+01	1.10E+01	1.10E+01							
Mn+4, (MT)	1.34E+02	1.34E+02	1.34E+02							
MnO2, (MT)	3.52E-02	3.52E-02	3.52E-02							
Mo+6, (MT)	8.87E-01	8.87E-01	8.87E-01							
MoO4-2, (MT)	4.28E-02	4.28E-02	4.28E-02							
N2, (MT)	1.76E-02	1.76E-02	1.76E-02							
N2O, (MT)										
Na+, (MT)	2.82E+03	2.82E+03	2.82E+03							
NH2OH, (MT)										
NH3, (MT)	1.42E-01	1.42E-01	1.42E-01							
NH4+, (MT)	2.99E-03	2.99E-03	2.99E-03							
Ni+3, (MT)	1.88E+02	1.88E+02	1.88E+02							
NO, (MT)										
NO2, (MT)	1.53E+00	1.53E+00	1.53E+00							
NO2-, (MT)										
NO3-, (MT)	7.54E+05	7.58E+05	7.58E+05		1.56E+02	1.56E+02	1.11E+03	8.38E+04	8.79E+04	3.90E+01
Np+4, (MT)	1.46E-01	1.46E-05	1.46E-05				1.46E-05	1.46E-01		
O2, (MT)	1.09E+02	1.09E+02	1.09E+02							
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)		2.03E+04	2.03E+04	9.49E+05	3.04E+06	3.98E+06	5.98E+03	3.96E+06		7.59E+05
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	3.28E+00	3.28E+00	3.28E+00							
PO4-3, (MT)	2.47E+02	2.47E+02	2.47E+02							
POLY, (MT)	2.23E+00	2.23E+00	2.23E+00							
PTA-3, (MT)	5.42E-01	5.42E-01	5.42E-01							
Pu+4, (MT)	4.54E-01	4.54E-03	4.54E-03				4.49E-05	4.49E-01		
Si+4, (MT)	7.89E+01	7.89E+01	7.89E+01							
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	1.31E+02	1.31E+02	1.31E+02							
Sr+2, (MT)	3.68E+01	3.68E+01	3.68E+01							
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	701	702	705	707	708	709	712	715	714	715
TcO4-, (MT)	5.68E-01	5.67E-01	5.67E-01				2.84E-04	5.68E-04		
Ti+4, (MT)	1.90E-02	1.90E-02	1.90E-02							
Tot Org Carbon, (MT)	1.16E+02	1.16E+02	1.16E+02							
UO2+2, (MT)	1.76E+03	1.76E-01	1.76E-01				1.76E+03	1.76E+03		
V+5, (MT)	1.88E-01	1.88E-01	1.88E-01							
W+6, (MT)	1.42E-05	1.42E-05	1.42E-05							
Zn+2, (MT)	9.44E-01	9.44E-01	9.44E-01							
Zr+4, (MT)	5.10E+02	5.10E+02	5.10E+02					5.10E-01		
ZrO2:2H2O, (MT)	3.96E-05	3.96E-05	3.96E-05							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	701	702	703	707	708	709	712	713	714	715
Total Mass Flow, (MT)	4.61E+03	4.61E+03	4.61E+03							
Cs and Ba, (MCi)	1.91E-02	1.91E-02	1.91E-02							
Sr and Y, (MCi)	3.48E-01	3.48E-01	3.48E-01							
Tc, (MCi)	1.62E-05	1.62E-05	1.62E-05							
TRU, (MCi)	6.25E-04	6.25E-04	6.25E-04							
Total MCi	3.67E-01	3.67E-01	3.67E-01							
Ag+, (MT)	3.45E-03	3.45E-03	3.45E-03							
Ag2O, (MT)	1.27E+00	1.27E+00	1.27E+00							
Al+3, (MT)	3.96E+00	3.96E+00	3.96E+00							
Al2O3, (MT)	1.41E+02	1.41E+02	1.41E+02							
Am+3, (MT)	7.59E-05	7.59E-05	7.59E-05							
Am2O3, (MT)	3.69E-08									
APM-, (MT)	3.06E-03	3.06E-03	3.06E-03							
As+5, (MT)	1.25E-03	1.25E-03	1.25E-03							
As2O5, (MT)	1.35E+00	1.35E+00	1.35E+00							
B+3, (MT)	2.49E-03	2.49E-03	2.49E-03							
B2O3, (MT)	4.61E-02	4.61E-02	4.61E-02							
Ba+2, (MT)	7.75E-03	7.75E-03	7.75E-03							
BaO, (MT)	8.39E-03	8.39E-03	8.39E-03							
Be+2, (MT)	1.91E-05	1.91E-05	1.91E-05							
BeO, (MT)	1.72E-01	1.72E-01	1.72E-01							
Bi+3, (MT)	4.92E-01	4.92E-01	4.92E-01							
Bi2O3, (MT)	2.78E+00	2.78E+00	2.78E+00							
Carbon14, (MT)	1.14E-06	1.14E-06	1.14E-06							
Ca+2, (MT)	3.76E-01	3.76E-01	3.76E-01							
Cancrinite, (MT)	9.71E+01	9.71E+01	9.71E+01							
CaO, (MT)	1.99E+00	1.99E+00	1.99E+00							
Cd+2, (MT)	1.99E-02	1.99E-02	1.99E-02							
CdO, (MT)	1.08E-01	1.08E-01	1.08E-01							
Ce+3, (MT)	5.97E-01	5.97E-01	5.97E-01							
Ce2O3, (MT)	2.63E+00	2.63E+00	2.63E+00							
Cl-, (MT)	8.76E-03	8.76E-03	8.76E-03							
CO3-2, (MT)	5.63E-01	5.63E-01	5.63E-01							
Cr+3, (MT)	4.52E-01	4.52E-01	4.52E-01							
Cr2O3, (MT)	7.96E-01	7.96E-01	7.96E-01							
Cs+, (MT)	2.32E-04	2.32E-04	2.32E-04							
Cs2O, (MT)	3.12E-07	3.12E-07	3.12E-07							
Cu+2, (MT)	1.87E-03	1.87E-03	1.87E-03							
CuO, (MT)	8.01E-01	8.01E-01	8.01E-01							
F-, (MT)	1.50E-01	1.50E-01	1.50E-01							
Fe+3, (MT)	2.66E+00	2.66E+00	2.66E+00							
Fe2O3, (MT)	3.47E+01	3.47E+01	3.47E+01							
H2O, (MT)	9.51E-01	9.51E-01	9.51E-01							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	701	702	705	707	708	709	712	713	714	715
Hg+2, (MT)	2.26E-05	2.26E-05	2.26E-05							
I-, (MT)	5.07E-02	5.07E-02	5.07E-02							
K+, (MT)	5.27E-02	5.27E-02	5.27E-02							
K2O, (MT)	9.36E-03	9.36E-03	9.36E-03							
La+3, (MT)	5.33E-02	5.33E-02	5.33E-02							
La2O3, (MT)	2.35E-01	2.35E-01	2.35E-01							
Li+, (MT)	6.16E-05	6.16E-05	6.16E-05							
Li2O, (MT)	2.39E-05	2.39E-05	2.39E-05							
Mg+2, (MT)	2.76E-02	2.76E-02	2.76E-02							
MgO, (MT)	1.88E-01	1.88E-01	1.88E-01							
MnO2, (MT)	5.30E-01	5.30E-01	5.30E-01							
Mo+6, (MT)	2.01E-03	2.01E-03	2.01E-03							
MoO3, (MT)	8.18E-02	8.18E-02	8.18E-02							
Na+, (MT)	2.31E+01	2.31E+01	2.31E+01							
Na2O, (MT)	1.04E+01	1.04E+01	1.04E+01							
Ni(OH)3, (MT)										
Ni+3, (MT)	2.66E-02	2.66E-02	2.66E-02							
Ni2FECN6, (MT)	2.35E+00	2.35E+00	2.35E+00							
Ni2O3, (MT)	2.51E+00	2.51E+00	2.51E+00							
NiO, (MT)										
NO2-, (MT)	1.85E-01	1.85E-01	1.85E-01							
NO3-, (MT)										
Np+4, (MT)	5.01E-04	5.01E-04	5.01E-04							
NpO2, (MT)	6.24E-05	6.24E-05	6.24E-05							
OH-, (MT)	4.21E+03	4.21E+03	4.21E+03							
P2O5, (MT)	3.52E+01	3.52E+01	3.52E+01							
P2O5:24W, (MT)	1.31E-03	1.31E-03	1.31E-03							
Pb+4, (MT)	8.23E-03	8.23E-03	8.23E-03							
PbO2, (MT)	4.19E+00	4.19E+00	4.19E+00							
PO4-3, (MT)	5.93E-01	5.93E-01	5.93E-01							
POLY, (MT)	8.08E-03	8.08E-03	8.08E-03							
Pu+4, (MT)	1.56E-03	1.56E-03	1.56E-03							
PuO2, (MT)	5.19E-05	5.19E-05	5.19E-05							
Si+4, (MT)	1.98E-01	1.98E-01	1.98E-01							
SiO2, (MT)	1.71E+00	1.71E+00	1.71E+00							
SO3, (MT)										
SO4-2, (MT)	9.85E-03	9.85E-03	9.85E-03							
Sr+2, (MT)	9.23E-02	9.23E-02	9.23E-02							
SrO, (MT)	4.22E-05	4.22E-05	4.22E-05							
Tc2O7, (MT)	1.35E-04	1.35E-04	1.35E-04							
TcO4-, (MT)	1.42E-03	1.42E-03	1.42E-03							
TiO2, (MT)	3.03E-04	3.03E-04	3.03E-04							
Tot Org Carbon, (MT)	2.90E-01	2.90E-01	2.90E-01							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	701	702	703	707	708	709	712	713	714	715
U3O8, (MT)	1.03E-02	1.03E-02	1.03E-02							
UO2+2, (MT)	4.18E+00	4.18E+00	4.18E+00							
UO3, (MT)										
V+5, (MT)	4.71E-04	4.71E-04	4.71E-04							
V2O5, (MT)	3.09E-01	3.09E-01	3.09E-01							
WO2, (MT)										
WO3, (MT)	6.53E-01	6.53E-01	6.53E-01							
Zn+2, (MT)	2.37E-03	2.37E-03	2.37E-03							
ZnO, (MT)	3.04E-01	3.04E-01	3.04E-01							
Zr+4, (MT)	6.94E-01	6.94E-01	6.94E-01							
ZrO2, (MT)	6.69E+00	6.69E+00	6.69E+00							
ZrO2:2H2O, (MT)	1.03E+00	1.03E+00	1.03E+00							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	719	720	721	722	723	724	727	728	729	730
Volume, Total Liters	4.72E+09	2.59E+09	1.22E+09	8.94E+08	1.45E+08	4.71E+09	2.61E+07	9.80E+08	3.79E+09	2.50E+05
Specific Gravity	1.00E+00	1.00E+00	1.40E+00	1.01E+00	1.00E+00	1.00E+00	1.03E+00	1.00E+00	1.00E+00	1.39E+00
Total Mass Flow, (MT)	4.72E+06	2.59E+06	1.70E+06	9.06E+05	1.45E+05	4.71E+06	2.67E+04	9.81E+05	3.79E+06	3.47E+02
Cs and Ba, (MCi)			8.47E+00							
Sr and Y, (MCi)			1.38E+02							
Tc, (MCi)	2.94E-06		5.88E-03							
TRU, (MCi)	1.02E-05		1.05E-01							
Total MCi	1.32E-05		1.47E+02							
Ag+, (MT)			1.38E+00							
Al(OH)4-, (MT)			9.16E-02							
Al+3, (MT)			2.11E+02							
Am+3, (MT)			3.02E-02							
As+5, (MT)			4.97E-01							
B+3, (MT)			9.93E-01							
Ba+2, (MT)			3.09E+00							
Be+2, (MT)			7.60E-03							
Bi+3, (MT)	1.96E-04		1.96E+02							
Carbon14, (MT)			4.52E-04							
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)			1.50E+02							
Cancrinite, (MT)			2.45E+02							
Cd+2, (MT)			7.92E+00							
Ce+3, (MT)	2.38E-06		2.38E+02							
Cl-, (MT)			8.83E+00							
Cl2, (MT)										
CO, (MT)		1.90E+02						1.90E+02		
CO2, (MT)		1.61E+00						1.61E+00		
CO3-2, (MT)							3.92E+02	3.92E+02		
Cr(OH)4-, (MT)			2.25E-03							
Cr+3, (MT)			1.34E+02							
Cs+, (MT)			1.03E-01							
Cu+2, (MT)			7.45E-01							
DTPA-3, (MT)										
F-, (MT)	2.65E-01		2.80E+04							
F2, (MT)										
Fe+3, (MT)			7.75E+02							
FeCN6-3, (MT)			6.98E+00							
FESA, (MT)										
H+, (MT)	4.89E+00		1.43E+04	2.72E+02						3.17E+00
H2, (MT)		5.87E-08						1.83E+02		
H2O, (MT)	8.76E+03	2.57E+06	8.97E+05	8.86E+05	1.45E+05	3.00E+03	2.60E+04	2.90E+04		1.49E+02
H2O2, (MT)			4.95E+02							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	719	720	721	722	723	724	727	728	729	730
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)			9.01E-03							
Hg2, (MT)			3.25E-02							
I-, (MT)			2.02E+01							
I2, (MT)										
K+, (MT)			2.13E+01							
La+3, (MT)	2.12E-07		2.12E+01							
Li+, (MT)			2.50E-02							
Mg+2, (MT)			1.10E+01							
Mn+4, (MT)			1.34E+02							
MnO2, (MT)			3.52E-02							
Mo+6, (MT)			8.87E-01							
MoO4-2, (MT)			4.28E-02							
N2, (MT)		1.76E-02						1.76E-02		
N2O, (MT)								2.00E+03		
Na+, (MT)			2.82E+03				2.99E+02	2.99E+02		
NH2OH, (MT)				3.00E+03						
NH3, (MT)			1.42E-01							
NH4+, (MT)			2.99E-03							
Ni+3, (MT)			1.88E+02							
NO, (MT)										
NO2, (MT)		1.53E+00						1.53E+00		
NO2-, (MT)										
NO3-, (MT)	1.11E+03		7.58E+05	1.67E+04						1.95E+02
Np+4, (MT)	1.46E-05		1.46E-05							
O2, (MT)		1.09E+02						1.09E+02		
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)	4.71E+06	2.03E+04				4.70E+06		9.49E+05	3.79E+06	
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)			3.28E+00							
PO4-3, (MT)			2.47E+02							
POLY, (MT)			2.23E+00							
PTA-3, (MT)			5.42E-01							
Pu+4, (MT)	4.49E-05		4.54E-03							
Si+4, (MT)			7.89E+01							
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)			1.31E+02							
Sr+2, (MT)			3.68E+01							
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	719	720	721	722	723	724	727	728	729	730
TcO4-, (MT)	2.84E-04		5.67E-01							
Ti+4, (MT)			1.90E-02							
Tot Org Carbon, (MT)			1.16E+02							
UO2+2, (MT)	1.76E+03		1.76E-01							
V+5, (MT)			1.88E-01							
W+6, (MT)			1.42E-05							
Zn+2, (MT)			9.44E-01							
Zr+4, (MT)			5.10E+02							
ZrO2:2H2O, (MT)			3.96E-05							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	719	720	721	722	723	724	727	728	729	730
Total Mass Flow, (MT)			4.61E+03							
Cs and Ba, (MCi)			1.91E-02							
Sr and Y, (MCi)			3.48E-01							
Tc, (MCi)			1.62E-05							
TRU, (MCi)			6.25E-04							
Total MCi			3.67E-01							
Ag+, (MT)			3.45E-03							
Ag2O, (MT)			1.27E+00							
Al+3, (MT)			3.96E+00							
Al2O3, (MT)			1.41E+02							
Am+3, (MT)			7.59E-05							
Am2O3, (MT)										
APM-, (MT)			3.06E-03							
As+5, (MT)			1.25E-03							
As2O5, (MT)			1.35E+00							
B+3, (MT)			2.49E-03							
B2O3, (MT)			4.61E-02							
Ba+2, (MT)			7.75E-03							
BaO, (MT)			8.39E-03							
Be+2, (MT)			1.91E-05							
BeO, (MT)			1.72E-01							
Bi+3, (MT)			4.92E-01							
Bi2O3, (MT)			2.78E+00							
Carbon14, (MT)			1.14E-06							
Ca+2, (MT)			3.76E-01							
Cancrinite, (MT)			9.71E+01							
CaO, (MT)			1.99E+00							
Cd+2, (MT)			1.99E-02							
CdO, (MT)			1.08E-01							
Ce+3, (MT)			5.97E-01							
Ce2O3, (MT)			2.63E+00							
Cl-, (MT)			8.76E-03							
CO3-2, (MT)			5.63E-01							
Cr+3, (MT)			4.52E-01							
Cr2O3, (MT)			7.96E-01							
Cs+, (MT)			2.32E-04							
Cs2O, (MT)			3.12E-07							
Cu+2, (MT)			1.87E-03							
CuO, (MT)			8.01E-01							
F-, (MT)			1.50E-01							
Fe+3, (MT)			2.66E+00							
Fe2O3, (MT)			3.47E+01							
H2O, (MT)			9.51E-01							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	719	720	721	722	723	724	727	728	729	730
Hg+2, (MT)			2.26E-05							
I-, (MT)			5.07E-02							
K+, (MT)			5.27E-02							
K2O, (MT)			9.36E-03							
La+3, (MT)			5.33E-02							
La2O3, (MT)			2.35E-01							
Li+, (MT)			6.16E-05							
Li2O, (MT)			2.39E-05							
Mg+2, (MT)			2.76E-02							
MgO, (MT)			1.88E-01							
MnO2, (MT)			5.30E-01							
Mo+6, (MT)			2.01E-03							
MoO3, (MT)			8.18E-02							
Na+, (MT)			2.31E+01							
Na2O, (MT)			1.04E+01							
Ni(OH)3, (MT)										
Ni+3, (MT)			2.66E-02							
Ni2FECN6, (MT)			2.35E+00							
Ni2O3, (MT)			2.51E+00							
NiO, (MT)										
NO2-, (MT)			1.85E-01							
NO3-, (MT)										
Np+4, (MT)			5.01E-04							
NpO2, (MT)			6.24E-05							
OH-, (MT)			4.21E+03							
P2O5, (MT)			3.52E+01							
P2O5:24W, (MT)			1.31E-03							
Pb+4, (MT)			8.23E-03							
PbO2, (MT)			4.19E+00							
PO4-3, (MT)			5.93E-01							
POLY, (MT)			8.08E-03							
Pu+4, (MT)			1.56E-03							
PuO2, (MT)			5.19E-05							
Si+4, (MT)			1.98E-01							
SiO2, (MT)			1.71E+00							
SO3, (MT)										
SO4-2, (MT)			9.85E-03							
Sr+2, (MT)			9.23E-02							
SrO, (MT)			4.22E-05							
Tc2O7, (MT)			1.35E-04							
TcO4-, (MT)			1.42E-03							
TiO2, (MT)			3.03E-04							
Tot Org Carbon, (MT)			2.90E-01							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	719	720	721	722	723	724	727	728	729	730
U3O8, (MT)			1.03E-02							
UO2+2, (MT)			4.18E+00							
UO3, (MT)										
V+5, (MT)			4.71E-04							
V2O5, (MT)			3.09E-01							
WO2, (MT)										
WO3, (MT)			6.53E-01							
Zn+2, (MT)			2.37E-03							
ZnO, (MT)			3.04E-01							
Zr+4, (MT)			6.94E-01							
ZrO2, (MT)			6.69E+00							
ZrO2:2H2O, (MT)			1.03E+00							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	731	732	733	734	735	736	737	738	739	742
Volume, Total Liters	3.79E+09	9.80E+08	9.58E+08	7.11E+08		1.43E+07	6.97E+08	2.49E+08	2.49E+08	2.49E+08
Specific Gravity	1.00E+00	1.00E+00	1.06E+00	1.00E+00		1.00E+00	1.00E+00	1.20E+00	1.20E+00	1.20E+00
Total Mass Flow, (MT)	3.80E+06	9.81E+05	1.01E+06	7.11E+05		1.43E+04	6.97E+05	2.99E+05	2.99E+05	2.99E+05
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)			2.94E-06					2.94E-06	2.94E-06	2.94E-06
TRU, (MCi)			1.02E-01					1.02E-01	1.02E-01	1.02E-01
Total MCi			1.02E-01					1.02E-01	1.02E-01	1.02E-01
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)			3.02E-06					3.02E-06	3.02E-06	3.02E-06
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)			1.96E-01					1.96E-01	1.96E-01	1.96E-01
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)			2.38E-02					2.38E-02	2.38E-02	2.38E-02
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)		1.90E+02								
CO2, (MT)		1.61E+00								
CO3-2, (MT)		3.92E+02								
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)			5.27E+01					5.27E+01	5.27E+01	5.27E+01
F2, (MT)										
Fe+3, (MT)			7.75E-02					7.75E-02	7.75E-02	7.75E-02
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	3.17E+00		1.62E+03					1.62E+03	1.62E+03	1.62E+03
H2, (MT)		1.83E+02		1.83E+02		1.83E+02				
H2O, (MT)	1.49E+02	2.90E+04	8.94E+05	6.97E+05			6.97E+05	1.98E+05	1.98E+05	1.98E+05
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	731	732	733	734	735	736	737	738	739	742
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)			2.12E-03					2.12E-03	2.12E-03	2.12E-03
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)		1.76E-02								
N2O, (MT)		2.00E+03		2.00E+03		2.00E+03				
Na+, (MT)		2.99E+02								
NH2OH, (MT)			3.00E+03							
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)		1.53E+00								
NO2-, (MT)										
NO3-, (MT)	1.95E+02		9.94E+04					9.94E+04	9.94E+04	9.94E+04
Np+4, (MT)			1.46E-01					1.46E-01	1.46E-01	1.46E-01
O2, (MT)		1.09E+02								
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)	3.79E+06	9.49E+05	1.21E+04	1.21E+04		1.21E+04				
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)			4.49E-01					4.49E-01	4.49E-01	4.49E-01
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	731	732	733	734	735	736	737	738	739	742
TcO4-, (MT)			2.84E-04					2.84E-04	2.84E-04	2.84E-04
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)			1.76E+00					1.76E+00	1.76E+00	1.76E+00
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)			5.10E-01					5.10E-01	5.10E-01	5.10E-01
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated-Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	731	732	733	734	735	736	737	738	739	740
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	731	732	733	734	735	736	737	738	739	742
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	731	732	733	734	735	736	737	738	739	742
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	743	744	745	746	747	748	749	759	760	761
Volume, Total Liters	5.98E+06	1.50E+08	1.44E+08	7.22E+06		2.06E+07	2.57E+09	9.12E+06	1.67E+06	1.80E+07
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.40E+00		1.00E+00	1.00E+00	1.00E+00	1.38E+00	1.20E+00
Total Mass Flow, (MT)	5.98E+03	1.50E+05	1.44E+05	1.01E+04		2.06E+04	2.57E+06	9.12E+03	2.30E+03	2.15E+04
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)				2.94E-06						2.94E-06
TRU, (MCi)				1.02E-05						1.02E-05
Total MCi				1.32E-05						1.32E-05
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)				1.96E-04						1.96E-04
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)				2.38E-06						2.38E-06
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)						1.90E+02				
CO2, (MT)						1.61E+00				
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)				2.65E-01						2.65E-01
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)				4.89E+00					2.05E+01	2.54E+01
H2, (MT)						5.87E-08				
H2O, (MT)		1.44E+05	1.44E+05	7.24E+03			2.57E+06	9.12E+03	1.01E+03	1.74E+04
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	743	744	745	746	747	748	749	759	760	761
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)				2.12E-07						2.12E-07
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)						1.76E-02				
N2O, (MT)										
Na+, (MT)										
NH2OH, (MT)								1.82E+00		1.82E+00
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)						1.53E+00				
NO2-, (MT)										
NO3-, (MT)				1.11E+03					1.26E+03	2.37E+03
Np+4, (MT)				1.46E-05						1.46E-05
O2, (MT)						1.09E+02				
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)	5.98E+03	5.98E+03				2.03E+04				
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)				4.49E-05						4.49E-05
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	743	744	745	746	747	748	749	759	760	761
TcO4-, (MT)				2.84E-04						2.84E-04
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)				1.76E+03						1.76E+03
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	743	744	745	746	747	748	749	759	760	761
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	743	744	745	746	747	748	749	759	760	761
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	743	744	745	746	747	748	749	759	760	761
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	800	802	805	806	807	808	810	811	902	905
Volume, Total Liters	1.19E+09	1.19E+09	1.19E+09	2.19E+00	2.19E+00				1.33E+07	8.61E+05
Specific Gravity	1.40E+00	1.40E+00	1.40E+00	1.00E+00	1.00E+00				1.30E+00	1.00E+00
Total Mass Flow, (MT)	1.66E+06	1.66E+06	1.66E+06	2.19E-03	2.19E-03				1.72E+04	8.61E+02
Cs and Ba, (MCi)	2.97E-01	2.97E-01	2.97E-01							
Sr and Y, (MCi)	1.50E-02	6.00E-05	6.00E-05							
Tc, (MCi)	2.61E-02	2.61E-02	2.61E-02						5.88E-06	
TRU, (MCi)	1.53E-04	1.53E-04	1.53E-04						1.05E-01	
Total MCi	3.39E-01	3.24E-01	3.24E-01						1.05E-01	
Ag+, (MT)	3.29E-01	3.29E-01	3.29E-01							
Al(OH)4-, (MT)	4.83E+03	4.83E+03	4.83E+03							
Al+3, (MT)	6.35E+03	6.35E+03	6.35E+03							
Am+3, (MT)	2.53E-05	2.53E-05	2.53E-05						3.02E-02	
As+5, (MT)	7.70E-01	7.70E-01	7.70E-01							
B+3, (MT)	5.20E-01	5.20E-01	5.20E-01							
Ba+2, (MT)	7.93E-01	7.93E-01	7.93E-01							
Be+2, (MT)	8.19E-02	8.19E-02	8.19E-02							
Bi+3, (MT)	6.77E+01	6.77E+01	6.77E+01						9.73E-01	
Carbon14, (MT)	7.43E-04	7.43E-04	7.43E-04							
C2H4O3, (MT)										
C2O4-2, (MT)									2.25E+03	
Ca+2, (MT)	1.68E-01	1.68E-01	1.68E-01							
Cancrinite, (MT)	2.38E+03	2.38E+03	2.38E+03							
Cd+2, (MT)	2.09E+00	2.09E+00	2.09E+00							
Ce+3, (MT)	2.52E-02	2.52E-02	2.52E-02						2.38E+02	
Cl-, (MT)	1.41E+03	1.41E+03	1.41E+03							
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)	3.76E+03	3.76E+03	3.76E+03							
Cr(OH)4-, (MT)	1.19E+02	1.19E+02	1.19E+02							
Cr+3, (MT)	4.38E+02	4.38E+02	4.38E+02							
Cs+, (MT)	3.62E-03	3.62E-03	3.62E-03							
Cu+2, (MT)	1.78E-01	1.78E-01	1.78E-01							
DTPA-3, (MT)										
F-, (MT)	1.31E+03	1.31E+03	1.31E+03						5.29E+01	
F2, (MT)										
Fe+3, (MT)	1.47E-01	1.47E-01	1.47E-01						7.75E-02	
FeCN6-3, (MT)	1.43E+03	1.43E+03	1.43E+03							
FESA, (MT)										
H+, (MT)									7.60E+01	
H2, (MT)										
H2O, (MT)	9.80E+05	9.80E+05	9.80E+05	2.19E-03	2.19E-03				1.29E+04	8.61E+02
H2O2, (MT)	2.63E+02	2.63E+02	2.63E+02							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	#01	#02	#05	#06	#07	#08	#10	#11	902	903
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	9.49E-01	9.49E-01	9.49E-01							
Hg2, (MT)	6.68E+00	6.68E+00	6.68E+00							
I-, (MT)	5.46E+02	5.46E+02	5.46E+02							
I2, (MT)										
K+, (MT)	7.07E+01	7.07E+01	7.07E+01							
La+3, (MT)	2.32E-03	2.32E-03	2.32E-03						2.12E+01	
Li+, (MT)	1.07E-01	1.07E-01	1.07E-01							
Mg+2, (MT)	9.72E-01	9.72E-01	9.72E-01							
Mn+4, (MT)	8.46E-02	8.46E-02	8.46E-02							
MnO2, (MT)	9.60E+01	9.60E+01	9.60E+01							
Mo+6, (MT)	4.87E+00	4.87E+00	4.87E+00							
MoO4-2, (MT)	8.79E+00	8.79E+00	8.79E+00							
N2, (MT)										
N2O, (MT)										
Na+, (MT)	3.11E+05	3.11E+05	3.11E+05							
NH2OH, (MT)										
NH3, (MT)	2.92E+01	2.92E+01	2.92E+01							
NH4+, (MT)	5.68E-02	5.68E-02	5.68E-02							
Ni+3, (MT)	4.08E-02	4.08E-02	4.08E-02							
NO, (MT)										
NO2, (MT)										
NO2-, (MT)	1.06E+04	1.06E+04	1.06E+04							
NO3-, (MT)	1.35E+05	1.35E+05	1.35E+05						1.71E+03	
Np+4, (MT)	1.47E-04	1.47E-04	1.47E-04						5.66E-03	
O2, (MT)										
OH-, (MT)	1.72E+05	1.72E+05	1.72E+05							
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.96E+00	1.96E+00	1.96E+00							
PO4-3, (MT)	4.72E+03	4.72E+03	4.72E+03							
POLY, (MT)	2.46E-01	2.46E-01	2.46E-01							
PTA-3, (MT)	1.86E+00	1.86E+00	1.86E+00							
Pu+4, (MT)	2.89E-04	2.89E-04	2.89E-04						4.54E-03	
Si+4, (MT)	5.70E+00	5.70E+00	5.70E+00							
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	2.80E+04	2.80E+04	2.80E+04							
Sr+2, (MT)	3.99E-03	1.59E-05	1.59E-05							
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	800	802	805	806	807	808	810	811	902	905
TcO4-, (MT)	2.52E+00	2.52E+00	2.52E+00						5.67E-04	
Ti+4, (MT)	1.29E-04	1.29E-04	1.29E-04							
Tot Org Carbon, (MT)	1.42E+01	1.42E+01	1.42E+01							
UO2+2, (MT)	8.63E-01	8.63E-01	8.63E-01						1.76E-01	
V+5, (MT)	6.21E-02	6.21E-02	6.21E-02							
W+6, (MT)	7.47E-01	7.47E-01	7.47E-01							
Zn+2, (MT)	3.59E+00	3.59E+00	3.59E+00							
Zr+4, (MT)	7.72E-01	7.72E-01	7.72E-01						5.10E-01	
ZrO2:2H2O, (MT)	2.15E+01	2.15E+01	2.15E+01							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	902	902	903	906	907	908	910	911	902	905
Total Mass Flow, (MT)	6.62E-04	6.62E-04	6.62E-04			1.91E-02		1.91E-02		
Cs and Ba, (MCi)										
Sr and Y, (MCi)	3.83E-06	3.83E-06	3.83E-06							
Tc, (MCi)										
TRU, (MCi)										
Total MCi	3.83E-06	3.83E-06	3.83E-06							
Ag+, (MT)	2.72E-08	2.72E-08	2.72E-08							
Ag2O, (MT)										
Al+3, (MT)	4.52E-05	4.52E-05	4.52E-05							
Al2O3, (MT)	2.48E-06	2.48E-06	2.48E-06							
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)	1.97E-08	1.97E-08	1.97E-08							
B2O3, (MT)										
Ba+2, (MT)	6.11E-08	6.11E-08	6.11E-08							
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)	3.88E-06	3.88E-06	3.88E-06							
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)	1.51E-05	1.51E-05	1.51E-05							
Cancrinite, (MT)	5.32E-05	5.32E-05	5.32E-05							
CaO, (MT)	3.50E-08	3.50E-08	3.50E-08							
Cd+2, (MT)	1.57E-07	1.57E-07	1.57E-07							
CdO, (MT)										
Ce+3, (MT)	6.53E-06	6.53E-06	6.53E-06							
Ce2O3, (MT)										
Cl-, (MT)	6.91E-08	6.91E-08	6.91E-08							
CO3-2, (MT)	4.44E-06	4.44E-06	4.44E-06							
Cr+3, (MT)	2.62E-06	2.62E-06	2.62E-06							
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)	1.48E-08	1.48E-08	1.48E-08							
CuO, (MT)										
F-, (MT)	1.18E-06	1.18E-06	1.18E-06							
Fe+3, (MT)	2.60E-05	2.60E-05	2.60E-05							
Fe2O3, (MT)	6.10E-07	6.10E-07	6.10E-07							
H2O, (MT)	1.64E-08	1.64E-08	1.64E-08							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	S00	S02	S05	S06	S07	S08	S10	S11	902	905
Hg+2, (MT)										
I-, (MT)	4.00E-07	4.00E-07	4.00E-07							
K+, (MT)	4.16E-07	4.16E-07	4.16E-07							
K2O, (MT)										
La+3, (MT)	5.88E-07	5.88E-07	5.88E-07							
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)	2.18E-07	2.18E-07	2.18E-07							
MgO, (MT)										
MnO2, (MT)	4.14E-06	4.14E-06	4.14E-06							
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)	6.24E-05	6.24E-05	6.24E-05							
Na2O, (MT)	1.82E-07	1.82E-07	1.82E-07							
Ni(OH)3, (MT)	2.49E-07	2.49E-07	2.49E-07							
Ni+3, (MT)	3.17E-06	3.17E-06	3.17E-06							
Ni2FECN6, (MT)	9.56E-06	9.56E-06	9.56E-06							
Ni2O3, (MT)	4.42E-08	4.42E-08	4.42E-08							
NiO, (MT)										
NO2-, (MT)	1.46E-06	1.46E-06	1.46E-06							
NO3-, (MT)	2.04E-05	2.04E-05	2.04E-05							
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)	2.36E-04	2.36E-04	2.36E-04							
P2O5, (MT)	6.19E-07	6.19E-07	6.19E-07							
P2O5:24W, (MT)										
Pb+4, (MT)	6.49E-08	6.49E-08	6.49E-08							
PbO2, (MT)	7.38E-08	7.38E-08	7.38E-08							
PO4-3, (MT)	4.57E-05	4.57E-05	4.57E-05							
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)	1.56E-06	1.56E-06	1.56E-06							
SiO2, (MT)	3.02E-08	3.02E-08	3.02E-08							
SO3, (MT)										
SO4-2, (MT)	7.51E-07	7.51E-07	7.51E-07							
Sr+2, (MT)	1.02E-06	1.02E-06	1.02E-06							
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)	2.29E-06	2.29E-06	2.29E-06							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	800	802	805	806	807	808	810	811	902	905
U3O8, (MT)										
UO2+2, (MT)	9.54E-05	9.54E-05	9.54E-05							
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)	1.87E-08	1.87E-08	1.87E-08							
ZnO, (MT)										
Zr+4, (MT)	5.48E-06	5.48E-06	5.48E-06							
ZrO2, (MT)	1.18E-07	1.18E-07	1.18E-07							
ZrO2:2H2O, (MT)	8.08E-06	8.08E-06	8.08E-06							

Table A-1. Material Balance for Integrated-Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	904	905	906	907	908	909	911	912	913	914
Volume, Total Liters	1.55E+06	5.17E+06	8.61E+05	1.23E+06	1.64E+05	8.61E+05	1.28E+07	8.61E+05	1.54E+06	5.17E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.16E+00	1.14E+00	1.00E+00	1.32E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.55E+03	5.17E+03	8.61E+02	1.42E+03	1.86E+02	8.61E+02	1.70E+04	8.61E+02	1.54E+03	5.17E+03
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)							5.88E-06			
TRU, (MCi)							1.04E-03			
Total MCi							1.05E-03			
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)							3.02E-06			
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Bc+2, (MT)										
Bi+3, (MT)							9.73E-01			
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)							2.25E+03			
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)							2.38E-02		9.03E+00	
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)	2.98E+01	5.36E+02							2.90E+01	5.36E+02
F-, (MT)							5.29E+01			
F2, (MT)										
Fe+3, (MT)							7.75E-02			
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)				6.24E+00			8.16E+01			
H2, (MT)										
H2O, (MT)	1.51E+03	4.54E+03	8.61E+02	1.03E+03	1.45E+02	8.61E+02	1.29E+04	8.61E+02	1.50E+03	4.54E+03
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	904	905	906	907	908	909	911	912	913	914
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)										
K+, (MT)										
La+3, (MT)							2.12E-03		8.06E-01	
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)	5.23E+00	9.40E+01								9.40E+01
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)				3.84E+02	2.72E+01		1.71E+03			
Np+4, (MT)							5.66E-03			
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)							4.54E-03			
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	904	905	906	907	908	909	911	912	913	914
TcO4-, (MT)							5.67E-04			
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)							1.76E-01			
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)					1.43E+01				1.36E-01	
Zr+4, (MT)							5.10E-01			
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	904	905	906	907	908	909	911	912	913	914
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	904	905	906	907	908	909	911	912	913	914
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	904	905	906	907	908	909	911	912	913	914
U3O8, (MT)										
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	915	916	917	918	924	925	926	1000	1001	1002
Volume, Total Liters	8.61E+05	1.37E+06	1.62E+05	8.61E+05	1.58E+04	1.06E+07	1.06E+07	3.60E+06	3.60E+06	3.60E+06
Specific Gravity	1.00E+00	1.29E+00	1.11E+00	1.00E+00	1.00E+00	1.03E+00	1.03E+00	1.40E+00	1.40E+00	1.40E+00
Total Mass Flow, (MT)	8.61E+02	1.68E+03	1.79E+02	8.61E+02	1.58E+01	1.12E+04	1.12E+04	5.04E+05	5.04E+05	5.04E+05
Cs and Ba, (MCi)								8.47E+00	8.47E+00	8.47E-04
Sr and Y, (MCi)								1.38E-02	1.38E-02	1.38E-02
Tc, (MCi)								5.87E-07	5.87E-07	5.87E-07
TRU, (MCi)					1.04E-01			1.05E-05	1.05E-05	1.05E-05
Total MCi					1.04E-01			8.49E+00	8.49E+00	1.47E-02
Ag+, (MT)								1.38E+00	1.38E+00	1.38E+00
Al(OH)4-, (MT)								9.16E-02	9.16E-02	9.16E-02
Al+3, (MT)								2.35E+02	2.35E+02	2.35E+02
Am+3, (MT)					3.02E-02			3.02E-06	3.02E-06	3.02E-06
As+5, (MT)								4.97E-01	4.97E-01	4.97E-01
B+3, (MT)								9.93E-01	9.93E-01	9.93E-01
Ba+2, (MT)								3.09E-04	3.09E-04	3.09E-04
Be+2, (MT)								7.60E-03	7.60E-03	7.60E-03
Bi+3, (MT)								9.78E-01	9.78E-01	9.78E-01
Carbon14, (MT)								4.52E-04	4.52E-04	4.52E-04
C2H4O3, (MT)										
C2O4-2, (MT)								2.16E+04	2.16E+04	2.16E+04
Ca+2, (MT)								1.50E+02	1.50E+02	1.50E+02
Cancrinite, (MT)								2.45E+02	2.45E+02	2.45E+02
Cd+2, (MT)								7.92E+00	7.92E+00	7.92E+00
Ce+3, (MT)		2.28E+02			2.38E-01	2.37E+02	2.37E+02	2.38E-02	2.38E-02	2.38E-02
Cl-, (MT)								8.83E+00	8.83E+00	8.83E+00
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)								2.25E-03	2.25E-03	2.25E-03
Cr+3, (MT)								1.34E+02	1.34E+02	1.34E+02
Cs+, (MT)								1.03E-01	1.03E-01	1.03E-05
Cu+2, (MT)								7.45E-01	7.45E-01	7.45E-01
DTPA-3, (MT)					2.98E-01	5.65E+02	5.65E+02			
F-, (MT)								2.79E+04	2.79E+04	2.79E+04
F2, (MT)										
Fe+3, (MT)								7.75E+02	7.75E+02	7.75E+02
FeCN6-3, (MT)								6.98E+00	6.98E+00	6.98E+00
FESA, (MT)								7.92E+03	7.92E+03	7.92E+03
H+, (MT)		2.21E-01	2.21E-01			4.42E-01	4.42E-01	2.52E+03	2.52E+03	2.52E+03
H2, (MT)										
H2O, (MT)	8.61E+02	1.03E+03	1.45E+02	8.61E+02	1.51E+01	9.79E+03	9.79E+03	4.37E+05	4.37E+05	4.37E+05
H2O2, (MT)								4.95E+02	4.95E+02	4.95E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	915	916	917	918	924	925	926	1000	1001	1002
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)								9.01E-03	9.01E-03	9.01E-03
Hg2, (MT)								3.25E-02	3.25E-02	3.25E-02
I-, (MT)								2.02E+01	2.02E+01	2.02E+01
I2, (MT)										
K+, (MT)								2.13E+01	2.13E+01	2.13E+01
La+3, (MT)		2.04E+01			2.12E-02	2.12E+01	2.12E+01	2.12E-03	2.12E-03	2.12E-03
Li+, (MT)								2.50E-02	2.50E-02	2.50E-02
Mg+2, (MT)								1.10E+01	1.10E+01	1.10E+01
Mn+4, (MT)								1.34E+02	1.34E+02	1.34E+02
MnO2, (MT)								3.52E-02	3.52E-02	3.52E-02
Mo+6, (MT)								8.87E-01	8.87E-01	8.87E-01
MoO4-2, (MT)								4.28E-02	4.28E-02	4.28E-02
N2, (MT)										
N2O, (MT)										
Na+, (MT)		5.13E+00				9.92E+01	9.92E+01	2.82E+03	2.82E+03	2.82E+03
NH2OH, (MT)										
NH3, (MT)								1.42E-01	1.42E-01	1.42E-01
NH4+, (MT)								2.99E-03	2.99E-03	1.66E-02
Ni+3, (MT)								1.88E+02	1.88E+02	1.88E+02
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)		3.84E+02	2.72E+01			4.11E+02	4.11E+02	1.94E+02	1.94E+02	1.94E+02
Np+4, (MT)										
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)								3.28E+00	3.28E+00	3.28E+00
PO4-3, (MT)								2.47E+02	2.47E+02	2.47E+02
POLY, (MT)								2.23E+00	2.23E+00	2.23E+00
PTA-3, (MT)								5.42E-01	5.42E-01	5.42E-01
Pu+4, (MT)								4.54E-07	4.54E-07	4.54E-07
Si+4, (MT)								7.89E+01	7.89E+01	7.89E+01
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)								1.31E+02	1.31E+02	1.31E+02
Sr+2, (MT)								3.68E-03	3.68E-03	3.68E-03
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	915	916	917	918	924	925	926	1000	1001	1002
TcO4-, (MT)								5.66E-05	5.66E-05	5.66E-05
Ti+4, (MT)								1.90E-02	1.90E-02	1.90E-02
Tot Org Carbon, (MT)								1.16E+02	1.16E+02	1.16E+02
UO2+2, (MT)								1.76E-05	1.76E-05	1.76E-05
V+5, (MT)								1.88E-01	1.88E-01	1.88E-01
W+6, (MT)								1.42E-05	1.42E-05	1.42E-05
Zn+2, (MT)		1.39E+01	7.17E+00		7.24E-02	2.12E+01	2.12E+01	9.44E-01	9.44E-01	9.44E-01
Zr+4, (MT)								5.09E+02	5.09E+02	5.09E+02
ZrO2:2H2O, (MT)								3.96E-05	3.96E-05	3.96E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	915	916	917	918	924	925	926	1000	1001	1002
Total Mass Flow, (MT)								4.61E+03	4.61E+00	4.46E+00
Cs and Ba, (MCi)								1.91E-02	1.91E-05	1.91E-05
Sr and Y, (MCi)								3.48E-01	3.48E-04	3.48E-04
Tc, (MCi)								1.62E-05	1.62E-08	1.62E-08
TRU, (MCi)								6.25E-04	6.25E-07	6.25E-07
Total MCi								3.67E-01	3.67E-04	3.67E-04
Ag+, (MT)								3.45E-03	3.45E-06	3.45E-06
Ag2O, (MT)								1.27E+00	1.27E-03	1.27E-03
Al+3, (MT)								3.96E+00	3.96E-03	3.96E-03
Al2O3, (MT)								1.41E+02	1.41E-01	
Am+3, (MT)								7.59E-05	7.59E-08	7.59E-08
Am2O3, (MT)										
APM-, (MT)								3.06E-03	3.06E-06	
As+5, (MT)								1.25E-03	1.25E-06	1.25E-06
As2O5, (MT)								1.35E+00	1.35E-03	1.35E-03
B+3, (MT)								2.49E-03	2.49E-06	2.49E-06
B2O3, (MT)								4.61E-02	4.61E-05	4.61E-05
Ba+2, (MT)								7.75E-03	7.75E-06	7.75E-06
BaO, (MT)								8.39E-03	8.39E-06	8.39E-06
Be+2, (MT)								1.91E-05	1.91E-08	1.91E-08
BeO, (MT)								1.72E-01	1.72E-04	1.72E-04
Bi+3, (MT)								4.92E-01	4.92E-04	4.92E-04
Bi2O3, (MT)								2.78E+00	2.78E-03	2.78E-03
Carbon14, (MT)								1.14E-06	1.14E-09	
Ca+2, (MT)								3.76E-01	3.76E-04	3.76E-04
Cancrinite, (MT)								9.71E+01	9.71E-02	9.71E-02
CaO, (MT)								1.99E+00	1.99E-03	1.99E-03
Cd+2, (MT)								1.99E-02	1.99E-05	1.99E-05
CdO, (MT)								1.08E-01	1.08E-04	1.08E-04
Ce+3, (MT)								5.97E-01	5.97E-04	5.97E-04
Ce2O3, (MT)								2.63E+00	2.63E-03	2.63E-03
Cl-, (MT)								8.76E-03	8.76E-06	8.76E-06
CO3-2, (MT)								5.63E-01	5.63E-04	5.63E-04
Cr+3, (MT)								4.52E-01	4.52E-04	4.52E-04
Cr2O3, (MT)								7.96E-01	7.96E-04	7.96E-04
Cs+, (MT)								2.32E-04	2.32E-07	2.32E-07
Cs2O, (MT)								3.12E-07	3.12E-10	
Cu+2, (MT)								1.87E-03	1.87E-06	1.87E-06
CuO, (MT)								8.01E-01	8.01E-04	8.01E-04
F-, (MT)								1.50E-01	1.50E-04	1.50E-04
Fe+3, (MT)								2.66E+00	2.66E-03	2.66E-03
Fe2O3, (MT)								3.47E+01	3.47E-02	3.47E-02
H2O, (MT)								9.51E-01	9.51E-04	9.51E-04

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste, Vitrification Flowsheet.

Stream Name / Solid Components	915	916	917	918	924	925	926	1000	1001	1002
Hg+2, (MT)								2.26E-05	2.26E-08	
I-, (MT)								5.07E-02	5.07E-05	5.07E-05
K+, (MT)								5.27E-02	5.27E-05	5.27E-05
K2O, (MT)								9.36E-03	9.36E-06	9.36E-06
La+3, (MT)								5.33E-02	5.33E-05	5.33E-05
La2O3, (MT)								2.35E-01	2.35E-04	2.35E-04
Li+, (MT)								6.16E-05	6.16E-08	6.16E-08
Li2O, (MT)								2.39E-05	2.39E-08	2.39E-08
Mg+2, (MT)								2.76E-02	2.76E-05	2.76E-05
MgO, (MT)								1.88E-01	1.88E-04	1.88E-04
MnO2, (MT)								5.30E-01	5.30E-04	5.30E-04
Mo+6, (MT)								2.01E-03	2.01E-06	2.01E-06
MoO3, (MT)								8.18E-02	8.18E-05	8.18E-05
Na+, (MT)								2.31E+01	2.31E-02	2.31E-02
Na2O, (MT)								1.04E+01	1.04E-02	1.04E-02
Ni(OH)3, (MT)										
Ni+3, (MT)								2.66E-02	2.66E-05	2.66E-05
Ni2FECN6, (MT)								2.35E+00	2.35E-03	2.35E-03
Ni2O3, (MT)								2.51E+00	2.51E-03	2.51E-03
NiO, (MT)										
NO2-, (MT)								1.85E-01	1.85E-04	1.85E-04
NO3-, (MT)										
Np+4, (MT)								5.01E-04	5.01E-07	5.01E-07
NpO2, (MT)								6.24E-05	6.24E-08	6.24E-08
OH-, (MT)								4.21E+03	4.21E+00	4.21E+00
P2O5, (MT)								3.52E+01	3.52E-02	3.52E-02
P2O5:24W, (MT)								1.31E-03	1.31E-06	1.31E-06
Pb+4, (MT)								8.23E-03	8.23E-06	8.23E-06
PbO2, (MT)								4.19E+00	4.19E-03	4.19E-03
PO4-3, (MT)								5.93E-01	5.93E-04	5.93E-04
POLY, (MT)								8.08E-03	8.08E-06	8.08E-06
Pu+4, (MT)								1.56E-03	1.56E-06	1.56E-06
PuO2, (MT)								5.19E-05	5.19E-08	5.19E-08
Si+4, (MT)								1.98E-01	1.98E-04	1.98E-04
SiO2, (MT)								1.71E+00	1.71E-03	1.71E-03
SO3, (MT)										
SO4-2, (MT)								9.85E-03	9.85E-06	9.85E-06
Sr+2, (MT)								9.23E-02	9.23E-05	9.23E-05
SrO, (MT)								4.22E-05	4.22E-08	4.22E-08
Tc2O7, (MT)								1.35E-04	1.35E-07	1.35E-07
TcO4-, (MT)								1.42E-03	1.42E-06	1.42E-06
TiO2, (MT)								3.03E-04	3.03E-07	3.03E-07
Tot Org Carbon, (MT)								2.90E-01	2.90E-04	2.90E-04

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	915	916	917	918	924	925	926	1000	1001	1002
U3O8, (MT)								1.03E-02	1.03E-05	1.03E-05
UO2+2, (MT)								4.18E+00	4.18E-03	4.18E-03
UO3, (MT)										
V+5, (MT)								4.71E-04	4.71E-07	4.71E-07
V2O5, (MT)								3.09E-01	3.09E-04	3.09E-04
WO2, (MT)										
WO3, (MT)								6.53E-01	6.53E-04	6.53E-04
Zn+2, (MT)								2.37E-03	2.37E-06	2.37E-06
ZnO, (MT)								3.04E-01	3.04E-04	3.04E-04
Zr+4, (MT)								6.94E-01	6.94E-04	6.94E-04
ZrO2, (MT)								6.69E+00	6.69E-03	6.69E-03
ZrO2:2H2O, (MT)								1.03E+00	1.03E-03	1.03E-03

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1003	1004	1005	1006	1007	1008	1109	1101	1102	1105
Volume, Total Liters	2.19E+00			2.19E+00	3.60E+08	3.60E+08	4.06E+08	2.00E+08	1.04E-01	2.00E+08
Specific Gravity	1.00E+00			1.00E+00	1.40E+00	1.40E+00	1.18E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.19E-03			2.19E-03	5.04E+05	5.04E+05	4.79E+05	2.00E+05	1.04E-04	2.00E+05
Cs and Ba, (MCi)					8.47E-04	8.47E-04	2.57E-04			
Sr and Y, (MCi)					1.38E-02	1.38E-02	1.38E+02			
Tc, (MCi)					5.87E-07	5.87E-07	3.19E-02			
TRU, (MCi)					1.05E-05	1.05E-05	2.06E-01			
Total MCi					1.47E-02	1.47E-02	1.39E+02			
Ag+, (MT)					1.38E+00	1.38E+00	4.61E-05			
Al(OH)4-, (MT)					9.16E-02	9.16E-02	2.14E-07			
Al+3, (MT)					2.35E+02	2.35E+02	2.14E-02			
Am+3, (MT)					3.02E-06	3.02E-06	3.02E-02			
As+5, (MT)					4.97E-01	4.97E-01	1.67E-05			
B+3, (MT)					9.93E-01	9.93E-01	3.33E-05			
Ba+2, (MT)					3.09E-04	3.09E-04	3.09E+00			
Be+2, (MT)					7.60E-03	7.60E-03	2.55E-07			
Bi+3, (MT)					9.78E-01	9.78E-01	2.02E-01			
Carbon14, (MT)					4.52E-04	4.52E-04	1.52E-08			
C2H4O3, (MT)										
C2O4-2, (MT)					2.16E+04	2.16E+04				
Ca+2, (MT)					1.50E+02	1.50E+02	5.02E-03			
Cancrinite, (MT)					2.45E+02	2.45E+02	8.33E-02			
Cd+2, (MT)					7.92E+00	7.92E+00	2.66E-04			
Ce+3, (MT)					2.38E-02	2.38E-02	2.69E-01			
Cl-, (MT)					8.83E+00	8.83E+00	1.29E-04			
Cl2, (MT)										
CO, (MT)							4.41E-06	4.41E-06	4.41E-06	
CO2, (MT)							5.09E-05	5.09E-05	5.09E-05	
CO3-2, (MT)										
Cr(OH)4-, (MT)					2.25E-03	2.25E-03				
Cr+3, (MT)					1.34E+02	1.34E+02	2.70E-03			
Cs+, (MT)					1.03E-05	1.03E-05	3.12E-06			
Cu+2, (MT)					7.45E-01	7.45E-01	2.50E-05			
DTPA-3, (MT)							2.98E-01			
F-, (MT)					2.79E+04	2.79E+04	6.27E+01			
F2, (MT)										
Fe+3, (MT)					7.75E+02	7.75E+02	9.33E-02			
FeCN6-3, (MT)					6.98E+00	6.98E+00	1.63E-05			
FESA, (MT)					7.92E+03	7.92E+03				
H+, (MT)					2.52E+03	2.52E+03	2.34E+03			
H2, (MT)										
H2O, (MT)	2.19E-03			2.19E-03	4.37E+05	4.37E+05	3.32E+05	2.00E+05		2.00E+05
H2O2, (MT)					4.95E+02	4.95E+02	6.44E+00			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1003	1004	1005	1006	1007	1008	1100	1101	1102	1103
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)					9.01E-03	9.01E-03	3.02E-07			
Hg2, (MT)					3.25E-02	3.25E-02	7.61E-08			
I-, (MT)					2.02E+01	2.02E+01	6.77E-04			
I2, (MT)										
K+, (MT)					2.13E+01	2.13E+01	7.04E-04			
La+3, (MT)					2.12E-03	2.12E-03	2.41E-02			
Li+, (MT)					2.50E-02	2.50E-02	8.24E-07			
Mg+2, (MT)					1.10E+01	1.10E+01	3.69E-04			
Mn+4, (MT)					1.34E+02	1.34E+02	4.47E-03			
MnO2, (MT)					3.52E-02	3.52E-02				
Mo+6, (MT)					8.87E-01	8.87E-01	2.70E-05			
MoO4-2, (MT)					4.28E-02	4.28E-02	1.00E-07			
N2, (MT)							5.19E-07	5.19E-07	5.19E-07	
N2O, (MT)										
Na+, (MT)					2.82E+03	2.82E+03	3.76E-01			
NH2OH, (MT)										
NH3, (MT)					1.42E-01	1.42E-01	3.32E-07			
NH4+, (MT)					1.66E-02	1.66E-02	7.00E-09			
Ni+3, (MT)					1.88E+02	1.88E+02	7.70E-04			
NO, (MT)										
NO2, (MT)							4.53E-05	4.53E-05	4.53E-05	
NO2-, (MT)										
NO3-, (MT)					1.94E+02	1.94E+02	1.44E+05			
Np+4, (MT)							1.46E-01			
O2, (MT)							2.61E-06	2.61E-06	2.61E-06	
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)					3.28E+00	3.28E+00	1.10E-04			
PO4-3, (MT)					2.47E+02	2.47E+02	7.94E-03			
POLY, (MT)					2.23E+00	2.23E+00	4.31E-04			
PTA-3, (MT)					5.42E-01	5.42E-01	1.79E-05			
Pu+4, (MT)					4.54E-07	4.54E-07	4.49E-01			
Si+4, (MT)					7.89E+01	7.89E+01	2.65E-03			
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)					1.31E+02	1.31E+02	4.28E-04			
Sr+2, (MT)					3.68E-03	3.68E-03	3.68E+01			
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1003	1004	1005	1006	1007	1008	1100	1101	1102	1105
TcO4-, (MT)					5.66E-05	5.66E-05	3.07E+00			
Ti+4, (MT)					1.90E-02	1.90E-02	6.80E-06			
Tot Org Carbon, (MT)					1.16E+02	1.16E+02	3.88E-03			
UO2+2, (MT)					1.76E-05	1.76E-05	1.82E+00			
V+5, (MT)					1.88E-01	1.88E-01	6.29E-06			
W+6, (MT)					1.42E-05	1.42E-05				
Zn+2, (MT)					9.44E-01	9.44E-01	7.24E-02			
Zr+4, (MT)					5.09E+02	5.09E+02	5.27E-01			
ZrO2:2H2O, (MT)					3.96E-05	3.96E-05				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1003	1004	1005	1006	1007	1008	1100	1101	1102	1103
Total Mass Flow, (MT)		2.09E+01	2.06E+01		4.46E+00	4.46E+00	5.12E+03			
Cs and Ba, (MCi)					1.91E-05	1.91E-05	3.66E-03			
Sr and Y, (MCi)					3.48E-04	3.48E-04	6.64E-02			
Tc, (MCi)					1.62E-08	1.62E-08	4.45E-06			
TRU, (MCi)					6.25E-07	6.25E-07	3.19E-04			
Total MCi					3.67E-04	3.67E-04	7.03E-02			
Ag+, (MT)					3.45E-06	3.45E-06	6.58E-04			
Ag2O, (MT)					1.27E-03	1.27E-03	1.42E+00			
Al+3, (MT)					3.96E-03	3.96E-03	2.88E+00			
Al2O3, (MT)		1.87E+01	1.86E+01				1.58E+02			
Am+3, (MT)					7.59E-08	7.59E-08	1.45E-05			
Am2O3, (MT)							1.20E-07			
APM-, (MT)		6.51E-01	2.06E+00				3.44E-03			
As+5, (MT)					1.25E-06	1.25E-06	2.38E-04			
As2O5, (MT)					1.35E-03	1.35E-03	1.51E+00			
B+3, (MT)					2.49E-06	2.49E-06	4.75E-04			
B2O3, (MT)					4.61E-05	4.61E-05	5.18E-02			
Ba+2, (MT)					7.75E-06	7.75E-06	1.48E-03			
BaO, (MT)					8.39E-06	8.39E-06	9.41E-03			
Be+2, (MT)					1.91E-08	1.91E-08	3.64E-06			
BeO, (MT)					1.72E-04	1.72E-04	1.93E-01			
Bi+3, (MT)					4.92E-04	4.92E-04	9.37E-02			
Bi2O3, (MT)					2.78E-03	2.78E-03	3.12E+00			
Carbon14, (MT)							2.17E-07			
Ca+2, (MT)					3.76E-04	3.76E-04	7.16E-02			
Cancrinite, (MT)					9.71E-02	9.71E-02	1.03E+02			
CaO, (MT)					1.99E-03	1.99E-03	2.23E+00			
Cd+2, (MT)					1.99E-05	1.99E-05	3.79E-03			
CdO, (MT)					1.08E-04	1.08E-04	1.22E-01			
Ce+3, (MT)					5.97E-04	5.97E-04	1.14E-01			
Ce2O3, (MT)					2.63E-03	2.63E-03	2.95E+00			
Cl-, (MT)					8.76E-06	8.76E-06	1.67E-03			
CO3-2, (MT)					5.63E-04	5.63E-04	1.07E-01			
Cr+3, (MT)					4.52E-04	4.52E-04	3.29E-01			
Cr2O3, (MT)					7.96E-04	7.96E-04	8.93E-01			
Cs+, (MT)					2.32E-07	2.32E-07	4.42E-05			
Cs2O, (MT)							3.52E-07			
Cu+2, (MT)					1.87E-06	1.87E-06	3.57E-04			
CuO, (MT)					8.01E-04	8.01E-04	8.99E-01			
F-, (MT)					1.50E-04	1.50E-04	2.85E-02			
Fe+3, (MT)					2.66E-03	2.66E-03	1.94E+00			
Fe2O3, (MT)					3.47E-02	3.47E-02	3.89E+01			
H2O, (MT)					9.51E-04	9.51E-04	1.10E+00			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1003	1004	1005	1006	1007	1009	1100	1101	1102	1105
Hg+2, (MT)							4.30E-06			
I-, (MT)					5.07E-05	5.07E-05	9.66E-03			
K+, (MT)					5.27E-05	5.27E-05	1.00E-02			
K2O, (MT)					9.36E-06	9.36E-06	1.05E-02			
La+3, (MT)					5.33E-05	5.33E-05	1.02E-02			
La2O3, (MT)					2.35E-04	2.35E-04	2.64E-01			
Li+, (MT)					6.16E-08	6.16E-08	1.17E-05			
Li2O, (MT)					2.39E-08	2.39E-08	2.68E-05			
Mg+2, (MT)					2.76E-05	2.76E-05	5.26E-03			
MgO, (MT)					1.88E-04	1.88E-04	2.11E-01			
MnO2, (MT)					5.30E-04	5.30E-04	1.01E-01			
Mo+6, (MT)					2.01E-06	2.01E-06	3.83E-04			
MoO3, (MT)					8.18E-05	8.18E-05	9.18E-02			
Na+, (MT)					2.31E-02	2.31E-02	4.22E+00			
Na2O, (MT)					1.04E-02	1.04E-02	1.16E+01			
Ni(OH)3, (MT)										
Ni+3, (MT)					2.66E-05	2.66E-05	5.07E-03			
Ni2FECN6, (MT)					2.35E-03	2.35E-03	2.64E+00			
Ni2O3, (MT)					2.51E-03	2.51E-03	2.81E+00			
NiO, (MT)										
NO2-, (MT)					1.85E-04	1.85E-04	3.53E-02			
NO3-, (MT)										
Np+4, (MT)					5.01E-07	5.01E-07	3.64E-04			
NpO2, (MT)					6.24E-08	6.24E-08	7.01E-05			
OH-, (MT)					4.21E+00	4.21E+00	4.72E+03			
P2O5, (MT)					3.52E-02	3.52E-02	3.95E+01			
P2O5:24W, (MT)					1.31E-06	1.31E-06	2.49E-04			
Pb+4, (MT)					8.23E-06	8.23E-06	1.57E-03			
PbO2, (MT)					4.19E-03	4.19E-03	4.71E+00			
PO4-3, (MT)					5.93E-04	5.93E-04	1.13E-01			
POLY, (MT)					8.08E-06	8.08E-06	5.33E-02			
Pu+4, (MT)					1.56E-06	1.56E-06	1.13E-03			
PuO2, (MT)					5.19E-08	5.19E-08	5.82E-05			
Si+4, (MT)					1.98E-04	1.98E-04	3.78E-02			
SiO2, (MT)					1.71E-03	1.71E-03	1.92E+00			
SO3, (MT)										
SO4-2, (MT)					9.85E-06	9.85E-06	1.88E-03			
Sr+2, (MT)					9.23E-05	9.23E-05	1.76E-02			
SrO, (MT)					4.22E-08	4.22E-08	4.74E-05			
Tc2O7, (MT)					1.35E-07	1.35E-07	1.51E-04			
TcO4-, (MT)					1.42E-06	1.42E-06	2.71E-04			
TiO2, (MT)					3.03E-07	3.03E-07	3.40E-04			
Tot Org Carbon, (MT)					2.90E-04	2.90E-04	5.53E-02			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1003	1004	1005	1006	1007	1008	1100	1101	1102	1103
U3O8, (MT)					1.03E-05	1.03E-05	1.15E-02			
UO2+2, (MT)					4.18E-03	4.18E-03	7.96E-01			
UO3, (MT)										
V+5, (MT)					4.71E-07	4.71E-07	8.98E-05			
V2O5, (MT)					3.09E-04	3.09E-04	3.47E-01			
WO2, (MT)										
WO3, (MT)					6.53E-04	6.53E-04	7.33E-01			
Zn+2, (MT)					2.37E-06	2.37E-06	4.52E-04			
ZnO, (MT)					3.04E-04	3.04E-04	3.41E-01			
Zr+4, (MT)					6.94E-04	6.94E-04	1.32E-01			
ZrO2, (MT)					6.69E-03	6.69E-03	7.51E+00			
ZrO2:2H2O, (MT)					1.03E-03	1.03E-03	1.95E-01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1104	1105	1108	1109	1110	1111	1112	1113	1114	1115
Volume, Total Liters	2.06E+08	2.06E+08	3.97E+07	3.25E+08	1.32E+08	3.25E+08	9.72E+07	3.57E+09	3.39E+09	1.79E+08
Specific Gravity	1.35E+00	1.35E+00	1.26E+00	1.02E+00	1.00E+00	1.02E+00	1.07E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.79E+05	2.79E+05	4.99E+04	3.30E+05	1.32E+05	3.30E+05	1.04E+05	3.58E+06	3.40E+06	1.79E+05
Cs and Ba, (MCi)	2.57E-04	2.57E-04		7.48E+01		7.48E+01				
Sr and Y, (MCi)	1.38E+02	1.38E+02		1.38E+02		1.38E+02				
Tc, (MCi)	3.19E-02	3.19E-02		3.19E-02		3.19E-02				
TRU, (MCi)	2.06E-01	2.06E-01		2.06E-01		2.06E-01				
Total MCi	1.39E+02	1.39E+02		2.13E+02		2.13E+02				
Ag+, (MT)	4.61E-05	4.61E-05		4.61E-05		4.61E-05				
Al(OH)4-, (MT)	2.14E-07	2.14E-07		2.14E-07		2.14E-07				
Al+3, (MT)	2.14E-02	2.14E-02		2.14E-02		2.14E-02				
Am+3, (MT)	3.02E-02	3.02E-02		3.02E-02		3.02E-02				
As+5, (MT)	1.67E-05	1.67E-05		1.67E-05		1.67E-05				
B+3, (MT)	3.33E-05	3.33E-05		3.33E-05		3.33E-05				
Ba+2, (MT)	3.09E+00	3.09E+00		3.09E+00		3.09E+00				
Be+2, (MT)	2.55E-07	2.55E-07		2.55E-07		2.55E-07				
Bi+3, (MT)	2.02E-01	2.02E-01		2.02E-01		2.02E-01				
Carbon14, (MT)	1.52E-08	1.52E-08		1.52E-08		1.52E-08				
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	5.02E-03	5.02E-03		5.02E-03		5.02E-03				
Cancrinite, (MT)	8.33E-02	8.33E-02		8.33E-02		8.33E-02				
Cd+2, (MT)	2.66E-04	2.66E-04		2.66E-04		2.66E-04				
Ce+3, (MT)	2.69E-01	2.69E-01		2.69E-01		2.69E-01				
Cl-, (MT)	1.29E-04	1.29E-04		1.29E-04		1.29E-04				
Cl2, (MT)										
CO, (MT)										
CO2, (MT)					4.75E+04					
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)	2.70E-03	2.70E-03		2.70E-03		2.70E-03				
Cs+, (MT)	3.12E-06	3.12E-06		9.11E-01		9.11E-01				
Cu+2, (MT)	2.50E-05	2.50E-05		2.50E-05		2.50E-05				
DTPA-3, (MT)	2.98E-01	2.98E-01		2.98E-01		2.98E-01				
F-, (MT)	6.27E+01	6.27E+01		6.27E+01		6.27E+01				
F2, (MT)										
Fe+3, (MT)	9.33E-02	9.33E-02		9.33E-02		9.33E-02				
FeCN6-3, (MT)	1.63E-05	1.63E-05		1.63E-05		1.63E-05				
FESA, (MT)										
H+, (MT)	2.34E+03	2.34E+03		1.67E+02		1.67E+02				
H2, (MT)										
H2O, (MT)	1.32E+05	1.32E+05	2.27E+04	3.20E+05		3.20E+05	3.59E+04	3.51E+06	3.33E+06	1.75E+05
H2O2, (MT)	6.44E+00	6.44E+00		6.44E+00		6.44E+00	6.77E+04	6.77E+04	6.43E+04	3.38E+03

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1104	1105	1108	1109	1110	1111	1112	1113	1114	1115
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)	3.02E-07	3.02E-07		3.02E-07		3.02E-07				
Hg2, (MT)	7.61E-08	7.61E-08		7.61E-08		7.61E-08				
I-, (MT)	6.77E-04	6.77E-04		6.77E-04		6.77E-04				
I2, (MT)										
K+, (MT)	7.04E-04	7.04E-04		7.04E-04		7.04E-04				
La+3, (MT)	2.41E-02	2.41E-02		2.41E-02		2.41E-02				
Li+, (MT)	8.24E-07	8.24E-07		8.24E-07		8.24E-07				
Mg+2, (MT)	3.69E-04	3.69E-04		3.69E-04		3.69E-04				
Mn+4, (MT)	4.47E-03	4.47E-03		4.47E-03		4.47E-03				
MnO2, (MT)										
Mo+6, (MT)	2.70E-05	2.70E-05		2.70E-05		2.70E-05				
MoO4-2, (MT)	1.00E-07	1.00E-07		1.00E-07		1.00E-07				
N2, (MT)										
N2O, (MT)										
Na+, (MT)	3.76E-01	3.76E-01		3.76E-01		3.76E-01				
NH2OH, (MT)										
NH3, (MT)	3.32E-07	3.32E-07		3.32E-07		3.32E-07				
NH4+, (MT)	7.00E-09	7.00E-09		7.00E-09		7.00E-09				
Ni+3, (MT)	7.70E-04	7.70E-04		7.70E-04		7.70E-04				
NO, (MT)					2.86E+04					
NO2, (MT)					5.55E+04					
NO2-, (MT)										
NO3-, (MT)	1.44E+05	1.44E+05		1.01E+04		1.01E+04				
Np+4, (MT)	1.46E-01	1.46E-01		1.46E-01		1.46E-01				
O2, (MT)										
OH-, (MT)										
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.10E-04	1.10E-04		1.10E-04		1.10E-04				
PO4-3, (MT)	7.94E-03	7.94E-03		7.94E-03		7.94E-03				
POLY, (MT)	4.31E-04	4.31E-04		4.31E-04		4.31E-04		2.23E+00	2.12E+00	1.12E-01
PTA-3, (MT)	1.79E-05	1.79E-05		1.79E-05		1.79E-05				
Pu+4, (MT)	4.49E-01	4.49E-01		4.49E-01		4.49E-01				
Si+4, (MT)	2.65E-03	2.65E-03		2.65E-03		2.65E-03				
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	4.28E-04	4.28E-04		4.28E-04		4.28E-04				
Sr+2, (MT)	3.68E+01	3.68E+01		3.68E+01		3.68E+01				
Sugar, (MT)			2.72E+04							

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1104	1105	1106	1109	1110	1111	1112	1113	1114	1115
TcO4-, (MT)	3.07E+00	3.07E+00		3.07E+00		3.07E+00				
Ti+4, (MT)	6.80E-06	6.80E-06		6.80E-06		6.80E-06				
Tot Org Carbon, (MT)	3.88E-03	3.88E-03		3.88E-03		3.88E-03				
UO2+2, (MT)	1.82E+00	1.82E+00		1.82E+00		1.82E+00				
V+5, (MT)	6.29E-06	6.29E-06		6.29E-06		6.29E-06				
W+6, (MT)										
Zn+2, (MT)	7.24E-02	7.24E-02		7.24E-02		7.24E-02				
Zr+4, (MT)	5.27E-01	5.27E-01		5.27E-01		5.27E-01				
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1104	1105	1108	1109	1110	1111	1112	1113	1114	1115
Total Mass Flow, (MT)	5.12E+03	5.12E+03		5.12E+03		5.12E+03				
Cs and Ba, (MCi)	3.66E-03	3.66E-03		3.66E-03		3.66E-03				
Sr and Y, (MCi)	6.64E-02	6.64E-02		6.64E-02		6.64E-02				
Tc, (MCi)	4.45E-06	4.45E-06		4.45E-06		4.45E-06				
TRU, (MCi)	3.19E-04	3.19E-04		3.19E-04		3.19E-04				
Total MCi	7.03E-02	7.03E-02		7.03E-02		7.03E-02				
Ag+, (MT)	6.58E-04	6.58E-04		6.58E-04		6.58E-04				
Ag2O, (MT)	1.42E+00	1.42E+00		1.42E+00		1.42E+00				
Al+3, (MT)	2.88E+00	2.88E+00		2.88E+00		2.88E+00				
Al2O3, (MT)	1.58E+02	1.58E+02		1.58E+02		1.58E+02				
Am+3, (MT)	1.45E-05	1.45E-05		1.45E-05		1.45E-05				
Am2O3, (MT)	1.20E-07	1.20E-07		1.20E-07		1.20E-07				
APM-, (MT)	3.44E-03	3.44E-03		3.44E-03		3.44E-03				
As+5, (MT)	2.38E-04	2.38E-04		2.38E-04		2.38E-04				
As2O5, (MT)	1.51E+00	1.51E+00		1.51E+00		1.51E+00				
B+3, (MT)	4.75E-04	4.75E-04		4.75E-04		4.75E-04				
B2O3, (MT)	5.18E-02	5.18E-02		5.18E-02		5.18E-02				
Ba+2, (MT)	1.48E-03	1.48E-03		1.48E-03		1.48E-03				
BaO, (MT)	9.41E-03	9.41E-03		9.41E-03		9.41E-03				
Be+2, (MT)	3.64E-06	3.64E-06		3.64E-06		3.64E-06				
BeO, (MT)	1.93E-01	1.93E-01		1.93E-01		1.93E-01				
Bi+3, (MT)	9.37E-02	9.37E-02		9.37E-02		9.37E-02				
Bi2O3, (MT)	3.12E+00	3.12E+00		3.12E+00		3.12E+00				
Carbon14, (MT)	2.17E-07	2.17E-07		2.17E-07		2.17E-07				
Ca+2, (MT)	7.16E-02	7.16E-02		7.16E-02		7.16E-02				
Cancrinite, (MT)	1.03E+02	1.03E+02		1.03E+02		1.03E+02				
CaO, (MT)	2.23E+00	2.23E+00		2.23E+00		2.23E+00				
Cd+2, (MT)	3.79E-03	3.79E-03		3.79E-03		3.79E-03				
CdO, (MT)	1.22E-01	1.22E-01		1.22E-01		1.22E-01				
Ce+3, (MT)	1.14E-01	1.14E-01		1.14E-01		1.14E-01				
Ce2O3, (MT)	2.95E+00	2.95E+00		2.95E+00		2.95E+00				
Cl-, (MT)	1.67E-03	1.67E-03		1.67E-03		1.67E-03				
CO3-2, (MT)	1.07E-01	1.07E-01		1.07E-01		1.07E-01				
Cr+3, (MT)	3.29E-01	3.29E-01		3.29E-01		3.29E-01				
Cr2O3, (MT)	8.93E-01	8.93E-01		8.93E-01		8.93E-01				
Cs+, (MT)	4.42E-05	4.42E-05		4.42E-05		4.42E-05				
Cs2O, (MT)	3.52E-07	3.52E-07		3.52E-07		3.52E-07				
Cu+2, (MT)	3.57E-04	3.57E-04		3.57E-04		3.57E-04				
CuO, (MT)	8.99E-01	8.99E-01		8.99E-01		8.99E-01				
F-, (MT)	2.85E-02	2.85E-02		2.85E-02		2.85E-02				
Fe+3, (MT)	1.94E+00	1.94E+00		1.94E+00		1.94E+00				
Fe2O3, (MT)	3.89E+01	3.89E+01		3.89E+01		3.89E+01				
H2O, (MT)	1.10E+00	1.10E+00		1.10E+00		1.10E+00				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1104	1105	1108	1109	1110	1111	1112	1113	1114	1115
Hg+2, (MT)	4.30E-06	4.30E-06		4.30E-06		4.30E-06				
I-, (MT)	9.66E-03	9.66E-03		9.66E-03		9.66E-03				
K+, (MT)	1.00E-02	1.00E-02		1.00E-02		1.00E-02				
K2O, (MT)	1.05E-02	1.05E-02		1.05E-02		1.05E-02				
La+3, (MT)	1.02E-02	1.02E-02		1.02E-02		1.02E-02				
La2O3, (MT)	2.64E-01	2.64E-01		2.64E-01		2.64E-01				
Li+, (MT)	1.17E-05	1.17E-05		1.17E-05		1.17E-05				
Li2O, (MT)	2.68E-05	2.68E-05		2.68E-05		2.68E-05				
Mg+2, (MT)	5.26E-03	5.26E-03		5.26E-03		5.26E-03				
MgO, (MT)	2.11E-01	2.11E-01		2.11E-01		2.11E-01				
MnO2, (MT)	1.01E-01	1.01E-01		1.01E-01		1.01E-01				
Mo+6, (MT)	3.83E-04	3.83E-04		3.83E-04		3.83E-04				
MoO3, (MT)	9.18E-02	9.18E-02		9.18E-02		9.18E-02				
Na+, (MT)	4.22E+00	4.22E+00		4.22E+00		4.22E+00				
Na2O, (MT)	1.16E+01	1.16E+01		1.16E+01		1.16E+01				
Ni(OH)3, (MT)										
Ni+3, (MT)	5.07E-03	5.07E-03		5.07E-03		5.07E-03				
Ni2FECN6, (MT)	2.64E+00	2.64E+00		2.64E+00		2.64E+00				
Ni2O3, (MT)	2.81E+00	2.81E+00		2.81E+00		2.81E+00				
NiO, (MT)										
NO2-, (MT)	3.53E-02	3.53E-02		3.53E-02		3.53E-02				
NO3-, (MT)										
Np+4, (MT)	3.64E-04	3.64E-04		3.64E-04		3.64E-04				
NpO2, (MT)	7.01E-05	7.01E-05		7.01E-05		7.01E-05				
OH-, (MT)	4.72E+03	4.72E+03		4.72E+03		4.72E+03				
P2O5, (MT)	3.95E+01	3.95E+01		3.95E+01		3.95E+01				
P2O5:24W, (MT)	2.49E-04	2.49E-04		2.49E-04		2.49E-04				
Pb+4, (MT)	1.57E-03	1.57E-03		1.57E-03		1.57E-03				
PbO2, (MT)	4.71E+00	4.71E+00		4.71E+00		4.71E+00				
PO4-3, (MT)	1.13E-01	1.13E-01		1.13E-01		1.13E-01				
POLY, (MT)	5.33E-02	5.33E-02		5.33E-02		5.33E-02				
Pu+4, (MT)	1.13E-03	1.13E-03		1.13E-03		1.13E-03				
PuO2, (MT)	5.82E-05	5.82E-05		5.82E-05		5.82E-05				
Si+4, (MT)	3.78E-02	3.78E-02		3.78E-02		3.78E-02				
SiO2, (MT)	1.92E+00	1.92E+00		1.92E+00		1.92E+00				
SO3, (MT)										
SO4-2, (MT)	1.88E-03	1.88E-03		1.88E-03		1.88E-03				
Sr+2, (MT)	1.76E-02	1.76E-02		1.76E-02		1.76E-02				
SrO, (MT)	4.74E-05	4.74E-05		4.74E-05		4.74E-05				
Tc2O7, (MT)	1.51E-04	1.51E-04		1.51E-04		1.51E-04				
TcO4-, (MT)	2.71E-04	2.71E-04		2.71E-04		2.71E-04				
TiO2, (MT)	3.40E-04	3.40E-04		3.40E-04		3.40E-04				
Tot Org Carbon, (MT)	5.53E-02	5.53E-02		5.53E-02		5.53E-02				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1104	1105	1108	1109	1110	1111	1112	1113	1114	1115
U3O8, (MT)	1.15E-02	1.15E-02		1.15E-02		1.15E-02				
UO2+2, (MT)	7.96E-01	7.96E-01		7.96E-01		7.96E-01				
UO3, (MT)										
V+5, (MT)	8.98E-05	8.98E-05		8.98E-05		8.98E-05				
V2O5, (MT)	3.47E-01	3.47E-01		3.47E-01		3.47E-01				
WO2, (MT)										
WO3, (MT)	7.33E-01	7.33E-01		7.33E-01		7.33E-01				
Zn+2, (MT)	4.52E-04	4.52E-04		4.52E-04		4.52E-04				
ZnO, (MT)	3.41E-01	3.41E-01		3.41E-01		3.41E-01				
Zr+4, (MT)	1.32E-01	1.32E-01		1.32E-01		1.32E-01				
ZrO2, (MT)	7.51E+00	7.51E+00		7.51E+00		7.51E+00				
ZrO2:2H2O, (MT)	1.95E-01	1.95E-01		1.95E-01		1.95E-01				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
Volume, Total Liters	2.43E+09	1.03E+09	3.72E+08	2.24E+06		2.24E+06	3.70E+08	1.68E+10	1.58E+10	1.78E+08
Specific Gravity	1.00E+00	1.06E+00	1.40E+00	1.00E+00		1.00E+00	1.40E+00	1.03E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.43E+06	1.10E+06	5.21E+05	2.24E+03		2.24E+03	5.18E+05	1.74E+07	1.58E+07	1.78E+05
Cs and Ba, (MCi)			8.47E-04				8.47E-04	3.13E-01		
Sr and Y, (MCi)			1.38E-02				1.38E-02	6.00E-05		
Tc, (MCi)			6.46E-06				6.46E-06	1.49E-04		
TRU, (MCi)			1.06E-03				1.06E-03	1.53E-04		
Total MCi			1.57E-02				1.57E-02	3.13E-01		
Ag+, (MT)			1.38E+00				1.38E+00	3.29E-01		
Al(OH)4-, (MT)			9.16E-02				9.16E-02	4.83E+03		
Al+3, (MT)			2.35E+02				2.35E+02	6.51E+03		
Am+3, (MT)			6.04E-06				6.04E-06	2.53E-05		
As+5, (MT)			4.97E-01				4.97E-01	7.70E-01		
B+3, (MT)			9.93E-01				9.93E-01	5.20E-01		
Ba+2, (MT)			3.09E-04				3.09E-04	7.93E-01		
Be+2, (MT)			7.60E-03				7.60E-03	8.19E-02		
Bi+3, (MT)			1.95E+00				1.95E+00	2.61E+02		
Carbon14, (MT)			4.52E-04				4.52E-04	7.43E-04		
C2H4O3, (MT)										
C2O4-2, (MT)			2.38E+04				2.38E+04			
Ca+2, (MT)			1.50E+02				1.50E+02	1.68E-01		
Cancrinite, (MT)			2.45E+02				2.45E+02	2.38E+03		
Cd+2, (MT)			7.92E+00				7.92E+00	2.09E+00		
Ce+3, (MT)			4.75E-02				4.75E-02	2.37E+02		
Cl-, (MT)			8.83E+00				8.83E+00	1.48E+03		
Cl2, (MT)										
CO, (MT)								1.90E+02	1.90E+02	1.90E+02
CO2, (MT)	4.75E+04							1.61E+00	1.61E+00	1.61E+00
CO3-2, (MT)								1.08E+04		
Cr(OH)4-, (MT)			2.25E-03				2.25E-03	1.19E+02		
Cr+3, (MT)			1.34E+02				1.34E+02	4.68E+02		
Cs+, (MT)			1.03E-05				1.03E-05	3.81E-03		
Cu+2, (MT)			7.45E-01				7.45E-01	1.78E-01		
DTPA-3, (MT)								5.65E+02		
F-, (MT)			2.80E+04				2.80E+04	1.31E+03		
F2, (MT)										
Fe+3, (MT)			7.75E+02				7.75E+02	1.47E-01		
FeCN6-3, (MT)			6.98E+00				6.98E+00	1.51E+03		
FESA, (MT)			7.92E+03				7.92E+03			
H+, (MT)		2.08E+03	2.60E+03				2.60E+03	1.18E+02		
H2, (MT)								2.30E+02	2.30E+02	2.30E+02
H2O, (MT)	2.38E+06	9.65E+05	4.50E+05	2.24E+03		2.24E+03	4.48E+05	1.64E+07	1.57E+07	
H2O2, (MT)		7.46E+01	4.95E+02				4.95E+02	2.63E+02		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)			9.01E-03				9.01E-03	9.49E-01		
Hg2, (MT)			3.25E-02				3.25E-02	7.13E+00		
I-, (MT)			2.02E+01				2.02E+01	5.46E+02		
I2, (MT)										
K+, (MT)			2.13E+01				2.13E+01	7.55E+01		
La+3, (MT)			4.24E-03				4.24E-03	2.12E+01		
Li+, (MT)			2.50E-02				2.50E-02	1.14E-01		
Mg+2, (MT)			1.10E+01				1.10E+01	9.72E-01		
Mn+4, (MT)			1.34E+02				1.34E+02	8.46E-02		
MnO2, (MT)			3.52E-02				3.52E-02	1.01E+02		
Mo+6, (MT)			8.87E-01				8.87E-01	4.87E+00		
MoO4-2, (MT)			4.28E-02				4.28E-02	9.26E+00		
N2, (MT)								1.76E-02	1.76E-02	1.76E-02
N2O, (MT)								2.00E+03	2.00E+03	2.00E+03
Na+, (MT)			2.82E+03				2.82E+03	3.31E+05		
NH2OH, (MT)										
NH3, (MT)			1.42E-01				1.42E-01	6.74E+01		
NH4+, (MT)			1.66E-02				1.66E-02	6.07E-02		
Ni+3, (MT)			1.88E+02				1.88E+02	4.08E-02		
NO, (MT)	2.86E+03									
NO2, (MT)								1.53E+00	1.53E+00	1.53E+00
NO2-, (MT)								1.07E+04		
NO3-, (MT)		1.28E+05	1.91E+03				1.91E+03	1.37E+05		
Np+4, (MT)			5.66E-03				5.66E-03	1.47E-04		
O2, (MT)								1.09E+02	1.09E+02	1.09E+02
OH-, (MT)								1.84E+05		
ORGS, (MT)								5.75E+04	5.75E+04	5.75E+04
ORGT, (MT)								1.04E+05	1.04E+05	1.04E+05
ORGU, (MT)								1.40E+04	1.40E+04	1.40E+04
P2O5, (MT)										
Pb+4, (MT)			3.28E+00				3.28E+00	1.96E+00		
PO4-3, (MT)			2.47E+02				2.47E+02	4.72E+03		
POLY, (MT)	2.12E+00		2.23E+00	2.23E+00		2.23E+00		2.46E-01	2.46E-01	
PTA-3, (MT)			5.42E-01				5.42E-01	1.98E+00		
Pu+4, (MT)			4.54E-03				4.54E-03	2.89E-04		
Si+4, (MT)			7.89E+01				7.89E+01	5.70E+00		
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)			1.31E+02				1.31E+02	2.98E+04		
Sr+2, (MT)			3.68E-03				3.68E-03	1.59E-05		
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
TcO4-, (MT)			6.24E-04				6.24E-04	1.44E-02		
Ti+4, (MT)			1.90E-02				1.90E-02	1.29E-04		
Tot Org Carbon, (MT)			1.16E+02				1.16E+02	1.42E+01		
UO2+2, (MT)			1.76E-01				1.76E-01	8.64E-01		
V+5, (MT)			1.88E-01				1.88E-01	6.21E-02		
W+6, (MT)			1.42E-05				1.42E-05	7.47E-01		
Zn+2, (MT)			9.44E-01				9.44E-01	2.48E+01		
Zr+4, (MT)			5.10E+02				5.10E+02	7.72E-01		
ZrO2:2H2O, (MT)			3.96E-05				3.96E-05	2.15E+01		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
Total Mass Flow, (MT)			4.46E+00				4.46E+00	2.44E+02		
Cs and Ba, (MCi)			1.91E-05				1.91E-05			
Sr and Y, (MCi)			3.48E-04				3.48E-04	1.42E-05		
Tc, (MCi)			1.62E-08				1.62E-08	1.13E-07		
TRU, (MCi)			6.25E-07				6.25E-07	8.05E-07		
Total MCi			3.67E-04				3.67E-04	1.51E-05		
Ag+, (MT)			3.45E-06				3.45E-06	2.72E-08		
Ag2O, (MT)			1.27E-03				1.27E-03	9.65E-02		
Al+3, (MT)			3.96E-03				3.96E-03	4.52E-05		
Al2O3, (MT)								2.34E+02		
Am+3, (MT)			7.59E-08				7.59E-08			
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)			1.25E-06				1.25E-06			
As2O5, (MT)			1.35E-03				1.35E-03	1.03E-01		
B+3, (MT)			2.49E-06				2.49E-06	1.97E-08		
B2O3, (MT)			4.61E-05				4.61E-05	3.56E-03		
Ba+2, (MT)			7.75E-06				7.75E-06	6.11E-08		
BaO, (MT)			8.39E-06				8.39E-06	6.48E-04		
Be+2, (MT)			1.91E-08				1.91E-08			
BeO, (MT)			1.72E-04				1.72E-04	1.31E-02		
Bi+3, (MT)			4.92E-04				4.92E-04	3.88E-06		
Bi2O3, (MT)			2.78E-03				2.78E-03	2.15E-01		
Carbon14, (MT)										
Ca+2, (MT)			3.76E-04				3.76E-04	1.51E-05		
Cancrinite, (MT)			9.71E-02				9.71E-02	1.92E+00		
CaO, (MT)			1.99E-03				1.99E-03	1.53E-01		
Cd+2, (MT)			1.99E-05				1.99E-05	1.57E-07		
CdO, (MT)			1.08E-04				1.08E-04	8.37E-03		
Ce+3, (MT)			5.97E-04				5.97E-04	6.53E-06		
Ce2O3, (MT)			2.63E-03				2.63E-03	2.03E-01		
Cl-, (MT)			8.76E-06				8.76E-06	6.91E-08		
CO3-2, (MT)			5.63E-04				5.63E-04	4.44E-06		
Cr+3, (MT)			4.52E-04				4.52E-04	2.62E-06		
Cr2O3, (MT)			7.96E-04				7.96E-04	6.15E-02		
Cs+, (MT)			2.32E-07				2.32E-07			
Cs2O, (MT)										
Cu+2, (MT)			1.87E-06				1.87E-06	1.48E-08		
CuO, (MT)			8.01E-04				8.01E-04	6.09E-02		
F-, (MT)			1.50E-04				1.50E-04	1.18E-06		
Fe+3, (MT)			2.66E-03				2.66E-03	2.60E-05		
Fe2O3, (MT)			3.47E-02				3.47E-02	2.68E+00		
H2O, (MT)			9.51E-04				9.51E-04	5.01E-05		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
Hg+2, (MT)										
I-, (MT)			5.07E-05				5.07E-05	4.00E-07		
K+, (MT)			5.27E-05				5.27E-05	4.16E-07		
K2O, (MT)			9.36E-06				9.36E-06	7.25E-04		
La+3, (MT)			5.33E-05				5.33E-05	5.88E-07		
La2O3, (MT)			2.35E-04				2.35E-04	1.82E-02		
Li+, (MT)			6.16E-08				6.16E-08			
Li2O, (MT)			2.39E-08				2.39E-08	1.85E-06		
Mg+2, (MT)			2.76E-05				2.76E-05	2.18E-07		
MgO, (MT)			1.88E-04				1.88E-04	1.45E-02		
MnO2, (MT)			5.30E-04				5.30E-04	1.55E-01		
Mo+6, (MT)			2.01E-06				2.01E-06			
MoO3, (MT)			8.18E-05				8.18E-05	6.32E-03		
Na+, (MT)			2.31E-02				2.31E-02	6.24E-05		
Na2O, (MT)			1.04E-02				1.04E-02	8.02E-01		
Ni(OH)3, (MT)								2.49E-07		
Ni+3, (MT)			2.66E-05				2.66E-05	3.17E-06		
Ni2FECN6, (MT)			2.35E-03				2.35E-03	1.13E-05		
Ni2O3, (MT)			2.51E-03				2.51E-03	1.94E-01		
NiO, (MT)										
NO2-, (MT)			1.85E-04				1.85E-04	1.46E-06		
NO3-, (MT)								2.04E-05		
Np+4, (MT)			5.01E-07				5.01E-07			
NpO2, (MT)			6.24E-08				6.24E-08	4.82E-06		
OH-, (MT)			4.21E+00				4.21E+00	2.36E-04		
P2O5, (MT)			3.52E-02				3.52E-02	2.72E+00		
P2O5:24W, (MT)			1.31E-06				1.31E-06			
Pb+4, (MT)			8.23E-06				8.23E-06	6.49E-08		
PbO2, (MT)			4.19E-03				4.19E-03	3.19E-01		
PO4-3, (MT)			5.93E-04				5.93E-04	4.57E-05		
POLY, (MT)			8.08E-06				8.08E-06	4.26E-07		
Pu+4, (MT)			1.56E-06				1.56E-06			
PuO2, (MT)			5.19E-08				5.19E-08	4.01E-06		
Si+4, (MT)			1.98E-04				1.98E-04	1.56E-06		
SiO2, (MT)			1.71E-03				1.71E-03	1.33E-01		
SO3, (MT)										
SO4-2, (MT)			9.85E-06				9.85E-06	7.51E-07		
Sr+2, (MT)			9.23E-05				9.23E-05	1.02E-06		
SrO, (MT)			4.22E-08				4.22E-08	3.26E-06		
Tc2O7, (MT)			1.35E-07				1.35E-07	1.04E-05		
TcO4-, (MT)			1.42E-06				1.42E-06			
TiO2, (MT)			3.03E-07				3.03E-07	2.34E-05		
Tot Org Carbon, (MT)			2.90E-04				2.90E-04	2.29E-06		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1116	1117	1118	1119	1120	1121	1122	1200	1201	1202
U3O8, (MT)			1.03E-05				1.03E-05	7.95E-04		
UO2+2, (MT)			4.18E-03				4.18E-03	9.54E-05		
UO3, (MT)										
V+5, (MT)			4.71E-07				4.71E-07			
V2O5, (MT)			3.09E-04				3.09E-04	2.35E-02		
WO2, (MT)										
WO3, (MT)			6.53E-04				6.53E-04	4.97E-02		
Zn+2, (MT)			2.37E-06				2.37E-06	1.87E-08		
ZnO, (MT)			3.04E-04				3.04E-04	2.35E-02		
Zr+4, (MT)			6.94E-04				6.94E-04	5.48E-06		
ZrO2, (MT)			6.69E-03				6.69E-03	5.17E-01		
ZrO2:2H2O, (MT)			1.03E-03				1.03E-03	8.08E-06		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
Volume, Total Liters	1.57E+10	1.02E+09	1.57E+10	7.82E+09	7.82E+09	5.57E+09	1.34E+10	8.66E+09	3.25E+08	5.66E+05
Specific Gravity	1.00E+00	1.50E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.02E+00	1.02E+00
Total Mass Flow, (MT)	1.57E+07	1.52E+06	1.57E+07	7.82E+06	7.82E+06	5.59E+06	1.34E+07	8.67E+06	3.30E+05	5.75E+02
Cs and Ba, (MCi)		3.13E-01							7.48E+01	1.30E-01
Sr and Y, (MCi)		6.00E-05							1.38E+02	2.41E-01
Tc, (MCi)		1.49E-04							3.19E-02	5.55E-05
TRU, (MCi)		1.53E-04							2.06E-01	3.58E-04
Total MCi		3.13E-01							2.13E+02	3.72E-01
Ag+, (MT)		3.29E-01							4.61E-05	8.03E-08
Al(OH)4-, (MT)		4.83E+03							2.14E-07	3.74E-10
Al+3, (MT)		6.51E+03							2.14E-02	3.72E-05
Am+3, (MT)		2.53E-05							3.02E-02	5.26E-05
As+5, (MT)		7.70E-01							1.67E-05	2.91E-08
B+3, (MT)		5.20E-01							3.33E-05	5.80E-08
Ba+2, (MT)		7.93E-01							3.09E+00	5.38E-03
Be+2, (MT)		8.19E-02							2.55E-07	4.44E-10
Bi+3, (MT)		2.61E+02							2.02E-01	3.52E-04
Carbon14, (MT)		7.43E-04							1.52E-08	2.64E-11
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)		1.68E-01							5.02E-03	8.75E-06
Cancrinite, (MT)		2.38E+03							8.33E-02	1.45E-04
Cd+2, (MT)		2.09E+00							2.66E-04	4.63E-07
Ce+3, (MT)		2.37E+02							2.69E-01	4.69E-04
Cl-, (MT)		1.48E+03							1.29E-04	2.25E-07
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)		1.08E+04								
Cr(OH)4-, (MT)		1.19E+02								
Cr+3, (MT)		4.68E+02							2.70E-03	4.70E-06
Cs+, (MT)		3.81E-03							9.11E-01	1.59E-03
Cu+2, (MT)		1.78E-01							2.50E-05	4.35E-08
DTPA-3, (MT)		5.65E+02							2.98E-01	5.19E-04
F-, (MT)		1.31E+03							6.27E+01	1.09E-01
F2, (MT)										
Fe+3, (MT)		1.47E-01							9.33E-02	1.63E-04
FeCN6-3, (MT)		1.51E+03							1.63E-05	2.85E-08
FESA, (MT)										
H+, (MT)		1.18E+02				4.09E+02	4.09E+02	2.64E+02	1.67E+02	2.90E-01
H2, (MT)										
H2O, (MT)	1.57E+07	7.95E+05	1.57E+07	7.82E+06	7.82E+06	5.56E+06	1.34E+07	8.65E+06	3.20E+05	5.57E+02
H2O2, (MT)		2.63E+02				3.46E+03	3.46E+03	2.24E+03	6.44E+00	1.12E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)		9.49E-01							3.02E-07	5.25E-10
Hg2, (MT)		7.13E+00							7.61E-08	1.33E-10
I-, (MT)		5.46E+02							6.77E-04	1.18E-06
I2, (MT)										
K+, (MT)		7.55E+01							7.04E-04	1.23E-06
La+3, (MT)		2.12E+01							2.41E-02	4.19E-05
Li+, (MT)		1.14E-01							8.24E-07	1.44E-09
Mg+2, (MT)		9.72E-01							3.69E-04	6.42E-07
Mn+4, (MT)		8.46E-02							4.47E-03	7.79E-06
MnO2, (MT)		1.01E+02								
Mo+6, (MT)		4.87E+00							2.70E-05	4.71E-08
MoO4-2, (MT)		9.26E+00							1.00E-07	1.75E-10
N2, (MT)										
N2O, (MT)										
Na+, (MT)		3.31E+05							3.76E-01	6.55E-04
NH2OH, (MT)										
NH3, (MT)		6.74E+01							3.32E-07	5.79E-10
NH4+, (MT)		6.07E-02							7.00E-09	1.22E-11
Ni+3, (MT)		4.08E-02							7.70E-04	1.34E-06
NO, (MT)										
NO2, (MT)										
NO2-, (MT)		1.07E+04								
NO3-, (MT)		1.37E+05				2.52E+04	2.52E+04	1.63E+04	1.01E+04	1.75E+01
Np+4, (MT)		1.47E-04							1.46E-01	2.54E-04
O2, (MT)										
OH-, (MT)		1.84E+05								
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)		1.96E+00							1.10E-04	1.91E-07
PO4-3, (MT)		4.72E+03							7.94E-03	1.38E-05
POLY, (MT)	2.46E-01		2.46E-01	1.23E-01	1.23E-01	1.12E-01	2.34E-01	1.52E-01	4.31E-04	7.51E-07
PTA-3, (MT)		1.98E+00							1.79E-05	3.12E-08
Pu+4, (MT)		2.89E-04							4.49E-01	7.83E-04
Si+4, (MT)		5.70E+00							2.65E-03	4.62E-06
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)		2.98E+04							4.28E-04	7.46E-07
Sr+2, (MT)		1.59E-05							3.68E+01	6.41E-02
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
TcO4-, (MT)		1.44E-02							3.07E+00	5.36E-03
Ti+4, (MT)		1.29E-04							6.80E-06	1.19E-08
Tot Org Carbon, (MT)		1.42E+01							3.88E-03	6.75E-06
UO2+2, (MT)		8.64E-01							1.82E+00	3.17E-03
V+5, (MT)		6.21E-02							6.29E-06	1.10E-08
W+6, (MT)		7.47E-01								
Zn+2, (MT)		2.48E+01							7.24E-02	1.26E-04
Zr+4, (MT)		7.72E-01							5.27E-01	9.19E-04
ZrO2:2H2O, (MT)		2.15E+01								

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
Total Mass Flow, (MT)		2.44E+02							5.12E+03	4.79E+03
Cs and Ba, (MCi)									3.66E-03	3.42E-03
Sr and Y, (MCi)		1.42E-05							6.64E-02	6.21E-02
Tc, (MCi)		1.13E-07							4.45E-06	4.17E-06
TRU, (MCi)		8.05E-07							3.19E-04	2.99E-04
Total MCi		1.51E-05							7.03E-02	6.58E-02
Ag+, (MT)		2.72E-08							6.58E-04	6.16E-04
Ag2O, (MT)		9.65E-02							1.42E+00	1.33E+00
Al+3, (MT)		4.52E-05							2.88E+00	2.70E+00
Al2O3, (MT)		2.34E+02							1.58E+02	1.48E+02
Am+3, (MT)									1.45E-05	1.35E-05
Am2O3, (MT)									1.20E-07	1.13E-07
APM-, (MT)									3.44E-03	3.22E-03
As+5, (MT)									2.38E-04	2.23E-04
As2O5, (MT)		1.03E-01							1.51E+00	1.42E+00
B+3, (MT)		1.97E-08							4.75E-04	4.45E-04
B2O3, (MT)		3.56E-03							5.18E-02	4.84E-02
Ba+2, (MT)		6.11E-08							1.48E-03	1.38E-03
BaO, (MT)		6.48E-04							9.41E-03	8.81E-03
Be+2, (MT)									3.64E-06	3.40E-06
BeO, (MT)		1.31E-02							1.93E-01	1.81E-01
Bi+3, (MT)		3.88E-06							9.37E-02	8.76E-02
Bi2O3, (MT)		2.15E-01							3.12E+00	2.92E+00
Carbon14, (MT)									2.17E-07	2.03E-07
Ca+2, (MT)		1.51E-05							7.16E-02	6.70E-02
Cancrinite, (MT)		1.92E+00							1.03E+02	9.62E+01
CaO, (MT)		1.53E-01							2.23E+00	2.09E+00
Cd+2, (MT)		1.57E-07							3.79E-03	3.55E-03
CdO, (MT)		8.37E-03							1.22E-01	1.14E-01
Ce+3, (MT)		6.53E-06							1.14E-01	1.06E-01
Ce2O3, (MT)		2.03E-01							2.95E+00	2.76E+00
Cl-, (MT)		6.91E-08							1.67E-03	1.56E-03
CO3-2, (MT)		4.44E-06							1.07E-01	1.00E-01
Cr+3, (MT)		2.62E-06							3.29E-01	3.08E-01
Cr2O3, (MT)		6.15E-02							8.93E-01	8.36E-01
Cs+, (MT)									4.42E-05	4.14E-05
Cs2O, (MT)									3.52E-07	3.30E-07
Cu+2, (MT)		1.48E-08							3.57E-04	3.34E-04
CuO, (MT)		6.09E-02							8.99E-01	8.41E-01
F-, (MT)		1.18E-06							2.85E-02	2.67E-02
Fe+3, (MT)		2.60E-05							1.94E+00	1.81E+00
Fe2O3, (MT)		2.68E+00							3.89E+01	3.64E+01
H2O, (MT)		5.01E-05							1.10E+00	1.03E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name — Solid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
Hg+2, (MT)									4.30E-06	4.03E-06
I-, (MT)		4.00E-07							9.66E-03	9.03E-03
K+, (MT)		4.16E-07							1.00E-02	9.39E-03
K2O, (MT)		7.25E-04							1.05E-02	9.82E-03
La+3, (MT)		5.88E-07							1.02E-02	9.50E-03
La2O3, (MT)		1.82E-02							2.64E-01	2.47E-01
Li+, (MT)									1.17E-05	1.10E-05
Li2O, (MT)		1.85E-06							2.68E-05	2.51E-05
Mg+2, (MT)		2.18E-07							5.26E-03	4.92E-03
MgO, (MT)		1.45E-02							2.11E-01	1.97E-01
MnO2, (MT)		1.55E-01							1.01E-01	9.45E-02
Mo+6, (MT)									3.83E-04	3.58E-04
MoO3, (MT)		6.32E-03							9.18E-02	8.59E-02
Na+, (MT)		6.24E-05							4.22E+00	3.95E+00
Na2O, (MT)		8.02E-01							1.16E+01	1.09E+01
Ni(OH)3, (MT)		2.49E-07								
Ni+3, (MT)		3.17E-06							5.07E-03	4.75E-03
Ni2FECN6, (MT)		1.13E-05							2.64E+00	2.47E+00
Ni2O3, (MT)		1.94E-01							2.81E+00	2.63E+00
NiO, (MT)										
NO2-, (MT)		1.46E-06							3.53E-02	3.30E-02
NO3-, (MT)		2.04E-05								
Np+4, (MT)									3.64E-04	3.41E-04
NpO2, (MT)		4.82E-06							7.01E-05	6.55E-05
OH-, (MT)		2.36E-04							4.72E+03	4.42E+03
P2O5, (MT)		2.72E+00							3.95E+01	3.69E+01
P2O5:24W, (MT)									2.49E-04	2.33E-04
Pb+4, (MT)		6.49E-08							1.57E-03	1.47E-03
PbO2, (MT)		3.19E-01							4.71E+00	4.40E+00
PO4-3, (MT)		4.57E-05							1.13E-01	1.06E-01
POLY, (MT)		4.26E-07							5.33E-02	4.99E-02
Pu+4, (MT)									1.13E-03	1.06E-03
PuO2, (MT)		4.01E-06							5.82E-05	5.45E-05
Si+4, (MT)		1.56E-06							3.78E-02	3.53E-02
SiO2, (MT)		1.33E-01							1.92E+00	1.80E+00
SO3, (MT)										
SO4-2, (MT)		7.51E-07							1.88E-03	1.76E-03
Sr+2, (MT)		1.02E-06							1.76E-02	1.65E-02
SrO, (MT)		3.26E-06							4.74E-05	4.44E-05
Tc2O7, (MT)		1.04E-05							1.51E-04	1.42E-04
TcO4-, (MT)									2.71E-04	2.54E-04
TiO2, (MT)		2.34E-05							3.40E-04	3.18E-04
Tot Org Carbon, (MT)		2.29E-06							5.53E-02	5.18E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1203	1204	1205	1206	1207	1208	1209	1210	1301	1302
U3O8, (MT)		7.95E-04							1.15E-02	1.08E-02
UO2+2, (MT)		9.54E-05							7.96E-01	7.44E-01
UO3, (MT)										
V+5, (MT)									8.98E-05	8.40E-05
V2O5, (MT)		2.35E-02							3.47E-01	3.25E-01
WO2, (MT)										
WO3, (MT)		4.97E-02							7.33E-01	6.86E-01
Zn+2, (MT)		1.87E-08							4.52E-04	4.23E-04
ZnO, (MT)		2.35E-02							3.41E-01	3.19E-01
Zr+4, (MT)		5.48E-06							1.32E-01	1.24E-01
ZrO2, (MT)		5.17E-01							7.51E+00	7.02E+00
ZrO2:2H2O, (MT)		8.08E-06							1.95E-01	1.83E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
Volume, Total Liters	3.24E+08	3.24E+08	3.24E+08	3.10E+06	3.10E+06	3.07E+08	1.43E+07	1.43E+07	1.49E+07	1.52E+07
Specific Gravity	1.02E+00	1.02E+00	1.02E+00	1.00E+00	1.00E+00	1.00E+00	1.36E+00	1.36E+00	1.35E+00	1.35E+00
Total Mass Flow, (MT)	3.30E+05	3.30E+05	3.30E+05	3.10E+05	3.10E+03	3.07E+05	1.95E+04	1.95E+04	2.01E+04	2.05E+04
Cs and Ba, (MCi)	7.46E+01	7.46E+01	7.46E+01				7.46E+01	7.46E+01	7.48E+01	7.48E+01
Sr and Y, (MCi)	1.38E+02	1.38E+02	1.38E+02				1.38E+02	1.38E+02	1.38E+02	1.38E+02
Tc, (MCi)	3.18E-02	3.18E-02	3.18E-02				3.18E-02	3.18E-02	3.19E-02	3.19E-02
TRU, (MCi)	2.05E-01	2.05E-01	2.05E-01				2.05E-01	2.05E-01	2.06E-01	2.06E-01
Total MCi	2.13E+02	2.13E+02	2.13E+02				2.13E+02	2.13E+02	2.13E+02	2.13E+02
Ag+, (MT)	4.60E-05	4.60E-05	4.60E-05				4.60E-05	4.60E-05	4.61E-05	4.61E-05
Al(OH)4-, (MT)	2.14E-07	2.14E-07	2.14E-07				2.14E-07	2.14E-07	2.14E-07	2.14E-07
Al+3, (MT)	2.13E-02	2.13E-02	2.13E-02				2.13E-02	2.13E-02	2.14E-02	2.14E-02
Am+3, (MT)	3.02E-02	3.02E-02	3.02E-02				3.02E-02	3.02E-02	3.02E-02	3.02E-02
As+5, (MT)	1.67E-05	1.67E-05	1.67E-05				1.67E-05	1.67E-05	1.67E-05	1.67E-05
B+3, (MT)	3.32E-05	3.32E-05	3.32E-05				3.32E-05	3.32E-05	3.33E-05	3.33E-05
Ba+2, (MT)	3.08E+00	3.08E+00	3.08E+00				3.08E+00	3.08E+00	3.09E+00	3.09E+00
Be+2, (MT)	2.55E-07	2.55E-07	2.55E-07				2.55E-07	2.55E-07	2.55E-07	2.55E-07
Bi+3, (MT)	2.02E-01	2.02E-01	2.02E-01				2.02E-01	2.02E-01	2.02E-01	2.02E-01
Carbon14, (MT)	1.51E-08	1.51E-08	1.51E-08				1.51E-08	1.51E-08	1.52E-08	1.52E-08
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	5.01E-03	5.01E-03	5.01E-03				5.01E-03	5.01E-03	5.02E-03	5.02E-03
Cancrinite, (MT)	8.32E-02	8.32E-02	8.32E-02				8.32E-02	8.32E-02	8.33E-02	8.33E-02
Cd+2, (MT)	2.65E-04	2.65E-04	2.65E-04				2.65E-04	2.65E-04	2.66E-04	2.66E-04
Ce+3, (MT)	2.69E-01	2.69E-01	2.69E-01				2.69E-01	2.69E-01	2.69E-01	2.69E-01
Cl-, (MT)	1.29E-04	1.29E-04	1.29E-04				1.29E-04	1.29E-04	1.29E-04	1.29E-04
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)	2.69E-03	2.69E-03	2.69E-03				2.69E-03	2.69E-03	2.70E-03	2.70E-03
Cs+, (MT)	9.09E-01	9.09E-01	9.09E-01				9.09E-01	9.09E-01	9.11E-01	9.11E-01
Cu+2, (MT)	2.49E-05	2.49E-05	2.49E-05				2.49E-05	2.49E-05	2.50E-05	2.50E-05
DTPA-3, (MT)	2.98E-01	2.98E-01	2.98E-01				2.98E-01	2.98E-01	2.98E-01	2.98E-01
F-, (MT)	6.26E+01	6.26E+01	6.26E+01				6.26E+01	6.26E+01	6.27E+01	6.27E+01
F2, (MT)										
Fe+3, (MT)	9.32E-02	9.32E-02	9.32E-02				9.32E-02	9.32E-02	9.33E-02	9.33E-02
FeCN6-3, (MT)	1.63E-05	1.63E-05	1.63E-05				1.63E-05	1.63E-05	1.63E-05	1.63E-05
FESA, (MT)										
H+, (MT)	1.66E+02	1.66E+02	1.66E+02				1.66E+02	1.66E+02	1.67E+02	1.68E+02
H2, (MT)										8.51E-10
H2O, (MT)	3.19E+05	3.19E+05	3.19E+05	3.10E+05	3.10E+03	3.07E+05	9.21E+03	9.21E+03	9.76E+03	9.76E+03
H2O2, (MT)	6.43E+00	6.43E+00	6.43E+00				6.43E+00	6.43E+00	6.44E+00	3.20E+02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
HCOO-, (MT)										
Hg, (MT)										5.00E-06
Hg+2, (MT)	3.01E-07	3.01E-07	3.01E-07				3.01E-07	3.01E-07	3.02E-07	3.02E-07
Hg2, (MT)	7.59E-08	7.59E-08	7.59E-08						1.33E-10	1.33E-10
I-, (MT)	6.76E-04	6.76E-04	6.76E-04				6.76E-04	6.76E-04	6.77E-04	6.77E-04
I2, (MT)										
K+, (MT)	7.03E-04	7.03E-04	7.03E-04				7.03E-04	7.03E-04	7.04E-04	7.04E-04
La+3, (MT)	2.40E-02	2.40E-02	2.40E-02				2.40E-02	2.40E-02	2.41E-02	2.41E-02
Li+, (MT)	8.23E-07	8.23E-07	8.23E-07				8.23E-07	8.23E-07	8.24E-07	8.24E-07
Mg+2, (MT)	3.68E-04	3.68E-04	3.68E-04				3.68E-04	3.68E-04	3.69E-04	3.69E-04
Mn+4, (MT)	4.46E-03	4.46E-03	4.46E-03				4.46E-03	4.46E-03	4.47E-03	4.47E-03
MnO2, (MT)										
Mo+6, (MT)	2.70E-05	2.70E-05	2.70E-05				2.70E-05	2.70E-05	2.70E-05	2.70E-05
MoO4-2, (MT)	1.00E-07	1.00E-07	1.00E-07				1.00E-07	1.00E-07	1.00E-07	1.00E-07
N2, (MT)										
N2O, (MT)										
Na+, (MT)	3.76E-01	3.76E-01	3.76E-01				3.76E-01	3.76E-01	3.76E-01	7.43E-01
NH2OH, (MT)										
NH3, (MT)	3.32E-07	3.32E-07	3.32E-07				3.32E-07	3.32E-07	3.32E-07	3.32E-07
NH4+, (MT)	6.99E-09	6.99E-09	6.99E-09				6.99E-09	6.99E-09	7.00E-09	7.00E-09
Ni+3, (MT)	7.69E-04	7.69E-04	7.69E-04				7.69E-04	7.69E-04	7.70E-04	7.70E-04
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	1.01E+04	1.01E+04	1.01E+04				1.01E+04	1.01E+04	1.01E+04	1.01E+04
Np+4, (MT)	1.46E-01	1.46E-01	1.46E-01				1.46E-01	1.46E-01	1.46E-01	1.46E-01
O2, (MT)										
OH-, (MT)										2.71E-01
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.10E-04	1.10E-04	1.10E-04				1.10E-04	1.10E-04	1.10E-04	1.10E-04
PO4-3, (MT)	7.93E-03	7.93E-03	7.93E-03				7.93E-03	7.93E-03	7.94E-03	7.94E-03
POLY, (MT)	4.30E-04	4.30E-04	4.30E-04				4.30E-04	4.30E-04	4.31E-04	4.31E-04
PTA-3, (MT)	1.79E-05	1.79E-05	1.79E-05				1.79E-05	1.79E-05	1.79E-05	1.79E-05
Pu+4, (MT)	4.49E-01	4.49E-01	4.49E-01				4.49E-01	4.49E-01	4.49E-01	4.49E-01
Si+4, (MT)	2.65E-03	2.65E-03	2.65E-03				2.65E-03	2.65E-03	2.65E-03	2.65E-03
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	4.28E-04	4.28E-04	4.28E-04				4.28E-04	4.28E-04	4.28E-04	4.28E-04
Sr+2, (MT)	3.67E+01	3.67E+01	3.67E+01				3.67E+01	3.67E+01	3.68E+01	3.68E+01
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
TcO4-, (MT)	3.07E+00	3.07E+00	3.07E+00				3.07E+00	3.07E+00	3.07E+00	3.07E+00
Ti+4, (MT)	6.79E-06	6.79E-06	6.79E-06				6.79E-06	6.79E-06	6.80E-06	6.80E-06
Tot Org Carbon, (MT)	3.87E-03	3.87E-03	3.87E-03				3.87E-03	3.87E-03	3.88E-03	3.88E-03
UO2+2, (MT)	1.82E+00	1.82E+00	1.82E+00				1.82E+00	1.82E+00	1.82E+00	1.82E+00
V+5, (MT)	6.28E-06	6.28E-06	6.28E-06				6.28E-06	6.28E-06	6.29E-06	6.29E-06
W+6, (MT)										
Za+2, (MT)	7.23E-02	7.23E-02	7.23E-02				7.23E-02	7.23E-02	7.24E-02	7.24E-02
Zr+4, (MT)	5.26E-01	5.26E-01	5.26E-01				5.26E-01	5.26E-01	5.27E-01	5.27E-01
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
Total Mass Flow, (MT)	3.30E+02	3.30E+02	3.30E+02				3.30E+02	3.30E+02	5.12E+03	5.13E+03
Cs and Ba, (MCi)	2.36E-04	2.36E-04	2.36E-04				2.34E-04	2.34E-04	3.66E-03	1.50E-01
Sr and Y, (MCi)	4.27E-03	4.27E-03	4.27E-03				4.27E-03	4.27E-03	6.64E-02	3.36E-01
Tc, (MCi)	2.87E-07	2.87E-07	2.87E-07				2.87E-07	2.87E-07	4.45E-06	6.67E-05
TRU, (MCi)	2.06E-05	2.06E-05	2.06E-05				2.05E-05	2.05E-05	3.19E-04	7.24E-04
Total MCi	4.53E-03	4.53E-03	4.53E-03				4.53E-03	4.53E-03	7.03E-02	4.87E-01
Ag+, (MT)	4.24E-05	4.24E-05	4.24E-05				4.24E-05	4.24E-05	6.58E-04	6.58E-04
Ag2O, (MT)	9.17E-02	9.17E-02	9.17E-02				9.17E-02	9.17E-02	1.42E+00	1.43E+00
Al+3, (MT)	1.86E-01	1.86E-01	1.86E-01				1.86E-01	1.86E-01	2.88E+00	2.88E+00
Al2O3, (MT)	1.02E+01	1.02E+01	1.02E+01				1.02E+01	1.02E+01	1.58E+02	1.59E+02
Am+3, (MT)	9.31E-07	9.31E-07	9.31E-07				9.31E-07	9.31E-07	1.45E-05	1.45E-05
Am2O3, (MT)	7.76E-09	7.76E-09	7.76E-09						1.13E-07	6.53E-05
APM-, (MT)	2.22E-04	2.22E-04	2.22E-04				2.22E-04	2.22E-04	3.44E-03	3.45E-03
As+5, (MT)	1.53E-05	1.53E-05	1.53E-05				1.53E-05	1.53E-05	2.38E-04	2.38E-04
As2O5, (MT)	9.74E-02	9.74E-02	9.74E-02				9.74E-02	9.74E-02	1.51E+00	1.52E+00
B+3, (MT)	3.06E-05	3.06E-05	3.06E-05				3.06E-05	3.06E-05	4.75E-04	4.75E-04
B2O3, (MT)	3.33E-03	3.33E-03	3.33E-03				3.33E-03	3.33E-03	5.18E-02	2.91E-01
Ba+2, (MT)	9.51E-05	9.51E-05	9.51E-05				9.51E-05	9.51E-05	1.48E-03	1.48E-03
BaO, (MT)	6.06E-04	6.06E-04	6.06E-04				6.06E-04	6.06E-04	9.41E-03	1.62E-02
Be+2, (MT)	2.34E-07	2.34E-07	2.34E-07				2.34E-07	2.34E-07	3.64E-06	3.64E-06
BeO, (MT)	1.25E-02	1.25E-02	1.25E-02				1.25E-02	1.25E-02	1.93E-01	1.94E-01
Bi+3, (MT)	6.03E-03	6.03E-03	6.03E-03				6.03E-03	6.03E-03	9.37E-02	9.37E-02
Bi2O3, (MT)	2.01E-01	2.01E-01	2.01E-01				2.01E-01	2.01E-01	3.12E+00	3.13E+00
Carbon14, (MT)	1.39E-08	1.39E-08	1.39E-08				1.39E-08	1.39E-08	2.17E-07	2.17E-07
Ca+2, (MT)	4.61E-03	4.61E-03	4.61E-03				4.61E-03	4.61E-03	7.16E-02	7.16E-02
Cancrinite, (MT)	6.62E+00	6.62E+00	6.62E+00				6.62E+00	6.62E+00	1.03E+02	1.03E+02
CaO, (MT)	1.44E-01	1.44E-01	1.44E-01				1.44E-01	1.44E-01	2.23E+00	2.23E+00
Cd+2, (MT)	2.44E-04	2.44E-04	2.44E-04				2.44E-04	2.44E-04	3.79E-03	3.79E-03
CdO, (MT)	7.83E-03	7.83E-03	7.83E-03				7.83E-03	7.83E-03	1.22E-01	1.22E-01
Ce+3, (MT)	7.32E-03	7.32E-03	7.32E-03				7.32E-03	7.32E-03	1.14E-01	1.14E-01
Ce2O3, (MT)	1.90E-01	1.90E-01	1.90E-01				1.90E-01	1.90E-01	2.95E+00	2.96E+00
Cl-, (MT)	1.07E-04	1.07E-04	1.07E-04				1.07E-04	1.07E-04	1.67E-03	1.67E-03
CO3-2, (MT)	6.91E-03	6.91E-03	6.91E-03				6.91E-03	6.91E-03	1.07E-01	1.07E-01
Cr+3, (MT)	2.12E-02	2.12E-02	2.12E-02				2.12E-02	2.12E-02	3.29E-01	3.29E-01
Cr2O3, (MT)	5.75E-02	5.75E-02	5.75E-02				5.75E-02	5.75E-02	8.93E-01	8.96E-01
Cs+, (MT)	2.85E-06	2.85E-06	2.85E-06				2.85E-06	2.85E-06	4.42E-05	4.42E-05
Cs2O, (MT)	2.27E-08	2.27E-08	2.27E-08						3.30E-07	1.89E-03
Cu+2, (MT)	2.30E-05	2.30E-05	2.30E-05				2.30E-05	2.30E-05	3.57E-04	3.57E-04
CuO, (MT)	5.79E-02	5.79E-02	5.79E-02				5.79E-02	5.79E-02	8.99E-01	9.00E-01
F-, (MT)	1.84E-03	1.84E-03	1.84E-03				1.84E-03	1.84E-03	2.85E-02	2.85E-02
Fe+3, (MT)	1.25E-01	1.25E-01	1.25E-01				1.25E-01	1.25E-01	1.94E+00	1.94E+00
Fe2O3, (MT)	2.51E+00	2.51E+00	2.51E+00				2.51E+00	2.51E+00	3.89E+01	3.90E+01
H2O, (MT)	7.06E-02	7.06E-02	7.06E-02				7.06E-02	7.06E-02	1.10E+00	1.10E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
Hg+2, (MT)	2.77E-07	2.77E-07	2.77E-07				2.77E-07	2.77E-07	4.30E-06	4.30E-06
I-, (MT)	6.22E-04	6.22E-04	6.22E-04				6.22E-04	6.22E-04	9.66E-03	9.66E-03
K+, (MT)	6.47E-04	6.47E-04	6.47E-04				6.47E-04	6.47E-04	1.00E-02	1.00E-02
K2O, (MT)	6.76E-04	6.76E-04	6.76E-04				6.76E-04	6.76E-04	1.05E-02	1.06E-02
La+3, (MT)	6.54E-04	6.54E-04	6.54E-04				6.54E-04	6.54E-04	1.02E-02	1.02E-02
La2O3, (MT)	1.70E-02	1.70E-02	1.70E-02				1.70E-02	1.70E-02	2.64E-01	2.65E-01
Li+, (MT)	7.56E-07	7.56E-07	7.56E-07				7.56E-07	7.56E-07	1.17E-05	1.17E-05
Li2O, (MT)	1.73E-06	1.73E-06	1.73E-06				1.73E-06	1.73E-06	2.68E-05	2.59E-02
Mg+2, (MT)	3.39E-04	3.39E-04	3.39E-04				3.39E-04	3.39E-04	5.26E-03	5.26E-03
MgO, (MT)	1.36E-02	1.36E-02	1.36E-02				1.36E-02	1.36E-02	2.11E-01	2.11E-01
MnO2, (MT)	6.50E-03	6.50E-03	6.50E-03				6.50E-03	6.50E-03	1.01E-01	1.01E-01
Mo+6, (MT)	2.47E-05	2.47E-05	2.47E-05				2.47E-05	2.47E-05	3.83E-04	3.83E-04
MoO3, (MT)	5.91E-03	5.91E-03	5.91E-03				5.91E-03	5.91E-03	9.18E-02	9.20E-02
Na+, (MT)	2.72E-01	2.72E-01	2.72E-01				2.72E-01	2.72E-01	4.22E+00	4.22E+00
Na2O, (MT)	7.48E-01	7.48E-01	7.48E-01				7.48E-01	7.48E-01	1.16E+01	1.18E+01
Ni(OH)3, (MT)										
Ni+3, (MT)	3.27E-04	3.27E-04	3.27E-04				3.27E-04	3.27E-04	5.07E-03	5.07E-03
Ni2FECN6, (MT)	1.70E-01	1.70E-01	1.70E-01				1.70E-01	1.70E-01	2.64E+00	2.64E+00
Ni2O3, (MT)	1.81E-01	1.81E-01	1.81E-01				1.81E-01	1.81E-01	2.81E+00	2.82E+00
NiO, (MT)										2.35E-03
NO2-, (MT)	2.27E-03	2.27E-03	2.27E-03				2.27E-03	2.27E-03	3.53E-02	3.53E-02
NO3-, (MT)										
Np+4, (MT)	2.34E-05	2.34E-05	2.34E-05				2.34E-05	2.34E-05	3.64E-04	3.64E-04
NpO2, (MT)	4.51E-06	4.51E-06	4.51E-06				4.51E-06	4.51E-06	7.01E-05	3.96E-04
OH-, (MT)	3.04E+02	3.04E+02	3.04E+02				3.04E+02	3.04E+02	4.72E+03	4.72E+03
P2O5, (MT)	2.54E+00	2.54E+00	2.54E+00				2.54E+00	2.54E+00	3.95E+01	3.96E+01
P2O5:24W, (MT)	1.60E-05	1.60E-05	1.60E-05				1.60E-05	1.60E-05	2.49E-04	2.49E-04
Pb+4, (MT)	1.01E-04	1.01E-04	1.01E-04				1.01E-04	1.01E-04	1.57E-03	1.57E-03
PbO2, (MT)	3.03E-01	3.03E-01	3.03E-01				3.03E-01	3.03E-01	4.71E+00	4.72E+00
PO4-3, (MT)	7.28E-03	7.28E-03	7.28E-03				7.28E-03	7.28E-03	1.13E-01	1.13E-01
POLY, (MT)	3.44E-03	3.44E-03	3.44E-03				3.44E-03	3.44E-03	5.33E-02	5.33E-02
Pu+4, (MT)	7.30E-05	7.30E-05	7.30E-05				7.30E-05	7.30E-05	1.13E-03	1.13E-03
PuO2, (MT)	3.75E-06	3.75E-06	3.75E-06				3.75E-06	3.75E-06	5.82E-05	1.06E-03
Si+4, (MT)	2.43E-03	2.43E-03	2.43E-03				2.43E-03	2.43E-03	3.78E-02	3.78E-02
SiO2, (MT)	1.24E-01	1.24E-01	1.24E-01				1.24E-01	1.24E-01	1.92E+00	3.40E+00
SO3, (MT)										3.76E-06
SO4-2, (MT)	1.21E-04	1.21E-04	1.21E-04				1.21E-04	1.21E-04	1.88E-03	1.88E-03
Sr+2, (MT)	1.13E-03	1.13E-03	1.13E-03				1.13E-03	1.13E-03	1.76E-02	1.76E-02
SrO, (MT)	3.05E-06	3.05E-06	3.05E-06				3.05E-06	3.05E-06	4.74E-05	8.51E-02
Tc2O7, (MT)	9.75E-06	9.75E-06	9.75E-06				9.75E-06	9.75E-06	1.51E-04	5.89E-03
TcO4-, (MT)	1.75E-05	1.75E-05	1.75E-05				1.75E-05	1.75E-05	2.71E-04	2.71E-04
TiO2, (MT)	2.19E-05	2.19E-05	2.19E-05				2.19E-05	2.19E-05	3.40E-04	3.41E-04
Tot Org Carbon, (MT)	3.56E-03	3.56E-03	3.56E-03				3.56E-03	3.56E-03	5.53E-02	5.53E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
U3O8, (MT)	7.43E-04	7.43E-04	7.43E-04				7.43E-04	7.43E-04	1.15E-02	1.16E-02
UO2+2, (MT)	5.12E-02	5.12E-02	5.12E-02				5.12E-02	5.12E-02	7.96E-01	7.96E-01
UO3, (MT)										5.44E-03
V+5, (MT)	5.78E-06	5.78E-06	5.78E-06				5.78E-06	5.78E-06	8.98E-05	8.98E-05
V2O5, (MT)	2.23E-02	2.23E-02	2.23E-02				2.23E-02	2.23E-02	3.47E-01	3.48E-01
WO2, (MT)										4.10E-07
WO3, (MT)	4.72E-02	4.72E-02	4.72E-02				4.72E-02	4.72E-02	7.33E-01	7.35E-01
Zn+2, (MT)	2.91E-05	2.91E-05	2.91E-05				2.91E-05	2.91E-05	4.52E-04	4.52E-04
ZnO, (MT)	2.19E-02	2.19E-02	2.19E-02				2.19E-02	2.19E-02	3.41E-01	3.42E-01
Zr+4, (MT)	8.52E-03	8.52E-03	8.52E-03				8.52E-03	8.52E-03	1.32E-01	1.32E-01
ZrO2, (MT)	4.83E-01	4.83E-01	4.83E-01				4.83E-01	4.83E-01	7.51E+00	7.52E+00
ZrO2:2H2O, (MT)	1.26E-02	1.26E-02	1.26E-02				1.26E-02	1.26E-02	1.95E-01	1.95E-01

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
Volume, Total Liters	5.44E+06		2.19E-09		1.54E+07	1.52E+07	5.44E+06	9.77E+05	8.79E+06	9.77E+05
Specific Gravity	1.97E+00		1.00E+00		1.00E+00	1.35E+00	1.97E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.07E+04		2.19E-12		1.54E+04	2.05E+04	1.07E+04	9.77E+02	8.79E+03	9.77E+02
Cs and Ba, (MCi)	7.48E+01					7.48E+01	7.48E+01	3.74E-04	3.36E-03	3.74E-04
Sr and Y, (MCi)	1.38E+02					1.38E+02	1.38E+02	6.92E-04	6.23E-03	6.92E-04
Tc, (MCi)	3.19E-02					3.19E-02	3.19E-02	1.59E-07	1.43E-06	1.59E-07
TRU, (MCi)	2.06E-01					2.06E-01	2.06E-01	1.03E-06	9.26E-06	1.03E-06
Total MCi	2.13E+02					2.13E+02	2.13E+02	1.07E-03	9.60E-03	1.07E-03
Ag+, (MT)	4.61E-05					4.61E-05	4.61E-05			
Al(OH)4-, (MT)	2.14E-07					2.14E-07	2.14E-07			
Al+3, (MT)	2.14E-02					2.14E-02	2.14E-02	1.07E-07	9.61E-07	1.07E-07
Am+3, (MT)	3.02E-02					3.02E-02	3.02E-02	1.51E-07	1.36E-06	1.51E-07
As+5, (MT)	1.67E-05					1.67E-05	1.67E-05			
B+3, (MT)	3.33E-05					3.33E-05	3.33E-05			
Ba+2, (MT)	3.09E+00					3.09E+00	3.09E+00	1.54E-05	1.39E-04	1.54E-05
Be+2, (MT)	2.55E-07					2.55E-07	2.55E-07			
Bi+3, (MT)	2.02E-01					2.02E-01	2.02E-01	1.01E-06	9.09E-06	1.01E-06
Carbon14, (MT)	1.52E-08					1.52E-08	1.52E-08			
C2H4O3, (MT)			1.55E-12							
C2O4-2, (MT)										
Ca+2, (MT)	5.02E-03					5.02E-03	5.02E-03	2.51E-08	2.26E-07	2.51E-08
Cancrinite, (MT)	8.33E-02					8.33E-02	8.33E-02	4.17E-07	3.75E-06	4.17E-07
Cd+2, (MT)	2.66E-04					2.66E-04	2.66E-04			
Ce+3, (MT)	2.69E-01					2.69E-01	2.69E-01	1.35E-06	1.21E-05	1.35E-06
Cl-, (MT)	1.29E-04					1.29E-04	1.29E-04			
Cl2, (MT)					1.80E-03					
CO, (MT)										
CO2, (MT)					2.60E+00					
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)	2.70E-03					2.70E-03	2.70E-03	1.35E-08	1.21E-07	1.35E-08
Cs+, (MT)	9.11E-01					9.11E-01	9.11E-01	4.55E-06	4.10E-05	4.55E-06
Cu+2, (MT)	2.50E-05					2.50E-05	2.50E-05			
DTPA-3, (MT)	2.98E-01					2.98E-01	2.98E-01	1.49E-06	1.34E-05	1.49E-06
F-, (MT)	6.27E+01					6.27E+01	6.27E+01	3.14E-04	2.82E-03	3.14E-04
F2, (MT)					6.27E+01					
Fe+3, (MT)	9.33E-02					9.33E-02	9.33E-02	4.67E-07	4.20E-06	4.67E-07
FeCN6-3, (MT)	1.63E-05					1.63E-05	1.63E-05			
FESA, (MT)										
H+, (MT)	1.68E+02				1.21E-07	1.68E+02	1.68E+02	8.40E-04	7.56E-03	8.40E-04
H2, (MT)					9.39E-10	8.51E-10		8.51E-10		8.51E-10
H2O, (MT)			6.44E-13		3.99E+03	9.76E+03		9.76E+02	8.79E+03	9.76E+02
H2O2, (MT)	3.20E+02				3.20E+02	3.20E+02	3.20E+02	1.60E-03	1.44E-02	1.60E-03

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
HCOO-, (MT)										
Hg, (MT)	5.00E-07				5.10E-06	5.00E-06	5.00E-07	2.25E-06	2.25E-06	2.25E-07
Hg+2, (MT)	3.02E-07					3.02E-07	3.02E-07			
Hg2, (MT)					4.33E-12	1.33E-10				
I-, (MT)	6.77E-04					6.77E-04	6.77E-04	3.38E-09	3.05E-08	
I2, (MT)					1.03E-02					
K+, (MT)	7.04E-04					7.04E-04	7.04E-04	3.52E-09	3.17E-08	
La+3, (MT)	2.41E-02					2.41E-02	2.41E-02	1.20E-07	1.08E-06	1.20E-07
Li+, (MT)	8.24E-07					8.24E-07	8.24E-07			
Mg+2, (MT)	3.68E-04					3.69E-04	3.68E-04	1.84E-09	1.66E-08	
Mn+4, (MT)	4.47E-03					4.47E-03	4.47E-03	2.24E-08	2.01E-07	2.24E-08
MnO2, (MT)										
Mo+6, (MT)	2.70E-05					2.70E-05	2.70E-05			
MoO4-2, (MT)	1.00E-07					1.00E-07	1.00E-07			
N2, (MT)					5.54E+02					
N2O, (MT)										
Na+, (MT)	7.43E-01					7.43E-01	7.43E-01	3.71E-06	3.34E-05	3.71E-06
NH2OH, (MT)										
NH3, (MT)	4.65E-09				1.11E+01	3.32E-07	4.65E-09	3.28E-08	2.95E-07	3.28E-08
NH4+, (MT)	7.00E-09					7.00E-09	7.00E-09			
Ni+3, (MT)	7.70E-04					7.70E-04	7.70E-04	3.85E-09	3.47E-08	
NO, (MT)					3.70E+03					
NO2, (MT)					7.27E+00					
NO2-, (MT)										
NO3-, (MT)	1.01E+04				8.50E-06	1.01E+04	1.01E+04	5.07E-02	4.56E-01	5.07E-02
Np+4, (MT)	1.46E-01					1.46E-01	1.46E-01	7.29E-07	6.56E-06	7.29E-07
O2, (MT)					6.77E+03					
OH-, (MT)	2.71E-01					2.71E-01	2.71E-01	1.36E-06	1.22E-05	1.36E-06
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)	1.10E-04					1.10E-04	1.10E-04			
PO4-3, (MT)	7.94E-03					7.94E-03	7.94E-03	3.97E-08	3.57E-07	3.97E-08
POLY, (MT)	4.31E-04					4.31E-04	4.31E-04	2.16E-09	1.94E-08	
PTA-3, (MT)	1.79E-05					1.79E-05	1.79E-05			
Pu+4, (MT)	4.49E-01					4.49E-01	4.49E-01	2.25E-06	2.02E-05	2.25E-06
Si+4, (MT)	2.65E-03					2.65E-03	2.65E-03	1.33E-08	1.19E-07	1.33E-08
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	4.28E-04					4.28E-04	4.28E-04	2.14E-09	1.93E-08	
Sr+2, (MT)	3.68E+01					3.68E+01	3.68E+01	1.84E-04	1.66E-03	1.84E-04
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
TcO4-, (MT)	3.07E+00					3.07E+00	3.07E+00	1.54E-05	1.38E-04	1.54E-05
Ti+4, (MT)	6.80E-06					6.80E-06	6.80E-06			
Tot Org Carbon, (MT)	3.87E-03					3.88E-03	3.87E-03	1.55E-07	1.40E-06	1.55E-07
UO2+2, (MT)	1.82E+00					1.82E+00	1.82E+00	9.09E-06	8.18E-05	9.09E-06
V+5, (MT)	6.29E-06					6.29E-06	6.29E-06			
W+6, (MT)										
Zn+2, (MT)	7.24E-02					7.24E-02	7.24E-02	3.62E-07	3.26E-06	3.62E-07
Zr+4, (MT)	5.27E-01					5.27E-01	5.27E-01	2.64E-06	2.37E-05	2.64E-06
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
Total Mass Flow, (MT)	5.13E+03	8.73E+02			2.64E+00	5.13E+03	5.13E+03	2.56E-02	2.31E-01	2.56E-02
Cs and Ba, (MCi)	1.50E-01				1.50E-01	1.50E-01	1.50E-01	7.33E-07	6.60E-06	
Sr and Y, (MCi)	3.36E-01				2.75E-01	3.36E-01	3.36E-01	1.68E-06	1.51E-05	1.68E-06
Tc, (MCi)	6.67E-05				6.35E-05	6.67E-05	6.67E-05	3.19E-10	2.87E-09	
TRU, (MCi)	7.24E-04				4.13E-04	7.24E-04	7.24E-04	2.35E-09	2.11E-08	
Total MCi	4.87E-01				4.26E-01	4.87E-01	4.87E-01	2.42E-06	2.18E-05	1.68E-06
Ag+, (MT)	6.58E-04					6.58E-04	6.58E-04	3.29E-09	2.96E-08	
Ag2O, (MT)	1.43E+00				2.86E-03	1.43E+00	1.43E+00	7.13E-06	6.42E-05	7.13E-06
Al+3, (MT)	2.88E+00					2.88E+00	2.88E+00	1.44E-05	1.30E-04	1.44E-05
Al2O3, (MT)	1.59E+02				3.90E-01	1.59E+02	1.59E+02	7.93E-04	7.13E-03	7.93E-04
Am+3, (MT)	1.45E-05					1.45E-05	1.45E-05			
Am2O3, (MT)	6.53E-05				6.65E-05	6.53E-05	6.53E-05			
APM-, (MT)	3.45E-03				6.89E-06	3.45E-03	3.45E-03			
As+5, (MT)	2.38E-04					2.38E-04	2.38E-04			
As2O5, (MT)	1.52E+00				3.03E-03	1.52E+00	1.52E+00	7.58E-06	6.82E-05	7.58E-06
B+3, (MT)	4.75E-04					4.75E-04	4.75E-04	2.38E-09	2.14E-08	2.38E-09
B2O3, (MT)	2.91E-01	1.22E+02			2.45E-01	2.91E-01	2.91E-01	1.46E-06	1.31E-05	1.46E-06
Ba+2, (MT)	1.48E-03					1.48E-03	1.48E-03	7.39E-09	6.65E-08	
BaO, (MT)	1.62E-02				6.93E-03	1.62E-02	1.62E-02	8.10E-08	7.29E-07	8.10E-08
Be+2, (MT)	3.64E-06					3.64E-06	3.64E-06			
BeO, (MT)	1.94E-01				3.87E-04	1.94E-01	1.94E-01	9.68E-07	8.72E-06	9.68E-07
Bi+3, (MT)	9.37E-02					9.37E-02	9.37E-02	4.68E-07	4.22E-06	4.68E-07
Bi2O3, (MT)	3.13E+00				6.91E-03	3.13E+00	3.13E+00	1.56E-05	1.41E-04	1.56E-05
Carbon14, (MT)	2.17E-07					2.17E-07	2.17E-07			
Ca+2, (MT)	7.16E-02					7.16E-02	7.16E-02	3.58E-07	3.22E-06	3.58E-07
Cancrinite, (MT)	1.03E+02					1.03E+02	1.03E+02	5.14E-04	4.63E-03	5.14E-04
CaO, (MT)	2.23E+00				4.68E-03	2.23E+00	2.23E+00	1.12E-05	1.01E-04	1.12E-05
Cd+2, (MT)	3.79E-03					3.79E-03	3.79E-03	1.90E-08	1.71E-07	
CdO, (MT)	1.22E-01				2.53E-04	1.22E-01	1.22E-01	6.09E-07	5.48E-06	6.09E-07
Ce+3, (MT)	1.14E-01					1.14E-01	1.14E-01	5.68E-07	5.12E-06	5.68E-07
Ce2O3, (MT)	2.96E+00				6.82E-03	2.96E+00	2.96E+00	1.48E-05	1.33E-04	1.48E-05
Cl-, (MT)	1.67E-03					1.67E-03	1.67E-03	8.34E-09	7.51E-08	8.34E-09
CO3-2, (MT)	1.07E-01					1.07E-01	1.07E-01	5.37E-07	4.83E-06	5.37E-07
Cr+3, (MT)	3.29E-01					3.29E-01	3.29E-01	1.65E-06	1.48E-05	1.65E-06
Cr2O3, (MT)	8.96E-01				2.76E-03	8.96E-01	8.96E-01	4.48E-06	4.03E-05	4.48E-06
Cs+, (MT)	4.42E-05					4.42E-05	4.42E-05			
Cs2O, (MT)	1.89E-03				1.93E-03	1.89E-03	1.89E-03	9.47E-09	8.52E-08	
Cu+2, (MT)	3.57E-04					3.57E-04	3.57E-04	1.78E-09	1.61E-08	
CuO, (MT)	9.00E-01				1.80E-03	9.00E-01	9.00E-01	4.50E-06	4.05E-05	4.50E-06
F-, (MT)	2.85E-02					2.85E-02	2.85E-02	1.43E-07	1.28E-06	1.43E-07
Fe+3, (MT)	1.94E+00					1.94E+00	1.94E+00	9.68E-06	8.71E-05	9.68E-06
Fe2O3, (MT)	3.90E+01				8.50E-02	3.90E+01	3.90E+01	1.95E-04	1.75E-03	1.95E-04
H2O, (MT)	1.10E+00				2.20E-03	1.10E+00	1.10E+00	5.49E-06	4.94E-05	5.49E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
Hg+2, (MT)	4.30E-06					4.30E-06	4.30E-06			
I-, (MT)	9.66E-03					9.66E-03	9.66E-03	4.83E-08	4.35E-07	4.83E-08
K+, (MT)	1.00E-02					1.00E-02	1.00E-02	5.02E-08	4.52E-07	5.02E-08
K2O, (MT)	1.06E-02				4.70E-05	1.06E-02	1.06E-02	5.27E-08	4.75E-07	5.27E-08
La+3, (MT)	1.02E-02					1.02E-02	1.02E-02	5.07E-08	4.57E-07	5.07E-08
La2O3, (MT)	2.65E-01				6.10E-04	2.65E-01	2.65E-01	1.32E-06	1.19E-05	1.32E-06
Li+, (MT)	1.17E-05					1.17E-05	1.17E-05			
Li2O, (MT)	2.59E-02	1.32E+01			2.64E-02	2.59E-02	2.59E-02	1.30E-07	1.17E-06	1.30E-07
Mg+2, (MT)	5.26E-03					5.26E-03	5.26E-03	2.63E-08	2.37E-07	2.63E-08
MgO, (MT)	2.11E-01				4.41E-04	2.11E-01	2.11E-01	1.06E-06	9.50E-06	1.06E-06
MnO2, (MT)	1.01E-01				2.17E-04	1.01E-01	1.01E-01	5.06E-07	4.55E-06	5.06E-07
Mo+6, (MT)	3.83E-04					3.83E-04	3.83E-04	1.92E-09	1.72E-08	
MoO3, (MT)	9.20E-02				1.85E-04	9.20E-02	9.20E-02	4.60E-07	4.14E-06	4.60E-07
Na+, (MT)	4.22E+00					4.22E+00	4.22E+00	2.11E-05	1.90E-04	2.11E-05
Na2O, (MT)	1.18E+01	2.40E+01			1.32E-01	1.18E+01	1.18E+01	5.87E-05	5.29E-04	5.87E-05
Ni(OH)3, (MT)										
Ni+3, (MT)	5.07E-03					5.07E-03	5.07E-03	2.54E-08	2.28E-07	2.54E-08
Ni2FECN6, (MT)	2.64E+00					2.64E+00	2.64E+00	1.32E-05	1.19E-04	1.32E-05
Ni2O3, (MT)	2.82E+00				5.66E-03	2.82E+00	2.82E+00	1.41E-05	1.27E-04	1.41E-05
NiO, (MT)	2.35E-03				2.40E-03	2.35E-03	2.35E-03	1.18E-08	1.06E-07	
NO2-, (MT)	3.53E-02					3.53E-02	3.53E-02	1.76E-07	1.59E-06	1.76E-07
NO3-, (MT)										
Np+4, (MT)	3.64E-04					3.64E-04	3.64E-04			
NpO2, (MT)	3.96E-04				3.33E-04	3.96E-04	3.96E-04			
OH-, (MT)	4.72E+03					4.72E+03	4.72E+03	2.36E-02	2.13E-01	2.36E-02
P2O5, (MT)	3.96E+01				7.93E-02	3.96E+01	3.96E+01	1.98E-04	1.78E-03	1.98E-04
P2O5:24W, (MT)	2.49E-04					2.49E-04	2.49E-04			
Pb+4, (MT)	1.57E-03					1.57E-03	1.57E-03	7.84E-09	7.06E-08	
PbO2, (MT)	4.71E+00				9.43E-03	4.72E+00	4.71E+00	2.36E-05	2.12E-04	2.36E-05
PO4-3, (MT)	1.13E-01					1.13E-01	1.13E-01	5.65E-07	5.08E-06	5.65E-07
POLY, (MT)	5.33E-02					5.33E-02	5.33E-02	2.67E-07	2.40E-06	2.67E-07
Pu+4, (MT)	1.13E-03					1.13E-03	1.13E-03	5.66E-09	5.10E-08	
PuO2, (MT)	1.06E-03				1.02E-03	1.06E-03	1.06E-03	5.31E-09	4.78E-08	
Si+4, (MT)	3.78E-02					3.78E-02	3.78E-02	1.89E-07	1.70E-06	1.89E-07
SiO2, (MT)	3.40E+00	7.13E+02			1.51E+00	3.40E+00	3.40E+00	1.70E-05	1.53E-04	1.70E-05
SO3, (MT)	3.76E-06				3.85E-06	3.76E-06	3.76E-06			
SO4-2, (MT)	1.88E-03					1.88E-03	1.88E-03	9.39E-09	8.45E-08	
Sr+2, (MT)	1.76E-02					1.76E-02	1.76E-02	8.80E-08	7.92E-07	8.80E-08
SrO, (MT)	8.51E-02				8.68E-02	8.51E-02	8.51E-02	4.26E-07	3.83E-06	4.26E-07
Tc2O7, (MT)	5.89E-03				5.86E-03	5.89E-03	5.89E-03	2.95E-08	2.65E-07	
TcO4-, (MT)	2.71E-04					2.71E-04	2.71E-04			
TiO2, (MT)	3.41E-04				7.04E-07	3.41E-04	3.41E-04	1.70E-09	1.53E-08	
Tot Org Carbon, (MT)	5.53E-02					5.53E-02	5.53E-02	2.77E-07	2.49E-06	2.77E-07

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322
U3O8, (MT)	1.16E-02				2.31E-05	1.16E-02	1.16E-02	5.78E-08	5.21E-07	
UO2+2, (MT)	7.96E-01					7.96E-01	7.96E-01	3.98E-06	3.58E-05	3.98E-06
UO3, (MT)	5.44E-03				5.55E-03	5.44E-03	5.44E-03	2.72E-08	2.45E-07	
V+5, (MT)	8.98E-05					8.98E-05	8.98E-05			
V2O5, (MT)	3.48E-01				6.95E-04	3.48E-01	3.48E-01	1.74E-06	1.56E-05	1.74E-06
WO2, (MT)	4.10E-07				4.52E-07	4.10E-07	4.10E-07			
WO3, (MT)	7.35E-01				1.47E-03	7.35E-01	7.35E-01	3.67E-06	3.31E-05	3.67E-06
Zn+2, (MT)	4.52E-04					4.52E-04	4.52E-04	2.26E-09	2.03E-08	
ZnO, (MT)	3.42E-01				8.64E-04	3.42E-01	3.42E-01	1.71E-06	1.54E-05	1.71E-06
Zr+4, (MT)	1.32E-01					1.32E-01	1.32E-01	6.62E-07	5.96E-06	6.62E-07
ZrO2, (MT)	7.52E+00				1.71E-02	7.52E+00	7.52E+00	3.76E-05	3.39E-04	3.76E-05
ZrO2:2H2O, (MT)	1.95E-01					1.95E-01	1.95E-01	9.76E-07	8.79E-06	9.76E-07

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
Volume, Total Liters	8.79E+06	3.23E+05	1.35E+03	3.19E+05			6.65E+02	8.79E+06	6.58E+03	
Specific Gravity	1.00E+00	1.21E+00	3.28E+00	1.21E+00			5.63E+00	1.00E+00	1.21E+00	
Total Mass Flow, (MT)	8.79E+03	3.90E+02	4.43E+00	3.87E+02			3.75E+00	8.79E+03	7.95E+00	
Cs and Ba, (MCi)	3.36E-03							3.36E-03		
Sr and Y, (MCi)	6.23E-03							6.23E-03		
Tc, (MCi)	1.43E-06							1.43E-06		
TRU, (MCi)	9.26E-06							9.26E-06		
Total MCi	9.60E-03							9.60E-03		
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)	9.61E-07							9.61E-07		
Am+3, (MT)	1.36E-06							1.36E-06		
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)	1.39E-04							1.39E-04		
Be+2, (MT)										
Bi+3, (MT)	9.09E-06							9.09E-06		
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)	2.26E-07							2.26E-07		
Cancrinite, (MT)	3.75E-06							3.75E-06		
Cd+2, (MT)										
Ce+3, (MT)	1.21E-05							1.21E-05		
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)	1.21E-07							1.21E-07		
Cs+, (MT)	4.10E-05							4.10E-05		
Cu+2, (MT)										
DTPA-3, (MT)	1.34E-05							1.34E-05		
F-, (MT)	2.82E-03							2.82E-03		
F2, (MT)										
Fe+3, (MT)	4.20E-06							4.20E-06		
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	7.56E-03	1.22E+00		1.22E+00				7.56E-03	2.49E-02	
H2, (MT)		8.51E-10		8.51E-10					1.74E-11	
H2O, (MT)	8.79E+03		6.84E-01	2.28E-01				8.79E+03		
H2O2, (MT)	1.44E-02	3.13E+02		3.13E+02				1.44E-02	6.40E+00	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
HCOO-, (MT)										
Hg, (MT)		5.00E-06		5.00E-06					1.02E-07	
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)	3.05E-08							3.05E-08		
I2, (MT)										
K+, (MT)	3.17E-08							3.17E-08		
La+3, (MT)	1.08E-06							1.08E-06		
Li+, (MT)										
Mg+2, (MT)	1.66E-08							1.66E-08		
Mn+4, (MT)	2.01E-07							2.01E-07		
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
N2O, (MT)										
Na+, (MT)	3.34E-05			3.67E-01				3.34E-05		
NH2OH, (MT)										
NH3, (MT)	2.95E-07							2.95E-07		
NH4+, (MT)										
Ni+3, (MT)	3.47E-08							3.47E-08		
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	4.56E-01	7.49E+01	3.75E+00	7.12E+01			3.75E+00	4.56E-01	1.53E+00	
Np+4, (MT)	6.56E-06							6.56E-06		
O2, (MT)										
OH-, (MT)	1.22E-05			2.71E-01				1.22E-05		
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)	3.57E-07							3.57E-07		
POLY, (MT)	1.94E-08							1.94E-08		
PTA-3, (MT)										
Pu+4, (MT)	2.02E-05							2.02E-05		
Si+4, (MT)	1.19E-07							1.19E-07		
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	1.93E-08							1.93E-08		
Sr+2, (MT)	1.66E-03							1.66E-03		
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
TcO4-, (MT)	1.38E-04							1.38E-04		
Ti+4, (MT)										
Tot Org Carbon, (MT)	1.40E-06							1.40E-06		
UO2+2, (MT)	8.18E-05							8.18E-05		
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)	3.26E-06							3.26E-06		
Zr+4, (MT)	2.37E-05							2.37E-05		
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
Total Mass Flow, (MT)	2.31E-01	2.59E+00		2.59E+00				2.31E-01	5.29E-02	
Cs and Ba, (MCi)	6.60E-06	1.47E-01		1.47E-01				6.60E-06	2.99E-03	
Sr and Y, (MCi)	1.51E-05	2.70E-01		2.70E-01				1.51E-05	5.51E-03	
Tc, (MCi)	2.87E-09	6.22E-05		6.22E-05				2.87E-09	1.27E-06	
TRU, (MCi)	1.16E-08	4.05E-04		4.05E-04				1.16E-08	8.26E-06	
Total MCi	2.17E-05	4.17E-01		4.17E-01				2.17E-05	8.51E-03	
Ag+, (MT)	2.96E-08							2.96E-08		
Ag2O, (MT)	6.42E-05	2.80E-03		2.80E-03				6.42E-05	5.71E-05	
Al+3, (MT)	1.30E-04			1.44E-06				1.30E-04		
Al2O3, (MT)	7.13E-03	3.82E-01		3.82E-01				7.13E-03	7.79E-03	
Am+3, (MT)										
Am2O3, (MT)		6.52E-05		6.52E-05					1.33E-06	
APM-, (MT)		6.73E-06		6.73E-06					1.37E-07	
As+5, (MT)										
As2O5, (MT)	6.82E-05	2.97E-03		2.97E-03				6.82E-05	6.07E-05	
B+3, (MT)	2.14E-08							2.14E-08		
B2O3, (MT)	1.31E-05	2.40E-01		2.40E-01				1.31E-05	4.89E-03	
Ba+2, (MT)	6.65E-08							6.65E-08		
BaO, (MT)	7.29E-07	6.79E-03		6.79E-03				7.29E-07	1.39E-04	
Be+2, (MT)										
BeO, (MT)	8.72E-06	3.80E-04		3.80E-04				8.72E-06	7.75E-06	
Bi+3, (MT)	4.22E-06			4.68E-08				4.22E-06		
Bi2O3, (MT)	1.41E-04	6.77E-03		6.77E-03				1.41E-04	1.38E-04	
Carbon14, (MT)										
Ca+2, (MT)	3.22E-06			3.58E-08				3.22E-06		
Cancrinite, (MT)	4.63E-03			5.14E-05				4.63E-03		
CaO, (MT)	1.01E-04	4.59E-03		4.59E-03				1.01E-04	9.36E-05	
Cd+2, (MT)	1.71E-07							1.71E-07		
CdO, (MT)	5.48E-06	2.48E-04		2.48E-04				5.48E-06	5.06E-06	
Ce+3, (MT)	5.12E-06			5.68E-08				5.12E-06		
Ce2O3, (MT)	1.33E-04	6.68E-03		6.68E-03				1.33E-04	1.36E-04	
Cl-, (MT)	7.51E-08							7.51E-08		
CO3-2, (MT)	4.83E-06			5.36E-08				4.83E-06		
Cr+3, (MT)	1.48E-05			1.64E-07				1.48E-05		
Cr2O3, (MT)	4.03E-05	2.71E-03		2.71E-03				4.03E-05	5.52E-05	
Cs+, (MT)										
Cs2O, (MT)	8.52E-08	1.89E-03		1.89E-03				8.52E-08	3.86E-05	
Cu+2, (MT)	1.61E-08							1.61E-08		
CuO, (MT)	4.05E-05	1.77E-03		1.77E-03				4.05E-05	3.60E-05	
F-, (MT)	1.28E-06			1.43E-08				1.28E-06		
Fe+3, (MT)	8.71E-05			9.67E-07				8.71E-05		
Fe2O3, (MT)	1.75E-03	8.33E-02		8.34E-02				1.75E-03	1.70E-03	
H2O, (MT)	4.94E-05	2.15E-03		2.15E-03				4.94E-05	4.39E-05	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
Hg+2, (MT)										
I-, (MT)	4.35E-07							4.35E-07		
K+, (MT)	4.52E-07							4.52E-07		
K2O, (MT)	4.75E-07	4.60E-05		4.60E-05				4.75E-07	9.39E-07	
La+3, (MT)	4.57E-07							4.57E-07		
La2O3, (MT)	1.19E-05	5.97E-04		5.98E-04				1.19E-05	1.22E-05	
Li+, (MT)										
Li2O, (MT)	1.17E-06	2.59E-02		2.59E-02				1.17E-06	5.29E-04	
Mg+2, (MT)	2.37E-07							2.37E-07		
MgO, (MT)	9.50E-06	4.32E-04		4.32E-04				9.50E-06	8.82E-06	
MnO2, (MT)	4.55E-06	2.12E-04		2.12E-04				4.55E-06	4.33E-06	
Mo+6, (MT)										
MoO3, (MT)	4.14E-06	1.82E-04		1.82E-04				4.14E-06	3.70E-06	
Na+, (MT)	1.90E-04			2.11E-06				1.90E-04		
Na2O, (MT)	5.29E-04	1.30E-01		1.30E-01				5.29E-04	2.64E-03	
Ni(OH)3, (MT)										
Ni+3, (MT)	2.28E-07							2.28E-07		
Ni2FECN6, (MT)	1.19E-04			1.32E-06				1.19E-04		
Ni2O3, (MT)	1.27E-04	5.54E-03		5.54E-03				1.27E-04	1.13E-04	
NiO, (MT)	1.06E-07	2.35E-03		2.35E-03				1.06E-07	4.80E-05	
NO2-, (MT)	1.59E-06			1.76E-08				1.59E-06		
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)		3.26E-04		3.26E-04					6.65E-06	
OH-, (MT)	2.13E-01			2.36E-03				2.13E-01		
P2O5, (MT)	1.78E-03	7.77E-02		7.77E-02				1.78E-03	1.59E-03	
P2O5:24W, (MT)										
Pb+4, (MT)	7.06E-08							7.06E-08		
PbO2, (MT)	2.12E-04	9.24E-03		9.25E-03				2.12E-04	1.89E-04	
PO4-3, (MT)	5.08E-06			5.65E-08				5.08E-06		
POLY, (MT)	2.40E-06			2.67E-08				2.40E-06		
Pu+4, (MT)	5.10E-08							5.10E-08		
PuO2, (MT)		1.00E-03		1.00E-03					2.05E-05	
Si+4, (MT)	1.70E-06			1.89E-08				1.70E-06		
SiO2, (MT)	1.53E-04	1.48E+00		1.48E+00				1.53E-04	3.01E-02	
SO3, (MT)		3.76E-06		3.76E-06					7.67E-08	
SO4-2, (MT)	8.45E-08							8.45E-08		
Sr+2, (MT)	7.92E-07							7.92E-07		
SrO, (MT)	3.83E-06	8.51E-02		8.51E-02				3.83E-06	1.74E-03	
Tc2O7, (MT)	2.65E-07	5.74E-03		5.74E-03				2.65E-07	1.17E-04	
TcO4-, (MT)										
TiO2, (MT)	1.53E-08	6.87E-07		6.87E-07				1.53E-08	1.40E-08	
Tot Org Carbon, (MT)	2.49E-06			2.76E-08				2.49E-06		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332
U3O8, (MT)	5.21E-07	2.26E-05		2.26E-05				5.21E-07	4.61E-07	
UO2+2, (MT)	3.58E-05			3.98E-07				3.58E-05		
UO3, (MT)	2.45E-07	5.44E-03		5.44E-03				2.45E-07	1.11E-04	
V+5, (MT)										
V2O5, (MT)	1.56E-05	6.82E-04		6.82E-04				1.56E-05	1.39E-05	
WO2, (MT)		4.10E-07		4.10E-07					8.36E-09	
WO3, (MT)	3.31E-05	1.44E-03		1.44E-03				3.31E-05	2.94E-05	
Zn+2, (MT)	2.03E-08							2.03E-08		
ZnO, (MT)	1.54E-05	8.47E-04		8.47E-04				1.54E-05	1.73E-05	
Zr+4, (MT)	5.96E-06			6.61E-08				5.96E-06		
ZrO2, (MT)	3.39E-04	1.68E-02		1.68E-02				3.39E-04	3.43E-04	
ZrO2:2H2O, (MT)	8.79E-06			9.76E-08				8.79E-06		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1331	1334	1335	1336	1337	1338	1344	1346	1347	1348
Volume, Total Liters		3.67E+06	1.25E+07	1.25E+07	6.84E+02					9.77E+06
Specific Gravity		1.00E+00	1.00E+00	1.00E+00	1.00E+00					1.00E+00
Total Mass Flow, (MT)		3.67E+03	1.25E+04	1.25E+04	6.84E-01					9.77E+03
Cs and Ba, (MCi)		3.36E-04	3.70E-03	3.70E-03						3.74E-03
Sr and Y, (MCi)		6.23E-04	6.85E-03	6.85E-03						6.92E-03
Tc, (MCi)		1.43E-07	1.58E-06	1.58E-06						1.59E-06
TRU, (MCi)		9.26E-07	1.02E-05	1.02E-05						1.03E-05
Total MCi		9.60E-04	1.06E-02	1.06E-02						1.07E-02
Ag+, (MT)										2.31E-09
Al(OH)4-, (MT)										1.07E-11
Al+3, (MT)		9.61E-08	1.06E-06	1.06E-06						1.07E-06
Am+3, (MT)		1.36E-07	1.50E-06	1.50E-06						1.51E-06
As+5, (MT)										8.34E-10
B+3, (MT)										1.67E-09
Ba+2, (MT)		1.39E-05	1.53E-04	1.53E-04						1.54E-04
Be+2, (MT)										1.28E-11
Bi+3, (MT)		9.09E-07	1.00E-05	1.00E-05						1.01E-05
Carbon14, (MT)										7.59E-13
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)		2.26E-08	2.49E-07	2.49E-07						2.51E-07
Cancrinite, (MT)		3.75E-07	4.12E-06	4.12E-06						4.17E-06
Cd+2, (MT)										1.33E-08
Ce+3, (MT)		1.21E-06	1.33E-05	1.33E-05						1.35E-05
Cl-, (MT)										6.47E-09
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)		1.21E-08	1.34E-07	1.34E-07						1.35E-07
Cs+, (MT)		4.10E-06	4.51E-05	4.51E-05						4.55E-05
Cu+2, (MT)										1.25E-09
DTPA-3, (MT)		1.49E-06	1.49E-05	1.49E-05						1.49E-05
F-, (MT)		2.82E-04	3.10E-03	3.10E-03						3.14E-03
F2, (MT)										
Fe+3, (MT)		4.20E-07	4.62E-06	4.62E-06						4.67E-06
FeCN6-3, (MT)										8.17E-10
FESA, (MT)										
H+, (MT)		7.56E-04	3.32E-02	3.32E-02						8.40E-03
H2, (MT)			1.74E-11	1.74E-11						8.51E-10
H2O, (MT)		3.67E+03	1.25E+04	1.25E+04	6.84E-01					9.76E+03
H2O2, (MT)		1.60E-03	6.41E+00	6.41E+00						1.60E-02

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1333	1334	1335	1336	1337	1338	1344	1346	1347	1348
HCOO-, (MT)										
Hg, (MT)		2.02E-07	3.04E-07	3.04E-07						4.50E-06
Hg+2, (MT)										1.51E-11
Hg2, (MT)										
I-, (MT)			3.05E-08	3.05E-08						3.38E-08
I2, (MT)										
K+, (MT)			3.17E-08	3.17E-08						3.52E-08
La+3, (MT)		1.08E-07	1.19E-06	1.19E-06						1.20E-06
Li+, (MT)										4.12E-11
Mg+2, (MT)			1.66E-08	1.66E-08						1.84E-08
Mn+4, (MT)		2.01E-08	2.21E-07	2.21E-07						2.24E-07
MnO2, (MT)										
Mo+6, (MT)										1.35E-09
MoO4-2, (MT)										5.01E-12
N2, (MT)										
N2O, (MT)										
Na+, (MT)		3.34E-06	3.68E-05	3.68E-05						3.71E-05
NH2OH, (MT)										
NH3, (MT)		3.11E-08	3.26E-07	3.26E-07						3.28E-07
NH4+, (MT)										3.50E-13
Ni+3, (MT)			3.47E-08	3.47E-08						3.85E-08
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)		3.42E+00	5.40E+00	5.40E+00						5.07E-01
Np+4, (MT)		6.56E-07	7.22E-06	7.22E-06						7.29E-06
O2, (MT)										
OH-, (MT)		1.22E-06	1.34E-05	1.34E-05						1.36E-05
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										5.49E-09
PO4-3, (MT)		3.57E-08	3.93E-07	3.93E-07						3.97E-07
POLY, (MT)			1.94E-08	1.94E-08						2.16E-08
PTA-3, (MT)										8.94E-10
Pu+4, (MT)		2.02E-06	2.22E-05	2.22E-05						2.25E-05
Si+4, (MT)		1.19E-08	1.31E-07	1.31E-07						1.33E-07
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)			1.93E-08	1.93E-08						2.14E-08
Sr+2, (MT)		1.66E-04	1.82E-03	1.82E-03						1.84E-03
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1333	1334	1335	1336	1337	1338	1344	1346	1347	1348
TcO4-, (MT)		1.38E-05	1.52E-04	1.52E-04						1.54E-04
Ti+4, (MT)										3.40E-10
Tot Org Carbon, (MT)		1.40E-07	1.54E-06	1.54E-06						1.55E-06
UO2+2, (MT)		8.18E-06	9.00E-05	9.00E-05						9.09E-05
V+5, (MT)										3.15E-10
W+6, (MT)										
Zn+2, (MT)		3.26E-07	3.58E-06	3.58E-06						3.62E-06
Zr+4, (MT)		2.37E-06	2.61E-05	2.61E-05						2.64E-05
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1333	1334	1335	1336	1337	1338	1344	1346	1347	1348
Total Mass Flow, (MT)		2.31E-02	3.07E-01	3.07E-01			1.32E+03			2.56E-01
Cs and Ba, (MCi)			3.00E-03	3.00E-03			7.46E+01			7.51E-06
Sr and Y, (MCi)		1.51E-06	5.53E-03	5.53E-03			1.37E+02			1.68E-05
Tc, (MCi)			1.27E-06	1.27E-06			3.17E-02			3.33E-09
TRU, (MCi)			8.27E-06	8.27E-06			2.06E-01			3.62E-08
Total MCi		1.51E-06	8.53E-03	8.53E-03			2.12E+02			2.44E-05
Ag+, (MT)			2.96E-08	2.96E-08						3.29E-08
Ag2O, (MT)		6.42E-06	1.28E-04	1.28E-04			1.43E+00			7.13E-05
Al+3, (MT)		1.30E-05	1.43E-04	1.43E-04						1.44E-04
Al2O3, (MT)		7.13E-04	1.56E-02	1.56E-02			1.94E+02			7.93E-03
Am+3, (MT)										7.23E-10
Am2O3, (MT)			1.33E-06	1.33E-06			3.32E-02			3.27E-09
APM-, (MT)			1.37E-07	1.37E-07			3.44E-03			1.72E-07
As+5, (MT)										1.19E-08
As2O5, (MT)		6.82E-06	1.36E-04	1.36E-04			1.51E+00			7.58E-05
B+3, (MT)		2.14E-09	2.35E-08	2.35E-08						2.38E-08
B2O3, (MT)		1.31E-06	4.91E-03	4.91E-03			1.22E+02			1.46E-05
Ba+2, (MT)			6.65E-08	6.65E-08						7.39E-08
BaO, (MT)		7.29E-08	1.39E-04	1.39E-04			3.46E+00			8.10E-07
Be+2, (MT)										1.82E-10
BeO, (MT)		8.72E-07	1.73E-05	1.73E-05			1.93E-01			9.68E-06
Bi+3, (MT)		4.22E-07	4.64E-06	4.64E-06						4.68E-06
Bi2O3, (MT)		1.41E-05	2.93E-04	2.93E-04			3.45E+00			1.56E-04
Carbon14, (MT)										1.08E-11
Ca+2, (MT)		3.22E-07	3.55E-06	3.55E-06						3.58E-06
Cancrinite, (MT)		4.63E-04	5.09E-03	5.09E-03						5.14E-03
CaO, (MT)		1.01E-05	2.04E-04	2.04E-04			2.34E+00			1.12E-04
Cd+2, (MT)			1.71E-07	1.71E-07						1.90E-07
CdO, (MT)		5.48E-07	1.11E-05	1.11E-05			1.26E-01			6.09E-06
Ce+3, (MT)		5.12E-07	5.63E-06	5.63E-06						5.68E-06
Ce2O3, (MT)		1.33E-05	2.83E-04	2.83E-04			3.40E+00			1.48E-04
Cl-, (MT)		7.51E-09	8.26E-08	8.26E-08						8.34E-08
CO3-2, (MT)		4.83E-07	5.31E-06	5.31E-06						5.37E-06
Cr+3, (MT)		1.48E-06	1.63E-05	1.63E-05						1.65E-05
Cr2O3, (MT)		4.03E-06	9.96E-05	9.96E-05			1.38E+00			4.48E-05
Cs+, (MT)										2.21E-09
Cs2O, (MT)			3.87E-05	3.87E-05			9.64E-01			9.47E-08
Cu+2, (MT)			1.61E-08	1.61E-08						1.78E-08
CuO, (MT)		4.05E-06	8.06E-05	8.06E-05			8.99E-01			4.50E-05
F-, (MT)		1.28E-07	1.41E-06	1.41E-06						1.43E-06
Fe+3, (MT)		8.71E-06	9.58E-05	9.58E-05						9.68E-05
Fe2O3, (MT)		1.75E-04	3.63E-03	3.63E-03			4.24E+01			1.95E-03
H2O, (MT)		4.94E-06	9.83E-05	9.83E-05			1.10E+00			5.49E-05

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1333	1334	1335	1336	1337	1338	1344	1346	1347	1348
Hg+2, (MT)										2.15E-10
I-, (MT)		4.35E-08	4.78E-07	4.78E-07						4.83E-07
K+, (MT)		4.52E-08	4.97E-07	4.97E-07						5.02E-07
K2O, (MT)		4.75E-08	1.46E-06	1.46E-06			2.34E-02			5.27E-07
La+3, (MT)		4.57E-08	5.02E-07	5.02E-07						5.07E-07
La2O3, (MT)		1.19E-06	2.53E-05	2.53E-05			3.04E-01			1.32E-05
Li+, (MT)										5.87E-10
Li2O, (MT)		1.17E-07	5.30E-04	5.30E-04			1.32E+01			1.30E-06
Mg+2, (MT)		2.37E-08	2.60E-07	2.60E-07						2.63E-07
MgO, (MT)		9.50E-07	1.93E-05	1.93E-05			2.20E-01			1.06E-05
MnO2, (MT)		4.55E-07	9.34E-06	9.34E-06			1.08E-01			5.06E-06
Mo+6, (MT)										1.92E-08
MoO3, (MT)		4.14E-07	8.26E-06	8.26E-06			9.24E-02			4.60E-06
Na+, (MT)		1.90E-05	2.09E-04	2.09E-04						2.11E-04
Na2O, (MT)		5.29E-05	3.22E-03	3.22E-03			6.59E+01			5.87E-04
Ni(OH)3, (MT)										
Ni+3, (MT)		2.28E-08	2.51E-07	2.51E-07						2.54E-07
Ni2FECN6, (MT)		1.19E-05	1.31E-04	1.31E-04						1.32E-04
Ni2O3, (MT)		1.27E-05	2.53E-04	2.53E-04			2.82E+00			1.41E-04
NiO, (MT)			4.82E-05	4.82E-05			1.20E+00			1.18E-07
NO2-, (MT)		1.59E-07	1.75E-06	1.75E-06						1.76E-06
NO3-, (MT)										
Np+4, (MT)										1.82E-08
NpO2, (MT)			6.65E-06	6.65E-06			1.66E-01			1.98E-08
OH-, (MT)		2.13E-02	2.34E-01	2.34E-01						2.36E-01
P2O5, (MT)		1.78E-04	3.54E-03	3.54E-03			3.96E+01			1.98E-03
P2O5:24W, (MT)										1.25E-08
Pb+4, (MT)			7.06E-08	7.06E-08						7.84E-08
PbO2, (MT)		2.12E-05	4.22E-04	4.22E-04			4.71E+00			2.36E-04
PO4-3, (MT)		5.08E-07	5.59E-06	5.59E-06						5.65E-06
POLY, (MT)		2.40E-07	2.64E-06	2.64E-06						2.67E-06
Pu+4, (MT)			5.10E-08	5.10E-08						5.66E-08
PuO2, (MT)			2.05E-05	2.05E-05			5.11E-01			5.31E-08
Si+4, (MT)		1.70E-07	1.87E-06	1.87E-06						1.89E-06
SiO2, (MT)		1.53E-05	3.03E-02	3.03E-02			7.52E+02			1.70E-04
SO3, (MT)			7.67E-08	7.67E-08			1.92E-03			1.88E-10
SO4-2, (MT)			8.45E-08	8.45E-08						9.39E-08
Sr+2, (MT)		7.92E-08	8.71E-07	8.71E-07						8.80E-07
SrO, (MT)		3.83E-07	1.74E-03	1.74E-03			4.33E+01			4.26E-06
Tc2O7, (MT)			1.17E-04	1.17E-04			2.92E+00			2.95E-07
TcO4-, (MT)										1.36E-08
TiO2, (MT)			2.94E-08	2.94E-08			3.51E-04			1.70E-08
Tot Org Carbon, (MT)		2.49E-07	2.74E-06	2.74E-06						2.77E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1333	1334	1335	1336	1337	1338	1344	1346	1347	1348
U3O8, (MT)			9.81E-07	9.81E-07			1.15E-02			5.78E-07
UO2+2, (MT)		3.58E-06	3.94E-05	3.94E-05						3.98E-05
UO3, (MT)			1.11E-04	1.11E-04			2.77E+00			2.72E-07
V+5, (MT)										4.49E-09
V2O5, (MT)		1.56E-06	3.11E-05	3.11E-05			3.47E-01			1.74E-05
WO2, (MT)			8.36E-09	8.36E-09			2.26E-04			2.05E-11
WO3, (MT)		3.31E-06	6.57E-05	6.57E-05			7.33E-01			3.67E-05
Zn+2, (MT)			2.03E-08	2.03E-08						2.26E-08
ZnO, (MT)		1.54E-06	3.42E-05	3.42E-05			4.31E-01			1.71E-05
Zr+4, (MT)		5.96E-07	6.55E-06	6.55E-06						6.62E-06
ZrO2, (MT)		3.39E-05	7.15E-04	7.15E-04			8.55E+00			3.76E-04
ZrO2:2H2O, (MT)		8.79E-07	9.67E-06	9.67E-06						9.76E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1349	1351	1352	1353	1354	1355	1356	1357	1358	1359
Volume, Total Liters	4.27E-03	3.10E+06	8.29E+02	8.66E+03	8.66E+03	3.21E+05	1.50E+07	1.50E+07	2.43E+04	1.50E+07
Specific Gravity	1.00E+00	1.00E+00	1.54E+00	1.21E+00	1.21E+00	1.21E+00	1.00E+00	1.00E+00	1.21E+00	1.00E+00
Total Mass Flow, (MT)	4.27E-06	3.10E+03	1.28E+00	1.05E+01	1.05E+01	3.88E+02	1.50E+04	1.50E+04	2.93E+01	1.50E+04
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)										
Cl2, (MT)							1.80E-03	1.80E-03		1.80E-03
CO, (MT)										
CO2, (MT)							2.60E+00	2.60E+00		2.60E+00
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)							6.27E+01	6.27E+01		6.27E+01
Fe+3, (MT)										
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)				3.27E-02	3.27E-02	1.21E+00	6.38E-02	9.65E-02	9.17E-02	4.82E-03
H2, (MT)				2.28E-11	2.28E-11	9.14E-10	4.81E-11	7.09E-11		
H2O, (MT)		3.10E+03	6.38E-01				3.98E+03	3.98E+03		3.98E+03
H2O2, (MT)				8.42E+00	8.42E+00	3.12E+02	1.64E+01	2.48E+01	2.36E+01	1.24E+00

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1349	1351	1352	1353	1354	1355	1356	1357	1358	1359
HCOO-, (MT)										
Hg, (MT)	4.27E-06			1.34E-07	1.34E-07	4.73E-06	5.11E-07	6.45E-07	5.82E-07	6.29E-08
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)							1.03E-02	1.03E-02		1.03E-02
K+, (MT)										
La+3, (MT)										
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)							5.54E+02	5.54E+02		5.54E+02
N2O, (MT)										
Na+, (MT)			3.67E-01							
NH2OH, (MT)										
NH3, (MT)							1.11E+01	1.11E+01		1.11E+01
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)							3.66E+03	3.66E+03		3.66E+03
NO2, (MT)							7.27E+00	7.27E+00		7.27E+00
NO2-, (MT)										
NO3-, (MT)		3.75E+00		2.01E+00	2.01E+00	7.45E+01	3.92E+00	5.94E+00	5.64E+00	2.97E-01
Np+4, (MT)										
O2, (MT)							6.74E+03	6.74E+03		6.74E+03
OH-, (MT)			2.71E-01							
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1349	1351	1352	1353	1354	1355	1356	1357	1358	1359
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1349	1351	1352	1353	1354	1355	1356	1357	1358	1359
Total Mass Flow, (MT)				6.95E-02	6.95E-02	2.58E+00	1.36E-01	2.05E-01	1.95E-01	1.03E-02
Cs and Ba, (MCi)				3.94E-03	3.94E-03	1.46E-01	7.68E-03	1.16E-02	1.10E-02	5.81E-04
Sr and Y, (MCi)				7.25E-03	7.25E-03	2.69E-01	1.41E-02	2.14E-02	2.03E-02	1.07E-03
Tc, (MCi)				1.67E-06	1.67E-06	6.19E-05	3.26E-06	4.93E-06	4.68E-06	2.46E-07
TRU, (MCi)				1.09E-05	1.09E-05	4.03E-04	2.12E-05	3.20E-05	3.04E-05	1.60E-06
Total MCi				1.12E-02	1.12E-02	4.15E-01	2.18E-02	3.30E-02	3.14E-02	1.65E-03
Ag+, (MT)										
Ag2O, (MT)				7.51E-05	7.51E-05	2.78E-03	1.47E-04	2.22E-04	2.11E-04	1.11E-05
Al+3, (MT)										
Al2O3, (MT)				1.03E-02	1.03E-02	3.80E-01	2.00E-02	3.02E-02	2.87E-02	1.51E-03
Am+3, (MT)										
Am2O3, (MT)				1.75E-06	1.75E-06	6.49E-05	3.41E-06	5.17E-06	4.91E-06	2.58E-07
APM-, (MT)				1.81E-07	1.81E-07	6.72E-06	3.54E-07	5.34E-07	5.08E-07	2.67E-08
As+5, (MT)										
As2O5, (MT)				7.98E-05	7.98E-05	2.96E-03	1.56E-04	2.35E-04	2.24E-04	1.18E-05
B+3, (MT)										
B2O3, (MT)				6.44E-03	6.44E-03	2.38E-01	1.26E-02	1.90E-02	1.80E-02	9.49E-04
Ba+2, (MT)										
BaO, (MT)				1.82E-04	1.82E-04	6.75E-03	3.56E-04	5.38E-04	5.11E-04	2.69E-05
Be+2, (MT)										
BeO, (MT)				1.02E-05	1.02E-05	3.78E-04	1.99E-05	3.01E-05	2.86E-05	1.50E-06
Bi+3, (MT)										
Bi2O3, (MT)				1.82E-04	1.82E-04	6.74E-03	3.55E-04	5.37E-04	5.10E-04	2.68E-05
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)				1.23E-04	1.23E-04	4.56E-03	2.40E-04	3.63E-04	3.45E-04	1.82E-05
Cd+2, (MT)										
CdO, (MT)				6.65E-06	6.65E-06	2.47E-04	1.30E-05	1.96E-05	1.87E-05	9.81E-07
Ce+3, (MT)										
Ce2O3, (MT)				1.79E-04	1.79E-04	6.65E-03	3.50E-04	5.29E-04	5.03E-04	2.65E-05
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)				7.27E-05	7.27E-05	2.69E-03	1.42E-04	2.14E-04	2.04E-04	1.07E-05
Cs+, (MT)										
Cs2O, (MT)				5.08E-05	5.08E-05	1.88E-03	9.91E-05	1.50E-04	1.43E-04	7.50E-06
Cu+2, (MT)										
CuO, (MT)				4.74E-05	4.74E-05	1.76E-03	9.25E-05	1.40E-04	1.33E-04	6.99E-06
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)				2.24E-03	2.24E-03	8.29E-02	4.36E-03	6.60E-03	6.27E-03	3.30E-04
H2O, (MT)				5.78E-05	5.78E-05	2.14E-03	1.13E-04	1.71E-04	1.62E-04	8.52E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1340	1351	1352	1353	1354	1355	1356	1357	1358	1359
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)				1.24E-06	1.24E-06	4.58E-05	2.41E-06	3.65E-06	3.46E-06	1.82E-07
La+3, (MT)										
La2O3, (MT)				1.60E-05	1.60E-05	5.94E-04	3.13E-05	4.73E-05	4.50E-05	2.37E-06
Li+, (MT)										
Li2O, (MT)				6.95E-04	6.95E-04	2.58E-02	1.36E-03	2.05E-03	1.95E-03	1.03E-04
Mg+2, (MT)										
MgO, (MT)				1.16E-05	1.16E-05	4.30E-04	2.26E-05	3.42E-05	3.25E-05	1.71E-06
MnO2, (MT)				5.70E-06	5.70E-06	2.11E-04	1.11E-05	1.68E-05	1.60E-05	8.41E-07
Mo+6, (MT)										
MoO3, (MT)				4.87E-06	4.87E-06	1.81E-04	9.50E-06	1.44E-05	1.37E-05	7.19E-07
Na+, (MT)										
Na2O, (MT)				3.48E-03	3.48E-03	1.29E-01	6.78E-03	1.03E-02	9.75E-03	5.13E-04
Ni(OH)3, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)				1.49E-04	1.49E-04	5.51E-03	2.90E-04	4.39E-04	4.17E-04	2.20E-05
NiO, (MT)				6.32E-05	6.32E-05	2.34E-03	1.23E-04	1.87E-04	1.77E-04	9.32E-06
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)				8.75E-06	8.75E-06	3.24E-04	1.71E-05	2.58E-05	2.45E-05	1.29E-06
OH-, (MT)										
P2O5, (MT)				2.09E-03	2.09E-03	7.73E-02	4.07E-03	6.16E-03	5.85E-03	3.08E-04
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)				2.48E-04	2.48E-04	9.20E-03	4.84E-04	7.32E-04	6.96E-04	3.66E-05
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)				2.69E-05	2.69E-05	9.98E-04	5.25E-05	7.95E-05	7.55E-05	3.97E-06
Si+4, (MT)										
SiO2, (MT)				3.96E-02	3.96E-02	1.47E+00	7.73E-02	1.17E-01	1.11E-01	5.85E-03
SO3, (MT)				1.01E-07	1.01E-07	3.75E-06	1.98E-07	2.99E-07	2.84E-07	1.49E-08
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)				2.28E-03	2.28E-03	8.47E-02	4.46E-03	6.74E-03	6.40E-03	3.37E-04
Tc2O7, (MT)				1.54E-04	1.54E-04	5.71E-03	3.01E-04	4.55E-04	4.32E-04	2.27E-05
TcO4-, (MT)										
TiO2, (MT)				1.85E-08	1.85E-08	6.86E-07	3.61E-08	5.46E-08	5.18E-08	2.73E-09
Tot Org Carbon, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1349	1351	1352	1353	1354	1355	1356	1357	1358	1359
U3O8, (MT)				6.06E-07	6.06E-07	2.26E-05	1.19E-06	1.79E-06	1.70E-06	8.97E-08
UO2+2, (MT)										
UO3, (MT)				1.46E-04	1.46E-04	5.41E-03	2.85E-04	4.31E-04	4.09E-04	2.15E-05
V+5, (MT)										
V2O5, (MT)				1.83E-05	1.83E-05	6.78E-04	3.57E-05	5.40E-05	5.13E-05	2.70E-06
WO2, (MT)				1.10E-08	1.10E-08	4.40E-07	2.32E-08	3.42E-08		
WO3, (MT)				3.87E-05	3.87E-05	1.43E-03	7.54E-05	1.14E-04	1.08E-04	5.70E-06
Zn+2, (MT)										
ZnO, (MT)				2.27E-05	2.27E-05	8.43E-04	4.44E-05	6.71E-05	6.37E-05	3.36E-06
Zr+4, (MT)										
ZrO2, (MT)				4.51E-04	4.51E-04	1.67E-02	8.79E-04	1.33E-03	1.26E-03	6.65E-05
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
Volume, Total Liters	1.50E+07		1.25E+03	1.50E+07	3.29E+05		1.73E+04			4.08E+05
Specific Gravity	1.00E+00		1.21E+00	1.00E+00	1.21E+00		1.21E+00			1.00E+00
Total Mass Flow, (MT)	1.50E+04		1.51E+00	1.50E+04	3.98E+02		2.09E+01			4.08E+02
Cs and Ba, (MCi)										3.74E-05
Sr and Y, (MCi)										6.92E-05
Tc, (MCi)										1.59E-08
TRU, (MCi)										1.03E-07
Total MCi										1.07E-04
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										1.07E-08
Am+3, (MT)										1.51E-08
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										1.54E-06
Be+2, (MT)										
Bi+3, (MT)										1.01E-07
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										2.51E-09
Cancrinite, (MT)										4.17E-08
Cd+2, (MT)										
Ce+3, (MT)										1.35E-07
Cl-, (MT)										
Cl2, (MT)	1.80E-03			1.80E-03						
CO, (MT)										
CO2, (MT)	2.60E+00			2.60E+00						
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										1.35E-09
Cs+, (MT)										4.55E-07
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										3.14E-05
F2, (MT)	6.27E+01			6.27E+01						
Fe+3, (MT)										4.67E-08
FeCN6-3, (MT)										
FESA, (MT)										
H+, (MT)	4.82E-03		4.73E-03	9.65E-05	1.24E+00		6.54E-02			8.40E-05
H2, (MT)					8.68E-10		4.57E-11			8.51E-10
H2O, (MT)	3.98E+03			3.98E+03						4.08E+02
H2O2, (MT)	1.24E+00		1.22E+00	2.48E-02	3.20E+02		1.68E+01			

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
HCOO-, (MT)										
Hg, (MT)	6.29E-08		5.85E-08	4.34E-09	5.10E-06		2.68E-07			2.25E-08
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
I2, (MT)	1.03E-02			1.03E-02						
K+, (MT)										
La+3, (MT)										1.20E-08
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										2.24E-09
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)	5.54E+02			5.54E+02						
N2O, (MT)										
Na+, (MT)										3.71E-07
NH2OH, (MT)										
NH3, (MT)	1.11E+01			1.11E+01						1.64E-09
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)	3.66E+03			3.66E+03						
NO2, (MT)	7.27E+00			7.27E+00						
NO2-, (MT)										
NO3-, (MT)	2.97E-01		2.91E-01	5.94E-03	7.64E+01		4.02E+00			3.80E-01
Np+4, (MT)										7.29E-08
O2, (MT)	6.74E+03			6.74E+03						
OH-, (MT)										1.36E-07
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										3.97E-09
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)										2.25E-07
Si+4, (MT)										1.33E-09
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										1.84E-05
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
TcO4-, (MT)										1.54E-06
Ti+4, (MT)										
Tot Org Carbon, (MT)										1.55E-08
UO2+2, (MT)										9.09E-07
V+5, (MT)										
W+6, (MT)										
Za+2, (MT)										3.62E-08
Zr+4, (MT)										2.64E-07
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
Total Mass Flow, (MT)	1.03E-02		1.01E-02	2.05E-04	2.64E+00		1.39E-01			2.56E-03
Cs and Ba, (MCi)	5.81E-04		5.69E-04	1.16E-05	1.50E-01		7.87E-03			
Sr and Y, (MCi)	1.07E-03		1.05E-03	2.14E-05	2.75E-01		1.45E-02			1.68E-07
Tc, (MCi)	2.46E-07		2.41E-07	4.93E-09	6.35E-05		3.34E-06			
TRU, (MCi)	1.60E-06		1.57E-06	3.20E-08	4.13E-04		2.17E-05			
Total MCi	1.65E-03		1.62E-03	3.30E-05	4.25E-01		2.24E-02			1.68E-07
Ag+, (MT)										
Ag2O, (MT)	1.11E-05		1.09E-05	2.22E-07	2.86E-03		1.50E-04			7.13E-07
Al+3, (MT)										1.44E-06
Al2O3, (MT)	1.51E-03		1.48E-03	3.02E-05	3.90E-01		2.05E-02			7.93E-05
Am+3, (MT)										
Am2O3, (MT)	2.58E-07		2.53E-07	5.17E-09	6.65E-05		3.50E-06			
APM-, (MT)	2.67E-08				6.87E-06		3.61E-07			
As+5, (MT)										
As2O5, (MT)	1.18E-05		1.15E-05	2.35E-07	3.03E-03		1.60E-04			7.58E-07
B+3, (MT)										2.38E-10
B2O3, (MT)	9.49E-04		9.30E-04	1.90E-05	2.45E-01		1.29E-02			1.46E-07
Ba+2, (MT)										
BaO, (MT)	2.69E-05		2.64E-05	5.38E-07	6.93E-03		3.65E-04			8.10E-09
Be+2, (MT)										
BeO, (MT)	1.50E-06		1.47E-06	3.01E-08	3.87E-04		2.04E-05			9.68E-08
Bi+3, (MT)										4.68E-08
Bi2O3, (MT)	2.68E-05		2.63E-05	5.37E-07	6.91E-03		3.64E-04			1.56E-06
Carbon14, (MT)										
Ca+2, (MT)										3.58E-08
Cancrinite, (MT)										5.14E-05
CaO, (MT)	1.82E-05		1.78E-05	3.63E-07	4.68E-03		2.46E-04			1.12E-06
Cd+2, (MT)										
CdO, (MT)	9.81E-07		9.62E-07	1.96E-08	2.53E-04		1.33E-05			6.09E-08
Ce+3, (MT)										5.68E-08
Ce2O3, (MT)	2.65E-05		2.59E-05	5.29E-07	6.82E-03		3.59E-04			1.48E-06
Cl-, (MT)										8.34E-10
CO3-2, (MT)										5.37E-08
Cr+3, (MT)										1.65E-07
Cr2O3, (MT)	1.07E-05		1.05E-05	2.14E-07	2.76E-03		1.45E-04			4.48E-07
Cs+, (MT)										
Cs2O, (MT)	7.50E-06		7.35E-06	1.50E-07	1.93E-03		1.02E-04			
Cu+2, (MT)										
CuO, (MT)	6.99E-06		6.85E-06	1.40E-07	1.80E-03		9.48E-05			4.50E-07
F-, (MT)										1.43E-08
Fe+3, (MT)										9.68E-07
Fe2O3, (MT)	3.30E-04		3.23E-04	6.60E-06	8.50E-02		4.48E-03			1.95E-05
H2O, (MT)	8.52E-06		8.35E-06	1.71E-07	2.20E-03		1.16E-04			5.49E-07

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
Hg+2, (MT)										
I-, (MT)										4.83E-09
K+, (MT)										5.02E-09
K2O, (MT)	1.82E-07		1.79E-07	3.65E-09	4.70E-05		2.47E-06			5.27E-09
La+3, (MT)										5.07E-09
La2O3, (MT)	2.37E-06		2.32E-06	4.73E-08	6.10E-04		3.21E-05			1.32E-07
Li+, (MT)										
Li2O, (MT)	1.03E-04		1.01E-04	2.05E-06	2.64E-02		1.39E-03			1.30E-08
Mg+2, (MT)										2.63E-09
MgO, (MT)	1.71E-06		1.68E-06	3.42E-08	4.41E-04		2.32E-05			1.06E-07
MnO2, (MT)	8.41E-07		8.24E-07	1.68E-08	2.17E-04		1.14E-05			5.06E-08
Mo+6, (MT)										
MoO3, (MT)	7.19E-07		7.04E-07	1.44E-08	1.85E-04		9.75E-06			4.60E-08
Na+, (MT)										2.11E-06
Na2O, (MT)	5.13E-04		5.03E-04	1.03E-05	1.32E-01		6.95E-03			5.87E-06
Ni(OH)3, (MT)										
Ni+3, (MT)										2.54E-09
Ni2FECN6, (MT)										1.32E-06
Ni2O3, (MT)	2.20E-05		2.15E-05	4.39E-07	5.66E-03		2.98E-04			1.41E-06
NiO, (MT)	9.32E-06		9.14E-06	1.87E-07	2.40E-03		1.26E-04			
NO2-, (MT)										1.76E-08
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)	1.29E-06		1.27E-06	2.58E-08	3.33E-04		1.75E-05			
OH-, (MT)										2.36E-03
P2O5, (MT)	3.08E-04		3.02E-04	6.16E-06	7.93E-02		4.17E-03			1.98E-05
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)	3.66E-05		3.59E-05	7.32E-07	9.43E-03		4.96E-04			2.36E-06
PO4-3, (MT)										5.65E-08
POLY, (MT)										2.67E-08
Pu+4, (MT)										
PuO2, (MT)	3.97E-06		3.89E-06	7.95E-08	1.02E-03		5.39E-05			
Si+4, (MT)										1.89E-08
SiO2, (MT)	5.85E-03		5.73E-03	1.17E-04	1.51E+00		7.93E-02			1.70E-06
SO3, (MT)	1.49E-08				3.84E-06		2.02E-07			
SO4-2, (MT)										
Sr+2, (MT)										8.80E-09
SrO, (MT)	3.37E-04		3.30E-04	6.74E-06	8.68E-02		4.57E-03			4.26E-08
Tc2O7, (MT)	2.27E-05		2.23E-05	4.55E-07	5.86E-03		3.08E-04			
TcO4-, (MT)										
TiO2, (MT)	2.73E-09				7.01E-07		3.69E-08			
Tot Org Carbon, (MT)										2.77E-08

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369
U3O8, (MT)	8.97E-08				2.30E-05		1.21E-06			
UO2+2, (MT)										3.98E-07
UO3, (MT)	2.15E-05		2.11E-05	4.31E-07	5.55E-03		2.92E-04			
V+5, (MT)										
V2O5, (MT)	2.70E-06		2.65E-06	5.40E-08	6.95E-04		3.66E-05			1.74E-07
WO2, (MT)					4.18E-07		2.20E-08			
WO3, (MT)	5.70E-06		5.59E-06	1.14E-07	1.47E-03		7.73E-05			3.67E-07
Zn+2, (MT)										
ZnO, (MT)	3.36E-06		3.29E-06	6.71E-08	8.64E-04		4.55E-05			1.71E-07
Zr+4, (MT)										6.62E-08
ZrO2, (MT)	6.65E-05		6.52E-05	1.33E-06	1.71E-02		9.01E-04			3.76E-06
ZrO2:2H2O, (MT)										9.76E-08

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1370	1371	1372	1373	1374	1375	1376	1511	1512	1512AR
Volume, Total Liters	2.03E+01	1.50E+07	2.03E+01	2.54E+02	4.08E+05	2.54E+02	2.74E+02	1.54E+09	1.07E+10	9.56E+09
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.33E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.03E-02	1.50E+04	2.03E-02	2.54E-01	4.08E+02	2.54E-01	2.74E-01	2.04E+06	1.07E+07	9.56E+06
Cs and Ba, (MCi)					3.74E-05			3.14E-01		
Sr and Y, (MCi)					6.92E-05			1.39E-02		
Tc, (MCi)					1.59E-08			1.55E-04		
TRU, (MCi)					1.03E-07			1.21E-03		
Total MCi					1.07E-04			3.29E-01		
Ag+, (MT)								1.70E+00		
Al(OH)4-, (MT)								4.83E+03		
Al+3, (MT)					1.07E-08			6.75E+03		
Am+3, (MT)					1.51E-08			3.13E-05		
As+5, (MT)								1.27E+00		
B+3, (MT)								1.51E+00		
Ba+2, (MT)					1.54E-06			7.93E-01		
Be+2, (MT)								8.95E-02		
Bi+3, (MT)					1.01E-07			2.63E+02		
Carbon14, (MT)								1.20E-03		
C2H4O3, (MT)										
C2O4-2, (MT)								2.38E+04		
Ca+2, (MT)					2.51E-09			1.50E+02		
Cancrinite, (MT)					4.17E-08			2.63E+03		
Cd+2, (MT)								1.00E+01		
Ce+3, (MT)					1.35E-07			2.37E+02		
Cl-, (MT)								1.49E+03		
Cl2, (MT)		1.80E-03								
CO, (MT)										
CO2, (MT)		2.60E+00								
CO3-2, (MT)								1.08E+04		
Cr(OH)4-, (MT)								1.19E+02		
Cr+3, (MT)					1.35E-09			6.02E+02		
Cs+, (MT)					4.55E-07			3.82E-03		
Cu+2, (MT)								9.23E-01		
DTPA-3, (MT)								5.65E+02		
F-, (MT)					3.14E-05			2.93E+04		
F2, (MT)		6.27E+01								
Fe+3, (MT)					4.67E-08			7.75E+02		
FeCN6-3, (MT)								1.52E+03		
FESA, (MT)								7.92E+03		
H+, (MT)		9.65E-05			8.40E-05					
H2, (MT)					8.51E-10					
H2O, (MT)	2.03E-02	3.98E+03	2.03E-02	2.54E-01	4.08E+02	2.54E-01	2.74E-01	1.29E+06	1.07E+07	
H2O2, (MT)		2.48E-02						7.58E+02		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1370	1371	1372	1373	1374	1375	1376	1511	1512	1512AIR
HCOO-, (MT)										
Hg, (MT)		4.34E-09			2.25E-08					
Hg+2, (MT)								9.58E-01		
Hg2, (MT)								7.16E+00		
I-, (MT)								5.66E+02		
I2, (MT)		1.03E-02								
K+, (MT)								9.69E+01		
La+3, (MT)					1.20E-08			2.12E+01		
Li+, (MT)								1.39E-01		
Mg+2, (MT)								1.20E+01		
Mn+4, (MT)					2.24E-09			1.34E+02		
MnO2, (MT)								1.01E+02		
Mo+6, (MT)								5.76E+00		
MoO4-2, (MT)								9.30E+00		
N2, (MT)		5.54E+02								7.33E+06
N2O, (MT)										
Na+, (MT)					3.71E-07			3.33E+05		
NH2OH, (MT)										
NH3, (MT)		1.11E+01			1.64E-09			6.75E+01		
NH4+, (MT)								7.72E-02		
Ni+3, (MT)								1.88E+02		
NO, (MT)		3.66E+03								
NO2, (MT)		7.27E+00								
NO2-, (MT)								1.07E+04		
NO3-, (MT)		5.94E-03			3.80E-01			1.39E+05		
Np+4, (MT)					7.29E-08			5.81E-03		
O2, (MT)		6.74E+03								2.23E+06
OH-, (MT)					1.36E-07			1.38E+05		
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)								5.24E+00		
PO4-3, (MT)					3.97E-09			4.97E+03		
POLY, (MT)										
PTA-3, (MT)								2.52E+00		
Pu+4, (MT)					2.25E-07			4.83E-03		
Si+4, (MT)					1.33E-09			8.46E+01		
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)								2.99E+04		
Sr+2, (MT)					1.84E-05			3.69E-03		
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1370	1371	1372	1373	1374	1375	1376	1511	1512	1512AIR
TcO4-, (MT)					1.54E-06			1.50E-02		
Ti+4, (MT)								1.92E-02		
Tot Org Carbon, (MT)					1.55E-08			1.30E+02		
UO2+2, (MT)					9.09E-07			1.04E+00		
V+5, (MT)								2.50E-01		
W+6, (MT)								7.47E-01		
Zn+2, (MT)					3.62E-08			2.58E+01		
Zr+4, (MT)					2.64E-07			5.11E+02		
ZrO2:2H2O, (MT)								2.15E+01		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1330	1371	1372	1373	1374	1375	1376	1511	1512	1512AIR
Total Mass Flow, (MT)		1.03E-07	2.05E-04		1.28E-06	2.56E-03	2.77E-03	2.49E+02		
Cs and Ba, (MCi)		5.81E-09	1.16E-05				1.16E-05	1.91E-05		
Sr and Y, (MCi)		1.07E-08	2.14E-05		8.41E-11	1.68E-07	2.15E-05	3.62E-04		
Tc, (MCi)		2.46E-12	4.93E-09				4.93E-09	1.29E-07		
TRU, (MCi)		1.60E-11	3.20E-08				3.20E-08	1.43E-06		
Total MCi		1.65E-08	3.30E-05		8.41E-11	1.68E-07	3.32E-05	3.82E-04		
Ag+, (MT)								3.48E-06		
Ag2O, (MT)		1.11E-10	2.22E-07		3.57E-10	7.13E-07	9.35E-07	9.78E-02		
Al+3, (MT)					7.20E-10	1.44E-06	1.44E-06	4.01E-03		
Al2O3, (MT)		1.51E-08	3.02E-05		3.96E-08	7.92E-05	1.09E-04	2.34E+02		
Am+3, (MT)								7.59E-08		
Am2O3, (MT)		2.58E-12	5.16E-09				5.16E-09			
APM-, (MT)										
As+5, (MT)								1.25E-06		
As2O5, (MT)		1.18E-10	2.35E-07		3.79E-10	7.58E-07	9.93E-07	1.04E-01		
B+3, (MT)					1.19E-13	2.38E-10	2.38E-10	2.51E-06		
B2O3, (MT)		9.49E-09	1.90E-05		7.29E-11	1.46E-07	1.91E-05	3.61E-03		
Ba+2, (MT)								7.81E-06		
BaO, (MT)		2.69E-10	5.38E-07		4.05E-12	8.10E-09	5.46E-07	6.56E-04		
Be+2, (MT)								1.91E-08		
BeO, (MT)		1.50E-11	3.01E-08		4.84E-11	9.68E-08	1.27E-07	1.33E-02		
Bi+3, (MT)					2.34E-11	4.68E-08	4.68E-08	4.95E-04		
Bi2O3, (MT)		2.68E-10	5.36E-07		7.81E-10	1.56E-06	2.10E-06	2.18E-01		
Carbon14, (MT)										
Ca+2, (MT)					1.79E-11	3.58E-08	3.58E-08	3.91E-04		
Cancrinite, (MT)					2.57E-08	5.14E-05	5.14E-05	2.02E+00		
CaO, (MT)		1.82E-10	3.63E-07		5.58E-10	1.12E-06	1.48E-06	1.55E-01		
Cd+2, (MT)								2.01E-05		
CdO, (MT)		9.81E-12	1.96E-08		3.05E-11	6.09E-08	8.05E-08	8.48E-03		
Ce+3, (MT)					2.84E-11	5.68E-08	5.68E-08	6.03E-04		
Ce2O3, (MT)		2.65E-10	5.29E-07		7.40E-10	1.48E-06	2.01E-06	2.06E-01		
Cl-, (MT)					4.17E-13	8.34E-10	8.34E-10	8.82E-06		
CO3-2, (MT)					2.68E-11	5.36E-08	5.36E-08	5.68E-04		
Cr+3, (MT)					8.23E-11	1.64E-07	1.64E-07	4.55E-04		
Cr2O3, (MT)		1.07E-10	2.14E-07		2.24E-10	4.48E-07	6.62E-07	6.23E-02		
Cs+, (MT)								2.32E-07		
Cs2O, (MT)		7.50E-11	1.50E-07				1.50E-07			
Cu+2, (MT)								1.89E-06		
CuO, (MT)		6.99E-11	1.40E-07		2.25E-10	4.50E-07	5.90E-07	6.17E-02		
F-, (MT)					7.13E-12	1.43E-08	1.43E-08	1.51E-04		
Fe+3, (MT)					4.84E-10	9.67E-07	9.67E-07	2.69E-03		
Fe2O3, (MT)		3.30E-09	6.60E-06		9.75E-09	1.95E-05	2.61E-05	2.71E+00		
H2O, (MT)		8.52E-11	1.70E-07		2.75E-10	5.49E-07	7.19E-07	1.00E-03		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1370	1371	1372	1373	1374	1375	1376	1511	1512	1512AIR
Hg+2, (MT)										
I-, (MT)					2.41E-12	4.83E-09	4.83E-09	5.11E-05		
K+, (MT)					2.51E-12	5.02E-09	5.02E-09	5.31E-05		
K2O, (MT)		1.82E-12	3.65E-09		2.64E-12	5.27E-09	8.92E-09	7.34E-04		
La+3, (MT)					2.54E-12	5.07E-09	5.07E-09	5.39E-05		
La2O3, (MT)		2.37E-11	4.73E-08		6.62E-11	1.32E-07	1.80E-07	1.84E-02		
Li+, (MT)								6.16E-08		
Li2O, (MT)		1.03E-09	2.05E-06		6.48E-12	1.30E-08	2.06E-06	1.88E-06		
Mg+2, (MT)					1.32E-12	2.63E-09	2.63E-09	2.78E-05		
MgO, (MT)		1.71E-11	3.42E-08		5.28E-11	1.06E-07	1.40E-07	1.47E-02		
MnO2, (MT)		8.41E-12	1.68E-08		2.53E-11	5.06E-08	6.74E-08	1.55E-01		
Mo+6, (MT)								2.01E-06		
MoO3, (MT)		7.19E-12	1.44E-08		2.30E-11	4.60E-08	6.03E-08	6.40E-03		
Na+, (MT)					1.06E-09	2.11E-06	2.11E-06	2.32E-02		
Na2O, (MT)		5.13E-09	1.03E-05		2.94E-09	5.87E-06	1.61E-05	8.13E-01		
Ni(OH)3, (MT)								2.49E-07		
Ni+3, (MT)					1.27E-12	2.54E-09	2.54E-09	2.98E-05		
Ni2FECN6, (MT)					6.61E-10	1.32E-06	1.32E-06	2.37E-03		
Ni2O3, (MT)		2.20E-10	4.39E-07		7.05E-10	1.41E-06	1.85E-06	1.96E-01		
NiO, (MT)		9.32E-11	1.86E-07				1.86E-07			
NO2-, (MT)					8.82E-12	1.76E-08	1.76E-08	1.87E-04		
NO3-, (MT)								2.04E-05		
Np+4, (MT)								5.01E-07		
NpO2, (MT)		1.29E-11	2.58E-08				2.58E-08	4.89E-06		
OH-, (MT)					1.18E-06	2.36E-03	2.36E-03	4.21E+00		
P2O5, (MT)		3.08E-09	6.15E-06		9.89E-09	1.98E-05	2.59E-05	2.75E+00		
P2O5:24W, (MT)								1.31E-06		
Pb+4, (MT)								8.29E-06		
PbO2, (MT)		3.66E-10	7.32E-07		1.18E-09	2.36E-06	3.09E-06	3.23E-01		
PO4-3, (MT)					2.82E-11	5.65E-08	5.65E-08	6.39E-04		
POLY, (MT)					1.33E-11	2.67E-08	2.67E-08	8.51E-06		
Pu+4, (MT)								1.56E-06		
PuO2, (MT)		3.97E-11	7.94E-08				7.94E-08	4.06E-06		
Si+4, (MT)					9.44E-12	1.89E-08	1.89E-08	2.00E-04		
SiO2, (MT)		5.85E-08	1.17E-04		8.50E-10	1.70E-06	1.19E-04	1.34E-01		
SO3, (MT)										
SO4-2, (MT)								1.06E-05		
Sr+2, (MT)					4.40E-12	8.79E-09	8.79E-09	9.34E-05		
SrO, (MT)		3.37E-09	6.74E-06		2.13E-11	4.25E-08	6.78E-06	3.31E-06		
Tc2O7, (MT)		2.27E-10	4.55E-07				4.55E-07	1.06E-05		
TcO4-, (MT)								1.42E-06		
TiO2, (MT)								2.37E-05		
Tot Org Carbon, (MT)					1.38E-11	2.76E-08	2.76E-08	2.93E-04		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1370	1371	1372	1373	1374	1375	1376	1511	1512	1512AIR
U3O8, (MT)								8.05E-04		
UO2+2, (MT)					1.99E-10	3.98E-07	3.98E-07	4.27E-03		
UO3, (MT)		2.15E-10	4.30E-07				4.30E-07			
V+5, (MT)								4.71E-07		
V2O5, (MT)		2.70E-11	5.40E-08		8.69E-11	1.74E-07	2.28E-07	2.38E-02		
WO2, (MT)										
WO3, (MT)		5.70E-11	1.14E-07		1.84E-10	3.67E-07	4.81E-07	5.04E-02		
Zn+2, (MT)								2.39E-06		
ZnO, (MT)		3.36E-11	6.71E-08		8.54E-11	1.71E-07	2.38E-07	2.38E-02		
Zr+4, (MT)					3.31E-11	6.61E-08	6.61E-08	7.00E-04		
ZrO2, (MT)		6.65E-10	1.33E-06		1.88E-09	3.76E-06	5.09E-06	5.23E-01		
ZrO2:2H2O, (MT)					4.88E-11	9.76E-08	9.76E-08	1.03E-03		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1512H2O	1512NH3	1513	1514	1515	1516	1517	1518	1519	1520
Volume, Total Liters	1.07E+10	1.44E-01	4.00E+09	2.20E+09	2.00E+10	1.83E+10	2.90E+07	1.82E+10		7.91E+09
Specific Gravity	1.00E+00	1.00E+00	1.24E+00	1.24E+00	1.00E+00	1.00E+00	1.89E+00	1.00E+00		1.00E+00
Total Mass Flow, (MT)	1.07E+07	1.44E-04	4.97E+06	2.74E+06	2.00E+07	1.83E+07	5.46E+04	1.82E+07		7.91E+06
Cs and Ba, (MCi)			6.90E-01	3.80E-01						
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi			6.90E-01	3.80E-01						
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)			1.05E+04	5.77E+03						
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)			3.31E+03	1.82E+03						
Cl2, (MT)										
CO, (MT)										
CO2, (MT)					3.65E+04	3.65E+04		3.65E+04		
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)			1.33E+03	7.29E+02						
Cs+, (MT)			8.41E-03	4.62E-03						
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)					2.93E+04	2.93E+04		2.93E+04		
Fe+3, (MT)										
FeCN6-3, (MT)			3.37E+03	1.85E+03						
FESA, (MT)										
H+, (MT)										
H2, (MT)										
H2O, (MT)	1.07E+07		3.61E+06	1.99E+06	1.03E+07	8.56E+06	2.36E+04	8.53E+06		7.91E+06
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1512H2O	1512NH3	1513	1514	1515	1516	1517	1518	1519	1520
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)			2.01E+01	1.11E+01	4.03E-02	4.03E-02	3.99E-02	4.03E-04		3.82E-04
I-, (MT)										
I2, (MT)					5.66E+02	5.66E+02		5.66E+02		
K+, (MT)			2.13E+02	1.17E+02						
La+3, (MT)										
Li+, (MT)			3.05E-01	1.68E-01						
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)			2.25E+02	1.24E+02						
Mo+6, (MT)										
MoO4-2, (MT)			2.07E+01	1.14E+01						
N2, (MT)					7.35E+06	7.35E+06		7.35E+06		
N2O, (MT)										
Na+, (MT)			7.39E+05	4.06E+05						
NH2OH, (MT)										
NH3, (MT)		1.44E-04	4.31E+00	2.37E+00	1.44E+00	1.44E+00	1.42E+00	1.44E-02		1.37E-02
NH4+, (MT)			1.72E-01	9.44E-02						
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)					3.09E+04	3.09E+04		1.55E+04		
NO2-, (MT)			9.85E+02	5.42E+02	9.85E+02	9.85E+02	9.75E+02	9.85E+00		9.36E+00
NO3-, (MT)			8.82E+03	4.85E+03	8.82E+03	8.82E+03	2.94E+04	2.96E+02		2.82E+02
Np+4, (MT)										
O2, (MT)					2.26E+06	2.26E+06		2.26E+06		
OH-, (MT)			5.19E+05	2.86E+05						
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)			5.61E+00	3.09E+00						
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)					9.63E+02	9.63E+02		4.81E+02		
SO3, (MT)										
SO4-2, (MT)			7.70E+04	4.23E+04			7.14E+02	7.22E+00		6.86E+00
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1512H2O	1512HB3	1513	1514	1515	1516	1517	1518	1519	1520
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)			2.89E+00	1.59E+00						
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1S12H2O	1S12NH3	1S13	1S14	1S15	1S16	1S17	1S18	1S19	1S20
Total Mass Flow, (MT)			4.49E+04	2.47E+04	8.99E+01	4.50E+01	4.45E+01	4.50E-01		4.50E-01
Cs and Ba, (MCi)			6.93E-03	3.81E-03	1.39E-05	6.94E-06	6.87E-06	6.94E-08		
Sr and Y, (MCi)			3.13E-02	1.72E-02	6.28E-05	3.14E-05	3.11E-05	3.14E-07		3.14E-07
Tc, (MCi)			3.42E-04	1.88E-04	6.85E-07	3.42E-07	3.39E-07	3.42E-09		3.42E-09
TRU, (MCi)			2.68E-03	1.47E-03	5.36E-06	2.68E-06	2.42E-06	2.44E-08		2.44E-08
Total MCi			4.13E-02	2.27E-02	8.27E-05	4.14E-05	4.07E-05	4.11E-07		3.42E-07
Ag+, (MT)										
Ag2O, (MT)			4.28E+00	2.36E+00						
Al+3, (MT)										
Al2O3, (MT)			1.47E+04	8.09E+03	2.95E+01	1.47E+01	1.46E+01	1.47E-01		1.47E-01
Am+3, (MT)										
Am2O3, (MT)			7.64E-05	4.20E-05	1.53E-07	7.65E-08				
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)			4.55E+00	2.50E+00						
B+3, (MT)										
B2O3, (MT)			1.08E+01	5.93E+00	2.16E-02	1.08E-02	1.07E-02	1.08E-04		1.08E-04
Ba+2, (MT)										
BaO, (MT)			1.96E+00	1.08E+00	3.93E-03	1.97E-03	1.95E-03	1.97E-05		1.97E-05
Be+2, (MT)										
BeO, (MT)			5.82E-01	3.20E-01						
Bi+3, (MT)										
Bi2O3, (MT)			6.50E+02	3.57E+02	1.30E+00	6.51E-01	6.45E-01	6.51E-03		6.51E-03
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)			5.81E+03	3.20E+03	1.17E+01	5.83E+00	5.77E+00	5.83E-02		5.83E-02
CaO, (MT)			4.64E+02	2.55E+02	9.30E-01	4.65E-01	4.61E-01	4.65E-03		4.65E-03
Cd+2, (MT)										
CdO, (MT)			2.53E+01	1.39E+01	5.07E-02	2.54E-02	2.51E-02	2.54E-04		2.54E-04
Ce+3, (MT)										
Ce2O3, (MT)			6.15E+02	3.38E+02	1.23E+00	6.17E-01	6.10E-01	6.17E-03		6.17E-03
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)			1.86E+02	1.02E+02	3.73E-01	1.86E-01	1.85E-01	1.86E-03		1.86E-03
Cs+, (MT)										
Cs2O, (MT)			8.95E-05	4.92E-05	1.79E-07	8.97E-08	8.88E-08	8.97E-10		
Cu+2, (MT)										
CuO, (MT)			2.70E+00	1.49E+00						
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)			8.10E+03	4.46E+03	1.62E+01	8.12E+00	8.04E+00	8.12E-02		8.12E-02
H2O, (MT)					1.00E-03					

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1512H2O	1512NH3	1513	1514	1515	1516	1517	1518	1519	1520
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)			2.58E+00	1.42E+00	5.17E-03	2.59E-03	2.56E-03	2.59E-05		2.59E-05
La+3, (MT)										
La2O3, (MT)			5.50E+01	3.03E+01	1.10E-01	5.51E-02	5.46E-02	5.51E-04		5.51E-04
Li+, (MT)										
Li2O, (MT)			6.60E-03	3.63E-03	1.32E-05	6.61E-06	6.54E-06	6.61E-08		6.61E-08
Mg+2, (MT)										
MgO, (MT)			4.39E+01	2.42E+01	8.80E-02	4.40E-02	4.36E-02	4.40E-04		4.40E-04
MnO2, (MT)			4.68E+02	2.58E+02	9.38E-01	4.69E-01	4.64E-01	4.69E-03		4.69E-03
Mo+6, (MT)										
MoO3, (MT)			1.91E+01	1.05E+01	3.83E-02	1.92E-02	1.90E-02	1.92E-04		1.92E-04
Na+, (MT)										
Na2O, (MT)			2.86E+03	1.57E+03	5.73E+00	2.86E+00	2.83E+00	2.86E-02		2.86E-02
Ni(OH)3, (MT)			5.53E-07	3.04E-07						
Ni+3, (MT)										
Ni2FECN6, (MT)			5.23E-03	2.88E-03	1.05E-05	5.24E-06	5.19E-06	5.24E-08		
Ni2O3, (MT)			5.86E+02	3.22E+02	1.18E+00	5.87E-01	5.82E-01	5.87E-03		5.87E-03
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)			1.46E-02	8.03E-03	2.92E-05	1.46E-05	1.45E-05	1.46E-07		1.46E-07
OH-, (MT)										
P2O5, (MT)			8.22E+03	4.52E+03	1.65E+01	8.24E+00	8.16E+00	8.24E-02		8.24E-02
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)			1.42E+01	7.79E+00						
PO4-3, (MT)										
POLY, (MT)			1.89E-05	1.04E-05						
Pu+4, (MT)										
PuO2, (MT)			1.21E-02	6.67E-03	2.43E-05	1.22E-05	1.20E-05	1.22E-07		1.22E-07
Si+4, (MT)										
SiO2, (MT)			4.01E+02	2.20E+02	8.03E-01	4.02E-01	3.98E-01	4.02E-03		4.02E-03
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)			9.87E-03	5.43E-03	1.98E-05	9.89E-06	9.79E-06	9.89E-08		9.89E-08
Tc2O7, (MT)			3.15E-02	1.74E-02	6.32E-05	3.16E-05	3.13E-05	3.16E-07		3.16E-07
TcO4-, (MT)										
TiO2, (MT)			7.08E-02	3.89E-02	1.42E-04	7.09E-05	7.02E-05	7.09E-07		7.09E-07
Tot Org Carbon, (MT)			6.47E-06	3.56E-06	1.30E-08	6.49E-09	6.42E-09	6.49E-11		

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1512H2O	1512NH3	1513	1514	1515	1516	1517	1518	1519	1520
U3O8, (MT)			2.41E+00	1.32E+00	4.82E-03	2.41E-03	2.39E-03	2.41E-05		2.41E-05
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)			1.04E+00	5.74E-01						
WO2, (MT)			2.45E-06	1.35E-06	4.91E-09					
WO3, (MT)			2.21E+00	1.21E+00						
Zn+2, (MT)										
ZnO, (MT)			7.10E+01	3.90E+01	1.42E-01	7.11E-02	7.04E-02	7.11E-04		7.11E-04
Zr+4, (MT)										
ZrO2, (MT)			1.56E+03	8.60E+02	3.13E+00	1.57E+00	1.55E+00	1.57E-02		1.57E-02
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
Volume, Total Liters	1.03E+10	1.03E+10	1.03E+08	7.63E+06	1.03E+10	1.03E+10	1.80E+09	1.87E+09	6.71E+07	-6.70E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.24E+00	1.23E+00	1.00E+00	-2.18E-01
Total Mass Flow, (MT)	1.03E+07	1.03E+07	1.03E+05	7.63E+03	1.03E+07	1.03E+07	2.24E+06	2.31E+06	6.71E+04	1.46E+03
Cs and Ba, (MCi)							3.11E-01	3.11E-01		6.21E-06
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi							3.11E-01	3.11E-01		6.21E-06
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)							4.72E+03	4.72E+03		1.42E+03
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)							1.49E+03	1.49E+03		2.98E-02
Cl2, (MT)										
CO, (MT)										
CO2, (MT)	3.65E+04	3.65E+04			3.65E+04	3.65E+04				
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)							5.96E+02	5.96E+02		1.19E-02
Cs+, (MT)							3.78E-03	3.78E-03		7.57E-08
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)	2.93E+04	2.93E+04			2.93E+04	2.93E+04				
Fe+3, (MT)										
FeCN6-3, (MT)							1.52E+03	1.52E+03		
FESA, (MT)										
H+, (MT)										
H2, (MT)										
H2O, (MT)	6.21E+05	6.21E+05	1.03E+05		6.33E+05	6.20E+05	1.62E+06	1.69E+06	6.71E+04	3.38E+01
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)	2.01E-05	1.01E-06			1.01E-06	5.03E-08	9.04E+00	9.04E+00		1.81E-04
I-, (MT)										
I2, (MT)	5.66E+02	5.66E+02			5.66E+02	5.66E+02				
K+, (MT)							9.59E+01	9.59E+01		
La+3, (MT)										
Li+, (MT)							1.37E-01	1.37E-01		
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)							1.01E+02	1.01E+02		
Mo+6, (MT)										
MoO4-2, (MT)							9.30E+00	9.30E+00		
N2, (MT)	7.35E+06	7.35E+06			7.37E+06	7.37E+06				
N2O, (MT)										
Na+, (MT)							3.32E+05	3.32E+05		6.65E+00
NH2OH, (MT)										
NH3, (MT)	7.18E-04	3.59E-05		7.63E+03	7.63E+01	3.81E+00	1.94E+00	1.94E+00		
NH4+, (MT)							7.72E-02	7.72E-02		
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)	1.55E+04	1.55E+04			1.55E+02	1.55E+02				
NO2-, (MT)	4.93E-01	2.46E-02			2.46E-02	1.23E-03	4.43E+02	4.43E+02		8.87E-03
NO3-, (MT)	1.48E+01	7.41E-01			7.41E-01	3.71E-02	3.97E+03	3.97E+03		7.94E-02
Np+4, (MT)										
O2, (MT)	2.26E+06	2.26E+06			2.26E+06	2.26E+06				
OH-, (MT)							2.34E+05	2.34E+05		4.67E+00
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)							2.52E+00	2.52E+00		
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)	4.81E+02	4.81E+02			4.81E+02	4.81E+02				
SO3, (MT)										
SO4-2, (MT)	3.61E-01	1.80E-02			1.80E-02	9.02E-04	3.46E+04	3.46E+04		6.93E-01
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)							1.30E+00	1.30E+00		2.60E-05
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
Total Mass Flow, (MT)							2.02E+04	2.02E+04		1.54E+04
Cs and Ba, (MCi)							3.12E-03	3.12E-03		3.09E-03
Sr and Y, (MCi)							1.41E-02	1.41E-02		1.40E-02
Tc, (MCi)							1.54E-04	1.54E-04		1.52E-04
TRU, (MCi)							1.20E-03	1.20E-03		1.19E-03
Total MCi							1.86E-02	1.86E-02		1.84E-02
Ag+, (MT)										
Ag2O, (MT)							1.93E+00	1.93E+00		
Al+3, (MT)										
Al2O3, (MT)							6.62E+03	6.62E+03		1.99E+03
Am+3, (MT)										
Am2O3, (MT)							3.44E-05	3.44E-05		3.40E-05
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)							2.05E+00	2.05E+00		
B+3, (MT)										
B2O3, (MT)							4.85E+00	4.85E+00		4.80E+00
Ba+2, (MT)										
BaO, (MT)							8.82E-01	8.82E-01		8.74E-01
Be+2, (MT)										
BeO, (MT)							2.62E-01	2.62E-01		
Bi+3, (MT)										
Bi2O3, (MT)							2.92E+02	2.92E+02		2.90E+02
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)							2.62E+03	2.62E+03		2.59E+03
CaO, (MT)							2.09E+02	2.09E+02		2.07E+02
Cd+2, (MT)										
CdO, (MT)							1.14E+01	1.14E+01		1.13E+01
Ce+3, (MT)										
Ce2O3, (MT)							2.77E+02	2.77E+02		2.74E+02
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)							8.37E+01	8.37E+01		8.29E+01
Cs+, (MT)										
Cs2O, (MT)							4.03E-05	4.03E-05		3.99E-05
Cu+2, (MT)										
CuO, (MT)							1.22E+00	1.22E+00		
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)							3.65E+03	3.65E+03		3.61E+03
H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)							1.16E+00	1.16E+00		1.15E+00
La+3, (MT)										
La2O3, (MT)							2.48E+01	2.48E+01		2.45E+01
Li+, (MT)										
Li2O, (MT)							2.97E-03	2.97E-03		2.94E-03
Mg+2, (MT)										
MgO, (MT)							1.98E+01	1.98E+01		1.96E+01
MnO2, (MT)							2.11E+02	2.11E+02		2.09E+02
Mo+6, (MT)										
MoO3, (MT)							8.61E+00	8.61E+00		8.52E+00
Na+, (MT)										
Na2O, (MT)							1.29E+03	1.29E+03		1.27E+03
Ni(OH)3, (MT)							2.49E-07	2.49E-07		
Ni+3, (MT)										
Ni2FECN6, (MT)							2.36E-03	2.36E-03		2.33E-03
Ni2O3, (MT)							2.64E+02	2.64E+02		2.61E+02
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)							6.57E-03	6.57E-03		6.50E-03
OH-, (MT)										
P2O5, (MT)							3.70E+03	3.70E+03		3.66E+03
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)							6.37E+00	6.37E+00		
PO4-3, (MT)										
POLY, (MT)							8.51E-06	8.51E-06		
Pu+4, (MT)										
PuO2, (MT)							5.46E-03	5.46E-03		5.40E-03
Si+4, (MT)										
SiO2, (MT)							1.80E+02	1.80E+02		1.79E+02
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)							4.44E-03	4.44E-03		4.40E-03
Tc2O7, (MT)							1.42E-02	1.42E-02		1.41E-02
TcO4-, (MT)										
TiO2, (MT)							3.19E-02	3.19E-02		3.15E-02
Tot Org Carbon, (MT)							2.91E-06	2.91E-06		2.88E-06

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1521	1522	1523	1524	1525	1526	1528	1529	1530	1531
U3O8, (MT)							1.08E+00	1.08E+00		1.07E+00
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)							4.70E-01	4.70E-01		
WO2, (MT)							1.10E-06	1.10E-06		1.09E-06
WO3, (MT)							9.93E-01	9.93E-01		
Zn+2, (MT)										
ZnO, (MT)							3.19E+01	3.19E+01		3.16E+01
Zr+4, (MT)										
ZrO2, (MT)							7.04E+02	7.04E+02		6.97E+02
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
Volume, Total Liters	-6.70E+06	1.71E+09	1.87E+09	3.59E+09	4.01E+09	1.45E+09	1.03E+08	4.01E+09	1.25E+07	7.92E+09
Specific Gravity	-2.18E-01	1.00E+00	1.23E+00	1.12E+00	1.00E+00	1.23E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.46E+03	1.71E+06	2.30E+06	4.02E+06	4.01E+06	1.79E+06	1.03E+05	4.01E+06	1.25E+04	7.93E+06
Cs and Ba, (MCi)	6.21E-06	6.88E-06	3.11E-01	3.11E-01		2.29E-01				
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi	6.21E-06	6.88E-06	3.11E-01	3.11E-01		2.29E-01				
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)	1.42E+03		3.31E+03	3.31E+03		2.44E+03				
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)	2.98E-02		1.49E+03	1.49E+03		1.10E+03				
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)	1.19E-02		5.96E+02	5.96E+02		4.40E+02				
Cs+, (MT)	7.57E-08	8.39E-08	3.78E-03	3.78E-03		2.80E-03				
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)			1.52E+03	1.52E+03		1.12E+03				
FESA, (MT)										
H+, (MT)										
H2, (MT)										
H2O, (MT)	3.38E+01	1.71E+06	1.69E+06	3.41E+06	4.01E+06	1.31E+06	1.03E+05	4.01E+06	1.24E+04	7.92E+06
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)	1.81E-04	8.05E-07	9.04E+00	9.04E+00	2.01E-04	6.71E+00	1.91E-05	2.01E-04	9.56E-07	3.83E-04
I-, (MT)										
I2, (MT)										
K+, (MT)		2.13E-03	9.59E+01	9.59E+01		7.08E+01				
La+3, (MT)										
Li+, (MT)		3.04E-06	1.37E-01	1.37E-01		1.01E-01				
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)			1.01E+02	1.01E+02		7.47E+01				
Mo+6, (MT)										
MoO4-2, (MT)			9.30E+00	9.30E+00		6.87E+00				
N2, (MT)										
N2O, (MT)										
Na+, (MT)	6.65E+00	2.10E+00	3.32E+05	3.32E+05		2.46E+05				
NH2OH, (MT)										
NH3, (MT)			1.94E+00	1.94E+00	3.62E+01	2.93E+01	6.82E-04	3.62E+01	7.25E+01	7.25E+01
NH4+, (MT)			7.72E-02	7.72E-02		5.71E-02				
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)	8.87E-03	1.97E-02	4.43E+02	4.43E+02	4.93E+00	1.05E+03	4.68E-01	4.93E+00	2.34E-02	9.38E+00
NO3-, (MT)	7.94E-02	1.76E-01	3.97E+03	3.97E+03	1.48E+02	2.47E+04	1.41E+01	1.48E+02	7.04E-01	2.82E+02
Np+4, (MT)										
O2, (MT)										
OH-, (MT)	4.67E+00	1.56E+00	2.34E+05	2.34E+05		1.73E+05				
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)			2.52E+00	2.52E+00		1.87E+00				
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)										
SO3, (MT)										
SO4-2, (MT)	6.93E-01		3.46E+04	3.46E+04	3.61E+00	2.61E+04	3.43E-01	3.61E+00	1.71E-02	6.87E+00
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)	2.60E-05		1.30E+00	1.30E+00		9.59E-01				
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
Total Mass Flow, (MT)	1.54E+04	4.21E+01	4.78E+03	4.83E+03	2.25E-01	3.60E+03		2.25E-01		4.50E-01
Cs and Ba, (MCi)	3.09E-03		3.12E-05	3.12E-05		2.81E-05				
Sr and Y, (MCi)	1.40E-02	3.14E-05	1.41E-04	1.72E-04	1.57E-07	1.50E-04		1.57E-07		3.14E-07
Tc, (MCi)	1.52E-04	3.42E-07	1.54E-06	1.88E-06	1.71E-09	1.64E-06		1.71E-09		3.42E-09
TRU, (MCi)	1.19E-03	2.44E-06	1.20E-05	1.45E-05	1.22E-08	1.25E-05		1.22E-08		2.44E-08
Total MCi	1.84E-02	3.42E-05	1.86E-04	2.20E-04	1.71E-07	1.93E-04		1.71E-07		3.42E-07
Ag+, (MT)										
Ag2O, (MT)			1.93E+00	1.93E+00		1.42E+00				
Al+3, (MT)										
Al2O3, (MT)	1.99E+03	1.47E+01	4.64E+03	4.65E+03	7.37E-02	3.45E+03		7.37E-02		1.47E-01
Am+3, (MT)										
Am2O3, (MT)	3.40E-05		3.44E-07	3.44E-07		2.54E-07				
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)			2.05E+00	2.05E+00		1.51E+00				
B+3, (MT)										
B2O3, (MT)	4.80E+00	1.08E-02	4.85E-02	5.93E-02	5.40E-05	5.18E-02		5.40E-05		1.08E-04
Ba+2, (MT)										
BaO, (MT)	8.74E-01	1.97E-03	8.82E-03	1.08E-02	9.82E-06	9.42E-03		9.82E-06		1.97E-05
Be+2, (MT)										
BeO, (MT)			2.62E-01	2.62E-01		1.93E-01				
Bi+3, (MT)										
Bi2O3, (MT)	2.90E+02	6.51E-01	2.92E+00	3.58E+00	3.26E-03	3.12E+00		3.26E-03		6.51E-03
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)	2.59E+03	5.83E+00	2.62E+01	3.20E+01	2.91E-02	2.79E+01		2.91E-02		5.83E-02
CaO, (MT)	2.07E+02	4.65E-01	2.09E+00	2.55E+00	2.33E-03	2.23E+00		2.33E-03		4.65E-03
Cd+2, (MT)										
CdO, (MT)	1.13E+01	2.54E-02	1.14E-01	1.39E-01	1.27E-04	1.22E-01		1.27E-04		2.54E-04
Ce+3, (MT)										
Ce2O3, (MT)	2.74E+02	6.17E-01	2.77E+00	3.39E+00	3.08E-03	2.95E+00		3.08E-03		6.17E-03
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)	8.29E+01	1.86E-01	8.37E-01	1.02E+00	9.32E-04	8.93E-01		9.32E-04		1.86E-03
Cs+, (MT)										
Cs2O, (MT)	3.99E-05		4.03E-07	4.03E-07		3.63E-07				
Cu+2, (MT)										
CuO, (MT)			1.22E+00	1.22E+00		8.99E-01				
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)	3.61E+03	8.12E+00	3.65E+01	4.46E+01	4.06E-02	3.89E+01		4.06E-02		8.12E-02
H2O, (MT)		1.00E-03		1.00E-03		7.39E-04				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)	1.15E+00	2.59E-05	1.16E-02	1.16E-02	1.29E-05	1.05E-02		1.29E-05		2.59E-05
La+3, (MT)										
La2O3, (MT)	2.45E+01	5.51E-02	2.48E-01	3.03E-01	2.76E-04	2.64E-01		2.76E-04		5.51E-04
Li+, (MT)										
Li2O, (MT)	2.94E-03	6.61E-08	2.97E-05	2.98E-05	3.31E-08	2.68E-05		3.31E-08		6.61E-08
Mg+2, (MT)										
MgO, (MT)	1.96E+01	4.40E-02	1.98E-01	2.42E-01	2.20E-04	2.11E-01		2.20E-04		4.40E-04
MnO2, (MT)	2.09E+02	4.69E-01	2.11E+00	2.58E+00	2.35E-03	2.25E+00		2.35E-03		4.69E-03
Mo+6, (MT)										
MoO3, (MT)	8.52E+00	1.92E-02	8.61E-02	1.05E-01	9.58E-05	9.18E-02		9.58E-05		1.92E-04
Na+, (MT)										
Na2O, (MT)	1.27E+03	2.86E-02	1.29E+01	1.29E+01	1.43E-02	1.16E+01		1.43E-02		2.86E-02
Ni(OH)3, (MT)			2.49E-07	2.49E-07		1.84E-07				
Ni+3, (MT)										
Ni2FECN6, (MT)	2.33E-03	5.24E-06	2.36E-05	2.88E-05		2.51E-05				
Ni2O3, (MT)	2.61E+02	5.87E-01	2.64E+00	3.23E+00	2.94E-03	2.82E+00		2.94E-03		5.87E-03
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)	6.50E-03	1.46E-05	6.57E-05	8.03E-05	7.31E-08	7.01E-05		7.31E-08		1.46E-07
OH-, (MT)										
P2O5, (MT)	3.66E+03	8.24E+00	3.70E+01	4.53E+01	4.12E-02	3.95E+01		4.12E-02		8.24E-02
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)			6.37E+00	6.37E+00		4.71E+00				
PO4-3, (MT)										
POLY, (MT)			8.51E-06	8.51E-06		6.29E-06				
Pu+4, (MT)										
PuO2, (MT)	5.40E-03	1.22E-05	5.46E-05	6.67E-05	6.07E-08	5.82E-05		6.07E-08		1.22E-07
Si+4, (MT)										
SiO2, (MT)	1.79E+02	4.02E-01	1.80E+00	2.21E+00	2.01E-03	1.92E+00		2.01E-03		4.02E-03
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)	4.40E-03	9.89E-06	4.44E-05	5.43E-05	4.95E-08	4.74E-05		4.95E-08		9.89E-08
Tc2O7, (MT)	1.41E-02	3.16E-05	1.42E-04	1.74E-04	1.58E-07	1.51E-04		1.58E-07		3.16E-07
TcO4-, (MT)										
TiO2, (MT)	3.15E-02	7.09E-05	3.19E-04	3.90E-04	3.55E-07	3.40E-04		3.55E-07		7.09E-07
Tot Org Carbon, (MT)	2.88E-06	6.49E-09	2.91E-08	3.56E-08		3.11E-08				

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1532	1533	1534	1535	1536	1537	1538	1539	1540	1541
U3O8, (MT)	1.07E+00	2.41E-03	1.08E-02	1.32E-02	1.21E-05	1.16E-02		1.21E-05		2.41E-05
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)			4.70E-01	4.70E-01		3.47E-01				
WO2, (MT)	1.09E-06		1.10E-08	1.10E-08						
WO3, (MT)			9.93E-01	9.93E-01		7.33E-01				
Zn+2, (MT)										
ZnO, (MT)	3.16E+01	7.11E-02	3.19E-01	3.90E-01	3.56E-04	3.41E-01		3.56E-04		7.11E-04
Zr+4, (MT)										
ZrO2, (MT)	6.97E+02	1.57E+00	7.04E+00	8.60E+00	7.83E-03	7.51E+00		7.83E-03		1.57E-02
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
Volume, Total Liters	1.03E+10		1.03E+10	7.63E+09	1.96E+09	5.67E+09		5.67E+09	4.14E+08	
Specific Gravity	1.00E+00		1.00E+00	1.06E+00	1.23E+00	1.00E+00		1.00E+00	1.23E+00	
Total Mass Flow, (MT)	1.03E+07		1.03E+07	8.09E+06	2.42E+06	5.67E+06		5.67E+06	5.10E+05	
Cs and Ba, (MCi)				3.11E-01	3.11E-01				6.56E-02	
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi				3.11E-01	3.11E-01				6.56E-02	
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)				3.31E+03	3.31E+03				6.98E+02	
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2H4O3, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)				1.49E+03	1.49E+03				3.15E+02	
Cℓ, (MT)										
CO, (MT)										
CO2, (MT)	3.65E+04		3.65E+04							
CO3-2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)				5.96E+02	5.96E+02				1.26E+02	
Cs+, (MT)				3.78E-03	3.78E-03				7.99E-04	
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
F2, (MT)	2.93E+04		2.93E+04							
Fe+3, (MT)										
FeCN6-3, (MT)				1.52E+03	1.52E+03				3.20E+02	
FESA, (MT)										
H+, (MT)										
H2, (MT)										
H2O, (MT)	6.20E+05		6.20E+05	7.44E+06	1.77E+06	5.67E+06		5.67E+06	3.75E+05	
H2O2, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
HCOO-, (MT)										
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)	5.03E-08		5.03E-08	9.08E+00	9.08E+00				1.92E+00	
I-, (MT)										
I2, (MT)	5.66E+02		5.66E+02							
K+, (MT)				9.59E+01	9.59E+01				2.03E+01	
La+3, (MT)										
Li+, (MT)				1.37E-01	1.37E-01				2.90E-02	
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)				1.01E+02	1.01E+02				2.14E+01	
Mo+6, (MT)										
MoO4-2, (MT)				9.30E+00	9.30E+00				1.96E+00	
N2, (MT)	7.37E+06		7.37E+06							
N2O, (MT)										
Na+, (MT)				3.32E+05	3.32E+05				7.02E+04	
NH2OH, (MT)										
NH3, (MT)	3.81E+00		3.81E+00	3.96E+01	3.96E+01				8.36E+00	
NH4+, (MT)				7.72E-02	7.72E-02				1.63E-02	
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)	1.55E+02		1.55E+02							
NO2-, (MT)	1.23E-03		1.23E-03	1.42E+03	1.42E+03				3.01E+02	
NO3-, (MT)	3.71E-02		3.71E-02	3.35E+04	3.35E+04				7.07E+03	
Np+4, (MT)										
O2, (MT)	2.26E+06		2.26E+06							
OH-, (MT)				2.34E+05	2.34E+05				4.93E+04	
ORGS, (MT)										
ORGT, (MT)										
ORGU, (MT)										
P2O5, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)				2.52E+00	2.52E+00				5.33E-01	
Pu+4, (MT)										
Si+4, (MT)										
SO2, (MT)	4.81E+02		4.81E+02							
SO3, (MT)										
SO4-2, (MT)	9.02E-04		9.02E-04	3.54E+04	3.54E+04				7.47E+03	
Sr+2, (MT)										
Sugar, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)				1.30E+00	1.30E+00				2.74E-01	
UO2+2, (MT)										
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										
ZrO2:2H2O, (MT)										

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
Total Mass Flow, (MT)				4.87E+03	4.87E+03				1.03E+03	
Cs and Ba, (MCi)				3.81E-05	3.81E-05				8.03E-06	
Sr and Y, (MCi)				2.04E-04	2.04E-04				4.30E-05	
Tc, (MCi)				2.22E-06	2.22E-06				4.69E-07	
TRU, (MCi)				1.69E-05	1.69E-05				3.57E-06	
Total MCi				2.61E-04	2.61E-04				5.51E-05	
Ag+, (MT)										
Ag2O, (MT)				1.93E+00	1.93E+00				4.07E-01	
Al+3, (MT)										
Al2O3, (MT)				4.66E+03	4.66E+03				9.85E+02	
Am+3, (MT)										
Am2O3, (MT)				3.44E-07	3.44E-07				7.26E-08	
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)				2.05E+00	2.05E+00				4.33E-01	
B+3, (MT)										
B2O3, (MT)				7.01E-02	7.01E-02				1.48E-02	
Ba+2, (MT)										
BaO, (MT)				1.27E-02	1.27E-02				2.69E-03	
Be+2, (MT)										
BeO, (MT)				2.62E-01	2.62E-01				5.53E-02	
Bi+3, (MT)										
Bi2O3, (MT)				4.22E+00	4.22E+00				8.92E-01	
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)				3.78E+01	3.78E+01				7.98E+00	
CaO, (MT)				3.02E+00	3.02E+00				6.37E-01	
Cd+2, (MT)										
CdO, (MT)				1.65E-01	1.65E-01				3.47E-02	
Ce+3, (MT)										
Ce2O3, (MT)				4.00E+00	4.00E+00				8.44E-01	
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)				1.21E+00	1.21E+00				2.55E-01	
Cs+, (MT)										
Cs2O, (MT)				4.91E-07	4.91E-07				1.04E-07	
Cu+2, (MT)										
CuO, (MT)				1.22E+00	1.22E+00				2.57E-01	
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)				5.27E+01	5.27E+01				1.11E+01	
H2O, (MT)				1.00E-03	1.00E-03				2.11E-04	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)				1.42E-02	1.42E-02				3.00E-03	
La+3, (MT)										
La2O3, (MT)				3.58E-01	3.58E-01				7.55E-02	
Li+, (MT)										
Li2O, (MT)				3.63E-05	3.63E-05				7.67E-06	
Mg+2, (MT)										
MgO, (MT)				2.85E-01	2.85E-01				6.03E-02	
MnO2, (MT)				3.04E+00	3.04E+00				6.42E-01	
Mo+6, (MT)										
MoO3, (MT)				1.24E-01	1.24E-01				2.62E-02	
Na+, (MT)										
Na2O, (MT)				1.57E+01	1.57E+01				3.32E+00	
Ni(OH)3, (MT)				2.49E-07	2.49E-07				5.25E-08	
Ni+3, (MT)										
Ni2FECN6, (MT)				3.40E-05	3.40E-05				7.17E-06	
Ni2O3, (MT)				3.81E+00	3.81E+00				8.04E-01	
NiO, (MT)										
NO2-, (MT)										
NO3-, (MT)										
Np+4, (MT)										
NpO2, (MT)				9.48E-05	9.48E-05				2.00E-05	
OH-, (MT)										
P2O5, (MT)				5.34E+01	5.34E+01				1.13E+01	
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)				6.37E+00	6.37E+00				1.35E+00	
PO4-3, (MT)										
POLY, (MT)				8.51E-06	8.51E-06				1.80E-06	
Pu+4, (MT)										
PuO2, (MT)				7.88E-05	7.88E-05				1.66E-05	
Si+4, (MT)										
SiO2, (MT)				2.61E+00	2.61E+00				5.50E-01	
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)				6.42E-05	6.42E-05				1.36E-05	
Tc2O7, (MT)				2.05E-04	2.05E-04				4.33E-05	
TcO4-, (MT)										
TiO2, (MT)				4.60E-04	4.60E-04				9.71E-05	
Tot Org Carbon, (MT)				4.20E-08	4.20E-08				8.87E-09	

Table A-1. Material Balance for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1543	1544	1545	1551	1552	1553	1554	1555	1556	
U3O8, (MT)				1.56E-02	1.56E-02				3.30E-03	
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)				4.70E-01	4.70E-01				9.92E-02	
WO2, (MT)				1.10E-06						
WO3, (MT)				9.93E-01	9.93E-01				2.10E-01	
Zn+2, (MT)										
ZnO, (MT)				4.61E-01	4.61E-01				9.74E-02	
Zr+4, (MT)										
ZrO2, (MT)				1.02E+01	1.02E+01				2.15E+00	
ZrO2:2H2O, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet. (63 sheets)

(14-Aug-95, Clean Flowsheet, LLW Vitrification, Integrated Pretreatment-HLW Vitrification Feed, Table A-1A, XXX10B, Revision 2 10:59:13.)

Sheet 1 of the process flow diagram for the standalone LLW vitrification flowsheet (Figure C-2) shows stream 233 as its feed. The actual LLW streams which make up stream 233 are streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1).

This page intentionally left blank.

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	12	19	26	35	36	37	38	40	41	42
Volume, Total Liters	8.96E+05	8.96E+05	8.96E+05							8.96E+05
Specific Gravity	1.00E+00	1.00E+00	1.00E+00							1.00E+00
Total Mass Flow, (MT)	8.96E+02	8.96E+02	8.96E+02							8.96E+02
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)	8.96E+02	8.96E+02	8.96E+02							8.96E+02
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)	6.32E-16	6.32E-16	6.32E-16							6.32E-16
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)										
OH-, (MT)	4.67E-16	4.67E-16	4.67E-16							4.67E-16
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	12	19	28	35	36	37	38	40	41	42
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	12	19	26	35	36	37	38	40	41	42
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	49	56	105	115	117	118	203	226	239	306
Volume, Total Liters	8.96E+05	8.96E+05					8.96E+05		4.17E+06	
Specific Gravity	1.00E+00	1.00E+00					1.00E+00		1.23E+00	
Total Mass Flow, (MT)	8.96E+02	8.96E+02					8.96E+02		5.12E+05	
Cs and Ba, (MCi)									6.56E-02	
Total MCi									6.56E-02	
Al(OH)4-, (MT)									7.45E+03	
Al+3, (MT)										
Cl-, (MT)									3.15E+02	
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)									2.91E+02	
Cr+3, (MT)										
Cs+, (MT)									7.99E-04	
DCPD, (MT)										
FeCN6-3, (MT)									3.20E+02	
H+, (MT)										
H2O, (MT)	8.96E+02	8.96E+02					8.96E+02		3.75E+05	
Hg, (MT)									1.92E+00	
Hg2, (MT)										
K+, (MT)									2.03E+01	
Kerosene, MT)										
Li+, (MT)									2.90E-02	
MnO2, (MT)									2.14E+01	
Mo+6, (MT)									1.18E+00	
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)	6.32E-16	6.32E-16							7.02E+04	
NH3, (MT)									8.38E+00	
NH4+, (MT)										
Ni+3, (MT)									2.81E-08	
NO, (MT)										
NO2, (MT)										
NO2-, (MT)									3.01E+02	
NO3-, (MT)									7.07E+03	
O2, (MT)										
OH-, (MT)	4.67E-16	4.67E-16							4.38E+04	
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)									7.47E+03	
Tot Org Carbon, (MT)									2.74E-01	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	49	56	105	115	117	118	203	226	235	305
Total Mass Flow, (MT)									1.65E+04	
Cs and Ba, (MCi)									3.09E-03	
Sr and Y, (MCi)									1.40E-02	
Tc, (MCi)									1.53E-04	
TRU, (MCi)									1.20E-03	
Total MCi									1.84E-02	
Ag2O, (MT)									4.07E-01	
Al2O3, (MT)									2.97E+03	
Am2O3, (MT)									3.41E-05	
As2O5, (MT)									4.33E-01	
B2O3, (MT)									4.82E+00	
BaO, (MT)									8.76E-01	
BeO, (MT)									5.53E-02	
Bi2O3, (MT)									2.90E+02	
Cancrinite, (MT)									2.60E+03	
CaO, (MT)									2.08E+02	
CdO, (MT)									1.13E+01	
Ce2O3, (MT)									2.75E+02	
Cr2O3, (MT)									8.31E+01	
CsO, (MT)									4.00E-05	
CuO, (MT)									2.57E-01	
DCPD, (MT)										
Fe2O3, (MT)									3.62E+03	
H2O, (MT)									2.11E-04	
HgO, (MT)										
K2O, (MT)									1.15E+00	
La2O3, (MT)									2.46E+01	
Li2O, (MT)									2.95E-03	
MgO, (MT)									1.96E+01	
MnO2, (MT)									2.09E+02	
MoO3, (MT)									8.55E+00	
Na2O, (MT)									1.28E+03	
Ni(OH)3, (MT)										
Ni2FECN6, (MT)									2.34E-03	
Ni2O3, (MT)									2.62E+02	
NiO, (MT)										
NpO2, (MT)									6.52E-03	
OLIGOMER, (MT)										
P2O5, (MT)									3.68E+03	
PbO2, (MT)									1.35E+00	
POLY, (MT)									1.80E-06	
PuO2, (MT)									5.42E-03	
S, (MT)										
SiO2, (MT)									1.79E+02	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	49	56	105	115	117	118	203	226	233	508
SO3, (MT)										
SrO, (MT)									4.41E-03	
Tc2O7, (MT)									1.41E-02	
TiO2, (MT)									3.16E-02	
Tot Org Carbon, (MT)									2.89E-06	
U3O8, (MT)									1.08E+00	
V2O5, (MT)									9.92E-02	
WO2, (MT)									1.09E-06	
WO3, (MT)									2.10E-01	
ZnO, (MT)									3.17E+01	
ZrO2, (MT)									6.99E+02	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	337	340	400	401	402	403	404	405	406	407
Volume, Total Liters			1.21E+09	9.03E+08	9.03E+06	8.94E+08	3.05E+08	3.25E+08	3.25E+08	
Specific Gravity			1.08E+00	1.00E+00	1.00E+00	1.00E+00	1.31E+00	1.29E+00	1.29E+00	
Total Mass Flow, (MT)			1.30E+06	9.03E+05	9.03E+03	8.94E+05	4.00E+05	4.20E+05	4.20E+05	
Cs and Ba, (MCi)			6.56E-02				6.56E-02	6.56E-02	6.56E-02	
Total MCi			6.56E-02				6.56E-02	6.56E-02	6.56E-02	
Al(OH)4-, (MT)			7.45E+03				7.45E+03	7.45E+03	7.45E+03	
Al+3, (MT)										
Cl-, (MT)			3.15E+02				3.15E+02	3.15E+02	3.15E+02	
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)			2.91E+02				2.91E+02	2.91E+02	2.91E+02	
Cr+3, (MT)										
Cs+, (MT)			7.99E-04				7.99E-04	7.99E-04	7.99E-04	
DCPD, (MT)										
FeCN6-3, (MT)			3.20E+02				3.20E+02	3.20E+02	3.20E+02	
H+, (MT)										
H2O, (MT)			1.17E+06	9.03E+05	9.03E+03	8.94E+05	2.63E+05	2.83E+05	2.83E+05	
Hg, (MT)			1.92E+00				1.92E+00	1.92E+00	1.92E+00	
Hg2, (MT)										
K+, (MT)			2.03E+01				2.03E+01	2.03E+01	2.03E+01	
Kerosene, MT)										
Li+, (MT)			2.90E-02				2.90E-02	2.90E-02	2.90E-02	
MnO2, (MT)			2.14E+01				2.14E+01	2.14E+01	2.14E+01	
Mo+6, (MT)			1.18E+00				1.18E+00	1.18E+00	1.18E+00	
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)			7.02E+04				7.02E+04	7.02E+04	7.02E+04	
NH3, (MT)			8.38E+00				8.38E+00	8.38E+00	8.38E+00	
NH4+, (MT)										
Ni+3, (MT)			2.81E-08				2.81E-08	2.81E-08	2.81E-08	
NO, (MT)										
NO2, (MT)										
NO2-, (MT)			3.01E+02				3.01E+02	3.01E+02	3.01E+02	
NO3-, (MT)			7.07E+03				7.07E+03	7.07E+03	7.07E+03	
O2, (MT)										
OH-, (MT)			4.38E+04				4.38E+04	4.38E+04	4.38E+04	
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)			7.47E+03				7.47E+03	7.47E+03	7.47E+03	
Tot Org Carbon, (MT)			2.74E-01				2.74E-01	2.74E-01	2.74E-01	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	337	340	400	401	402	403	404	405	406	407
Total Mass Flow, (MT)			2.08E+04				2.08E+04	2.47E+04	2.47E+04	2.65E+05
Cs and Ba, (MCi)			3.86E-03				3.86E-03	4.56E-03	4.56E-03	
Sr and Y, (MCi)			1.42E-02				1.42E-02	1.43E-02	1.43E-02	
Tc, (MCi)			1.54E-04				1.54E-04	1.56E-04	1.56E-04	
TRU, (MCi)			1.21E-03				1.21E-03	1.22E-03	1.22E-03	
Total MCi			1.94E-02				1.94E-02	2.02E-02	2.02E-02	
Ag2O, (MT)			4.12E-01				4.12E-01	4.16E-01	4.16E-01	
Al2O3, (MT)			3.19E+03				3.19E+03	3.38E+03	3.38E+03	1.16E+04
Am2O3, (MT)			3.45E-05				3.45E-05	3.48E-05	3.48E-05	
As2O5, (MT)			4.37E-01				4.37E-01	4.42E-01	4.42E-01	
B2O3, (MT)			4.87E+00				4.87E+00	4.92E+00	4.92E+00	
BaO, (MT)			8.86E-01				8.86E-01	8.95E-01	8.95E-01	
BeO, (MT)			5.59E-02				5.59E-02	5.64E-02	5.64E-02	
Bi2O3, (MT)			2.94E+02				2.94E+02	2.97E+02	2.97E+02	
Cancrinite, (MT)			2.60E+03				2.60E+03	2.60E+03	2.60E+03	
CaO, (MT)			6.41E+02				6.41E+02	1.03E+03	1.03E+03	3.84E+04
CdO, (MT)			1.14E+01				1.14E+01	1.16E+01	1.16E+01	
Ce2O3, (MT)			2.78E+02				2.78E+02	2.81E+02	2.81E+02	
Cr2O3, (MT)			8.61E+01				8.61E+01	8.88E+01	8.88E+01	
Cs2O, (MT)			4.99E-05				4.99E-05	5.89E-05	5.89E-05	
CuO, (MT)			2.60E-01				2.60E-01	2.62E-01	2.62E-01	
DCPD, (MT)										
Fe2O3, (MT)			3.66E+03				3.66E+03	3.70E+03	3.70E+03	
H2O, (MT)			2.14E-04				2.14E-04	2.16E-04	2.16E-04	
HgO, (MT)			2.32E-02				2.32E-02	4.41E-02	4.41E-02	
K2O, (MT)			1.44E+00				1.44E+00	1.70E+00	1.70E+00	
La2O3, (MT)			2.49E+01				2.49E+01	2.51E+01	2.51E+01	
Li2O, (MT)			3.68E-03				3.68E-03	4.34E-03	4.34E-03	
MgO, (MT)			1.98E+01				1.98E+01	2.00E+01	2.00E+01	
MnO2, (MT)			2.12E+02				2.12E+02	2.14E+02	2.14E+02	
MoO3, (MT)			8.66E+00				8.66E+00	8.77E+00	8.77E+00	
Na2O, (MT)			2.36E+03				2.36E+03	3.33E+03	3.33E+03	
Ni(OH)3, (MT)										
Ni2FECN6, (MT)			2.34E-03				2.34E-03	2.34E-03	2.34E-03	
Ni2O3, (MT)			2.65E+02				2.65E+02	2.68E+02	2.68E+02	
NiO, (MT)			1.19E-05				1.19E-05	2.26E-05	2.26E-05	
NpO2, (MT)			6.59E-03				6.59E-03	6.66E-03	6.66E-03	
OLIGOMER, (MT)										
P2O5, (MT)			3.72E+03				3.72E+03	3.75E+03	3.75E+03	
PbO2, (MT)			1.36E+00				1.36E+00	1.37E+00	1.37E+00	
POLY, (MT)			1.80E-06				1.80E-06	1.80E-06	1.80E-06	
PuO2, (MT)			5.48E-03				5.48E-03	5.53E-03	5.53E-03	
S, (MT)										
SiO2, (MT)			2.60E+03				2.60E+03	4.78E+03	4.78E+03	2.15E+05

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	397	540	400	401	402	403	404	405	406	407
SO3, (MT)			6.98E+01				6.98E+01	1.33E+02	1.33E+02	
SrO, (MT)			4.46E-03				4.46E-03	4.51E-03	4.51E-03	
Tc2O7, (MT)			1.43E-02				1.43E-02	1.44E-02	1.44E-02	
TiO2, (MT)			3.20E-02				3.20E-02	3.23E-02	3.23E-02	
Tot Org Carbon, (MT)			2.89E-06				2.89E-06	2.89E-06	2.89E-06	
U3O8, (MT)			1.09E+00				1.09E+00	1.10E+00	1.10E+00	
V2O5, (MT)			1.00E-01				1.00E-01	1.01E-01	1.01E-01	
WO2, (MT)			1.10E-06				1.10E-06	1.11E-06	1.11E-06	
WO3, (MT)			2.12E-01				2.12E-01	2.14E-01	2.14E-01	
ZnO, (MT)			3.21E+01				3.21E+01	3.24E+01	3.24E+01	
ZrO2, (MT)			7.07E+02				7.07E+02	7.14E+02	7.14E+02	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	408	409	410	411	412	413	414	415	416	417
Volume, Total Liters	4.31E+07	1.69E+08	5.29E+08		7.88E+07	7.88E+07	7.80E+09	7.88E+09	3.94E+08	7.80E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	4.31E+04	1.69E+05	5.29E+05		7.88E+04	7.88E+04	7.80E+06	7.88E+06	3.94E+05	7.80E+03
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)			3.15E+02							
CO, (MT)			1.76E+03							
CO2, (MT)			1.36E+05							
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)			3.57E+05		7.88E+04	7.88E+04	7.80E+06	7.88E+06	3.94E+05	7.80E+03
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)	4.31E+04									
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)		1.24E+04	1.24E+04							
Na+, (MT)										
NH3, (MT)			8.38E+00							
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)			8.13E+02							
NO2, (MT)			4.98E+03							
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)		1.57E+05	1.57E+04							
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	408	409	410	411	412	413	414	415	416	417
Total Mass Flow, (MT)				3.94E+05			3.94E+05	3.94E+05		3.90E+05
Cs and Ba, (MCi)				7.00E-02			7.00E-02	7.00E-02		6.93E-02
Sr and Y, (MCi)				1.43E-02			1.43E-02	1.43E-02		1.42E-02
Tc, (MCi)				1.56E-04			1.56E-04	1.56E-04		1.54E-04
TRU, (MCi)				1.22E-03			1.22E-03	1.22E-03		1.21E-03
Total MCi				8.57E-02			8.57E-02	8.57E-02		8.48E-02
Ag2O, (MT)				4.16E-01			4.16E-01	4.16E-01		4.12E-01
Al2O3, (MT)				1.97E+04			1.97E+04	1.97E+04		1.95E+04
Am2O3, (MT)				3.48E-05			3.48E-05	3.48E-05		3.45E-05
As2O5, (MT)				4.42E-01			4.42E-01	4.42E-01		4.37E-01
B2O3, (MT)				4.92E+00			4.92E+00	4.92E+00		4.87E+00
BaO, (MT)				8.95E-01			8.95E-01	8.95E-01		8.86E-01
BeO, (MT)				5.64E-02			5.64E-02	5.64E-02		5.59E-02
Bi2O3, (MT)				2.97E+02			2.97E+02	2.97E+02		2.94E+02
Cancrinite, (MT)										
CaO, (MT)				3.94E+04			3.94E+04	3.94E+04		3.90E+04
CdO, (MT)				1.16E+01			1.16E+01	1.16E+01		1.14E+01
Ce2O3, (MT)				2.81E+02			2.81E+02	2.81E+02		2.78E+02
Cr2O3, (MT)				2.73E+02			2.73E+02	2.73E+02		2.70E+02
Cs2O, (MT)				9.04E-04			9.04E-04	9.04E-04		8.95E-04
CuO, (MT)				2.62E-01			2.62E-01	2.62E-01		2.60E-01
DCPD, (MT)										
Fe2O3, (MT)				3.82E+03			3.82E+03	3.82E+03		3.78E+03
H2O, (MT)				2.16E-04			2.16E-04	2.16E-04		2.14E-04
HgO, (MT)				2.11E+00			2.11E+00	2.11E+00		2.09E+00
K2O, (MT)				2.61E+01			2.61E+01	2.61E+01		2.58E+01
La2O3, (MT)				2.51E+01			2.51E+01	2.51E+01		2.49E+01
Li2O, (MT)				6.67E-02			6.67E-02	6.67E-02		6.60E-02
MgO, (MT)				2.00E+01			2.00E+01	2.00E+01		1.98E+01
MnO2, (MT)				2.36E+02			2.36E+02	2.36E+02		2.33E+02
MoO3, (MT)				1.05E+01			1.05E+01	1.05E+01		1.04E+01
Na2O, (MT)				9.85E+04			9.85E+04	9.85E+04		9.75E+04
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)				2.68E+02			2.68E+02	2.68E+02		2.65E+02
NiO, (MT)				1.08E-03			1.08E-03	1.08E-03		1.07E-03
NpO2, (MT)				6.66E-03			6.66E-03	6.66E-03		6.59E-03
OLIGOMER, (MT)										
P2O5, (MT)				3.75E+03			3.75E+03	3.75E+03		3.72E+03
PbO2, (MT)				1.37E+00			1.37E+00	1.37E+00		1.36E+00
POLY, (MT)										
PuO2, (MT)				5.53E-03			5.53E-03	5.53E-03		5.48E-03
S, (MT)										
SiO2, (MT)				2.20E+05			2.20E+05	2.20E+05		2.18E+05

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	408	409	410	411	412	413	414	415	416	417
SO3, (MT)				6.36E+03			6.36E+03	6.36E+03		6.29E+03
SrO, (MT)				4.51E-03			4.51E-03	4.51E-03		4.46E-03
Tc2O7, (MT)				1.44E-02			1.44E-02	1.44E-02		1.43E-02
TiO2, (MT)				3.23E-02			3.23E-02	3.23E-02		3.20E-02
Tot Org Carbon, (MT)										
U3O8, (MT)				1.10E+00			1.10E+00	1.10E+00		1.09E+00
V2O5, (MT)				1.01E-01			1.01E-01	1.01E-01		1.00E-01
WO2, (MT)				1.11E-06			1.11E-06	1.11E-06		1.10E-06
WO3, (MT)				2.14E-01			2.14E-01	2.14E-01		2.12E-01
ZnO, (MT)				3.24E+01			3.24E+01	3.24E+01		3.21E+01
ZrO2, (MT)				7.14E+02			7.14E+02	7.14E+02		7.07E+02

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	418	419	420	421	422	423	424	425	426	427
Volume, Total Liters	8.27E+09	3.86E+08	7.88E+09	7.88E+09	7.88E+09	3.28E+09	3.28E+09	4.98E+08	4.85E+08	1.32E+07
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	8.27E+06	3.86E+05	7.88E+06	7.88E+06	7.88E+06	3.28E+06	3.28E+06	4.98E+05	4.85E+05	1.32E+04
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)	8.27E+06	3.86E+05	7.88E+06	7.88E+06	7.88E+06	3.65E+04	3.65E+04	1.32E+04		1.32E+04
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)						2.57E+06	2.57E+06	3.83E+05	3.83E+05	
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)						6.82E+05	6.82E+05	1.02E+05	1.02E+05	
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	418	419	420	421	422	423	424	425	426	427
Total Mass Flow, (MT)	3.94E+03	3.94E+03	3.94E+00	3.94E+00	3.94E+00			3.90E+02	3.90E+02	
Cs and Ba, (MCi)	7.00E-04	7.00E-04	7.00E-07	7.00E-07	7.00E-07			6.93E-05	6.93E-05	
Sr and Y, (MCi)	1.43E-04	1.43E-04	1.43E-07	1.43E-07	1.43E-07			1.42E-05	1.42E-05	
Tc, (MCi)	1.56E-06	1.56E-06	1.56E-09	1.56E-09	1.56E-09			1.54E-07	1.54E-07	
TRU, (MCi)	1.22E-05	1.22E-05	1.22E-08	1.22E-08	1.22E-08			1.21E-06	1.21E-06	
Total MCi	8.57E-04	8.56E-04	8.57E-07	8.57E-07	8.57E-07			8.48E-05	8.48E-05	
Ag2O, (MT)	4.16E-03	4.15E-03	4.16E-06	4.16E-06	4.16E-06			4.12E-04	4.12E-04	
Al2O3, (MT)	1.97E+02	1.97E+02	1.97E-01	1.97E-01	1.97E-01			1.95E+01	1.95E+01	
Am2O3, (MT)	3.48E-07	3.48E-07	3.48E-10	3.48E-10	3.48E-10			3.45E-08	3.45E-08	
As2O5, (MT)	4.42E-03	4.41E-03	4.42E-06	4.42E-06	4.42E-06			4.37E-04	4.37E-04	
B2O3, (MT)	4.92E-02	4.92E-02	4.92E-05	4.92E-05	4.92E-05			4.87E-03	4.87E-03	
BaO, (MT)	8.95E-03	8.94E-03	8.95E-06	8.95E-06	8.95E-06			8.86E-04	8.86E-04	
BeO, (MT)	5.64E-04	5.64E-04	5.64E-07	5.64E-07	5.64E-07			5.59E-05	5.59E-05	
Bi2O3, (MT)	2.97E+00	2.96E+00	2.97E-03	2.97E-03	2.97E-03			2.94E-01	2.94E-01	
Cancrinite, (MT)										
CaO, (MT)	3.94E+02	3.94E+02	3.94E-01	3.94E-01	3.94E-01			3.90E+01	3.90E+01	
CdO, (MT)	1.16E-01	1.15E-01	1.16E-04	1.16E-04	1.16E-04			1.14E-02	1.14E-02	
Ce2O3, (MT)	2.81E+00	2.81E+00	2.81E-03	2.81E-03	2.81E-03			2.78E-01	2.78E-01	
Cr2O3, (MT)	2.73E+00	2.73E+00	2.73E-03	2.73E-03	2.73E-03			2.70E-01	2.70E-01	
Cs2O, (MT)	9.04E-06	9.03E-06	9.04E-09	9.04E-09	9.04E-09			8.95E-07	8.95E-07	
CuO, (MT)	2.62E-03	2.62E-03	2.62E-06	2.62E-06	2.62E-06			2.60E-04	2.60E-04	
DCPD, (MT)										
Fe2O3, (MT)	3.82E+01	3.82E+01	3.82E-02	3.82E-02	3.82E-02			3.78E+00	3.78E+00	
H2O, (MT)	2.16E-06	2.16E-06	2.16E-09	2.16E-09	2.16E-09			2.14E-07	2.14E-07	
HgO, (MT)	2.11E-02	2.11E-02	2.11E-05	2.11E-05	2.11E-05			2.09E-03	2.09E-03	
K2O, (MT)	2.61E-01	2.61E-01	2.61E-04	2.61E-04	2.61E-04			2.58E-02	2.58E-02	
La2O3, (MT)	2.51E-01	2.51E-01	2.51E-04	2.51E-04	2.51E-04			2.49E-02	2.49E-02	
Li2O, (MT)	6.67E-04	6.66E-04	6.67E-07	6.67E-07	6.67E-07			6.60E-05	6.60E-05	
MgO, (MT)	2.00E-01	2.00E-01	2.00E-04	2.00E-04	2.00E-04			1.98E-02	1.98E-02	
MnO2, (MT)	2.36E+00	2.35E+00	2.36E-03	2.36E-03	2.36E-03			2.33E-01	2.33E-01	
MoO3, (MT)	1.05E-01	1.05E-01	1.05E-04	1.05E-04	1.05E-04			1.04E-02	1.04E-02	
Na2O, (MT)	9.85E+02	9.84E+02	9.85E-01	9.85E-01	9.85E-01			9.75E+01	9.75E+01	
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)	2.68E+00	2.67E+00	2.68E-03	2.68E-03	2.68E-03			2.65E-01	2.65E-01	
NiO, (MT)	1.08E-05	1.08E-05	1.08E-08	1.08E-08	1.08E-08			1.07E-06	1.07E-06	
NpO2, (MT)	6.66E-05	6.65E-05	6.66E-08	6.66E-08	6.66E-08			6.59E-06	6.59E-06	
OLIGOMER, (MT)										
P2O5, (MT)	3.75E+01	3.75E+01	3.75E-02	3.75E-02	3.75E-02			3.72E+00	3.72E+00	
PbO2, (MT)	1.37E-02	1.37E-02	1.37E-05	1.37E-05	1.37E-05			1.36E-03	1.36E-03	
POLY, (MT)										
PuO2, (MT)	5.53E-05	5.53E-05	5.53E-08	5.53E-08	5.53E-08			5.48E-06	5.48E-06	
S, (MT)										
SiO2, (MT)	2.20E+03	2.20E+03	2.20E+00	2.20E+00	2.20E+00			2.18E+02	2.18E+02	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	418	419	420	421	422	423	424	425	426	427
SO3, (MT)	6.36E+01	6.35E+01	6.36E-02	6.36E-02	6.36E-02			6.29E+00	6.29E+00	
SrO, (MT)	4.51E-05	4.50E-05	4.51E-08	4.51E-08	4.51E-08			4.46E-06	4.46E-06	
Tc2O7, (MT)	1.44E-04	1.44E-04	1.44E-07	1.44E-07	1.44E-07			1.43E-05	1.43E-05	
TiO2, (MT)	3.23E-04	3.23E-04	3.23E-07	3.23E-07	3.23E-07			3.20E-05	3.20E-05	
Tot Org Carbon, (MT)										
U3O8, (MT)	1.10E-02	1.10E-02	1.10E-05	1.10E-05	1.10E-05			1.09E-03	1.09E-03	
V2O5, (MT)	1.01E-03	1.01E-03	1.01E-06	1.01E-06	1.01E-06			1.00E-04	1.00E-04	
WO2, (MT)	1.11E-08	1.11E-08	1.11E-11	1.11E-11	1.11E-11			1.10E-09	1.10E-09	
WO3, (MT)	2.14E-03	2.14E-03	2.14E-06	2.14E-06	2.14E-06			2.12E-04	2.12E-04	
ZnO, (MT)	3.24E-01	3.24E-01	3.24E-04	3.24E-04	3.24E-04			3.21E-02	3.21E-02	
ZrO2, (MT)	7.14E+00	7.13E+00	7.14E-03	7.14E-03	7.14E-03			7.07E-01	7.07E-01	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	428	429	430	431	432	433	434	435	436	437
Volume, Total Liters	1.32E+07	2.79E+09	2.79E+07	2.77E+09	2.77E+09	3.82E+05	2.77E+09	3.82E+05	3.82E+05	
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	
Total Mass Flow, (MT)	1.32E+04	2.79E+06	2.79E+04	2.77E+06	2.77E+06	3.82E+02	2.77E+06	3.82E+02	3.82E+02	
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)	1.32E+04	3.11E+04	3.11E+02	3.08E+04	3.08E+04	3.82E+02	3.08E+04	3.82E+02	3.82E+02	
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)		2.18E+06	2.18E+04	2.16E+06	2.16E+06		2.16E+06			
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)		5.80E+05	5.80E+03	5.74E+05	5.74E+05		5.74E+05			
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	428	429	430	431	432	433	434	435	436	437
Total Mass Flow, (MT)		3.90E+05	3.90E+03	3.86E+05	3.86E+00		1.93E-03	3.86E+00	3.86E+00	3.86E+05
Cs and Ba, (MCi)		6.93E-02	6.93E-04	6.86E-02	6.86E-07		3.43E-10	6.85E-07	6.85E-07	6.86E-02
Sr and Y, (MCi)		1.41E-02	1.41E-04	1.40E-02	1.40E-07		7.00E-11	1.40E-07	1.40E-07	1.40E-02
Tc, (MCi)		1.54E-04	1.54E-06	1.53E-04	1.53E-09		7.63E-13	1.53E-09	1.53E-09	1.53E-04
TRU, (MCi)		1.21E-03	1.21E-05	1.20E-03	1.20E-08		5.98E-12	1.20E-08	1.20E-08	1.20E-03
Total MCi		8.48E-02	8.48E-04	8.39E-02	8.39E-07		4.20E-10	8.39E-07	8.39E-07	8.39E-02
Ag2O, (MT)		4.11E-01	4.11E-03	4.07E-01	4.07E-06		2.04E-09	4.07E-06	4.07E-06	4.07E-01
Al2O3, (MT)		1.95E+04	1.95E+02	1.93E+04	1.93E-01		9.65E-05	1.93E-01	1.93E-01	1.93E+04
Am2O3, (MT)		3.44E-05	3.44E-07	3.41E-05	3.41E-10		1.71E-13	3.41E-10	3.41E-10	3.41E-05
As2O5, (MT)		4.37E-01	4.37E-03	4.33E-01	4.33E-06		2.16E-09	4.32E-06	4.32E-06	4.33E-01
B2O3, (MT)		4.87E+00	4.87E-02	4.82E+00	4.82E-05		2.41E-08	4.82E-05	4.82E-05	4.82E+00
BaO, (MT)		8.85E-01	8.85E-03	8.76E-01	8.76E-06		4.38E-09	8.76E-06	8.76E-06	8.76E-01
BeO, (MT)		5.58E-02	5.58E-04	5.53E-02	5.53E-07		2.76E-10	5.52E-07	5.52E-07	5.53E-02
Bi2O3, (MT)		2.93E+02	2.93E+00	2.90E+02	2.90E-03		1.45E-06	2.90E-03	2.90E-03	2.90E+02
Cancrinite, (MT)										
CaO, (MT)		3.90E+04	3.90E+02	3.86E+04	3.86E-01		1.93E-04	3.86E-01	3.86E-01	3.86E+04
CdO, (MT)		1.14E+01	1.14E-01	1.13E+01	1.13E-04		5.66E-08	1.13E-04	1.13E-04	1.13E+01
Ce2O3, (MT)		2.78E+02	2.78E+00	2.75E+02	2.75E-03		1.38E-06	2.75E-03	2.75E-03	2.75E+02
Cr2O3, (MT)		2.70E+02	2.70E+00	2.67E+02	2.67E-03		1.34E-06	2.67E-03	2.67E-03	2.67E+02
Cs2O, (MT)		8.94E-04	8.94E-06	8.85E-04	8.85E-09		4.43E-12	8.85E-09	8.85E-09	8.85E-04
CuO, (MT)		2.60E-01	2.60E-03	2.57E-01	2.57E-06		1.28E-09	2.57E-06	2.57E-06	2.57E-01
DCPD, (MT)										
Fe2O3, (MT)		3.78E+03	3.78E+01	3.74E+03	3.74E-02		1.87E-05	3.74E-02	3.74E-02	3.74E+03
H2O, (MT)		2.13E-04	2.13E-06	2.11E-04	2.11E-09		1.06E-12	2.11E-09	2.11E-09	2.11E-04
HgO, (MT)		2.09E+00	2.09E-02	2.07E+00	2.07E-05		1.04E-08	2.07E-05	2.07E-05	2.07E+00
K2O, (MT)		2.58E+01	2.58E-01	2.55E+01	2.55E-04		1.28E-07	2.55E-04	2.55E-04	2.55E+01
La2O3, (MT)		2.48E+01	2.48E-01	2.46E+01	2.46E-04		1.23E-07	2.46E-04	2.46E-04	2.46E+01
Li2O, (MT)		6.59E-02	6.59E-04	6.53E-02	6.53E-07		3.26E-10	6.52E-07	6.52E-07	6.53E-02
MgO, (MT)		1.98E+01	1.98E-01	1.96E+01	1.96E-04		9.81E-08	1.96E-04	1.96E-04	1.96E+01
MnO2, (MT)		2.33E+02	2.33E+00	2.31E+02	2.31E-03		1.15E-06	2.31E-03	2.31E-03	2.31E+02
MoO3, (MT)		1.04E+01	1.04E-01	1.03E+01	1.03E-04		5.16E-08	1.03E-04	1.03E-04	1.03E+01
Na2O, (MT)		9.74E+04	9.74E+02	9.65E+04	9.65E-01		4.82E-04	9.64E-01	9.64E-01	9.65E+04
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)		2.65E+02	2.65E+00	2.62E+02	2.62E-03		1.31E-06	2.62E-03	2.62E-03	2.62E+02
NiO, (MT)		1.07E-03	1.07E-05	1.06E-03	1.06E-08		5.30E-12	1.06E-08	1.06E-08	1.06E-03
NpO2, (MT)		6.59E-03	6.59E-05	6.52E-03	6.52E-08		3.26E-11	6.52E-08	6.52E-08	6.52E-03
OLIGOMER, (MT)										
P2O5, (MT)		3.71E+03	3.71E+01	3.68E+03	3.68E-02		1.84E-05	3.67E-02	3.67E-02	3.68E+03
PbO2, (MT)		1.36E+00	1.36E-02	1.35E+00	1.35E-05		6.73E-09	1.34E-05	1.34E-05	1.35E+00
POLY, (MT)										
PuO2, (MT)		5.47E-03	5.47E-05	5.42E-03	5.42E-08		2.71E-11	5.42E-08	5.42E-08	5.42E-03
S, (MT)										
SiO2, (MT)		2.18E+05	2.18E+03	2.16E+05	2.16E+00		1.08E-03	2.16E+00	2.16E+00	2.16E+05

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	428	429	430	431	432	433	434	435	436	437
SO3, (MT)		6.29E+03	6.29E+01	6.22E+03	6.22E-02		3.11E-05	6.22E-02	6.22E-02	6.22E+03
SrO, (MT)		4.46E-03	4.46E-05	4.41E-03	4.41E-08		2.21E-11	4.41E-08	4.41E-08	4.41E-03
Tc2O7, (MT)		1.42E-02	1.42E-04	1.41E-02	1.41E-07		7.05E-11	1.41E-07	1.41E-07	1.41E-02
TiO2, (MT)		3.20E-02	3.20E-04	3.16E-02	3.16E-07		1.58E-10	3.16E-07	3.16E-07	3.16E-02
Tot Org Carbon, (MT)										
U3O8, (MT)		1.09E+00	1.09E-02	1.08E+00	1.08E-05		5.37E-09	1.07E-05	1.07E-05	1.08E+00
V2O5, (MT)		1.00E-01	1.00E-03	9.92E-02	9.92E-07		4.96E-10	9.91E-07	9.91E-07	9.92E-02
WO2, (MT)		1.10E-06	1.10E-08	1.09E-06	1.09E-11		5.46E-15	1.09E-11	1.09E-11	1.09E-06
WO3, (MT)		2.12E-01	2.12E-03	2.10E-01	2.10E-06		1.05E-09	2.10E-06	2.10E-06	2.10E-01
ZnO, (MT)		3.20E+01	3.20E-01	3.17E+01	3.17E-04		1.59E-07	3.17E-04	3.17E-04	3.17E+01
ZrO2, (MT)		7.06E+02	7.06E+00	6.99E+02	6.99E-03		3.49E-06	6.98E-03	6.98E-03	6.99E+02

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	438	439	440	441	442	443	444	445	446	447
Volume, Total Liters	1.84E+14	1.84E+14	1.84E+14			1.84E+14	1.84E+14	1.85E+10		
Specific Gravity	1.00E+00	1.00E+00	1.00E+00			1.00E+00	1.00E+00	1.00E+00		
Total Mass Flow, (MT)	1.84E+11	1.84E+11	1.84E+11			1.84E+11	1.84E+11	1.85E+07		
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)	1.84E+11	1.84E+11	1.84E+11			1.84E+11	1.84E+11	1.85E+07		
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)										
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)										
OH-, (MT)										
OLIGOMER, (MT)	6.67E+03	6.67E+03	6.67E+03			6.67E+03	6.67E+03			
PTA-3, (MT)										
S, (MT)	2.54E+05	2.54E+05	2.54E+05			2.54E+05	2.54E+05			
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	439	439	440	441	442	443	444	445	446	447
Total Mass Flow, (MT)	3.86E+01	3.86E+05	3.86E+05	5.08E+05		3.86E+01	3.86E+01			
Ca and Ba, (MCi)	6.86E-06	6.86E-02	6.86E-02	6.86E-02		6.86E-06	6.86E-06			
Sr and Y, (MCi)	1.40E-06	1.40E-02	1.40E-02	1.40E-02		1.40E-06	1.40E-06			
Tc, (MCi)	1.53E-08	1.53E-04	1.53E-04	1.53E-04		1.53E-08	1.53E-08			
TRU, (MCi)	1.20E-07	1.20E-03	1.20E-03	1.20E-03		1.20E-07	1.20E-07			
Total MCi	8.39E-06	8.39E-02	8.39E-02	8.39E-02		8.39E-06	8.39E-06			
Ag2O, (MT)	4.07E-05	4.07E-01	4.07E-01	4.07E-01		4.07E-05	4.07E-05			
Al2O3, (MT)	1.93E+00	1.93E+04	1.93E+04	1.93E+04		1.93E+00	1.93E+00			
Am2O3, (MT)	3.41E-09	3.41E-05	3.41E-05	3.41E-05		3.41E-09	3.41E-09			
As2O5, (MT)	4.33E-05	4.33E-01	4.33E-01	4.33E-01		4.33E-05	4.33E-05			
B2O3, (MT)	4.82E-04	4.82E+00	4.82E+00	4.82E+00		4.82E-04	4.82E-04			
BaO, (MT)	8.76E-05	8.76E-01	8.76E-01	8.76E-01		8.76E-05	8.76E-05			
BeO, (MT)	5.53E-06	5.53E-02	5.53E-02	5.53E-02		5.53E-06	5.53E-06			
Bi2O3, (MT)	2.90E-02	2.90E+02	2.90E+02	2.90E+02		2.90E-02	2.90E-02			
Cancrinite, (MT)										
CaO, (MT)	3.86E+00	3.86E+04	3.86E+04	3.86E+04		3.86E+00	3.86E+00			
CdO, (MT)	1.13E-03	1.13E+01	1.13E+01	1.13E+01		1.13E-03	1.13E-03			
Ce2O3, (MT)	2.75E-02	2.75E+02	2.75E+02	2.75E+02		2.75E-02	2.75E-02			
Cr2O3, (MT)	2.67E-02	2.67E+02	2.67E+02	2.67E+02		2.67E-02	2.67E-02			
Cs2O, (MT)	8.86E-08	8.86E-04	8.86E-04	8.85E-04		8.86E-08	8.86E-08			
CuO, (MT)	2.57E-05	2.57E-01	2.57E-01	2.57E-01		2.57E-05	2.57E-05			
DCPD, (MT)				1.22E+05						
Fe2O3, (MT)	3.74E-01	3.74E+03	3.74E+03	3.74E+03		3.74E-01	3.74E-01			
H2O, (MT)	2.11E-08	2.11E-04	2.11E-04	2.11E-04		2.11E-08	2.11E-08			
HgO, (MT)	2.07E-04	2.07E+00	2.07E+00	2.07E+00		2.07E-04	2.07E-04			
K2O, (MT)	2.55E-03	2.55E+01	2.55E+01	2.55E+01		2.55E-03	2.55E-03			
La2O3, (MT)	2.46E-03	2.46E+01	2.46E+01	2.46E+01		2.46E-03	2.46E-03			
Li2O, (MT)	6.53E-06	6.53E-02	6.53E-02	6.53E-02		6.53E-06	6.53E-06			
MgO, (MT)	1.96E-03	1.96E+01	1.96E+01	1.96E+01		1.96E-03	1.96E-03			
MnO2, (MT)	2.31E-02	2.31E+02	2.31E+02	2.31E+02		2.31E-02	2.31E-02			
MoO3, (MT)	1.03E-03	1.03E+01	1.03E+01	1.03E+01		1.03E-03	1.03E-03			
Na2O, (MT)	9.65E+00	9.65E+04	9.65E+04	9.65E+04		9.65E+00	9.65E+00			
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)	2.62E-02	2.62E+02	2.62E+02	2.62E+02		2.62E-02	2.62E-02			
NiO, (MT)	1.06E-07	1.06E-03	1.06E-03	1.06E-03		1.06E-07	1.06E-07			
NpO2, (MT)	6.52E-07	6.52E-03	6.52E-03	6.52E-03		6.52E-07	6.52E-07			
OLIGOMER, (MT)				4.41E-03						
P2O5, (MT)	3.68E-01	3.68E+03	3.68E+03	3.68E+03		3.68E-01	3.68E-01			
PbO2, (MT)	1.35E-04	1.35E+00	1.35E+00	1.35E+00		1.35E-04	1.35E-04			
POLY, (MT)										
PuO2, (MT)	5.42E-07	5.42E-03	5.42E-03	5.42E-03		5.42E-07	5.42E-07			
S, (MT)				1.68E-01						
SiO2, (MT)	2.16E+01	2.16E+05	2.16E+05	2.16E+05		2.16E+01	2.16E+01			

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	439	439	440	441	442	443	444	445	446	447
SO3, (MT)	6.22E-01	6.22E+03	6.22E+03	6.22E+03		6.22E-01	6.22E-01			
SrO, (MT)	4.41E-07	4.41E-03	4.41E-03	4.41E-03		4.41E-07	4.41E-07			
Tc2O7, (MT)	1.41E-06	1.41E-02	1.41E-02	1.41E-02		1.41E-06	1.41E-06			
TiO2, (MT)	3.16E-06	3.16E-02	3.16E-02	3.16E-02		3.16E-06	3.16E-06			
Tot Org Carbon, (MT)										
U3O8, (MT)	1.08E-04	1.08E+00	1.08E+00	1.08E+00		1.08E-04	1.08E-04			
V2O5, (MT)	9.92E-06	9.92E-02	9.92E-02	9.92E-02		9.92E-06	9.92E-06			
WO2, (MT)	1.09E-10	1.09E-06	1.09E-06	1.09E-06		1.09E-10	1.09E-10			
WO3, (MT)	2.10E-05	2.10E-01	2.10E-01	2.10E-01		2.10E-05	2.10E-05			
ZnO, (MT)	3.17E-03	3.17E+01	3.17E+01	3.17E+01		3.17E-03	3.17E-03			
ZrO2, (MT)	6.99E-02	6.99E+02	6.99E+02	6.99E+02		6.99E-02	6.99E-02			

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	448	449	450	S10	S11	S12	S13	S14	S20	S21
Volume, Total Liters	1.85E+10		1.85E+10	2.79E+07			1.95E+07	1.95E+07	2.79E+07	3.86E+03
Specific Gravity	1.00E+00		1.00E+00	1.00E+00			1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.85E+07		1.85E+07	2.79E+04			1.95E+04	1.95E+04	2.79E+04	3.86E+00
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)	1.85E+07		1.85E+07							
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)				3.11E+02			1.95E+04	1.95E+04	3.11E+02	3.86E+00
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)				2.18E+04					2.18E+04	
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)				5.80E+03					5.80E+03	
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	448	449	450	510	511	512	513	514	520	521
Total Mass Flow, (MT)				3.90E+03	3.90E+03	3.90E+03		3.90E+03	3.90E-02	
Cs and Ba, (MCi)				6.93E-04	6.93E-04	6.93E-04		6.93E-04	6.93E-09	
Sr and Y, (MCi)				1.41E-04	1.41E-04	1.41E-04		1.41E-04	1.41E-09	
Tc, (MCi)				1.54E-06	1.54E-06	1.54E-06		1.54E-06	1.54E-11	
TRU, (MCi)				1.21E-05	1.21E-05	1.21E-05		1.21E-05	1.21E-10	
Total MCi				8.48E-04	8.48E-04	8.48E-04		8.48E-04	8.48E-09	
Ag2O, (MT)				4.11E-03	4.11E-03	4.11E-03		4.11E-03	4.11E-08	
Al2O3, (MT)				1.95E+02	1.95E+02	1.95E+02		1.95E+02	1.95E-03	
Am2O3, (MT)				3.44E-07	3.44E-07	3.44E-07		3.44E-07	3.44E-12	
As2O5, (MT)				4.37E-03	4.37E-03	4.37E-03		4.37E-03	4.37E-08	
B2O3, (MT)				4.87E-02	4.87E-02	4.87E-02		4.87E-02	4.87E-07	
BaO, (MT)				8.85E-03	8.85E-03	8.85E-03		8.85E-03	8.85E-08	
BeO, (MT)				5.58E-04	5.58E-04	5.58E-04		5.58E-04	5.58E-09	
Bi2O3, (MT)				2.93E+00	2.93E+00	2.93E+00		2.93E+00	2.93E-05	
Cancrinite, (MT)										
CaO, (MT)				3.90E+02	3.90E+02	3.90E+02		3.90E+02	3.90E-03	
CdO, (MT)				1.14E-01	1.14E-01	1.14E-01		1.14E-01	1.14E-06	
Ce2O3, (MT)				2.78E+00	2.78E+00	2.78E+00		2.78E+00	2.78E-05	
Cr2O3, (MT)				2.70E+00	2.70E+00	2.70E+00		2.70E+00	2.70E-05	
Cs2O, (MT)				8.94E-06	8.94E-06	8.94E-06		8.94E-06	8.94E-11	
CuO, (MT)				2.60E-03	2.60E-03	2.60E-03		2.60E-03	2.60E-08	
DCPD, (MT)										
Fe2O3, (MT)				3.78E+01	3.78E+01	3.78E+01		3.78E+01	3.78E-04	
H2O, (MT)				2.13E-06	2.13E-06	2.13E-06		2.13E-06	2.13E-11	
HgO, (MT)				2.09E-02	2.09E-02	2.09E-02		2.09E-02	2.09E-07	
K2O, (MT)				2.58E-01	2.58E-01	2.58E-01		2.58E-01	2.58E-06	
La2O3, (MT)				2.48E-01	2.48E-01	2.48E-01		2.48E-01	2.48E-06	
Li2O, (MT)				6.59E-04	6.59E-04	6.59E-04		6.59E-04	6.59E-09	
MgO, (MT)				1.98E-01	1.98E-01	1.98E-01		1.98E-01	1.98E-06	
MnO2, (MT)				2.33E+00	2.33E+00	2.33E+00		2.33E+00	2.33E-05	
MoO3, (MT)				1.04E-01	1.04E-01	1.04E-01		1.04E-01	1.04E-06	
Na2O, (MT)				9.74E+02	9.74E+02	9.74E+02		9.74E+02	9.74E-03	
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)				2.65E+00	2.65E+00	2.65E+00		2.65E+00	2.65E-05	
NiO, (MT)				1.07E-05	1.07E-05	1.07E-05		1.07E-05	1.07E-10	
NpO2, (MT)				6.59E-05	6.59E-05	6.59E-05		6.59E-05	6.59E-10	
OLIGOMER, (MT)										
P2O5, (MT)				3.71E+01	3.71E+01	3.71E+01		3.71E+01	3.71E-04	
PbO2, (MT)				1.36E-02	1.36E-02	1.36E-02		1.36E-02	1.36E-07	
POLY, (MT)										
PuO2, (MT)				5.47E-05	5.47E-05	5.47E-05		5.47E-05	5.47E-10	
S, (MT)										
SiO2, (MT)				2.18E+03	2.18E+03	2.18E+03		2.18E+03	2.18E-02	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	448	449	450	S10	S11	S12	S13	S14	S20	S21
SO3, (MT)				6.29E+01	6.29E+01	6.29E+01		6.29E+01	6.29E-04	
SrO, (MT)				4.46E-05	4.46E-05	4.46E-05		4.46E-05	4.46E-10	
Tc2O7, (MT)				1.42E-04	1.42E-04	1.42E-04		1.42E-04	1.42E-09	
TiO2, (MT)				3.20E-04	3.20E-04	3.20E-04		3.20E-04	3.20E-09	
Tot Org Carbon, (MT)										
U3O8, (MT)				1.09E-02	1.09E-02	1.09E-02		1.09E-02	1.09E-07	
V2O5, (MT)				1.00E-03	1.00E-03	1.00E-03		1.00E-03	1.00E-08	
WO2, (MT)				1.10E-08	1.10E-08	1.10E-08		1.10E-08	1.10E-13	
WO3, (MT)				2.12E-03	2.12E-03	2.12E-03		2.12E-03	2.12E-08	
ZnO, (MT)				3.20E-01	3.20E-01	3.20E-01		3.20E-01	3.20E-06	
ZrO2, (MT)				7.06E+00	7.06E+00	7.06E+00		7.06E+00	7.06E-05	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	522	523	524	615	618	619	620	621	622	625
Volume, Total Liters	2.79E+07	3.86E+03	3.86E+03		9.84E+09	7.50E+08	9.62E+09	1.20E+08	8.71E+08	1.04E+03
Specific Gravity	1.00E+00	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.98E+00
Total Mass Flow, (MT)	2.79E+04	3.86E+00	3.86E+00		9.84E+06	7.50E+05	9.62E+06	1.20E+05	8.71E+05	2.06E+00
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)						3.15E+02			3.15E+02	
CO, (MT)						1.76E+03			1.76E+03	
CO2, (MT)						1.36E+05			1.36E+05	
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)					5.54E-01	2.77E-02	5.26E-01	6.78E-03	3.45E-02	3.27E-02
H2O, (MT)	3.11E+02	3.86E+00	3.86E+00		9.84E+06	5.79E+05	9.62E+06	1.20E+05	6.99E+05	
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)	2.18E+04					1.24E+04			1.24E+04	
Na+, (MT)										
NH3, (MT)						8.38E+00			8.38E+00	
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)						8.13E+02			8.13E+02	
NO2, (MT)						4.98E+03			4.98E+03	
NO2-, (MT)										
NO3-, (MT)					3.43E+01	1.72E+00	3.26E+01	4.20E-01	2.14E+00	2.03E+00
O2, (MT)	5.80E+03					1.57E+04			1.57E+04	
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

522 Solid Compounds	523	524	615	618	619	620	621	622	623	
Total Mass Flow, (MT)	1.95E-05	3.90E-02	3.90E-02							
Cs and Ba, (MCi)	3.46E-12	6.92E-09	6.92E-09							
Sr and Y, (MCi)	7.07E-13	1.41E-09	1.41E-09							
Tc, (MCi)	7.71E-15	1.54E-11	1.54E-11							
TRU, (MCi)	6.04E-14	1.21E-10	1.21E-10							
Total MCi	4.24E-12	8.47E-09	8.47E-09							
Ag2O, (MT)	2.06E-11	4.11E-08	4.11E-08							
Al2O3, (MT)	9.74E-07	1.95E-03	1.95E-03							
Am2O3, (MT)	1.72E-15	3.44E-12	3.44E-12							
As2O5, (MT)	2.18E-11	4.37E-08	4.37E-08							
B2O3, (MT)	2.43E-10	4.87E-07	4.87E-07							
BaO, (MT)	4.43E-11	8.85E-08	8.85E-08							
BeO, (MT)	2.79E-12	5.58E-09	5.58E-09							
Bi2O3, (MT)	1.47E-08	2.93E-05	2.93E-05							
Caocrinite, (MT)										
CaO, (MT)	1.95E-06	3.90E-03	3.90E-03							
CdO, (MT)	5.72E-10	1.14E-06	1.14E-06							
Ce2O3, (MT)	1.39E-08	2.78E-05	2.78E-05							
Cr2O3, (MT)	1.35E-08	2.70E-05	2.70E-05							
Cs2O, (MT)	4.47E-14	8.94E-11	8.94E-11							
CuO, (MT)	1.30E-11	2.59E-08	2.59E-08							
DCPD, (MT)										
Fe2O3, (MT)	1.89E-07	3.78E-04	3.78E-04							
H2O, (MT)	1.07E-14	2.13E-11	2.13E-11							
HgO, (MT)	1.05E-10	2.09E-07	2.09E-07							
K2O, (MT)	1.29E-09	2.58E-06	2.58E-06							
La2O3, (MT)	1.24E-09	2.48E-06	2.48E-06							
Li2O, (MT)	3.30E-12	6.59E-09	6.59E-09							
MgO, (MT)	9.91E-10	1.98E-06	1.98E-06							
MnO2, (MT)	1.17E-08	2.33E-05	2.33E-05							
MoO3, (MT)	5.21E-10	1.04E-06	1.04E-06							
Na2O, (MT)	4.87E-06	9.74E-03	9.74E-03							
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)	1.32E-08	2.65E-05	2.65E-05							
NiO, (MT)	5.36E-14	1.07E-10	1.07E-10							
NpO2, (MT)	3.29E-13	6.58E-10	6.58E-10							
OLIGOMER, (MT)										
P2O5, (MT)	1.86E-07	3.71E-04	3.71E-04							
PbO2, (MT)	6.79E-11	1.36E-07	1.36E-07							
POLY, (MT)										
PuO2, (MT)	2.74E-13	5.47E-10	5.47E-10							
S, (MT)										
SiO2, (MT)	1.09E-05	2.18E-02	2.18E-02							

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

S22 Solid Components	523	524	615	618	619	620	621	622	623	
SO3, (MT)	3.14E-07	6.28E-04	6.28E-04							
SrO, (MT)	2.23E-13	4.46E-10	4.46E-10							
Tc2O7, (MT)	7.12E-13	1.42E-09	1.42E-09							
TiO2, (MT)	1.60E-12	3.19E-09	3.19E-09							
Tot Org Carbon, (MT)										
U3O8, (MT)	5.43E-11	1.09E-07	1.09E-07							
V2O5, (MT)	5.01E-12	1.00E-08	1.00E-08							
WO2, (MT)	5.51E-17	1.10E-13	1.10E-13							
WO3, (MT)	1.06E-11	2.12E-08	2.12E-08							
ZnO, (MT)	1.60E-09	3.20E-06	3.20E-06							
ZrO2, (MT)	3.53E-08	7.05E-05	7.05E-05							

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	624	625	626	627	628	629	630	631	632	634
Volume, Total Liters	8.71E+08	8.71E+08		1.76E+08	6.95E+08	1.57E+03	3.53E+08	9.96E+09	2.19E-07	1.76E+08
Specific Gravity	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.39E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	8.71E+05	8.71E+05		1.76E+05	6.95E+05	2.19E+00	3.53E+05	9.96E+06	2.19E-10	1.76E+05
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)	3.15E+02	3.15E+02		3.15E+02						3.15E+02
CO, (MT)	1.76E+03	1.76E+03		1.76E+03						1.76E+03
CO2, (MT)	1.36E+05	1.36E+05		1.36E+05						1.36E+05
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)	1.72E-03	1.72E-03		3.45E-05	1.69E-03	1.98E-02	1.99E-02	5.60E-01		3.45E-05
H2O, (MT)	6.99E+05	6.99E+05		4.54E+03	6.95E+05	9.43E-01	3.53E+05	9.96E+06	2.19E-10	4.54E+03
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)	1.24E+04	1.24E+04		1.24E+04						1.24E+04
Na+, (MT)										
NH3, (MT)	8.38E+00	8.38E+00		8.38E+00						8.38E+00
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)	8.13E+02	8.13E+02		8.13E+02						8.13E+02
NO2, (MT)	4.98E+03	4.98E+03		4.98E+03						4.98E+03
NO2-, (MT)										
NO3-, (MT)	1.07E-01	1.07E-01		2.14E-03	1.05E-01	1.23E+00	1.23E+00	3.47E+01		2.14E-03
O2, (MT)	1.57E+04	1.57E+04		1.57E+04						1.57E+04
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	624	625	626	627	628	629	630	631	633	634
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	624	625	626	627	628	629	630	631	633	634
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	635	636	637	638	639	640	641	642	643	644
Volume, Total Liters	2.19E-07	2.19E-07		1.76E+08	1.76E+08	1.76E+08	1.76E+08	1.76E+08	3.07E+06	1.79E+08
Specific Gravity	1.00E+00	1.00E+00		1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.19E-10	2.19E-10		1.76E+05	1.76E+05	1.76E+05	1.76E+05	1.76E+05	3.07E+03	1.79E+05
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)				3.15E+02	3.15E+02	3.15E+02	3.15E+02	3.15E+02		3.15E+02
CO, (MT)				1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03		1.76E+03
CO2, (MT)				1.36E+05	1.36E+05	1.36E+05	1.36E+05	1.36E+05		1.36E+05
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)				3.45E-05	3.45E-05	3.45E-05	3.45E-05	3.45E-05		3.45E-05
H2O, (MT)	2.19E-10	2.19E-10		4.54E+03	4.54E+03	4.54E+03	4.54E+03	4.54E+03		9.36E+03
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)				1.24E+04	1.24E+04	1.24E+04	1.24E+04	1.24E+04		1.68E+04
Na+, (MT)										
NH3, (MT)				8.38E+00	8.38E+00	8.38E+00	8.38E+00	8.38E+00	3.07E+03	3.65E+01
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)				8.13E+02	8.13E+02	8.13E+02	8.13E+02	8.13E+02		8.13E+00
NO2, (MT)				4.98E+03	4.98E+03	4.98E+03	4.98E+03	4.98E+03		6.22E+01
NO2-, (MT)										
NO3-, (MT)				2.14E-03	2.14E-03	2.14E-03	2.14E-03	2.14E-03		2.14E-03
O2, (MT)				1.57E+04	1.57E+04	1.57E+04	1.57E+04	1.57E+04		1.53E+04
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	635	636	637	638	639	640	641	642	643	644
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	633	634	637	638	639	640	641	642	643	644
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	645	646	647	648	649	650	651	652	653	654
Volume, Total Liters	1.79E+08									3.07E+06
Specific Gravity	1.00E+00									1.00E+00
Total Mass Flow, (MT)	1.79E+05									3.07E+03
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)	3.15E+02									
CO, (MT)	1.76E+03									
CO2, (MT)	1.36E+05									
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)	3.45E-05									
H2O, (MT)	9.36E+03									
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)	1.68E+04									
Na+, (MT)										
NH3, (MT)	3.65E+01									3.07E+03
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)	8.13E+00									
NO2, (MT)	6.22E+01									
NO2-, (MT)										
NO3-, (MT)	2.14E-03									
O2, (MT)	1.53E+04									
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Solid Components	645	646	647	648	649	650	651	652	653	654
Total Mass Flow, (MT)		1.76E-04				1.76E-04				
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)		1.76E-04				1.76E-04				
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	645	646	647	648	649	650	651	652	653	654
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	655	656	670	671	672	673	674	675	676	677
Volume, Total Liters	1.57E+03									
Specific Gravity	1.39E+00									
Total Mass Flow, (MT)	2.19E+00									
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)	1.98E-02									
H2O, (MT)	9.43E-01									
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	1.23E+00									
O2, (MT)										
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	655	656	670	671	672	673	674	675	676	677
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	655	656	670	671	672	673	674	675	676	677
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	678	679	680	681	682	683	684	685	686	690
Volume, Total Liters										
Specific Gravity										
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)										
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)										
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Num:	678	679	680	681	682	683	684	685	686	690
Solid Components										
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	678	679	680	681	682	683	684	685	686	690
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	700	701	702	703	704	705	706	707	708
Volume, Total Liters	3.53E+06	9.03E+06	2.19E+00	9.03E+06	2.19E+00		2.19E-09		2.19E-09	2.19E+00
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00		1.00E+00		1.00E+00	1.00E+00
Total Mass Flow, (MT)	3.53E+05	9.03E+03	2.19E-03	9.03E+03	2.19E-03		2.19E-12		2.19E-12	2.19E-03
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)	1.99E-02									
H2O, (MT)	3.53E+05	9.03E+03	2.19E-03	9.03E+03	2.19E-03		2.19E-12		2.19E-12	2.19E-03
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)	1.23E+00									
O2, (MT)										
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	692	700	701	702	703	704	705	706	707	708
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	652	700	701	702	703	704	705	706	707	708
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	800	801	802	803	804	805	806	807	900	901
Volume, Total Liters	8.94E+08	8.96E+05	8.93E+08	1.43E-09	8.93E+08		8.93E+08	8.87E+08		
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.54E+00	1.00E+00		1.00E+00	1.00E+00		
Total Mass Flow, (MT)	8.94E+05	8.96E+02	8.93E+05	2.19E-12	8.93E+05		8.93E+05	8.87E+05		
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)	8.94E+05	8.96E+02	8.93E+05	1.10E-12	8.93E+05		8.93E+05	8.87E+05		
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)				6.30E-13	6.30E-13		6.30E-13	6.26E-13		
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)										
OH-, (MT)				4.66E-13	4.66E-13		4.66E-13	4.63E-13		
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	#00	#01	#02	#03	#04	#05	#06	#07	900	901
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	800	801	802	803	804	805	806	807	900	901
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	902	903	904	905	906	907	908	909	910	911
Volume, Total Liters			1.93E+02	1.93E+02	1.93E+02	2.98E+09				
Specific Gravity			1.00E+00	1.00E+00	1.00E+00	1.00E+00				
Total Mass Flow, (MT)			1.93E-01	1.93E-01	1.93E-01	2.98E+06				
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)						3.15E+02				
CO, (MT)						1.76E+03				
CO2, (MT)						1.36E+05				
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)						3.45E-05				
H2O, (MT)			1.93E-01	1.93E-01	1.93E-01	4.95E+04				
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)						2.20E+06				
Na+, (MT)										
NH3, (MT)						3.65E+01				
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)						8.13E+00				
NO2, (MT)						6.22E+01				
NO2-, (MT)										
NO3-, (MT)						2.14E-03				
O2, (MT)						5.95E+05				
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	902	903	904	905	906	907	908	909	910	911
Total Mass Flow, (MT)				1.95E-03	1.95E-03	9.74E-07				
Cs and Ba, (MCi)				3.46E-10	3.46E-10	1.73E-13				
Sr and Y, (MCi)				7.07E-11	7.07E-11	3.54E-14				
Tc, (MCi)				7.71E-13	7.71E-13	3.86E-16				
TRU, (MCi)				6.03E-12	6.03E-12	3.02E-15				
Total MCi				4.24E-10	4.24E-10	2.12E-13				
Ag2O, (MT)				2.06E-09	2.06E-09	1.03E-12				
Al2O3, (MT)				9.74E-05	9.74E-05	4.87E-08				
Am2O3, (MT)				1.72E-13	1.72E-13	8.61E-17				
As2O5, (MT)				2.18E-09	2.18E-09	1.09E-12				
B2O3, (MT)				2.43E-08	2.43E-08	1.22E-11				
BaO, (MT)				4.42E-09	4.42E-09	2.21E-12				
BeO, (MT)				2.79E-10	2.79E-10	1.40E-13				
Bi2O3, (MT)				1.47E-06	1.47E-06	7.33E-10				
Cancrinite, (MT)										
CaO, (MT)				1.95E-04	1.95E-04	9.74E-08				
CdO, (MT)				5.71E-08	5.71E-08	2.86E-11				
Ce2O3, (MT)				1.39E-06	1.39E-06	6.94E-10				
Cr2O3, (MT)				1.35E-06	1.35E-06	6.75E-10				
Cs2O, (MT)				4.47E-12	4.47E-12	2.24E-15				
CuO, (MT)				1.30E-09	1.30E-09	6.49E-13				
DCPD, (MT)										
Fe2O3, (MT)				1.89E-05	1.89E-05	9.45E-09				
H2O, (MT)				1.07E-12	1.07E-12	5.34E-16				
HgO, (MT)				1.05E-08	1.05E-08	5.23E-12				
K2O, (MT)				1.29E-07	1.29E-07	6.45E-11				
La2O3, (MT)				1.24E-07	1.24E-07	6.21E-11				
Li2O, (MT)				3.30E-10	3.30E-10	1.65E-13				
MgO, (MT)				9.91E-08	9.91E-08	4.96E-11				
MnO2, (MT)				1.16E-06	1.16E-06	5.82E-10				
MoO3, (MT)				5.21E-08	5.21E-08	2.60E-11				
Na2O, (MT)				4.87E-04	4.87E-04	2.44E-07				
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)				1.32E-06	1.32E-06	6.62E-10				
NiO, (MT)				5.36E-12	5.36E-12	2.68E-15				
NpO2, (MT)				3.29E-11	3.29E-11	1.65E-14				
OLIGOMER, (MT)										
P2O5, (MT)				1.86E-05	1.86E-05	9.28E-09				
PbO2, (MT)				6.79E-09	6.79E-09	3.40E-12				
POLY, (MT)										
PuO2, (MT)				2.74E-11	2.74E-11	1.37E-14				
S, (MT)										
SiO2, (MT)				1.09E-03	1.09E-03	5.45E-07				

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	902	903	904	905	906	907	908	909	910	911
SO3, (MT)				3.14E-05	3.14E-05	1.57E-08				
SrO, (MT)				2.23E-11	2.23E-11	1.11E-14				
Tc2O7, (MT)				7.12E-11	7.12E-11	3.56E-14				
TiO2, (MT)				1.60E-10	1.60E-10	7.99E-14				
Tot Org Carbon, (MT)										
U3O8, (MT)				5.43E-09	5.43E-09	2.71E-12				
V2O5, (MT)				5.01E-10	5.01E-10	2.50E-13				
WO2, (MT)				5.51E-15	5.51E-15	2.76E-18				
WO3, (MT)				1.06E-09	1.06E-09	5.29E-13				
ZnO, (MT)				1.60E-07	1.60E-07	8.01E-11				
ZrO2, (MT)				3.53E-06	3.53E-06	1.76E-09				

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	912	913	914	915	916	917	1000	1001	1002	1003
Volume, Total Liters	3.86E+07	4.85E+06	4.85E+06	3.86E+07	3.86E+07	4.85E+06				
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00				
Total Mass Flow, (MT)	3.86E+04	4.85E+05	4.85E+05	3.86E+04	3.86E+04	4.85E+05				
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)	3.86E+04			3.86E+04	3.86E+04					
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)		3.83E+05	3.83E+05			3.83E+05				
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)		1.02E+05	1.02E+05			1.02E+05				
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	912	913	914	915	916	917	1000	1001	1002	1003
Total Mass Flow, (MT)		3.90E+02	3.90E+02	3.90E+02	3.90E+02	1.95E-01	2.65E+05			
Cs and Ba, (MCi)		6.93E-05	6.93E-05	6.93E-05	6.93E-05	3.47E-08				
Sr and Y, (MCi)		1.42E-05	1.42E-05	1.42E-05	1.42E-05	7.08E-09				
Tc, (MCi)		1.54E-07	1.54E-07	1.54E-07	1.54E-07	7.72E-11				
TRU, (MCi)		1.21E-06	1.21E-06	1.21E-06	1.21E-06	6.04E-10				
Total MCi		8.48E-05	8.48E-05	8.48E-05	8.48E-05	4.24E-08				
Ag2O, (MT)		4.12E-04	4.12E-04	4.11E-04	4.11E-04	2.06E-07				
Al2O3, (MT)		1.95E+01	1.95E+01	1.95E+01	1.95E+01	9.75E-03	1.16E+04			
Am2O3, (MT)		3.45E-08	3.45E-08	3.45E-08	3.45E-08	1.72E-11				
As2O5, (MT)		4.37E-04	4.37E-04	4.37E-04	4.37E-04	2.19E-07				
B2O3, (MT)		4.87E-03	4.87E-03	4.87E-03	4.87E-03	2.44E-06				
BaO, (MT)		8.86E-04	8.86E-04	8.86E-04	8.86E-04	4.43E-07				
BeO, (MT)		5.59E-05	5.59E-05	5.58E-05	5.58E-05	2.79E-08				
Bi2O3, (MT)		2.94E-01	2.94E-01	2.93E-01	2.93E-01	1.47E-04				
Cancrinite, (MT)										
CaO, (MT)		3.90E+01	3.90E+01	3.90E+01	3.90E+01	1.95E-02	3.84E+04			
CdO, (MT)		1.14E-02	1.14E-02	1.14E-02	1.14E-02	5.72E-06				
Ce2O3, (MT)		2.78E-01	2.78E-01	2.78E-01	2.78E-01	1.39E-04				
Cr2O3, (MT)		2.70E-01	2.70E-01	2.70E-01	2.70E-01	1.35E-04				
Cs2O, (MT)		8.95E-07	8.95E-07	8.95E-07	8.95E-07	4.48E-10				
CuO, (MT)		2.60E-04	2.60E-04	2.60E-04	2.60E-04	1.30E-07				
DCPD, (MT)										
Fe2O3, (MT)		3.78E+00	3.78E+00	3.78E+00	3.78E+00	1.89E-03				
H2O, (MT)		2.14E-07	2.14E-07	2.14E-07	2.14E-07	1.07E-10				
HgO, (MT)		2.09E-03	2.09E-03	2.09E-03	2.09E-03	1.05E-06				
K2O, (MT)		2.58E-02	2.58E-02	2.58E-02	2.58E-02	1.29E-05				
La2O3, (MT)		2.49E-02	2.49E-02	2.48E-02	2.48E-02	1.24E-05				
Li2O, (MT)		6.60E-05	6.60E-05	6.60E-05	6.60E-05	3.30E-08				
MgO, (MT)		1.98E-02	1.98E-02	1.98E-02	1.98E-02	9.92E-06				
MnO2, (MT)		2.33E-01	2.33E-01	2.33E-01	2.33E-01	1.17E-04				
MoO3, (MT)		1.04E-02	1.04E-02	1.04E-02	1.04E-02	5.21E-06				
Na2O, (MT)		9.75E+01	9.75E+01	9.75E+01	9.75E+01	4.88E-02				
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)		2.65E-01	2.65E-01	2.65E-01	2.65E-01	1.32E-04				
NiO, (MT)		1.07E-06	1.07E-06	1.07E-06	1.07E-06	5.36E-10				
NpO2, (MT)		6.59E-06	6.59E-06	6.59E-06	6.59E-06	3.30E-09				
OLIGOMER, (MT)										
P2O5, (MT)		3.72E+00	3.72E+00	3.71E+00	3.71E+00	1.86E-03				
PbO2, (MT)		1.36E-03	1.36E-03	1.36E-03	1.36E-03	6.80E-07				
POLY, (MT)										
PuO2, (MT)		5.48E-06	5.48E-06	5.48E-06	5.48E-06	2.74E-09				
S, (MT)										
SiO2, (MT)		2.18E+02	2.18E+02	2.18E+02	2.18E+02	1.09E-01	2.15E+05			

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	912	913	914	915	916	917	1000	1001	1002	1003
SO3, (MT)		6.29E+00	6.29E+00	6.29E+00	6.29E+00	3.15E-03				
SrO, (MT)		4.46E-06	4.46E-06	4.46E-06	4.46E-06	2.23E-09				
Tc2O7, (MT)		1.43E-05	1.43E-05	1.42E-05	1.42E-05	7.13E-09				
TiO2, (MT)		3.20E-05	3.20E-05	3.20E-05	3.20E-05	1.60E-08				
Tot Org Carbon, (MT)										
U3O8, (MT)		1.09E-03	1.09E-03	1.09E-03	1.09E-03	5.43E-07				
V2O5, (MT)		1.00E-04	1.00E-04	1.00E-04	1.00E-04	5.01E-08				
WO2, (MT)		1.10E-09	1.10E-09	1.10E-09	1.10E-09	5.52E-13				
WO3, (MT)		2.12E-04	2.12E-04	2.12E-04	2.12E-04	1.06E-07				
ZnO, (MT)		3.21E-02	3.21E-02	3.21E-02	3.21E-02	1.60E-05				
ZrO2, (MT)		7.07E-01	7.07E-01	7.06E-01	7.06E-01	3.53E-04				

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013
Volume, Total Liters	1.85E+10		1.43E-09	1.57E+03	3.07E+06			4.31E+07	4.53E+08	
Specific Gravity	1.00E+00		1.54E+00	1.39E+00	1.00E+00			1.00E+00	1.00E+00	
Total Mass Flow, (MT)	1.85E+07		2.19E-12	2.19E+00	3.07E+03			4.31E+04	4.53E+05	
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)	1.85E+07									
FeCN6-3, (MT)										
H+, (MT)				1.98E-02						
H2O, (MT)			1.10E-12	9.43E-01					4.53E+05	
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)								4.31E+04		
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)			6.30E-13							
NH3, (MT)					3.07E+03					
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)				1.23E+00						
O2, (MT)										
OH-, (MT)			4.66E-13							
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039
Volume, Total Liters										
Specific Gravity										
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Al+3, (MT)										
Cl-, (MT)										
Cl2, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
DCPD, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)										
Hg, (MT)										
Hg2, (MT)										
K+, (MT)										
Kerosene, MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO, (MT)										
NO2, (MT)										
NO2-, (MT)										
NO3-, (MT)										
O2, (MT)										
OH-, (MT)										
OLIGOMER, (MT)										
PTA-3, (MT)										
S, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
Cs2O, (MT)										
CuO, (MT)										
DCPD, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni(OH)3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
OLIGOMER, (MT)										
P2O5, (MT)										
PbO2, (MT)										
POLY, (MT)										
PuO2, (MT)										
S, (MT)										
SiO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
V2O5, (MT)										
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	1040	1041	1042	1532	1556	
Volume, Total Liters				-6.70E+06	4.14E+06	
Specific Gravity				-2.18E-01	1.23E+00	
Total Mass Flow, (MT)				1.46E+03	5.10E+05	
Cs and Ba, (MCi)				6.21E-06	6.56E-02	
Total MCi				6.21E-06	6.56E-02	
Al(OH)4-, (MT)						
Al+3, (MT)				1.42E+03	6.98E+02	
Cl-, (MT)				2.98E-02	3.15E+02	
Cl2, (MT)						
CO, (MT)						
CO2, (MT)						
Cr(OH)4-, (MT)						
Cr+3, (MT)				1.19E-02	1.26E+02	
Cs+, (MT)				7.57E-06	7.99E-04	
DCPD, (MT)						
FeCN6-3, (MT)					3.20E+02	
H+, (MT)						
H2O, (MT)				3.38E+01	3.75E+05	
Hg, (MT)						
Hg2, (MT)				1.81E-04	1.92E+00	
K+, (MT)					2.03E+01	
Kerosene, MT)						
Li+, (MT)					2.90E-02	
MnO2, (MT)					2.14E+01	
Mo+6, (MT)						
MoO4-2, (MT)					1.96E+00	
N2, (MT)						
Na+, (MT)				6.65E+00	7.02E+04	
NH3, (MT)					8.36E+00	
NH4+, (MT)					1.63E-02	
Ni+3, (MT)						
NO, (MT)						
NO2, (MT)						
NO2-, (MT)				8.87E-03	3.01E+02	
NO3-, (MT)				7.94E-02	7.07E+03	
O2, (MT)						
OH-, (MT)				4.67E+00	4.93E+04	
OLIGOMER, (MT)						
PTA-3, (MT)					5.33E-01	
S, (MT)						
SO4-2, (MT)				6.93E-01	7.47E+03	
Tot Org Carbon, (MT)				2.60E-05	2.74E-01	

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1040	1041	1042	1552	1556
Total Mass Flow, (MT)				1.54E+04	1.03E+03
Cs and Ba, (MCi)				3.09E-03	8.03E-06
Sr and Y, (MCi)				1.40E-02	4.30E-05
Tc, (MCi)				1.52E-04	4.69E-07
TRU, (MCi)				1.19E-03	3.57E-06
Total MCi				1.84E-02	5.51E-05
Ag2O, (MT)					4.07E-01
Al2O3, (MT)				1.99E+03	9.85E+02
Am2O3, (MT)				3.40E-05	7.26E-08
As2O5, (MT)					4.33E-01
B2O3, (MT)				4.80E+00	1.48E-02
BaO, (MT)				8.74E-01	2.69E-03
BeO, (MT)					5.53E-02
Bi2O3, (MT)				2.90E+02	8.92E-01
Cancrinite, (MT)				2.59E+03	7.98E+00
CaO, (MT)				2.07E+02	6.37E-01
CdO, (MT)				1.13E+01	3.47E-02
Ce2O3, (MT)				2.74E+02	8.44E-01
Cr2O3, (MT)				8.29E+01	2.55E-01
Cs2O, (MT)				3.99E-05	1.04E-07
CuO, (MT)					2.57E-01
DCPD, (MT)					
Fe2O3, (MT)				3.61E+03	1.11E+01
H2O, (MT)					2.11E-04
HgO, (MT)					
K2O, (MT)				1.15E+00	3.00E-03
La2O3, (MT)				2.45E+01	7.55E-02
Li2O, (MT)				2.94E-03	7.67E-06
MgO, (MT)				1.96E+01	6.03E-02
MnO2, (MT)				2.09E+02	6.42E-01
MoO3, (MT)				8.52E+00	2.62E-02
Na2O, (MT)				1.27E+03	3.32E+00
Ni(OH)3, (MT)					5.25E-08
Ni2FECN6, (MT)				2.33E-03	7.17E-06
Ni2O3, (MT)				2.61E+02	8.04E-01
NiO, (MT)					
NpO2, (MT)				6.50E-03	2.00E-05
OLIGOMER, (MT)					
P2O5, (MT)				3.66E+03	1.13E+01
PbO2, (MT)					1.35E+00
POLY, (MT)					1.80E-06
PuO2, (MT)				5.40E-03	1.66E-05
S, (MT)					
SiO2, (MT)				1.79E+02	5.50E-01

Table A-1A. Material Balance for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	1040	1041	1042	1552	1556
SO3, (MT)					
SrO, (MT)				4.40E-03	1.36E-05
Tc2O7, (MT)				1.41E-02	4.33E-05
TiO2, (MT)				3.15E-02	9.71E-05
Tot Org Carbon, (MT)				2.88E-06	8.87E-09
U3O8, (MT)				1.07E+00	3.30E-03
V2O5, (MT)					9.92E-02
WO2, (MT)				1.09E-06	
WO3, (MT)					2.10E-01
ZnO, (MT)				3.16E+01	9.74E-02
ZrO2, (MT)				6.97E+02	2.15E+00

This page intentionally left blank.

Table A-1B. Material Balance for Low-Level Waste Salt Grout (Option B) Flowsheet. (6 sheets)

(15-Sep-95, Clean Flowsheet, LLW Vit, Integrated Pretreatment-HLW Vit Feed, Chrome Removal, Table A-2A, 11_GJ_GL, Revision 2 14:34:35) 15:31:41.)

The material balance for the LLW salt grout treatment flowsheet (Figure C-3) shows stream 1 as its feed. The actual LLW streams which make up stream 1 are streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1, respectively).

This page intentionally left blank.

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name Liquid Components	1122	1556	PEWH2O	1	2	3	4	5	6	7
Volume, Total Liters		4.14E+08	2.54E+08	6.62E+08	6.37E+04	7.10E+08	7.10E+08	7.10E+08	1.22E+06	4.77E+07
Specific Gravity		1.23E+00	1.00E+00	1.16E+00	1.00E+00	1.15E+00	1.15E+00	1.15E+00	1.11E+00	1.11E+00
Total Mass Flow, (MT)		5.10E+05	2.54E+05	7.66E+05	6.37E+01	8.19E+05	8.19E+05	8.19E+05	1.36E+03	5.30E+04
Cs and Ba, (MCi)		6.56E-02		6.56E-02		6.89E-02	6.89E-02	6.89E-02	8.62E-05	3.36E-03
Total MCi		6.56E-02		6.56E-02		6.89E-02	6.89E-02	6.89E-02	8.62E-05	3.36E-03
Al+3, (MT)		6.98E+02		2.12E+03		2.22E+03	2.22E+03	2.22E+03	2.78E+00	1.08E+02
Cl-, (MT)		3.15E+02		3.15E+02		3.31E+02	3.31E+02	3.31E+02	4.13E-01	1.61E+01
Cr+3, (MT)		1.26E+02		1.26E+02		1.32E+02	1.32E+02	1.32E+02	1.65E-01	6.45E+00
Cs+, (MT)		7.99E-04		7.99E-04		8.40E-04	8.40E-04	8.40E-04	1.05E-06	4.09E-05
FeCN6-3, (MT)		3.20E+02		3.20E+02		1.28E+04	1.28E+04	1.28E+04	3.20E+02	1.25E+04
H2O, (MT)		3.75E+05	2.54E+05	6.29E+05		6.61E+05	6.61E+05	6.61E+05	8.26E+02	3.22E+04
Hg2, (MT)		1.92E+00		1.92E+00		7.67E+01	7.67E+01	7.67E+01	1.92E+00	7.47E+01
K+, (MT)		2.03E+01		2.03E+01		2.13E+01	2.13E+01	2.13E+01	2.66E-02	1.04E+00
Li+, (MT)		2.90E-02		2.90E-02		3.04E-02	3.04E-02	3.04E-02	3.80E-05	1.48E-03
MnO2, (MT)		2.14E+01		2.14E+01		8.54E+02	8.54E+02	8.54E+02	2.13E+01	8.32E+02
MoO4-2, (MT)		1.96E+00		1.96E+00		7.85E+01	7.85E+01	7.85E+01	1.96E+00	7.66E+01
N2, (MT)					4.78E+01	4.78E+01				
Na+, (MT)		7.02E+04		7.02E+04		7.38E+04	7.38E+04	7.38E+04	9.22E+01	3.60E+03
NH3, (MT)		8.36E+00		8.36E+00		3.34E+02	3.34E+02	3.34E+02	8.36E+00	3.26E+02
NH4+, (MT)		1.63E-02		1.63E-02		6.52E-01	6.52E-01	6.52E-01	1.63E-02	6.36E-01
NO2-, (MT)		3.01E+02		3.01E+02		3.16E+02	3.16E+02	3.16E+02	3.95E-01	1.54E+01
NO3-, (MT)		7.07E+03		7.07E+03		7.43E+03	7.43E+03	7.43E+03	9.29E+00	3.62E+02
O2, (MT)					1.59E+01	1.59E+01				
OH-, (MT)		4.93E+04		4.93E+04		5.19E+04	5.19E+04	5.19E+04	6.48E+01	2.53E+03
PTA-3, (MT)		5.33E-01		5.33E-01		5.60E-01	5.60E-01	5.60E-01	7.00E-04	2.73E-02
SO4-2, (MT)		7.47E+03		7.47E+03		7.85E+03	7.85E+03	7.85E+03	9.81E+00	3.83E+02
Total Org Carbon, (M		2.74E-01		2.74E-01		2.88E-01	2.88E-01	2.88E-01	3.60E-04	1.41E-02

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name / Solid Components	1122	1556	PIX3H2O	1	2	3	4	5	6	7
Total Mass Flow, (MT)		1.03E+03		1.65E+04	7.36E+05	7.53E+05	7.53E+05	7.53E+05	1.52E+06	
Cs and Ba, (MCi)		8.03E-06		3.09E-03		3.09E-03	3.09E-03	3.09E-03	6.86E-02	
Sr and Y, (MCi)		4.30E-05		1.40E-02		1.40E-02	1.40E-02	1.40E-02	1.40E-02	
Tc, (MCi)		4.69E-07		1.53E-04		1.53E-04	1.53E-04	1.53E-04	1.53E-04	
TRU, (MCi)		3.57E-06		1.20E-03		1.20E-03	1.20E-03	1.20E-03	1.20E-03	
Total MCi		5.51E-05		1.84E-02		1.84E-02	1.84E-02	1.84E-02	8.39E-02	
Ag2O, (MT)		4.07E-01		4.07E-01		4.07E-01	4.07E-01	4.07E-01	4.07E-01	
Al+3, (MT)									2.11E+03	
Al2O3, (MT)		9.85E+02		2.97E+03		2.97E+03	2.97E+03	2.97E+03	2.97E+03	
Am2O3, (MT)		7.26E-08		3.41E-05		3.41E-05	3.41E-05	3.41E-05	3.41E-05	
As2O5, (MT)		4.33E-01		4.33E-01		4.33E-01	4.33E-01	4.33E-01	4.33E-01	
B2O3, (MT)		1.48E-02		4.82E+00		4.82E+00	4.82E+00	4.82E+00	4.82E+00	
BaO, (MT)		2.69E-03		8.76E-01		8.76E-01	8.76E-01	8.76E-01	8.76E-01	
BeO, (MT)		5.53E-02		5.53E-02		5.53E-02	5.53E-02	5.53E-02	5.53E-02	
Bi2O3, (MT)		8.92E-01		2.90E+02		2.90E+02	2.90E+02	2.90E+02	2.90E+02	
BLAST-SL, (MT)					2.06E+05	2.06E+05	2.06E+05	2.06E+05	2.06E+05	
Cancrinite, (MT)		7.98E+00		2.60E+03		2.60E+03	2.60E+03	2.60E+03	2.60E+03	
CaO, (MT)		6.37E-01		2.08E+02		2.08E+02	2.08E+02	2.08E+02	2.08E+02	
CdO, (MT)		3.47E-02		1.13E+01		1.13E+01	1.13E+01	1.13E+01	1.13E+01	
Ce2O3, (MT)		8.44E-01		2.75E+02		2.75E+02	2.75E+02	2.75E+02	2.75E+02	
Cl-, (MT)									3.14E+02	
Cr+3, (MT)									1.26E+02	
Cr2O3, (MT)		2.55E-01		8.31E+01		8.31E+01	8.31E+01	8.31E+01	8.31E+01	
Cs+, (MT)									7.98E-04	
Cs2O, (MT)		1.04E-07		4.00E-05		4.00E-05	4.00E-05	4.00E-05	4.00E-05	
CST, (MT)		5.18E-07		5.18E-07		5.18E-07	5.18E-07	5.18E-07	5.18E-07	
CuO, (MT)		2.57E-01		2.57E-01		2.57E-01	2.57E-01	2.57E-01	2.57E-01	
Fe2O3, (MT)		1.11E+01		3.62E+03		3.62E+03	3.62E+03	3.62E+03	3.62E+03	
FLY-ASH, (MT)					2.06E+05	2.06E+05	2.06E+05	2.06E+05	2.06E+05	
H2O, (MT)		2.11E-04		2.11E-04		2.11E-04	2.11E-04	2.11E-04	6.28E+05	
K+, (MT)									2.02E+01	
K2O, (MT)		3.00E-03		1.15E+00		1.15E+00	1.15E+00	1.15E+00	1.15E+00	
La2O3, (MT)		7.55E-02		2.46E+01		2.46E+01	2.46E+01	2.46E+01	2.46E+01	
Li+, (MT)									2.89E-02	
Li2O, (MT)		7.67E-06		2.95E-03		2.95E-03	2.95E-03	2.95E-03	2.95E-03	
Limestone, (MT)					2.95E+05	2.95E+05	2.95E+05	2.95E+05	2.95E+05	
MgO, (MT)		6.03E-02		1.96E+01		1.96E+01	1.96E+01	1.96E+01	1.96E+01	
MnO2, (MT)		6.42E-01		2.09E+02		2.09E+02	2.09E+02	2.09E+02	2.09E+02	
MoO3, (MT)		2.62E-02		8.55E+00		8.55E+00	8.55E+00	8.55E+00	8.55E+00	
Na+, (MT)									7.01E+04	
Na2O, (MT)		3.32E+00		1.28E+03		1.28E+03	1.28E+03	1.28E+03	1.28E+03	
Ni(OH)3, (MT)		5.25E-08		5.25E-08		5.25E-08	5.25E-08	5.25E-08	5.25E-08	
Ni2FeCN6, (MT)		7.17E-06		2.34E-03		2.34E-03	2.34E-03	2.34E-03	2.34E-03	
Ni2O3, (MT)		8.04E-01		2.62E+02		2.62E+02	2.62E+02	2.62E+02	2.62E+02	

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name Solid Components	1122	1556	PX3120	1	2	3	4	5	6	7
NO2-, (MT)									3.00E+02	
NO3-, (MT)									7.06E+03	
NpO2, (MT)		2.00E-05		6.52E-03		6.52E-03	6.52E-03	6.52E-03	6.52E-03	
OH-, (MT)									4.93E+04	
P2O5, (MT)		1.13E+01		3.68E+03		3.68E+03	3.68E+03	3.68E+03	3.68E+03	
PbO2, (MT)		1.35E+00		1.35E+00		1.35E+00	1.35E+00	1.35E+00	1.35E+00	
POLY, (MT)		1.80E-06		1.80E-06		1.80E-06	1.80E-06	1.80E-06	1.80E-06	
PORTL and , (MT)					2.95E+04	2.95E+04	2.95E+04	2.95E+04	2.95E+04	
PTA-3, (MT)									5.32E-01	
PuO2, (MT)		1.66E-05		5.42E-03		5.42E-03	5.42E-03	5.42E-03	5.42E-03	
SiO2, (MT)		5.50E-01		1.79E+02		1.79E+02	1.79E+02	1.79E+02	1.79E+02	
SO4-2, (MT)									7.46E+03	
SrO, (MT)		1.36E-05		4.41E-03		4.41E-03	4.41E-03	4.41E-03	4.41E-03	
Tc2O7, (MT)		4.33E-05		1.41E-02		1.41E-02	1.41E-02	1.41E-02	1.41E-02	
TiO2, (MT)		9.71E-05		3.16E-02		3.16E-02	3.16E-02	3.16E-02	3.16E-02	
Total OrgCarbon, (M		8.87E-09		2.89E-06		2.89E-06	2.89E-06	2.89E-06	2.74E-01	
U3O8, (MT)		3.30E-03		1.08E+00		1.08E+00	1.08E+00	1.08E+00	1.08E+00	
V2O5, (MT)		9.92E-02		9.92E-02		9.92E-02	9.92E-02	9.92E-02	9.92E-02	
WO2, (MT)				1.09E-06		1.09E-06	1.09E-06	1.09E-06	1.09E-06	
WO3, (MT)		2.10E-01		2.10E-01		2.10E-01	2.10E-01	2.10E-01	2.10E-01	
ZnO, (MT)		9.74E-02		3.17E+01		3.17E+01	3.17E+01	3.17E+01	3.17E+01	
ZrO2, (MT)		2.15E+00		6.99E+02		6.99E+02	6.99E+02	6.99E+02	6.99E+02	

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name / Liquid Components	10	11	12	13	14	15	16
Volume, Total Liters	2.42E+07	4.44E+06	1.33E+05	2.87E+07	2.88E+07	2.88E+07	3.52E+03
Specific Gravity	1.00E+00	1.00E+00	1.06E+00	1.00E+00	1.00E+00	1.00E+00	4.12E+00
Total Mass Flow, (MT)	2.42E+04	4.44E+03	1.44E+02	2.87E+04	2.88E+04	2.88E+04	1.45E+01
Cs and Ba, (MCi)			6.89E-06		6.89E-06		6.20E-06
Total MCi			6.89E-06		6.89E-06		6.20E-06
Al+3, (MT)			2.22E-01		2.22E-01	2.00E-08	2.22E-01
Cl-, (MT)			3.31E-02		3.31E-02	2.98E-10	3.31E-02
Cr+3, (MT)			1.32E-02		1.32E-02	1.19E-10	1.32E-02
Cs+, (MT)			8.40E-08		8.40E-08		7.56E-08
FeCN6-3, (MT)							
H2O, (MT)			6.61E+01		6.61E+01	6.61E+01	
Hg2, (MT)							
K+, (MT)			2.13E-03		2.13E-03	1.92E-11	2.13E-03
Li+, (MT)			3.04E-06		3.04E-06		3.04E-06
MnO2, (MT)			8.54E-02		8.54E-02	7.68E-10	8.54E-02
MoO4-2, (MT)							
N2, (MT)	1.86E+04	3.41E+03	4.78E+01	2.20E+04	2.21E+04	2.21E+04	
Na+, (MT)			7.38E+00		7.38E+00	6.64E-08	7.38E+00
NH3, (MT)							
NH4+, (MT)							
NO2-, (MT)			3.16E-02		3.16E-02	2.84E-10	3.16E-02
NO3-, (MT)			7.43E-01		7.43E-01	6.69E-09	7.43E-01
O2, (MT)	5.63E+03	1.03E+03	1.59E+01	6.66E+03	6.68E+03	6.68E+03	
OH-, (MT)			5.19E+00		5.19E+00	4.67E-08	5.19E+00
PTA-3, (MT)			5.60E-05		5.60E-05		5.60E-05
SO4-2, (MT)			7.85E-01		7.85E-01	7.06E-09	7.85E-01
Total Org Carbon, (M)			2.88E-05		2.88E-05		2.88E-05

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name Solid Components	10	11	12	13	14	15	16
Total Mass Flow, (MT)			7.39E+01		7.39E+01	6.65E-07	7.39E+01
Cs and Ba, (MCi)							
Sr and Y, (MCi)							
Tc, (MCi)							
TRU, (MCi)							
Total MCi							
Ag2O, (MT)							
Al+3, (MT)							
Al2O3, (MT)							
Am2O3, (MT)							
As2O5, (MT)							
B2O3, (MT)							
BaO, (MT)							
BeO, (MT)							
Bi2O3, (MT)							
BLAST-SL, (MT)			2.06E+01		2.06E+01	1.86E-07	2.06E+01
Cancrinite, (MT)			2.60E-01		2.60E-01	2.34E-09	2.60E-01
CaO, (MT)							
CdO, (MT)							
Ce2O3, (MT)							
Cl-, (MT)							
Cr+3, (MT)							
Cr2O3, (MT)							
Cs+, (MT)							
Cs2O, (MT)							
CST, (MT)							
CuO, (MT)							
Fe2O3, (MT)							
FLY-ASH, (MT)			2.06E+01		2.06E+01	1.86E-07	2.06E+01
H2O, (MT)			2.11E-08		2.11E-08	6.34E-12	
K+, (MT)							
K2O, (MT)							
La2O3, (MT)							
Li+, (MT)							
Li2O, (MT)							
Limestone, (MT)			2.95E+01		2.95E+01	2.65E-07	2.95E+01
MgO, (MT)							
MnO2, (MT)			2.09E-02		2.09E-02	1.88E-10	2.09E-02
MoO3, (MT)							
Na+, (MT)							
Na2O, (MT)							
Ni(OH)3, (MT)							
Ni2FeCN6, (MT)			2.34E-07		2.34E-07		2.11E-07
Ni2O3, (MT)							

Table A-1B. Material Balance for Low-Level Waste Option B Grout Flowsheet.

Stream Name Solid Components	10	11	12	13	14	15	16
NO2-, (MT)							
NO3-, (MT)							
NpO2, (MT)							
OH-, (MT)							
P2O5, (MT)							
PbO2, (MT)							
POLY, (MT)							
PORTL and , (MT)			2.95E+00		2.95E+00	2.65E-08	2.95E+00
PTA-3, (MT)							
PuO2, (MT)							
SiO2, (MT)							
SO4-2, (MT)							
SrO, (MT)							
Tc2O7, (MT)							
TiO2, (MT)							
Total OrgCarbon, (M			2.89E-10		2.89E-10		
U3O8, (MT)							
V2O5, (MT)							
WO2, (MT)							
WO3, (MT)							
ZnO, (MT)							
ZrO2, (MT)							

Table A-2. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids Removal from Recycle Sodium Hydroxide. (5 sheets)

(15-Sep-95, Clean Flowsheet, Caustic Recycle with Chrome Removal, Table A-2, XXX11_GJ, Revision 2, 14:33:55)

The material balance summary for the integrated pretreatment/HLW vitrification flowsheet with chromium reduction and removal added along with solids removal from recycle sodium hydroxide uses the processes shown on sheet 35B in Figure C-1, replacing those on sheet 35A.

This page intentionally left blank.

Table A-2. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids removal from Recycle Sodium Hydroxide.

Stream Name / Liquid Components	1322	1314	1318	1344	1356
Volume, Total Liters	3.51E+08		1.41E+07		4.18E+08
Specific Gravity	1.40E+00		1.37E+00		1.25E+00
Total Mass Flow, (MT)	4.92E+05		1.94E+04		5.23E+05
Cs and Ba, (MCi)	8.47E-04		7.48E+01		6.67E-02
Sr and Y, (MCi)	1.38E-02		1.38E+02		
Tc, (MCi)	6.46E-06		3.19E-02		
TRU, (MCi)	1.06E-03		2.06E-01		
Total MCi	1.57E-02		2.13E+02		6.67E-02
Ag+, (MT)	1.38E+00		4.60E-05		
Al(OH)4-, (MT)	8.85E-02		2.06E-07		
Al+3, (MT)	2.51E+02		2.14E-02		2.35E+03
Am+3, (MT)	6.04E-06		3.02E-02		
As+5, (MT)	4.97E-01		1.66E-05		
B+3, (MT)	9.93E-01		3.32E-05		
Ba+2, (MT)	3.09E-04		3.09E+00		
Be+2, (MT)	7.60E-03		2.54E-07		
Bi+3, (MT)	1.95E+00		2.02E-01		
Carbon14, (MT)	4.52E-04		1.51E-08		
C2O4-2, (MT)	2.26E+04				
Ca+2, (MT)	1.50E+02		5.01E-03		
Cancrinite, (MT)	2.42E+02		8.23E-02		
Cd+2, (MT)	7.92E+00		2.65E-04		
Ce+3, (MT)	4.75E-02		2.69E-01		
Cl-, (MT)	8.52E+00		1.28E-04		3.14E+02
Cr(OH)4-, (MT)	2.18E-03				
Cr+3, (MT)	1.32E+02		2.69E-03		2.83E-01
Cs+, (MT)	1.03E-05		9.11E-01		8.13E-04
Cu+2, (MT)	7.45E-01		2.49E-05		
DTPA-3, (MT)			2.98E-01		
F-, (MT)	2.65E+04		5.93E+01		
Fe+3, (MT)	7.75E+02		9.33E-02		
FeCN6-3, (MT)	6.61E+00		1.54E-05		3.20E+02
FESA, (MT)	7.52E+03				
H+, (MT)	2.45E+03		1.66E+02		8.43E-02
H2, (MT)			3.53E-08		
H2O, (MT)	4.25E+05		8.73E+03		3.86E+05
H2O2, (MT)	4.66E+02		3.00E+02		6.92E-01
Hg, (MT)			4.99E-06		
Hg+2, (MT)	9.01E-03		3.01E-07		
Hg2, (MT)	3.06E-02				1.91E+00
I-, (MT)	2.02E+01		6.75E-04		
K+, (MT)	2.13E+01		7.03E-04		2.02E+01

Table A-2. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids removal from Recycle Sodium Hydroxide.

Stream Name Liquid Components	1522	1514	1518	1544	1556
La+3, (MT)	4.24E-03		2.41E-02		
Li+, (MT)	2.50E-02		8.22E-07		2.89E-02
Mg+2, (MT)	1.10E+01		3.68E-04		
Mn+4, (MT)	1.32E+02		4.42E-03		
MnO2, (MT)	3.32E-02				2.13E+01
Mo+6, (MT)	8.87E-01		2.70E-05		
MoO4-2, (MT)	4.06E-02		9.42E-08		1.96E+00
N2, (MT)					1.88E+01
Na+, (MT)	2.75E+03		7.22E-01		7.00E+04
NH2OH, (MT)	2.49E-01		5.78E-07		1.56E+01
NH3, (MT)	1.36E-01		3.17E-07		8.50E+00
NH4+, (MT)	1.66E-02		6.91E-09		1.63E-02
Ni+3, (MT)	1.88E+02		7.67E-04		
NO2-, (MT)					3.06E+02
NO3-, (MT)	1.83E+03		1.00E+04		7.18E+03
Np+4, (MT)	5.34E-03		1.46E-01		
OH-, (MT)			2.56E-01		4.92E+04
Pb+4, (MT)	3.28E+00		1.10E-04		
PO4-3, (MT)	2.46E+02		7.92E-03		
POLY, (MT)			3.99E-04		2.23E-04
PTA-3, (MT)	5.41E-01		1.78E-05		5.32E-01
Pu+4, (MT)	4.54E-03		4.49E-01		
Si+4, (MT)	7.89E+01		2.65E-03		
SO4-2, (MT)	1.19E+02		3.99E-04		7.18E+03
Sr+2, (MT)	3.68E-03		3.68E+01		
TcO4-, (MT)	6.24E-04		3.07E+00		
Ti+4, (MT)	1.90E-02		6.79E-06		
Tot Org Carbon, (MT)	1.16E+02		3.87E-03		2.79E-01
UO2+2, (MT)	1.76E-01		1.82E+00		
V+5, (MT)	1.88E-01		6.28E-06		
W+6, (MT)	1.37E-05				
Zn+2, (MT)	9.44E-01		7.24E-02		
Zr+4, (MT)	5.10E+02		5.27E-01		
ZrO2:2H2O, (MT)	3.83E-05				

Table A-2. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids removal from Recycle Sodium Hydroxide.

Stream Name / Solid Components	1122	1314	1318	1344	1556
Total Mass Flow, (MT)	4.38E+00	8.67E+01	4.84E+03	2.53E+02	9.28E-02
Cs and Ba, (MCi)	1.93E-05		1.50E-01	7.46E+01	
Sr and Y, (MCi)	3.51E-04		3.36E-01	1.37E+02	4.37E-08
Tc, (MCi)	1.49E-08		6.50E-05	3.17E-02	4.77E-10
TRU, (MCi)	6.20E-07		7.11E-04	2.06E-01	3.40E-09
Total MCi	3.71E-04		4.87E-01	2.12E+02	4.76E-08
Ag+, (MT)	3.49E-06		6.58E-04		
Ag2O, (MT)	1.21E-06		1.35E-03	2.10E-03	3.93E-04
Al+3, (MT)	3.99E-03		2.88E+00		
Al2O3, (MT)			9.21E-01	3.68E+01	8.38E-03
Am+3, (MT)	7.67E-08		1.45E-05		
Am2O3, (MT)			6.52E-05	3.32E-02	
APM-, (MT)			3.45E-03	3.44E-03	
As+5, (MT)	1.26E-06		2.38E-04		
As2O5, (MT)	1.28E-06		1.43E-03	1.82E-03	4.18E-04
B+3, (MT)	2.52E-06		4.75E-04		
B2O3, (MT)	4.62E-08	1.26E+01	2.49E-02	1.26E+01	1.50E-05
Ba+2, (MT)	7.84E-06		1.48E-03		
BaO, (MT)			6.78E-03	3.45E+00	2.73E-06
Be+2, (MT)	1.93E-08		3.64E-06		
BeO, (MT)	1.64E-07		1.83E-04	1.93E-04	5.33E-05
Bi+3, (MT)	4.97E-04		9.36E-02		
Bi2O3, (MT)	2.78E-06		3.75E-03	3.33E-01	9.06E-04
Carbon14, (MT)			2.16E-07		
Ca+2, (MT)	3.80E-04		7.16E-02		
Cancrinite, (MT)	9.68E-02		1.02E+02		8.02E-03
CaO, (MT)	1.99E-06		2.43E-03	1.09E-01	6.47E-04
Cd+2, (MT)	2.01E-05		3.79E-03		
CdO, (MT)	1.09E-07		1.30E-04	4.75E-03	3.53E-05
Ce+3, (MT)	6.03E-04		1.14E-01		
Ce2O3, (MT)	2.63E-06		3.82E-03	4.52E-01	8.58E-04
Cl-, (MT)	8.85E-06		1.67E-03		
CO3-2, (MT)	5.69E-04		1.07E-01		
Cr+3, (MT)	4.56E-04		3.29E-01		
Cr2O3, (MT)	1.26E-04		1.42E-01	6.25E-01	4.11E-02
Cs+, (MT)	2.35E-07		4.42E-05		
Cs2O, (MT)			1.89E-03	9.64E-01	
Cu+2, (MT)	1.89E-06		3.57E-04		
CuO, (MT)	7.61E-07		8.51E-04	1.33E-03	2.48E-04
F-, (MT)	1.51E-04		2.85E-02		
Fe+3, (MT)	2.68E-03		1.93E+00		
Fe2O3, (MT)	3.35E-05	1.47E+00	4.72E-02	5.05E+00	1.09E-02

Table A-2. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids removal from Recycle Sodium Hydroxide.

Stream Name Solid Component	1122	1314	1318	1344	1556
H2O, (MT)	9.56E-04		1.10E+00	1.09E+00	2.05E-07
Hg+2, (MT)			4.30E-06		
I-, (MT)	5.12E-05		9.65E-03		
K+, (MT)	5.33E-05		1.00E-02		
K2O, (MT)			3.57E-05	1.29E-02	3.00E-06
La+3, (MT)	5.38E-05		1.01E-02		
La2O3, (MT)	2.36E-07		3.42E-04	4.04E-02	7.67E-05
Li+, (MT)	6.23E-08		1.17E-05		
Li2O, (MT)		2.53E+00	4.96E-03	2.53E+00	7.67E-09
Mg+2, (MT)	2.79E-05		5.26E-03		
MgO, (MT)	1.88E-07		2.28E-04	9.54E-03	6.12E-05
MnO2, (MT)	5.30E-04		1.00E-01	1.07E-01	6.46E-04
Mo+6, (MT)	2.03E-06		3.83E-04		
MoO3, (MT)	8.20E-08		9.26E-05	7.06E-04	2.67E-05
Na+, (MT)	2.34E-02		4.22E+00		
Na2O, (MT)	9.92E-06		7.00E-02	3.00E+01	3.23E-03
Ni+3, (MT)	2.69E-05		5.07E-03		
Ni2FECN6, (MT)	2.37E-03		2.64E+00		
Ni2O3, (MT)	2.51E-06		2.82E-03	1.10E-02	8.17E-04
NiO, (MT)			2.35E-03	1.20E+00	
NO2-, (MT)	1.87E-04		3.53E-02		
Np+4, (MT)	5.05E-07		3.64E-04		
NpO2, (MT)			3.26E-04	1.66E-01	1.92E-08
OH-, (MT)	4.24E+00		4.72E+03		
P2O5, (MT)	3.52E-05		3.95E-02	1.30E-01	1.15E-02
P2O5:24W, (MT)	1.32E-06		2.49E-04		
Pb+4, (MT)	8.32E-06		1.57E-03		
PbO2, (MT)	3.99E-06		4.45E-03	6.38E-03	1.30E-03
PO4-3, (MT)	5.99E-04		1.13E-01		
POLY, (MT)	8.08E-06		5.33E-02		
Pu+4, (MT)	1.57E-06		1.13E-03		
PuO2, (MT)			1.00E-03	5.11E-01	1.69E-08
Si+4, (MT)	2.00E-04		3.78E-02		
SiO2, (MT)	1.72E-06	7.00E+01	2.10E-01	1.06E+02	5.59E-04
SO3, (MT)			3.71E-06	1.90E-03	
SO4-2, (MT)	9.96E-06		1.88E-03		
Sr+2, (MT)	9.34E-05		1.76E-02		
SrO, (MT)			8.51E-02	4.33E+01	1.38E-08
Tc2O7, (MT)			5.74E-03	2.92E+00	4.40E-08
TcO4-, (MT)	1.44E-06		2.71E-04		
TiO2, (MT)			3.76E-07	1.17E-05	9.87E-08
Tot Org Carbon, (MT)	2.93E-04		5.53E-02		

Table A-2. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Chromium Removal and Solids removal from Recycle Sodium Hydroxide.

Stream Name Solid Components	1122	1314	1318	1344	1556
U3O8, (MT)			1.18E-05	1.18E-05	3.35E-06
UO2+2, (MT)	4.22E-03		7.95E-01		
UO3, (MT)			5.44E-03	2.77E+00	
V+5, (MT)	4.76E-07		8.97E-05		
V2O5, (MT)	2.94E-07		3.28E-04	4.99E-04	9.57E-05
WO2, (MT)			4.10E-07	2.26E-04	
WO3, (MT)	6.21E-07		6.93E-04	6.92E-04	2.02E-04
Zn+2, (MT)	2.40E-06		4.52E-04		
ZnO, (MT)	3.04E-07		5.17E-04	9.10E-02	9.90E-05
Zr+4, (MT)	7.02E-04		1.32E-01		
ZrO2, (MT)	6.69E-06		9.51E-03	1.05E+00	2.18E-03
ZrO2:2H2O, (MT)	1.04E-03		1.95E-01		

This page intentionally left blank.

Table A-2A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet. (3 sheets)

(15-Sep-95, Clean Flowsheet, LLW Vit, Integrated Pretreatment-HLW Vit Feed, Chrome Removal, Table A-2A, 11_GJ_GL, Revision 2, 14:34:35)

This page intentionally left blank.

Table A-2A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name / Liquid Components	233	406	407	411	441
Volume, Total Liters	4.27E+08	3.24E+08			
Specific Gravity	1.22E+00	1.30E+00			
Total Mass Flow, (MT)	5.23E+05	4.20E+05			
Cs and Ba, (MCi)	6.68E-02	6.68E-02			
Total MCi	6.68E-02	6.68E-02			
Al(OH)4-, (MT)	8.28E+03	8.28E+03			
Cl-, (MT)	3.14E+02	3.14E+02			
Cr(OH)4-, (MT)	6.58E-01	6.58E-01			
Cs+, (MT)	8.13E-04	8.13E-04			
FeCN6-3, (MT)	3.20E+02	3.20E+02			
H+, (MT)	8.43E-02				
H2O, (MT)	3.86E+05	2.83E+05			
Hg, (MT)	1.91E+00	1.91E+00			
K+, (MT)	2.02E+01	2.02E+01			
Li+, (MT)	2.89E-02	2.89E-02			
MnO2, (MT)	2.13E+01	2.13E+01			
Mo+6, (MT)	1.18E+00	1.18E+00			
N2, (MT)	1.88E+01				
Na+, (MT)	7.00E+04	7.00E+04			
NH2OH, (MT)	1.56E+01				
NH3, (MT)	8.51E+00	8.51E+00			
NO2-, (MT)	3.06E+02	3.06E+02			
NO3-, (MT)	7.18E+03	7.18E+03			
OH-, (MT)	4.33E+04	4.33E+04			
POLY, (MT)	2.23E-04	2.23E-04			
SO4-2, (MT)	7.18E+03	7.18E+03			
Tot Org Carbon, (MT)	2.79E-01	2.79E-01			

Table A-2A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
Total Mass Flow, (MT)	1.58E+04	2.40E+04	2.64E+05	3.93E+05	5.06E+05
Cs and Ba, (MCi)	3.09E-03	4.58E-03		7.12E-02	6.97E-02
Sr and Y, (MCi)	1.40E-02	1.43E-02		1.43E-02	1.40E-02
Tc, (MCi)	1.52E-04	1.55E-04		1.55E-04	1.52E-04
TRU, (MCi)	1.19E-03	1.22E-03		1.22E-03	1.19E-03
Total MCi	1.84E-02	2.02E-02		8.68E-02	8.50E-02
Ag2O, (MT)	3.93E-04	4.01E-04		4.01E-04	3.93E-04
Al2O3, (MT)	2.64E+03	3.05E+03	1.14E+04	1.96E+04	1.92E+04
Am2O3, (MT)	3.40E-05	3.48E-05		3.48E-05	3.40E-05
As2O5, (MT)	4.18E-04	4.27E-04		4.27E-04	4.18E-04
B2O3, (MT)	4.80E+00	4.90E+00		4.90E+00	4.80E+00
BaO, (MT)	8.73E-01	8.92E-01		8.92E-01	8.73E-01
BeO, (MT)	5.33E-05	5.45E-05		5.45E-05	5.33E-05
Bi2O3, (MT)	2.89E+02	2.95E+02		2.95E+02	2.89E+02
Cancrinite, (MT)	2.56E+03	2.56E+03			
CaO, (MT)	2.07E+02	1.03E+03	3.83E+04	3.93E+04	3.85E+04
CdO, (MT)	1.13E+01	1.15E+01		1.15E+01	1.13E+01
Ce2O3, (MT)	2.74E+02	2.80E+02		2.80E+02	2.74E+02
Cr2O3, (MT)	7.61E+01	7.77E+01		7.82E+01	7.65E+01
CsO, (MT)	3.99E-05	5.91E-05		9.20E-04	9.01E-04
CuO, (MT)	2.48E-04	2.53E-04		2.53E-04	2.48E-04
DCPD, (MT)					1.21E+05
Fe2O3, (MT)	3.48E+03	3.56E+03		3.68E+03	3.60E+03
H2O, (MT)	2.05E-07	2.10E-07		2.10E-07	2.05E-07
HgO, (MT)		4.41E-02		2.11E+00	2.07E+00
K2O, (MT)	1.13E+00	1.67E+00		2.61E+01	2.55E+01
La2O3, (MT)	2.45E+01	2.50E+01		2.50E+01	2.45E+01
Li2O, (MT)	2.89E-03	4.28E-03		6.66E-02	6.52E-02
MgO, (MT)	1.96E+01	2.00E+01		2.00E+01	1.96E+01
MnO2, (MT)	2.06E+02	2.11E+02		2.32E+02	2.28E+02
MoO3, (MT)	8.51E+00	8.73E+00		1.05E+01	1.03E+01
Na2O, (MT)	1.22E+03	3.27E+03		9.82E+04	9.61E+04
Ni2FECN6, (MT)	2.35E-03	2.35E-03			
Ni2O3, (MT)	2.61E+02	2.67E+02		2.67E+02	2.61E+02
NiO, (MT)		2.27E-05		1.09E-03	1.06E-03
NpO2, (MT)	6.14E-03	6.27E-03		6.27E-03	6.14E-03
OLIGOMER, (MT)					4.39E-03
P2O5, (MT)	3.66E+03	3.74E+03		3.74E+03	3.66E+03
PbO2, (MT)	1.30E-03	1.33E-03		1.33E-03	1.30E-03
PuO2, (MT)	5.40E-03	5.51E-03		5.51E-03	5.40E-03
S, (MT)					1.67E-01
SiO2, (MT)	1.78E+02	4.78E+03	2.14E+05	2.20E+05	2.16E+05
SO3, (MT)		1.28E+02		6.11E+03	5.99E+03
SrO, (MT)	4.40E-03	4.49E-03		4.49E-03	4.40E-03

Table A-2A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
Tc2O7, (MT)	1.40E-02	1.43E-02		1.43E-02	1.40E-02
TiO2, (MT)	3.15E-02	3.22E-02		3.22E-02	3.15E-02
Tot Org Carbon, (MT)	2.91E-06	2.91E-06			
U3O8, (MT)	1.07E+00	1.09E+00		1.09E+00	1.07E+00
V2O5, (MT)	9.57E-05	9.78E-05		9.78E-05	9.57E-05
WO2, (MT)	1.10E-06	1.13E-06		1.13E-06	1.10E-06
WO3, (MT)	2.02E-04	2.07E-04		2.07E-04	2.02E-04
ZnO, (MT)	3.16E+01	3.23E+01		3.23E+01	3.16E+01
ZrO2, (MT)	6.96E+02	7.11E+02		7.11E+02	6.96E+02

This page intentionally left blank.

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet. (6 sheets)

(15-Sep-95, Clean Flowsheet, LLW Option B Grout Flowsheet, George Jansen Chrome Removal, Table A-2B, 11_GJ_GR, Revision 2, 14:35:11)

The material balance summary for the LLW salt grout treatment flowsheet (Figure C-3) is based on the LLW streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35b in Figure C-1) with chromium reduction and removal added along with solids removal from recycle sodium hydroxide.

This page intentionally left blank.

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name Liquid Components	1122	1336	FDGH2O	1	2	3	4	5	6	7
Volume, Total Liters		4.18E+08	2.41E+08	6.59E+08	6.35E+04	7.06E+08	7.06E+08	7.06E+08	1.22E+06	4.76E+07
Specific Gravity		1.25E+00	1.00E+00	1.16E+00	1.00E+00	1.16E+00	1.16E+00	1.16E+00	1.13E+00	1.13E+00
Total Mass Flow, (MT)		5.23E+05	2.41E+05	7.64E+05	6.35E+01	8.18E+05	8.18E+05	8.18E+05	1.37E+03	5.35E+04
Cs and Ba, (MCi)		6.67E-02		6.68E-02		7.02E-02	7.02E-02	7.02E-02	8.77E-05	3.42E-03
Total MCi		6.67E-02		6.68E-02		7.02E-02	7.02E-02	7.02E-02	8.77E-05	3.42E-03
Al+3, (MT)		2.35E+03		2.35E+03		2.47E+03	2.47E+03	2.47E+03	3.09E+00	1.21E+02
Cl-, (MT)		3.14E+02		3.14E+02		3.30E+02	3.30E+02	3.30E+02	4.13E-01	1.61E+01
Cr+3, (MT)		2.83E-01		2.85E-01		3.00E-01	3.00E-01	3.00E-01	3.75E-04	1.46E-02
Cs+, (MT)		8.13E-04		8.13E-04		8.55E-04	8.55E-04	8.55E-04	1.07E-06	4.17E-05
FeCN6-3, (MT)		3.20E+02		3.20E+02		1.28E+04	1.28E+04	1.28E+04	3.20E+02	1.25E+04
H+, (MT)		8.43E-02		8.43E-02		8.45E-02	8.45E-02	8.45E-02	5.28E-06	2.06E-04
H2O, (MT)		3.86E+05	2.41E+05	6.27E+05		6.59E+05	6.59E+05	6.59E+05	8.24E+02	3.21E+04
H2O2, (MT)		6.92E-01		6.92E-01		2.77E+01	2.77E+01	2.77E+01	6.92E-01	2.70E+01
Hg2, (MT)		1.91E+00		1.91E+00		7.66E+01	7.66E+01	7.66E+01	1.91E+00	7.46E+01
K+, (MT)		2.02E+01		2.02E+01		2.13E+01	2.13E+01	2.13E+01	2.66E-02	1.04E+00
Li+, (MT)		2.89E-02		2.89E-02		3.04E-02	3.04E-02	3.04E-02	3.80E-05	1.48E-03
MnO2, (MT)		2.13E+01		2.13E+01		8.53E+02	8.53E+02	8.53E+02	2.13E+01	8.32E+02
MoO4-2, (MT)		1.96E+00		1.96E+00		7.84E+01	7.84E+01	7.84E+01	1.96E+00	7.64E+01
N2, (MT)		1.88E+01		1.88E+01	4.77E+01	6.65E+01				
Na+, (MT)		7.00E+04		7.00E+04		7.36E+04	7.36E+04	7.36E+04	9.20E+01	3.59E+03
NH2OH, (MT)		1.56E+01		1.56E+01		6.22E+02	6.22E+02	6.22E+02	1.55E+01	6.06E+02
NH3, (MT)		8.50E+00		8.50E+00		3.40E+02	3.40E+02	3.40E+02	8.49E+00	3.31E+02
NH4+, (MT)		1.63E-02		1.63E-02		6.51E-01	6.51E-01	6.51E-01	1.63E-02	6.35E-01
NO2-, (MT)		3.06E+02		3.06E+02		3.21E+02	3.21E+02	3.21E+02	4.02E-01	1.57E+01
NO3-, (MT)		7.18E+03		7.18E+03		7.55E+03	7.55E+03	7.55E+03	9.44E+00	3.68E+02
O2, (MT)					1.59E+01	1.59E+01				
OH-, (MT)		4.92E+04		4.92E+04		5.17E+04	5.17E+04	5.17E+04	6.47E+01	2.52E+03
POLY, (MT)		2.23E-04		2.23E-04		2.34E-04	2.34E-04	2.34E-04	2.92E-07	1.14E-05
PTA-3, (MT)		5.32E-01		5.32E-01		5.60E-01	5.60E-01	5.60E-01	6.99E-04	2.73E-02
SO4-2, (MT)		7.18E+03		7.18E+03		7.55E+03	7.55E+03	7.55E+03	9.44E+00	3.68E+02
Total Org Carbon, (MT)		2.79E-01		2.79E-01		2.93E-01	2.93E-01	2.93E-01	3.66E-04	1.43E-02

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name Solid Components	1122	1556	FDGR2O	1	2	3	4	5	6	7
Total Mass Flow, (MT)		9.28E-02		1.58E+04	7.34E+05	7.50E+05	7.50E+05	7.50E+05	1.51E+06	
Cs and Ba, (MCi)				3.09E-03		3.09E-03	3.09E-03	3.09E-03	6.98E-02	
Sr and Y, (MCi)		4.37E-08		1.40E-02		1.40E-02	1.40E-02	1.40E-02	1.40E-02	
Tc, (MCi)		4.77E-10		1.52E-04		1.52E-04	1.52E-04	1.52E-04	1.52E-04	
TRU, (MCi)		3.40E-09		1.19E-03		1.19E-03	1.19E-03	1.19E-03	1.19E-03	
Total MCi		4.76E-08		1.84E-02		1.84E-02	1.84E-02	1.84E-02	8.50E-02	
Ag2O, (MT)		3.93E-04		3.93E-04		3.93E-04	3.93E-04	3.93E-04	3.93E-04	
Al+3, (MT)									2.35E+03	
Al2O3, (MT)		8.38E-03		2.64E+03		2.64E+03	2.64E+03	2.64E+03	2.64E+03	
Am2O3, (MT)				3.40E-05		3.40E-05	3.40E-05	3.40E-05	3.40E-05	
As2O5, (MT)		4.18E-04		4.18E-04		4.18E-04	4.18E-04	4.18E-04	4.18E-04	
B2O3, (MT)		1.50E-05		4.80E+00		4.80E+00	4.80E+00	4.80E+00	4.80E+00	
BaO, (MT)		2.73E-06		8.73E-01		8.73E-01	8.73E-01	8.73E-01	8.73E-01	
BeO, (MT)		5.33E-05		5.33E-05		5.33E-05	5.33E-05	5.33E-05	5.33E-05	
Bi2O3, (MT)		9.06E-04		2.89E+02		2.89E+02	2.89E+02	2.89E+02	2.89E+02	
BLAST-SL, (MT)					2.06E+05	2.06E+05	2.06E+05	2.06E+05	2.06E+05	
Cancrinite, (MT)		8.02E-03		2.56E+03		2.56E+03	2.56E+03	2.56E+03	2.56E+03	
CaO, (MT)		6.47E-04		2.07E+02		2.07E+02	2.07E+02	2.07E+02	2.07E+02	
CdO, (MT)		3.53E-05		1.13E+01		1.13E+01	1.13E+01	1.13E+01	1.13E+01	
Ce2O3, (MT)		8.58E-04		2.74E+02		2.74E+02	2.74E+02	2.74E+02	2.74E+02	
Cl-, (MT)									3.14E+02	
Cr+3, (MT)									2.85E-01	
Cr2O3, (MT)		4.11E-02		7.61E+01		7.61E+01	7.61E+01	7.61E+01	7.61E+01	
Cs+, (MT)									8.12E-04	
Cs2O, (MT)				3.99E-05		3.99E-05	3.99E-05	3.99E-05	3.99E-05	
CuO, (MT)		2.48E-04		2.48E-04		2.48E-04	2.48E-04	2.48E-04	2.48E-04	
Fe2O3, (MT)		1.09E-02		3.48E+03		3.48E+03	3.48E+03	3.48E+03	3.48E+03	
FLY-ASH, (MT)					2.06E+05	2.06E+05	2.06E+05	2.06E+05	2.06E+05	
H+, (MT)									8.43E-02	
H2O, (MT)		2.05E-07		2.05E-07		2.05E-07	2.05E-07	2.05E-07	6.26E+05	
K+, (MT)									2.02E+01	
K2O, (MT)		3.00E-06		1.13E+00		1.13E+00	1.13E+00	1.13E+00	1.13E+00	
La2O3, (MT)		7.67E-05		2.45E+01		2.45E+01	2.45E+01	2.45E+01	2.45E+01	
Li+, (MT)									2.89E-02	
Li2O, (MT)		7.67E-09		2.89E-03		2.89E-03	2.89E-03	2.89E-03	2.89E-03	
Limestone, (MT)					2.94E+05	2.94E+05	2.94E+05	2.94E+05	2.94E+05	
MgO, (MT)		6.12E-05		1.96E+01		1.96E+01	1.96E+01	1.96E+01	1.96E+01	
MnO2, (MT)		6.46E-04		2.06E+02		2.06E+02	2.06E+02	2.06E+02	2.06E+02	
MoO3, (MT)		2.67E-05		8.51E+00		8.51E+00	8.51E+00	8.51E+00	8.51E+00	
Na+, (MT)									6.99E+04	
Na2O, (MT)		3.23E-03		1.22E+03		1.22E+03	1.22E+03	1.22E+03	1.22E+03	
Ni2FeCN6, (MT)				2.35E-03		2.35E-03	2.35E-03	2.35E-03	2.35E-03	
Ni2O3, (MT)		8.17E-04		2.61E+02		2.61E+02	2.61E+02	2.61E+02	2.61E+02	
NO2-, (MT)									3.05E+02	

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name Solid Components	1122	1556	FEED2O	1	2	3	4	5	6	7
NO3-, (MT)									7.17E+03	
NpO2, (MT)		1.92E-08		6.14E-03		6.14E-03	6.14E-03	6.14E-03	6.14E-03	
OH-, (MT)									4.91E+04	
P2O5, (MT)		1.15E-02		3.66E+03		3.66E+03	3.66E+03	3.66E+03	3.66E+03	
PbO2, (MT)		1.30E-03		1.30E-03		1.30E-03	1.30E-03	1.30E-03	1.30E-03	
POLY, (MT)									2.22E-04	
PORTL and , (MT)					2.94E+04	2.94E+04	2.94E+04	2.94E+04	2.94E+04	
PTA-3, (MT)									5.32E-01	
PuO2, (MT)		1.69E-08		5.40E-03		5.40E-03	5.40E-03	5.40E-03	5.40E-03	
SiO2, (MT)		5.59E-04		1.78E+02		1.78E+02	1.78E+02	1.78E+02	1.78E+02	
SO4-2, (MT)									7.17E+03	
SrO, (MT)		1.38E-08		4.40E-03		4.40E-03	4.40E-03	4.40E-03	4.40E-03	
Tc2O7, (MT)		4.40E-08		1.40E-02		1.40E-02	1.40E-02	1.40E-02	1.40E-02	
TiO2, (MT)		9.87E-08		3.15E-02		3.15E-02	3.15E-02	3.15E-02	3.15E-02	
Total OrgCarbon, (M				2.91E-06		2.91E-06	2.91E-06	2.91E-06	2.78E-01	
U3O8, (MT)		3.35E-06		1.07E+00		1.07E+00	1.07E+00	1.07E+00	1.07E+00	
V2O5, (MT)		9.57E-05		9.57E-05		9.57E-05	9.57E-05	9.57E-05	9.57E-05	
WO2, (MT)				1.10E-06		1.10E-06	1.10E-06	1.10E-06	1.10E-06	
WO3, (MT)		2.02E-04		2.02E-04		2.02E-04	2.02E-04	2.02E-04	2.02E-04	
ZnO, (MT)		9.90E-05		3.16E+01		3.16E+01	3.16E+01	3.16E+01	3.16E+01	
ZrO2, (MT)		2.18E-03		6.96E+02		6.96E+02	6.96E+02	6.96E+02	6.96E+02	

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name / Liquid Components	F0	L1	L2	L3	L4	L5	L6
Volume, Total Liters	2.42E+07	4.44E+06	1.52E+05	2.87E+07	2.88E+07	2.88E+07	3.37E+03
Specific Gravity	1.00E+00	1.00E+00	1.07E+00	1.00E+00	1.00E+00	1.00E+00	4.29E+00
Total Mass Flow, (MT)	2.42E+04	4.44E+03	1.63E+02	2.87E+04	2.88E+04	2.88E+04	1.44E+01
Cs and Ba, (MCi)			7.02E-06		7.02E-06		6.32E-06
Total MCi			7.02E-06		7.02E-06		6.32E-06
Al+3, (MT)			2.47E-01		2.47E-01	2.23E-08	2.47E-01
Cl-, (MT)			3.30E-02		3.30E-02	2.97E-10	3.30E-02
Cr+3, (MT)			3.00E-05		3.00E-05		3.00E-05
Cs+, (MT)			8.55E-08		8.55E-08		7.69E-08
FeCN6-3, (MT)							
H+, (MT)			8.45E-06		8.45E-06	7.60E-14	8.45E-06
H2O, (MT)			6.59E+01		6.59E+01	6.59E+01	
H2O2, (MT)							
Hg2, (MT)							
K+, (MT)			2.13E-03		2.13E-03	1.92E-11	2.13E-03
Li+, (MT)			3.04E-06		3.04E-06		3.04E-06
MnO2, (MT)			8.53E-02		8.53E-02	7.68E-10	8.53E-02
MoO4-2, (MT)							
N2, (MT)	1.86E+04	3.41E+03	6.65E+01	2.20E+04	2.21E+04	2.21E+04	
Na+, (MT)			7.36E+00		7.36E+00	6.62E-08	7.36E+00
NH2OH, (MT)							
NH3, (MT)							
NH4+, (MT)							
NO2-, (MT)			3.21E-02		3.21E-02	2.89E-10	3.21E-02
NO3-, (MT)			7.55E-01		7.55E-01	6.80E-09	7.55E-01
O2, (MT)	5.63E+03	1.03E+03	1.59E+01	6.66E+03	6.68E+03	6.68E+03	
OH-, (MT)			5.17E+00		5.17E+00	4.66E-08	5.17E+00
POLY, (MT)							
PTA-3, (MT)			5.60E-05		5.60E-05		5.60E-05
SO4-2, (MT)			7.55E-01		7.55E-01	6.80E-09	7.55E-01
Total Org Carbon, (MT)			2.93E-05		2.93E-05		2.93E-05

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name Solid Components	10	11	12	13	14	15	16
Total Mass Flow, (MT)			7.37E+01		7.37E+01	6.63E-07	7.37E+01
Cs and Ba, (MCi)							
Sr and Y, (MCi)							
Tc, (MCi)							
TRU, (MCi)							
Total MCi							
Ag2O, (MT)							
Al+3, (MT)							
Al2O3, (MT)							
Am2O3, (MT)							
As2O5, (MT)							
B2O3, (MT)							
BaO, (MT)							
BeO, (MT)							
Bi2O3, (MT)							
BLAST-SL, (MT)			2.06E+01		2.06E+01	1.85E-07	2.06E+01
Cancrinite, (MT)			2.56E-01		2.56E-01	2.31E-09	2.56E-01
CaO, (MT)							
CdO, (MT)							
Ce2O3, (MT)							
Cl-, (MT)							
Cr+3, (MT)							
Cr2O3, (MT)							
Cs+, (MT)							
Cs2O, (MT)							
CuO, (MT)							
Fe2O3, (MT)							
FLY-ASH, (MT)			2.06E+01		2.06E+01	1.85E-07	2.06E+01
H+, (MT)							
H2O, (MT)			2.05E-11		2.05E-11		
K+, (MT)							
K2O, (MT)							
La2O3, (MT)							
Li+, (MT)							
Li2O, (MT)							
Limestone, (MT)			2.94E+01		2.94E+01	2.64E-07	2.94E+01
MgO, (MT)							
MnO2, (MT)			2.06E-02		2.06E-02	1.86E-10	2.06E-02
MoO3, (MT)							
Na+, (MT)							
Na2O, (MT)							
Ni2FeCN6, (MT)			2.35E-07		2.35E-07		2.11E-07
Ni2O3, (MT)							
NO2-, (MT)							

Table A-2B. Material Balance Summary for Low-Level Waste Grout Flowsheet.

Stream Name Solid Components	10	11	12	13	14	15	16
NO3-, (MT)							
NpO2, (MT)							
OH-, (MT)							
P2O5, (MT)							
PbO2, (MT)							
POLY, (MT)							
PORTL and , (MT)			2.94E+00		2.94E+00	2.64E-08	2.94E+00
PTA-3, (MT)							
PuO2, (MT)							
SiO2, (MT)							
SO4-2, (MT)							
SrO, (MT)							
Tc2O7, (MT)							
TiO2, (MT)							
Total OrgCarbon, (M			2.91E-10		2.91E-10		
U3O8, (MT)							
V2O5, (MT)							
WO2, (MT)							
WO3, (MT)							
ZnO, (MT)							
ZrO2, (MT)							

Table A-3. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending. (5 sheets)

(15-Sep-95, Clean Flowsheet, Cs/Sr Capsule Blending into Glass Feed, Table A-3, XXX13, Revision 2, 14:36:51)

The material balance summary for the integrated pretreatment/HLW vitrification flowsheet with cesium/strontium capsule blending is the same as the integrated pretreatment/HLW vitrification flowsheet shown in Table A-1 except that stream SRCSCAPS, which is the cesium/strontium capsule inventory, is blended into TK-332 (see sheet 28 in Figure C-1) as additional feed to the HLW glass melter. The cesium-strontium curie inventory for this stream is based on WHC-SD-WM-DP-087, Rev. B.

To conform to the flowsheet calculation scheme the capsule input mass stream was adjusted to preserve the total radionuclide content using the average tank isotopic distribution provided on page A-4. The actual total capsule inventory is discussed in Section 5.16, and shown in Table 5-2.

Nankani, F. D., 1995, *Disposition of Cesium and Strontium Capsules Engineering Data Package for Tank Waste Remediation System Environmental Impact Statement*, WHC-SD-WM-DP-087, Rev. B, Westinghouse Hanford Company, Richland, Washington.

This page intentionally left blank.

Table A-3. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Stream Name Liquid Components	1122	1314	1318	1322	1344	1556	
Volume, Total Liters	3.70E+08		1.52E+07	4.98E+03		4.14E+08	
Specific Gravity	1.40E+00		1.35E+00	1.72E+00		1.23E+00	
Total Mass Flow, (MT)	5.19E+05		2.05E+04	8.59E+00		5.10E+05	
Cs and Ba, (MCi)	8.47E-04		7.48E+01	4.74E+01		6.56E-02	
Sr and Y, (MCi)	1.38E-02		1.38E+02	2.05E+01			
Tc, (MCi)	6.46E-06		3.19E-02				
TRU, (MCi)	1.06E-03		2.06E-01				
Total MCi	1.57E-02		2.13E+02	6.79E+01		6.56E-02	
Ag+, (MT)	1.38E+00		4.61E-05				
Al(OH)4-, (MT)	9.16E-02		2.14E-07				
Al+3, (MT)	2.35E+02		2.14E-02			6.98E+02	
Am+3, (MT)	6.04E-06		3.02E-02				
As+5, (MT)	4.97E-01		1.67E-05				
B+3, (MT)	9.93E-01		3.33E-05				
Ba+2, (MT)	3.09E-04		3.09E+00				
Be+2, (MT)	7.60E-03		2.55E-07				
Bi+3, (MT)	1.95E+00		2.02E-01				
Carbon14, (MT)	4.52E-04		1.52E-08				
C2O4-2, (MT)	2.38E+04						
Ca+2, (MT)	1.50E+02		5.02E-03				
Cancrinite, (MT)	2.45E+02		8.34E-02				
Cd+2, (MT)	7.92E+00		2.66E-04				
Ce+3, (MT)	4.75E-02		2.69E-01				
Cl-, (MT)	8.82E+00		1.30E-04			3.15E+02	
Cr(OH)4-, (MT)	2.25E-03						
Cr+3, (MT)	1.34E+02		2.70E-03			1.26E+02	
Cs+, (MT)	1.03E-05		9.11E-01	5.77E-01		7.99E-04	
Cu+2, (MT)	7.45E-01		2.50E-05				
DTPA-3, (MT)			2.98E-01				
F-, (MT)	2.80E+04		6.27E+01	2.30E+00			
Fe+3, (MT)	7.75E+02		9.34E-02				
FeCN6-3, (MT)	6.98E+00		1.63E-05			3.20E+02	
FESA, (MT)	7.92E+03						
H+, (MT)	2.60E+03		1.68E+02				
H2, (MT)			8.51E-10				
H2O, (MT)	4.48E+05		9.76E+03			3.74E+05	
H2O2, (MT)	4.95E+02		3.20E+02				
Hg, (MT)			5.00E-06				
Hg+2, (MT)	9.01E-03		3.02E-07				
Hg2, (MT)	3.25E-02		1.33E-10			1.92E+00	
I-, (MT)	2.02E+01		6.77E-04				
K+, (MT)	2.13E+01		7.05E-04			2.02E+01	
La+3, (MT)	4.24E-03		2.41E-02				

Table A-3. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Stream Name Liquid Components	1122	1314	1318	1342	1344	1556	
Li+, (MT)	2.50E-02		8.25E-07			2.90E-02	
Mg+2, (MT)	1.10E+01		3.69E-04				
Mn+4, (MT)	1.34E+02		4.48E-03				
MnO2, (MT)	3.52E-02					2.14E+01	
Mo+6, (MT)	8.87E-01		2.71E-05				
MoO4-2, (MT)	4.28E-02		1.00E-07			1.96E+00	
Na+, (MT)	2.82E+03		7.43E-01			7.02E+04	
NH3, (MT)	1.42E-01		3.32E-07			8.36E+00	
NH4+, (MT)	1.66E-02		7.00E-09			1.63E-02	
Ni+3, (MT)	1.88E+02		7.71E-04				
NO2-, (MT)						3.01E+02	
NO3-, (MT)	1.91E+03		1.02E+04	2.61E-01		7.07E+03	
Np+4, (MT)	5.66E-03		1.46E-01				
OH-, (MT)			2.71E-01			4.93E+04	
Pb+4, (MT)	3.28E+00		1.10E-04				
PO4-3, (MT)	2.47E+02		7.95E-03				
POLY, (MT)			4.30E-04				
PTA-3, (MT)	5.42E-01		1.79E-05			5.33E-01	
Pu+4, (MT)	4.54E-03		4.49E-01				
Si+4, (MT)	7.89E+01		2.66E-03				
SO4-2, (MT)	1.31E+02		4.28E-04			7.46E+03	
Sr+2, (MT)	3.68E-03		3.68E+01	5.45E+00			
TcO4-, (MT)	6.24E-04		3.07E+00				
Ti+4, (MT)	1.90E-02		6.81E-06				
Tot Org Carbon, (MT)	1.16E+02		3.88E-03			2.74E-01	
UO2+2, (MT)	1.76E-01		1.82E+00				
V+5, (MT)	1.88E-01		6.30E-06				
W+6, (MT)	1.42E-05						
Zn+2, (MT)	9.44E-01		7.24E-02				
Zr+4, (MT)	5.10E+02		5.27E-01				
ZrO2:2H2O, (MT)	3.96E-05						

Table A-3. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Stream Name Solid Components	1122	1314	1318	[illegible]	1344	1556
Total Mass Flow, (MT)	4.46E+00	8.65E+02	5.12E+03		1.32E+03	1.03E+03
Cs and Ba, (MCi)	1.91E-05		2.43E-01		1.22E+02	8.03E-06
Sr and Y, (MCi)	3.48E-04		3.76E-01		1.58E+02	4.30E-05
Tc, (MCi)	1.62E-08		6.67E-05		3.17E-02	4.69E-07
TRU, (MCi)	6.25E-07		7.24E-04		2.06E-01	3.57E-06
Total MCi	3.67E-04		6.20E-01		2.80E+02	5.51E-05
Ag+, (MT)	3.45E-06		6.58E-04			
Ag2O, (MT)	1.27E-03		1.43E+00		1.42E+00	4.07E-01
Al+3, (MT)	3.96E-03		2.88E+00			
Al2O3, (MT)			1.59E+02		1.94E+02	9.85E+02
Am+3, (MT)	7.59E-08		1.45E-05			
Am2O3, (MT)			6.53E-05		3.32E-02	7.26E-08
APM-, (MT)			3.45E-03		3.44E-03	
As+5, (MT)	1.25E-06		2.38E-04			
As2O5, (MT)	1.35E-03		1.52E+00		1.51E+00	4.33E-01
B+3, (MT)	2.49E-06		4.75E-04			
B2O3, (MT)	4.61E-05	1.15E+02	2.77E-01		1.15E+02	1.48E-02
Ba+2, (MT)	7.75E-06		1.48E-03			
BaO, (MT)	8.38E-06		1.62E-02		3.46E+00	2.69E-03
Be+2, (MT)	1.91E-08		3.64E-06			
BeO, (MT)	1.72E-04		1.94E-01		1.93E-01	5.53E-02
Bi+3, (MT)	4.92E-04		9.37E-02			
Bi2O3, (MT)	2.78E-03		3.12E+00		3.45E+00	8.92E-01
Carbon14, (MT)			2.17E-07			
Ca+2, (MT)	3.76E-04		7.16E-02			
Cancrinite, (MT)	9.71E-02		1.03E+02			7.98E+00
CaO, (MT)	1.98E-03		2.23E+00		2.33E+00	6.37E-01
Cd+2, (MT)	1.99E-05		3.79E-03			
CdO, (MT)	1.08E-04		1.22E-01		1.26E-01	3.48E-02
Ce+3, (MT)	5.97E-04		1.14E-01			
Ce2O3, (MT)	2.63E-03		2.96E+00		3.40E+00	8.44E-01
Cl-, (MT)	8.76E-06		1.67E-03			
CO3-2, (MT)	5.63E-04		1.07E-01			
Cr+3, (MT)	4.52E-04		3.29E-01			
Cr2O3, (MT)	7.95E-04		8.95E-01		1.38E+00	2.55E-01
Cs+, (MT)	2.32E-07		4.42E-05			
Cs2O, (MT)			3.09E-03		1.58E+00	1.04E-07
Cu+2, (MT)	1.87E-06		3.57E-04			
CuO, (MT)	8.00E-04		9.00E-01		8.99E-01	2.57E-01
F-, (MT)	1.50E-04		2.85E-02			
Fe+3, (MT)	2.66E-03		1.94E+00			
Fe2O3, (MT)	3.46E-02		3.90E+01		4.24E+01	1.11E+01
H2O, (MT)	9.50E-04		1.10E+00		1.10E+00	2.11E-04

Table A-3. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Stream Name Solid Components	1122	1314	1518	[illegible]	1344	1556
Hg+2, (MT)			4.30E-06			
I-, (MT)	5.07E-05		9.66E-03			
K+, (MT)	5.27E-05		1.00E-02			
K2O, (MT)	9.35E-06		1.05E-02		2.34E-02	3.00E-03
La+3, (MT)	5.33E-05		1.02E-02			
La2O3, (MT)	2.35E-04		2.65E-01		3.04E-01	7.55E-02
Li+, (MT)	6.16E-08		1.17E-05			
Li2O, (MT)	2.39E-08	1.32E+01	2.59E-02		1.32E+01	7.67E-06
Mg+2, (MT)	2.76E-05		5.26E-03			
MgO, (MT)	1.88E-04		2.11E-01		2.20E-01	6.03E-02
MnO2, (MT)	5.30E-04		1.01E-01		1.08E-01	6.42E-01
Mo+6, (MT)	2.01E-06		3.83E-04			
MoO3, (MT)	8.17E-05		9.19E-02		9.24E-02	2.62E-02
Na+, (MT)	2.31E-02		4.22E+00			
Na2O, (MT)	1.03E-02	2.40E+01	1.17E+01		6.59E+01	3.32E+00
Ni(OH)3, (MT)						5.25E-08
Ni+3, (MT)	2.66E-05		5.07E-03			
Ni2FECN6, (MT)	2.35E-03		2.64E+00			7.18E-06
Ni2O3, (MT)	2.51E-03		2.82E+00		2.82E+00	8.04E-01
NiO, (MT)			2.35E-03		1.20E+00	
NO2-, (MT)	1.85E-04		3.53E-02			
Np+4, (MT)	5.01E-07		3.64E-04			
NpO2, (MT)	6.24E-08		3.96E-04		1.66E-01	2.00E-05
OH-, (MT)	4.21E+00		4.72E+03			
P2O5, (MT)	3.52E-02		3.95E+01		3.95E+01	1.13E+01
P2O5:24W, (MT)	1.31E-06		2.49E-04			
Pb+4, (MT)	8.23E-06		1.57E-03			
PbO2, (MT)	4.19E-03		4.71E+00		4.70E+00	1.35E+00
PO4-3, (MT)	5.93E-04		1.13E-01			
POLY, (MT)	8.08E-06		5.33E-02			1.80E-06
Pu+4, (MT)	1.56E-06		1.13E-03			
PuO2, (MT)	5.18E-08		1.06E-03		5.11E-01	1.66E-05
Si+4, (MT)	1.98E-04		3.78E-02			
SiO2, (MT)	1.71E-03	7.13E+02	3.40E+00		7.51E+02	5.50E-01
SO3, (MT)			3.76E-06		1.92E-03	
SO4-2, (MT)	9.85E-06		1.88E-03			
Sr+2, (MT)	9.24E-05		1.76E-02			
SrO, (MT)	4.22E-08		9.77E-02		4.97E+01	1.36E-05
Tc2O7, (MT)	1.35E-07		5.89E-03		2.92E+00	4.33E-05
TcO4-, (MT)	1.43E-06		2.71E-04			
TiO2, (MT)	3.03E-07		3.40E-04		3.51E-04	9.72E-05
Tot Org Carbon, (MT)	2.90E-04		5.53E-02			8.88E-09
U3O8, (MT)	1.03E-05		1.16E-02		1.15E-02	3.30E-03

Table A-3. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Cesium/Strontium Capsule Blending.

Stream Name Solid Components	1122	1314	1518	accscaps	1344	1556
UO2+2, (MT)	4.18E-03		7.96E-01			
UO3, (MT)			5.44E-03		2.77E+00	
V+5, (MT)	4.71E-07		8.98E-05			
V2O5, (MT)	3.09E-04		3.47E-01		3.47E-01	9.92E-02
WO2, (MT)			4.10E-07		2.26E-04	
WO3, (MT)	6.53E-04		7.34E-01		7.33E-01	2.10E-01
Zn+2, (MT)	2.37E-06		4.52E-04			
ZnO, (MT)	3.03E-04		3.41E-01		4.31E-01	9.74E-02
Zr+4, (MT)	6.95E-04		1.32E-01			
ZrO2, (MT)	6.68E-03		7.52E+00		8.54E+00	2.15E+00
ZrO2:2H2O, (MT)	1.03E-03		1.95E-01			

This page intentionally left blank.

Table A-3A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet. (3 sheets)

(15-Sep-95, Clean Flowsheet, LLW Vitrification with Cs/Sr Capsule Blending, Table A-3.1, XXX13B, Revision 2, 14:37:35)

The material balance summary for the LLW vitrification flowsheet (Figure C-2) is based on the LLW streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1) with the cesium/strontium capsule inventory blended into the HLW glass melter feed.

This page intentionally left blank.

Table A-3A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	235	406	407	411	441
Volume, Total Liters	4.17E+08	3.25E+08			
Specific Gravity	1.23E+00	1.29E+00			
Total Mass Flow, (MT)	5.12E+05	4.20E+05			
Cs and Ba, (MCi)	6.56E-02	6.56E-02			
Total MCi	6.56E-02	6.56E-02			
Al(OH)4-, (MT)	7.45E+03	7.45E+03			
Cl-, (MT)	3.15E+02	3.15E+02			
Cr(OH)4-, (MT)	2.91E+02	2.91E+02			
Cs+, (MT)	7.99E-04	7.99E-04			
FeCN6-3, (MT)	3.20E+02	3.20E+02			
H2O, (MT)	3.75E+05	2.83E+05			
Hg, (MT)	1.92E+00	1.92E+00			
K+, (MT)	2.02E+01	2.02E+01			
Li+, (MT)	2.90E-02	2.90E-02			
MnO2, (MT)	2.14E+01	2.14E+01			
Mo+6, (MT)	1.18E+00	1.18E+00			
Na+, (MT)	7.02E+04	7.02E+04			
NH3, (MT)	8.38E+00	8.38E+00			
Ni+3, (MT)	2.81E-08	2.81E-08			
NO2-, (MT)	3.01E+02	3.01E+02			
NO3-, (MT)	7.07E+03	7.07E+03			
OH-, (MT)	4.38E+04	4.38E+04			
SO4-2, (MT)	7.46E+03	7.46E+03			
Tot Org Carbon, (MT)	2.74E-01	2.74E-01			

Table A-3A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	235	406	407	411	441
Total Mass Flow, (MT)	1.65E+04	2.47E+04	2.65E+05	3.94E+05	5.08E+05
Cs and Ba, (MCi)	3.09E-03	4.56E-03		7.00E-02	6.86E-02
Sr and Y, (MCi)	1.40E-02	1.43E-02		1.43E-02	1.40E-02
Tc, (MCi)	1.53E-04	1.56E-04		1.56E-04	1.53E-04
TRU, (MCi)	1.20E-03	1.22E-03		1.22E-03	1.20E-03
Total MCi	1.84E-02	2.02E-02		8.57E-02	8.39E-02
Ag2O, (MT)	4.07E-01	4.16E-01		4.16E-01	4.07E-01
Al2O3, (MT)	2.97E+03	3.38E+03	1.16E+04	1.97E+04	1.93E+04
Am2O3, (MT)	3.41E-05	3.48E-05		3.48E-05	3.41E-05
As2O5, (MT)	4.33E-01	4.42E-01		4.42E-01	4.33E-01
B2O3, (MT)	4.82E+00	4.92E+00		4.92E+00	4.82E+00
BaO, (MT)	8.76E-01	8.95E-01		8.95E-01	8.76E-01
BeO, (MT)	5.53E-02	5.64E-02		5.64E-02	5.53E-02
Bi2O3, (MT)	2.90E+02	2.97E+02		2.97E+02	2.90E+02
Cancrinite, (MT)	2.60E+03	2.60E+03			
CaO, (MT)	2.08E+02	1.03E+03	3.84E+04	3.94E+04	3.86E+04
CdO, (MT)	1.13E+01	1.16E+01		1.16E+01	1.13E+01
Ce2O3, (MT)	2.75E+02	2.81E+02		2.81E+02	2.75E+02
Cr2O3, (MT)	8.31E+01	8.88E+01		2.73E+02	2.67E+02
CsO, (MT)	4.00E-05	5.89E-05		9.04E-04	8.86E-04
CuO, (MT)	2.57E-01	2.62E-01		2.62E-01	2.57E-01
DCPD, (MT)					1.22E+05
Fe2O3, (MT)	3.62E+03	3.70E+03		3.82E+03	3.74E+03
H2O, (MT)	2.11E-04	2.16E-04		2.16E-04	2.11E-04
HgO, (MT)		4.41E-02		2.11E+00	2.07E+00
K2O, (MT)	1.15E+00	1.70E+00		2.61E+01	2.55E+01
La2O3, (MT)	2.46E+01	2.51E+01		2.51E+01	2.46E+01
Li2O, (MT)	2.95E-03	4.34E-03		6.67E-02	6.53E-02
MgO, (MT)	1.96E+01	2.00E+01		2.00E+01	1.96E+01
MnO2, (MT)	2.09E+02	2.14E+02		2.36E+02	2.31E+02
MoO3, (MT)	8.55E+00	8.77E+00		1.05E+01	1.03E+01
Na2O, (MT)	1.28E+03	3.33E+03		9.85E+04	9.65E+04
Ni2FECN6, (MT)	2.34E-03	2.34E-03			

Table A-3A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	235	406	407	411	441
Ni2O3, (MT)	2.62E+02	2.68E+02		2.68E+02	2.62E+02
NiO, (MT)		2.26E-05		1.08E-03	1.06E-03
NpO2, (MT)	6.52E-03	6.66E-03		6.66E-03	6.52E-03
OLIGOMER, (MT)					4.41E-03
P2O5, (MT)	3.68E+03	3.75E+03		3.75E+03	3.68E+03
PbO2, (MT)	1.35E+00	1.37E+00		1.37E+00	1.35E+00
POLY, (MT)	1.80E-06	1.80E-06			
PuO2, (MT)	5.42E-03	5.53E-03		5.53E-03	5.42E-03
S, (MT)					1.68E-01
SiO2, (MT)	1.79E+02	4.78E+03	2.15E+05	2.20E+05	2.16E+05
SO3, (MT)		1.33E+02		6.35E+03	6.22E+03
SrO, (MT)	4.41E-03	4.51E-03		4.51E-03	4.41E-03
Tc2O7, (MT)	1.41E-02	1.44E-02		1.44E-02	1.41E-02
TiO2, (MT)	3.16E-02	3.23E-02		3.23E-02	3.16E-02
Tot Org Carbon, (MT)	2.89E-06	2.89E-06			
U3O8, (MT)	1.08E+00	1.10E+00		1.10E+00	1.08E+00
V2O5, (MT)	9.92E-02	1.01E-01		1.01E-01	9.92E-02
WO2, (MT)	1.09E-06	1.11E-06		1.11E-06	1.09E-06
WO3, (MT)	2.10E-01	2.14E-01		2.14E-01	2.10E-01
ZnO, (MT)	3.17E+01	3.24E+01		3.24E+01	3.17E+01
ZrO2, (MT)	6.99E+02	7.14E+02		7.14E+02	6.99E+02

This page intentionally left blank.

Table A-4. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation. (5 sheets)

(15-Sep-95, Clean Flowsheet, Caustic Recycle without Chrome Removal, Without Am/La Separation, Table A-4, XX12, Revision 2, 14:35:35)

The material balance summary for the integrated pretreatment/HLW vitrification flowsheet without Am/LAN separation is the same as the integrated pretreatment/HLW vitrification flowsheet except that sheet 20 of the process flow diagram (see Figure C-1) has been eliminated. Stream 628, the feed into sheet 20, is routed directly to the HLW waste evaporator, TK-141 on sheet 24 in Figure C-1. In addition, stream 628 is normally neutralized with caustic in TK-45 on sheet 19. The caustic neutralization is eliminated with no Am/LAN separation.

This page intentionally left blank.

Table A-4. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation.

Stream Name Liquid Components	1122	1314	1318	1344	1556
Volume, Total Liters	3.70E+08		1.19E+07		4.14E+08
Specific Gravity	1.40E+00		1.72E+00		1.23E+00
Total Mass Flow, (MT)	5.19E+05		2.05E+04		5.10E+05
Cs and Ba, (MCi)	8.47E-04		7.48E+01		6.55E-02
Sr and Y, (MCi)	1.38E-02		1.38E+02		
Tc, (MCi)	6.46E-06		3.19E-02		
TRU, (MCi)	1.06E-03		3.10E-01		
Total MCi	1.57E-02		2.14E+02		6.55E-02
Ag+, (MT)	1.38E+00		4.61E-05		
Al(OH)4-, (MT)	9.15E-02		2.14E-07		
Al+3, (MT)	2.35E+02		2.14E-02		6.98E+02
Am+3, (MT)	6.04E-06		6.04E-02		
As+5, (MT)	4.97E-01		1.67E-05		
B+3, (MT)	9.93E-01		3.33E-05		
Ba+2, (MT)	3.09E-04		3.09E+00		
Be+2, (MT)	7.60E-03		2.55E-07		
Bi+3, (MT)	1.95E+00		1.18E+00		
Carbon14, (MT)	4.52E-04		1.52E-08		
C2O4-2, (MT)	2.38E+04		2.25E+03		
Ca+2, (MT)	1.50E+02		5.02E-03		
Cancrinite, (MT)	2.45E+02		8.34E-02		
Cd+2, (MT)	7.92E+00		2.66E-04		
Ce+3, (MT)	4.75E-02		2.38E+02		
Cl-, (MT)	8.82E+00		1.30E-04		3.14E+02
Cr(OH)4-, (MT)	2.25E-03				
Cr+3, (MT)	1.34E+02		2.70E-03		1.26E+02
Cs+, (MT)	1.03E-05		9.11E-01		7.98E-04
Cu+2, (MT)	7.45E-01		2.50E-05		
DTPA-3, (MT)			2.98E-01		
F-, (MT)	2.80E+04		1.16E+02		
Fe+3, (MT)	7.75E+02		1.71E-01		
FeCN6-3, (MT)	6.98E+00		1.63E-05		3.20E+02
FESA, (MT)	7.92E+03				
H+, (MT)	2.60E+03		2.22E+02		
H2, (MT)			8.51E-10		
H2O, (MT)	4.48E+05		6.79E+03		3.74E+05
H2O2, (MT)	5.00E+02		3.22E+02		
Hg, (MT)			5.00E-06		
Hg+2, (MT)	9.01E-03		3.02E-07		

Table A-4. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation.

Stream Name Liquid Components	1122	1514	1318	1344	1556
Hg2, (MT)	3.25E-02		1.27E-10		1.92E+00
I-, (MT)	2.02E+01		6.77E-04		
K+, (MT)	2.13E+01		7.05E-04		2.02E+01
La+3, (MT)	4.24E-03		2.12E+01		
Li+, (MT)	2.50E-02		8.25E-07		2.89E-02
Mg+2, (MT)	1.10E+01		3.69E-04		
Mn+4, (MT)	1.34E+02		4.48E-03		
MnO2, (MT)	3.52E-02				2.13E+01
Mo+6, (MT)	8.87E-01		2.71E-05		
MoO4-2, (MT)	4.28E-02		1.00E-07		1.96E+00
Na+, (MT)	2.82E+03		7.47E-01		7.01E+04
NH3, (MT)	1.42E-01		3.32E-07		8.35E+00
NH4+, (MT)	1.66E-02		7.00E-09		1.63E-02
Ni+3, (MT)	1.88E+02		7.71E-04		
NO2-, (MT)					3.00E+02
NO3-, (MT)	1.91E+03		1.05E+04		7.06E+03
Np+4, (MT)	5.66E-03		1.52E-01		
OH-, (MT)			2.74E-01		4.93E+04
Pb+4, (MT)	3.28E+00		1.10E-04		
PO4-3, (MT)	2.47E+02		7.95E-03		
POLY, (MT)			4.30E-04		
PTA-3, (MT)	5.42E-01		1.79E-05		5.33E-01
Pu+4, (MT)	4.54E-03		4.54E-01		
Si+4, (MT)	7.89E+01		2.66E-03		
SO4-2, (MT)	1.31E+02		4.28E-04		7.46E+03
Sr+2, (MT)	3.68E-03		3.68E+01		
TcO4-, (MT)	6.24E-04		3.08E+00		
Ti+4, (MT)	1.90E-02		6.81E-06		
Tot Org Carbon, (MT)	1.16E+02		3.88E-03		2.74E-01
UO2+2, (MT)	1.76E-01		1.99E+00		
V+5, (MT)	1.88E-01		6.29E-06		
W+6, (MT)	1.42E-05				
Zn+2, (MT)	9.44E-01		7.24E-02		
Zr+4, (MT)	5.10E+02		1.04E+00		
ZrO2:2H2O, (MT)	3.95E-05				

Table A-4. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation.

Stream Name Solid Components	1122	1314	1318	1344	1556
SO4-2, (MT)	9.85E-06		1.88E-03		
Sr+2, (MT)	9.23E-05		1.76E-02		
SrO, (MT)	4.22E-08		8.51E-02	4.33E+01	1.35E-05
Tc2O7, (MT)	1.35E-07		5.89E-03	2.92E+00	4.33E-05
TcO4-, (MT)	1.42E-06		2.71E-04		
TiO2, (MT)	3.03E-07		3.41E-04	3.51E-04	9.71E-05
Tot Org Carbon, (MT)	2.90E-04		5.53E-02		8.87E-09
U3O8, (MT)	1.03E-05		1.16E-02	1.15E-02	3.30E-03
UO2+2, (MT)	4.18E-03		7.96E-01		
UO3, (MT)			5.80E-03	2.96E+00	
V+5, (MT)	4.71E-07		8.98E-05		
V2O5, (MT)	3.09E-04		3.48E-01	3.47E-01	9.91E-02
WO2, (MT)			4.10E-07	2.26E-04	
WO3, (MT)	6.53E-04		7.34E-01	7.33E-01	2.09E-01
Zn+2, (MT)	2.37E-06		4.52E-04		
ZnO, (MT)	3.03E-04		3.41E-01	4.31E-01	9.73E-02
Zr+4, (MT)	6.95E-04		1.32E-01		
ZrO2, (MT)	6.69E-03		7.52E+00	9.23E+00	2.14E+00
ZrO2:2H2O, (MT)	1.03E-03		1.95E-01		

This page intentionally left blank.

Table A-4A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet Without Americium/Lanthanide Separation. (3 sheets)

(15-Sep-95, Clean Flowsheet, LLW Vitrification without Am/La Separation, Table A-4.1, XXX12B, Revision 2, 14:36:15)

The material balance summary for the LLW vitrification flowsheet (Figure C-2) is based on the LLW streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1) without americium/lanthanide separation.

This page intentionally left blank.

Table A-4A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	233	406	407	411	441
Volume, Total Liters	4.16E+06	3.25E+06			
Specific Gravity	1.23E+00	1.29E+00			
Total Mass Flow, (MT)	5.12E+05	4.20E+05			
Cs and Ba, (MCi)	6.55E-02	6.55E-02			
Total MCi	6.55E-02	6.55E-02			
Al(OH)4-, (MT)	7.45E+03	7.45E+03			
Cl-, (MT)	3.14E+02	3.14E+02			
Cr(OH)4-, (MT)	2.90E+02	2.90E+02			
Cs+, (MT)	7.98E-04	7.98E-04			
FeCN6-3, (MT)	3.20E+02	3.20E+02			
H2O, (MT)	3.74E+05	2.83E+05			
Hg, (MT)	1.92E+00	1.92E+00			
K+, (MT)	2.02E+01	2.02E+01			
Li+, (MT)	2.89E-02	2.89E-02			
MnO2, (MT)	2.13E+01	2.13E+01			
Mo+6, (MT)	1.18E+00	1.18E+00			
Na+, (MT)	7.02E+04	7.02E+04			
NH3, (MT)	8.37E+00	8.37E+00			
Ni+3, (MT)	2.81E-08	2.81E-08			
NO2-, (MT)	3.00E+02	3.00E+02			
NO3-, (MT)	7.06E+03	7.06E+03			
OH-, (MT)	4.38E+04	4.38E+04			
SO4-2, (MT)	7.46E+03	7.46E+03			
Tot Org Carbon, (MT)	2.74E-01	2.74E-01			

Table A-4A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
Total Mass Flow, (MT)	1.65E+04	2.47E+04	2.65E+05	3.94E+05	5.07E+05
Cs and Ba, (MCi)	3.09E-03	4.56E-03		7.00E-02	6.85E-02
Sr and Y, (MCi)	1.40E-02	1.43E-02		1.43E-02	1.40E-02
Tc, (MCi)	1.53E-04	1.56E-04		1.56E-04	1.53E-04
TRU, (MCi)	1.20E-03	1.22E-03		1.22E-03	1.20E-03
Total MCi	1.84E-02	2.02E-02		8.56E-02	8.39E-02
Ag2O, (MT)	4.07E-01	4.15E-01		4.15E-01	4.07E-01
Al2O3, (MT)	2.97E+03	3.38E+03	1.15E+04	1.97E+04	1.93E+04
Am2O3, (MT)	3.41E-05	3.48E-05		3.48E-05	3.41E-05
As2O5, (MT)	4.32E-01	4.41E-01		4.41E-01	4.32E-01
B2O3, (MT)	4.82E+00	4.92E+00		4.92E+00	4.82E+00
BaO, (MT)	8.76E-01	8.95E-01		8.95E-01	8.76E-01
BeO, (MT)	5.52E-02	5.64E-02		5.64E-02	5.52E-02
Bi2O3, (MT)	2.90E+02	2.97E+02		2.97E+02	2.90E+02
Cancrinite, (MT)	2.60E+03	2.60E+03			
CaO, (MT)	2.08E+02	1.03E+03	3.84E+04	3.94E+04	3.86E+04
CdO, (MT)	1.13E+01	1.16E+01		1.16E+01	1.13E+01
Ce2O3, (MT)	2.75E+02	2.81E+02		2.81E+02	2.75E+02
Cr2O3, (MT)	8.31E+01	8.88E+01		2.73E+02	2.67E+02
Cs2O, (MT)	4.00E-05	5.88E-05		9.04E-04	8.85E-04
CuO, (MT)	2.57E-01	2.62E-01		2.62E-01	2.57E-01
DCPD, (MT)					1.22E+05
Fe2O3, (MT)	3.62E+03	3.70E+03		3.82E+03	3.74E+03
H2O, (MT)	2.11E-04	2.16E-04		2.16E-04	2.11E-04
HgO, (MT)		4.41E-02		2.11E+00	2.07E+00
K2O, (MT)	1.15E+00	1.70E+00		2.61E+01	2.55E+01
La2O3, (MT)	2.46E+01	2.51E+01		2.51E+01	2.46E+01
Li2O, (MT)	2.95E-03	4.34E-03		6.66E-02	6.52E-02
MgO, (MT)	1.96E+01	2.00E+01		2.00E+01	1.96E+01
MnO2, (MT)	2.09E+02	2.14E+02		2.36E+02	2.31E+02
MoO3, (MT)	8.55E+00	8.77E+00		1.05E+01	1.03E+01
Na2O, (MT)	1.28E+03	3.33E+03		9.85E+04	9.64E+04
Ni2FECN6, (MT)	2.34E-03	2.34E-03			
Ni2O3, (MT)	2.62E+02	2.68E+02		2.68E+02	2.62E+02
NiO, (MT)		2.26E-05		1.08E-03	1.06E-03
NpO2, (MT)	6.52E-03	6.66E-03		6.66E-03	6.52E-03
OLIGOMER, (MT)					4.41E-03
P2O5, (MT)	3.68E+03	3.75E+03		3.75E+03	3.68E+03
PbO2, (MT)	1.34E+00	1.37E+00		1.37E+00	1.34E+00
POLY, (MT)	1.80E-06	1.80E-06			

Table A-4A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
PuO2, (MT)	5.42E-03	5.53E-03		5.53E-03	5.42E-03
S, (MT)					1.68E-01
SiO2, (MT)	1.79E+02	4.78E+03	2.15E+05	2.20E+05	2.16E+05
SO3, (MT)		1.33E+02		6.35E+03	6.22E+03
SrO, (MT)	4.41E-03	4.51E-03		4.51E-03	4.41E-03
Tc2O7, (MT)	1.41E-02	1.44E-02		1.44E-02	1.41E-02
TiO2, (MT)	3.16E-02	3.23E-02		3.23E-02	3.16E-02
Tot Org Carbon, (MT)	2.89E-06	2.89E-06			
U3O8, (MT)	1.08E+00	1.10E+00		1.10E+00	1.08E+00
V2O5, (MT)	9.91E-02	1.01E-01		1.01E-01	9.91E-02
WO2, (MT)	1.09E-06	1.11E-06		1.11E-06	1.09E-06
WO3, (MT)	2.09E-01	2.14E-01		2.14E-01	2.09E-01
ZnO, (MT)	3.17E+01	3.24E+01		3.24E+01	3.17E+01
ZrO2, (MT)	6.99E+02	7.14E+02		7.14E+02	6.99E+02

This page intentionally left blank.

Table A-5. Material Balance Summary for Integrated Pretreatment-High-Level Waste Vitrification Flowsheet With Low Temperature Glass Limits. (5 sheets)

(15-Sep-95, Clean Flowsheet, Caustic Recycle without Chrome Removal, Low Temp Glass Limits, Table A-5, XXX10_LT, Revision 2, 14:38:15)

The material balance summary for the integrated pretreatment/HLW vitrification flowsheet with low temperature glass limits is the same as the integrated pretreatment/HLW vitrification flowsheet except that different HLW glass limits are applied.

This page intentionally left blank.

Table A-5. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Low Temperature Glass Limits.

Stream Name Liquid Components	1122	1314	1518	1544	1556
Volume, Total Liters	3.70E+08		1.52E+07		4.13E+08
Specific Gravity	1.40E+00		1.35E+00		1.23E+00
Total Mass Flow, (MT)	5.18E+05		2.05E+04		5.09E+05
Cs and Ba, (MCi)	8.47E-04		7.48E+01		6.56E-02
Sr and Y, (MCi)	1.38E-02		1.38E+02		
Tc, (MCi)	6.46E-06		3.19E-02		
TRU, (MCi)	1.06E-03		2.06E-01		
Total MCi	1.57E-02		2.13E+02		6.56E-02
Ag+, (MT)	1.38E+00		4.63E-05		
Al(OH)4-, (MT)	9.14E-02		2.15E-07		
Al+3, (MT)	2.35E+02		2.14E-02		6.98E+02
Am+3, (MT)	6.04E-06		3.02E-02		
As+5, (MT)	4.97E-01		1.67E-05		
B+3, (MT)	9.93E-01		3.34E-05		
Ba+2, (MT)	3.09E-04		3.09E+00		
Be+2, (MT)	7.60E-03		2.56E-07		
Bi+3, (MT)	1.95E+00		2.02E-01		
Carbon14, (MT)	4.52E-04		1.52E-08		
C2O4-2, (MT)	2.38E+04				
Ca+2, (MT)	1.50E+02		5.04E-03		
Cancrinite, (MT)	2.45E+02		8.36E-02		
Cd+2, (MT)	7.92E+00		2.67E-04		
Ce+3, (MT)	4.75E-02		2.69E-01		
Cl-, (MT)	8.81E+00		1.30E-04		3.15E+02
Cr(OH)4-, (MT)	2.25E-03				
Cr+3, (MT)	1.34E+02		2.71E-03		1.26E+02
Cs+, (MT)	1.03E-05		9.11E-01		7.99E-04
Cu+2, (MT)	7.45E-01		2.51E-05		
DTPA-3, (MT)			2.98E-01		
F-, (MT)	2.79E+04		6.26E+01		
Fe+3, (MT)	7.75E+02		9.34E-02		
FeCN6-3, (MT)	6.96E+00		1.64E-05		3.20E+02
FESA, (MT)	7.91E+03				
H+, (MT)	2.59E+03		1.68E+02		
H2, (MT)			8.54E-10		
H2O, (MT)	4.48E+05		9.78E+03		3.74E+05
H2O2, (MT)	5.01E+02		3.24E+02		
Hg, (MT)			5.01E-06		
Hg+2, (MT)	9.01E-03		3.03E-07		

Table A-5. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Low Temperature Glass Limits.

Stream Name Liquid Components	1122	1314	1318	1544	1556
Hg2, (MT)	3.24E-02		7.62E-08		1.92E+00
I-, (MT)	2.02E+01		6.79E-04		
K+, (MT)	2.13E+01		7.07E-04		2.02E+01
La+3, (MT)	4.24E-03		2.41E-02		
Li+, (MT)	2.50E-02		8.27E-07		2.90E-02
Mg+2, (MT)	1.10E+01		3.70E-04		
Mn+4, (MT)	1.34E+02		4.49E-03		
MnO2, (MT)	3.51E-02				2.14E+01
Mo+6, (MT)	8.87E-01		2.71E-05		
MoO4-2, (MT)	4.27E-02		1.00E-07		1.96E+00
Na+, (MT)	2.81E+03		7.47E-01		7.01E+04
NH3, (MT)	1.42E-01		3.33E-07		8.36E+00
NH4+, (MT)	1.66E-02		7.03E-09		1.63E-02
Ni+3, (MT)	1.88E+02		7.73E-04		
NO2-, (MT)					3.01E+02
NO3-, (MT)	1.91E+03		1.01E+04		7.07E+03
Np+4, (MT)	5.65E-03		1.46E-01		
OH-, (MT)			2.74E-01		4.93E+04
Pb+4, (MT)	3.28E+00		1.10E-04		
PO4-3, (MT)	2.47E+02		7.97E-03		
POLY, (MT)			4.36E-04		
PTA-3, (MT)	5.42E-01		1.80E-05		5.33E-01
Pu+4, (MT)	4.54E-03		4.49E-01		
Si+4, (MT)	7.89E+01		2.66E-03		
SO4-2, (MT)	1.30E+02		4.29E-04		7.45E+03
Sr+2, (MT)	3.68E-03		3.68E+01		
TcO4-, (MT)	6.24E-04		3.07E+00		
Ti+4, (MT)	1.91E-02		6.81E-06		
Tot Org Carbon, (MT)	1.16E+02		3.89E-03		2.74E-01
UO2+2, (MT)	1.76E-01		1.82E+00		
V+5, (MT)	1.88E-01		6.31E-06		
W+6, (MT)	1.41E-05				
Zn+2, (MT)	9.44E-01		7.24E-02		
Zr+4, (MT)	5.10E+02		5.27E-01		
ZrO2:2H2O, (MT)	3.95E-05				

Table A-5. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Low Temperature Glass Limits.

Stream Name / Solid Components	1122	1314	1318	1344	1556
Total Mass Flow, (MT)	4.18E+00	1.35E+03	5.12E+03	1.80E+03	1.03E+03
Cs and Ba, (MCi)	1.71E-05		1.50E-01	7.46E+01	8.03E-06
Sr and Y, (MCi)	3.11E-04		3.37E-01	1.37E+02	4.29E-05
Tc, (MCi)	1.46E-08		6.67E-05	3.17E-02	4.69E-07
TRU, (MCi)	5.59E-07		7.25E-04	2.06E-01	3.57E-06
Total MCi	3.29E-04		4.88E-01	2.12E+02	5.50E-05
Ag+, (MT)	3.09E-06		6.60E-04		
Ag2O, (MT)	1.19E-03		1.43E+00	1.42E+00	4.07E-01
Al+3, (MT)	3.65E-03		2.89E+00		
Al2O3, (MT)			1.59E+02	1.95E+02	9.85E+02
Am+3, (MT)	6.79E-08		1.45E-05		
Am2O3, (MT)			6.53E-05	3.32E-02	7.26E-08
APM-, (MT)			3.46E-03	3.45E-03	
As+5, (MT)	1.12E-06		2.39E-04		
As2O5, (MT)	1.26E-03		1.52E+00	1.51E+00	4.33E-01
B+3, (MT)	2.23E-06		4.77E-04		
B2O3, (MT)	4.32E-05	2.33E+02	5.10E-01	2.33E+02	1.48E-02
Ba+2, (MT)	6.94E-06		1.48E-03		
BaO, (MT)	7.85E-06		1.62E-02	3.46E+00	2.69E-03
Be+2, (MT)	1.71E-08		3.65E-06		
BeO, (MT)	1.61E-04		1.94E-01	1.93E-01	5.53E-02
Bi+3, (MT)	4.40E-04		9.40E-02		
Bi2O3, (MT)	2.60E-03		3.12E+00	3.45E+00	8.92E-01
Carbon14, (MT)			2.17E-07		
Ca+2, (MT)	3.36E-04		7.19E-02		
Cancrinite, (MT)	9.09E-02		1.03E+02		7.98E+00
CaO, (MT)	1.86E-03		2.23E+00	2.33E+00	6.37E-01
Cd+2, (MT)	1.78E-05		3.80E-03		
CdO, (MT)	1.01E-04		1.22E-01	1.26E-01	3.48E-02
Ce+3, (MT)	5.34E-04		1.14E-01		
Ce2O3, (MT)	2.46E-03		2.96E+00	3.40E+00	8.44E-01
Cl-, (MT)	7.83E-06		1.67E-03		
CO3-2, (MT)	5.04E-04		1.08E-01		
Cr+3, (MT)	4.17E-04		3.30E-01		
Cr2O3, (MT)	7.44E-04		8.95E-01	1.38E+00	2.55E-01
Cs+, (MT)	2.08E-07		4.44E-05		
Cs2O, (MT)			1.89E-03	9.64E-01	1.04E-07
Cu+2, (MT)	1.68E-06		3.58E-04		
CuO, (MT)	7.49E-04		9.00E-01	8.98E-01	2.57E-01

Table A-5. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Low Temperature Glass Limits.

Stream Name Solid Components	1122	1514	1518	1544	1556
F-, (MT)	1.34E-04		2.86E-02		
Fe+3, (MT)	2.45E-03		1.94E+00		
Fe2O3, (MT)	3.24E-02	2.95E+01	3.90E+01	7.19E+01	1.11E+01
H2O, (MT)	8.91E-04		1.10E+00	1.10E+00	1.98E-04
Hg+2, (MT)			4.32E-06		
I-, (MT)	4.53E-05		9.69E-03		
K+, (MT)	4.71E-05		1.01E-02		
K2O, (MT)	8.75E-06		1.05E-02	2.35E-02	3.00E-03
La+3, (MT)	4.77E-05		1.02E-02		
La2O3, (MT)	2.20E-04		2.65E-01	3.04E-01	7.55E-02
Li+, (MT)	5.52E-08		1.18E-05		
Li2O, (MT)	2.23E-08	3.60E+01	7.06E-02	3.59E+01	7.67E-06
Mg+2, (MT)	2.47E-05		5.28E-03		
MgO, (MT)	1.76E-04		2.11E-01	2.20E-01	6.03E-02
MnO2, (MT)	4.74E-04		1.02E-01	1.08E-01	6.43E-01
Mo+6, (MT)	1.80E-06		3.84E-04		
MoO3, (MT)	7.65E-05		9.19E-02	9.23E-02	2.62E-02
Na+, (MT)	2.06E-02		4.22E+00		
Na2O, (MT)	9.67E-03	8.39E+01	1.18E+01	1.26E+02	3.32E+00
Ni(OH)3, (MT)					5.25E-08
Ni+3, (MT)	2.38E-05		5.09E-03		
Ni2FECN6, (MT)	2.21E-03		2.65E+00		6.74E-06
Ni2O3, (MT)	2.35E-03		2.82E+00	2.82E+00	8.04E-01
NiO, (MT)			2.36E-03	1.20E+00	
NO2-, (MT)	1.66E-04		3.54E-02		
Np+4, (MT)	4.61E-07		3.65E-04		
NpO2, (MT)	5.81E-08		3.96E-04	1.66E-01	2.00E-05
OH-, (MT)	3.94E+00		4.72E+03		
P2O5, (MT)	3.29E-02		3.95E+01	3.95E+01	1.13E+01
P2O5:24W, (MT)	1.17E-06		2.50E-04		
Pb+4, (MT)	7.36E-06		1.57E-03		
PbO2, (MT)	3.92E-03		4.71E+00	4.70E+00	1.35E+00
PO4-3, (MT)	5.31E-04		1.13E-01		
POLY, (MT)	8.08E-06		5.33E-02		1.80E-06
Pu+4, (MT)	1.43E-06		1.14E-03		
PuO2, (MT)			1.06E-03	5.11E-01	1.66E-05
Si+4, (MT)	1.77E-04		3.79E-02		
SiO2, (MT)	1.60E-03	9.68E+02	3.90E+00	1.01E+03	5.50E-01
SO3, (MT)			3.77E-06	1.93E-03	

Table A-5. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Low Temperature Glass Limits.

Stream Name Solid Components	1122	1514	3318	1544	1556
SO4-2, (MT)	8.82E-06		1.88E-03		
Sr+2, (MT)	8.26E-05		1.77E-02		
SrO, (MT)	3.94E-08		8.51E-02	4.33E+01	1.35E-05
Tc2O7, (MT)	1.26E-07		5.89E-03	2.92E+00	4.33E-05
TcO4-, (MT)	1.28E-06		2.72E-04		
TiO2, (MT)	2.83E-07		3.40E-04	3.51E-04	9.72E-05
Tot Org Carbon, (MT)	2.60E-04		5.55E-02		7.95E-09
U3O8, (MT)	9.62E-06		1.16E-02	1.15E-02	3.30E-03
UO2+2, (MT)	3.74E-03		7.98E-01		
UO3, (MT)			5.44E-03	2.77E+00	
V+5, (MT)	4.22E-07		9.01E-05		
V2O5, (MT)	2.89E-04		3.47E-01	3.47E-01	9.92E-02
WO2, (MT)			4.11E-07	2.26E-04	
WO3, (MT)	6.11E-04		7.34E-01	7.33E-01	2.10E-01
Zn+2, (MT)	2.12E-06		4.53E-04		
ZnO, (MT)	2.84E-04		3.41E-01	4.31E-01	9.74E-02
Zr+4, (MT)	6.21E-04		1.33E-01		
ZrO2, (MT)	6.26E-03		7.52E+00	8.54E+00	2.15E+00
ZrO2:2H2O, (MT)	9.17E-04		1.96E-01		

This page intentionally left blank.

Table A-5A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet. (3 sheets)

15-Sep-95, Clean Flowsheet, LLW Vitrification, HLW Vit Feed with Low Temp Glass Limits, Table A-5A, 10B_LT, Revision 2, 14:38:51)

The material balance summary for the LLW vitrification flowsheet (Figure C-2) is based on the LLW streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1) with low temperature glass limits applied.

This page intentionally left blank.

Table A-5A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	231	406	407	411	441
Volume, Total Liters	4.16E+06	3.24E+06			
Specific Gravity	1.23E+00	1.29E+00			
Total Mass Flow, (MT)	5.11E+05	4.19E+05			
Cs and Ba, (MCi)	6.56E-02	6.56E-02			
Total MCi	6.56E-02	6.56E-02			
Al(OH)4-, (MT)	7.45E+03	7.45E+03			
Cl-, (MT)	3.15E+02	3.15E+02			
Cr(OH)4-, (MT)	2.91E+02	2.91E+02			
Cs+, (MT)	7.99E-04	7.99E-04			
FeCN6-3, (MT)	3.20E+02	3.20E+02			
H2O, (MT)	3.74E+05	2.82E+05			
Hg, (MT)	1.92E+00	1.92E+00			
K+, (MT)	2.02E+01	2.02E+01			
Li+, (MT)	2.90E-02	2.90E-02			
MnO2, (MT)	2.14E+01	2.14E+01			
Mo+6, (MT)	1.18E+00	1.18E+00			
Na+, (MT)	7.01E+04	7.01E+04			
NH3, (MT)	8.38E+00	8.38E+00			
Ni+3, (MT)	2.81E-08	2.81E-08			
NO2-, (MT)	3.01E+02	3.01E+02			
NO3-, (MT)	7.07E+03	7.07E+03			
OH-, (MT)	4.38E+04	4.38E+04			
SO4-2, (MT)	7.45E+03	7.45E+03			
Tot Org Carbon, (MT)	2.74E-01	2.74E-01			

Table A-5A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
Total Mass Flow, (MT)	1.64E+04	2.47E+04	2.64E+05	3.94E+05	5.07E+05
Cs and Ba, (MCi)	3.10E-03	4.56E-03		7.00E-02	6.86E-02
Sr and Y, (MCi)	1.40E-02	1.43E-02		1.43E-02	1.40E-02
Tc, (MCi)	1.53E-04	1.56E-04		1.56E-04	1.53E-04
TRU, (MCi)	1.20E-03	1.22E-03		1.22E-03	1.20E-03
Total MCi	1.84E-02	2.02E-02		8.57E-02	8.39E-02
Ag2O, (MT)	4.07E-01	4.16E-01		4.16E-01	4.07E-01
Al2O3, (MT)	2.97E+03	3.38E+03	1.15E+04	1.97E+04	1.93E+04
Am2O3, (MT)	3.41E-05	3.48E-05		3.48E-05	3.41E-05
As2O5, (MT)	4.33E-01	4.42E-01		4.42E-01	4.33E-01
B2O3, (MT)	4.82E+00	4.92E+00		4.92E+00	4.82E+00
BaO, (MT)	8.76E-01	8.95E-01		8.95E-01	8.76E-01
BeO, (MT)	5.53E-02	5.64E-02		5.64E-02	5.53E-02
Bi2O3, (MT)	2.90E+02	2.97E+02		2.97E+02	2.90E+02
Cancrinite, (MT)	2.60E+03	2.60E+03			
CaO, (MT)	2.08E+02	1.03E+03	3.83E+04	3.94E+04	3.85E+04
CdO, (MT)	1.13E+01	1.16E+01		1.16E+01	1.13E+01
Ce2O3, (MT)	2.75E+02	2.81E+02		2.81E+02	2.75E+02
Cr2O3, (MT)	8.31E+01	8.88E+01		2.73E+02	2.67E+02
Cs2O, (MT)	4.00E-05	5.89E-05		9.04E-04	8.86E-04
CuO, (MT)	2.57E-01	2.62E-01		2.62E-01	2.57E-01
DCPD, (MT)					1.22E+05
Fe2O3, (MT)	3.62E+03	3.70E+03		3.82E+03	3.74E+03
H2O, (MT)	1.98E-04	2.02E-04		2.02E-04	1.98E-04
HgO, (MT)		4.41E-02		2.11E+00	2.07E+00
K2O, (MT)	1.15E+00	1.70E+00		2.61E+01	2.55E+01
La2O3, (MT)	2.46E+01	2.51E+01		2.51E+01	2.46E+01
Li2O, (MT)	2.95E-03	4.34E-03		6.67E-02	6.53E-02
MgO, (MT)	1.96E+01	2.00E+01		2.00E+01	1.96E+01
MnO2, (MT)	2.09E+02	2.14E+02		2.36E+02	2.31E+02
MoO3, (MT)	8.55E+00	8.77E+00		1.05E+01	1.03E+01
Na2O, (MT)	1.27E+03	3.33E+03		9.84E+04	9.63E+04
Ni2FECN6, (MT)	2.20E-03	2.20E-03			
Ni2O3, (MT)	2.62E+02	2.68E+02		2.68E+02	2.62E+02
NiO, (MT)		2.13E-05		1.02E-03	9.97E-04
NpO2, (MT)	6.51E-03	6.65E-03		6.65E-03	6.51E-03
OLIGOMER, (MT)					4.40E-03
P2O5, (MT)	3.68E+03	3.75E+03		3.75E+03	3.68E+03
PbO2, (MT)	1.35E+00	1.37E+00		1.37E+00	1.35E+00
POLY, (MT)	1.80E-06	1.80E-06			

Table A-5A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
PuO2, (MT)	5.42E-03	5.53E-03		5.53E-03	5.42E-03
S, (MT)					1.67E-01
SiO2, (MT)	1.79E+02	4.77E+03	2.14E+05	2.20E+05	2.15E+05
SO3, (MT)		1.33E+02		6.34E+03	6.21E+03
SrO, (MT)	4.40E-03	4.50E-03		4.50E-03	4.40E-03
Tc2O7, (MT)	1.41E-02	1.44E-02		1.44E-02	1.41E-02
TiO2, (MT)	3.16E-02	3.23E-02		3.23E-02	3.16E-02
Tot Org Carbon, (MT)	2.59E-06	2.59E-06			
U3O8, (MT)	1.07E+00	1.10E+00		1.10E+00	1.07E+00
V2O5, (MT)	9.92E-02	1.01E-01		1.01E-01	9.92E-02
WO2, (MT)	9.76E-07	9.97E-07		9.97E-07	9.76E-07
WO3, (MT)	2.10E-01	2.14E-01		2.14E-01	2.10E-01
ZnO, (MT)	3.17E+01	3.24E+01		3.24E+01	3.17E+01
ZrO2, (MT)	6.99E+02	7.14E+02		7.14E+02	6.99E+02

This page intentionally left blank.

Table A-6. Material Balance Summary for Integrated Pretreatment-High Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution. (5 sheets)

(15-Sep-95, Clean Flowsheet, Caustic Recycle without Chrome Removal, Revision 2, Low Temp. and 25% Total Oxide Loading Limit, 14:39:35)

The material balance summary for the integrated pretreatment/HLW vitrification flowsheet with incomplete solids dissolution is the same as the integrated pretreatment/HLW vitrification flowsheet except that the dissolution process specifications were changed to represent a three pass process assuming 90 percent dissolution on the first pass, 10 percent on the second and 5 percent on the third pass.

This page intentionally left blank.

Table A-6. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution.

Stream Name / Liquid Components	1122	1314	1318	1344	1356
Volume, Total Liters	4.00E+07		2.48E+07		4.08E+06
Specific Gravity	1.41E+00		1.06E+00		1.25E+00
Total Mass Flow, (MT)	5.62E+04		2.64E+04		5.11E+05
Cs and Ba, (MCi)	8.28E-04		7.46E+01		1.74E-01
Sr and Y, (MCi)	6.86E+01		6.89E+01		
Tc, (MCi)	2.92E-03		2.89E-02		
TRU, (MCi)	1.02E-03		2.02E-01		
Total MCi	6.86E+01		1.44E+02		1.74E-01
Ag+, (MT)	1.37E+00		5.64E-04		
Al(OH)4-, (MT)	6.80E-02		1.12E-06		
Al+3, (MT)	1.79E+02		2.53E-01		9.59E+02
Am+3, (MT)	6.00E-06		3.00E-02		
As+5, (MT)	4.94E-01		2.04E-04		
B+3, (MT)	9.87E-01		4.07E-04		
Ba+2, (MT)	1.53E+00		1.54E+00		
Be+2, (MT)	7.56E-03		3.12E-06		
Bi+3, (MT)	1.94E+00		2.75E-01		
Carbon14, (MT)	4.50E-04		1.86E-07		
C2O4-2, (MT)	3.14E+03				
Ca+2, (MT)	1.49E+02		6.14E-02		
Cancrinite, (MT)	1.20E+02		6.08E-01		
Cd+2, (MT)	7.87E+00		3.25E-03		
Ce+3, (MT)	4.72E-02		3.57E-01		
Cl-, (MT)	4.24E+00		1.44E-03		3.15E+02
Cr(OH)4-, (MT)	1.67E-03		2.76E-08		
Cr+3, (MT)	1.28E+02		3.48E-02		1.25E+02
Cs+, (MT)	1.01E-05		9.09E-01		2.12E-03
Cu+2, (MT)	7.41E-01		3.06E-04		
DTPA-3, (MT)			2.98E-01		
F-, (MT)	2.46E+03		1.74E+01		
Fe+3, (MT)	7.50E+02		2.79E-01		
FeCN6-3, (MT)	1.78E+00		2.93E-05		2.96E+02
FESA, (MT)	1.05E+03				
H+, (MT)	1.62E+02		4.84E+01		
H2, (MT)			8.10E-09		
H2O, (MT)	4.45E+04		2.32E+04		3.72E+05
H2O2, (MT)	2.39E+01		1.63E+02		
Hg, (MT)			7.00E-05		
Hg+2, (MT)	8.95E-03		3.69E-06		

Table A-6. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution.

Stream Name Liquid Components	1122	1314	1318	1344	1556
Hg2, (MT)	4.71E-03		7.76E-08		1.92E+00
I-, (MT)	2.01E+01		8.28E-03		
K+, (MT)	2.09E+01		8.61E-03		2.07E+01
La+3, (MT)	4.21E-03		3.19E-02		
Li+, (MT)	2.45E-02		1.01E-05		2.96E-02
Mg+2, (MT)	1.09E+01		4.51E-03		
Mn+4, (MT)	1.32E+02		5.44E-02		
MnO2, (MT)	4.45E-03				2.16E+01
Mo+6, (MT)	8.68E-01		3.29E-04		
MoO4-2, (MT)	1.14E-02		1.87E-07		1.89E+00
Na+, (MT)	1.71E+03		4.22E+00		6.70E+04
NH3, (MT)	5.34E-02		8.80E-07		2.17E+01
NH4+, (MT)	1.56E-02		4.64E-06		1.55E-02
Ni+3, (MT)	1.74E+02		7.04E-03		
NO2-, (MT)					7.57E+02
NO3-, (MT)	5.25E+02		2.95E+03		1.78E+04
Np+4, (MT)	8.49E-04		1.41E-01		
OH-, (MT)			1.32E-01		4.85E+04
Pb+4, (MT)	3.26E+00		1.34E-03		
PO4-3, (MT)	2.10E+02		8.35E-02		
POLY, (MT)			1.62E-04		
PTA-3, (MT)	5.31E-01		2.18E-04		5.29E-01
Pu+4, (MT)	4.39E-03		4.35E-01		
Si+4, (MT)	7.85E+01		3.25E-02		
SO4-2, (MT)	1.03E+01		1.50E-03		2.75E+03
Sr+2, (MT)	1.82E+01		1.83E+01		
TcO4-, (MT)	2.82E-01		2.79E+00		
Ti+4, (MT)	1.66E-02		8.79E-05		
Tot Org Carbon, (MT)	1.15E+02		4.74E-02		7.22E-01
UO2+2, (MT)	1.75E-01		2.43E+00		
V+5, (MT)	1.86E-01		7.69E-05		
W+6, (MT)	1.05E-05				
Zn+2, (MT)	9.38E-01		7.28E-02		
Zr+4, (MT)	5.07E+02		7.16E-01		
ZrO2:2H2O, (MT)	2.52E-05				

Table A-6. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution.

Stream Name / Solid Components	1122	1314	1318	1344	1556
Total Mass Flow, (MT)	4.50E-01	6.46E+03	6.59E+03	8.22E+03	1.95E+03
Cs and Ba, (MCi)	2.55E-05		1.98E-01	7.45E+01	2.13E-05
Sr and Y, (MCi)	4.90E-04		1.45E+00	6.97E+01	5.48E-01
Tc, (MCi)	2.09E-08		1.13E-04	2.88E-02	2.45E-05
TRU, (MCi)	7.67E-07		4.62E-03	2.06E-01	9.16E-06
Total MCi	5.17E-04		1.65E+00	1.45E+02	5.48E-01
Ag+, (MT)	4.63E-06		9.30E-03		
Ag2O, (MT)	4.84E-05		7.45E-01	7.54E-01	1.08E+00
Al+3, (MT)	4.10E-03		3.44E+01		
Al2O3, (MT)			5.40E+02	9.04E+02	1.87E+03
Am+3, (MT)	1.02E-07		2.04E-04		
Am2O3, (MT)			6.53E-05	3.32E-02	1.91E-07
APM-, (MT)			5.14E-02	5.13E-02	
As+5, (MT)	1.68E-06		3.37E-03		
As2O5, (MT)	5.16E-05		7.94E-01	7.97E-01	1.15E+00
B+3, (MT)	3.34E-06		6.72E-03		
B2O3, (MT)	1.75E-06	1.40E+03	2.77E+00	1.40E+03	3.90E-02
Ba+2, (MT)	1.04E-05		2.09E-02		
BaO, (MT)	9.37E-07		1.78E-02	1.75E+00	2.09E-02
Be+2, (MT)	2.56E-08		5.14E-05		
BeO, (MT)	6.60E-06		1.02E-01	1.02E-01	1.47E-01
Bi+3, (MT)	6.59E-04		1.32E+00		
Bi2O3, (MT)	1.06E-04		1.63E+00	3.40E+00	2.35E+00
Carbon14, (MT)			3.06E-06		
Ca+2, (MT)	5.04E-04		1.01E+00		
Cancrinite, (MT)	6.98E-02		1.00E+03		1.37E+01
CaO, (MT)	7.53E-05		1.16E+00	2.66E+00	1.68E+00
Cd+2, (MT)	2.67E-05		5.36E-02		
CdO, (MT)	4.11E-06		6.34E-02	1.28E-01	9.15E-02
Ce+3, (MT)	7.99E-04		1.61E+00		
Ce2O3, (MT)	9.98E-05		1.54E+00	3.83E+00	2.22E+00
Cl-, (MT)	1.17E-05		2.36E-02		
CO3-2, (MT)	7.55E-04		1.52E+00		
Cr+3, (MT)	5.35E-04		4.48E+00		
Cr2O3, (MT)	2.84E-05		4.50E-01	7.04E+00	6.32E-01
Cs+, (MT)	3.11E-07		6.25E-04		
Cs2O, (MT)			1.89E-03	9.63E-01	2.76E-07
Cu+2, (MT)	2.51E-06		5.04E-03		
CuO, (MT)	3.05E-05		4.70E-01	4.76E-01	6.80E-01

Table A-6. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution.

Stream Name Solid Components	1522	1514	1518	1544	1556
F-, (MT)	2.01E-04		4.03E-01		
Fe+3, (MT)	3.14E-03		2.64E+01		
Fe2O3, (MT)	5.09E-04	2.73E+02	8.47E+00	3.29E+02	1.13E+01
H2O, (MT)	2.84E-05		1.10E+00	1.10E+00	1.68E-05
Hg+2, (MT)			6.08E-05		
I-, (MT)	6.79E-05		1.37E-01		
K+, (MT)	7.06E-05		1.42E-01		
K2O, (MT)	1.38E-07		2.48E-03	1.83E-01	3.07E-03
La+3, (MT)	7.14E-05		1.43E-01		
La2O3, (MT)	8.92E-06		1.38E-01	3.43E-01	1.99E-01
Li+, (MT)	8.26E-08		1.66E-04		
Li2O, (MT)		2.91E+02	5.72E-01	2.91E+02	7.85E-06
Mg+2, (MT)	3.70E-05		7.43E-02		
MgO, (MT)	7.12E-06		1.10E-01	2.40E-01	1.59E-01
MnO2, (MT)	7.07E-04		1.42E+00	1.51E+00	1.68E+00
Mo+6, (MT)	2.69E-06		5.41E-03		
MoO3, (MT)	3.11E-06		4.79E-02	5.64E-02	6.93E-02
Na+, (MT)	3.38E-02		6.54E+01		
Na2O, (MT)	1.10E-04	2.50E+02	2.82E+00	5.75E+02	2.44E+00
Ni(OH)3, (MT)					1.29E-07
Ni+3, (MT)	3.57E-05		7.16E-02		
Ni2FECN6, (MT)	2.62E-03		4.03E+01		2.12E-05
Ni2O3, (MT)	8.88E-05		1.37E+00	1.48E+00	1.98E+00
NiO, (MT)			3.59E-02	1.83E+01	
NO2-, (MT)	2.48E-04		4.99E-01		
Np+4, (MT)	5.91E-07		4.96E-03		
NpO2, (MT)			3.32E-04	1.66E-01	9.09E-06
OH-, (MT)	3.19E-01		4.79E+03		
P2O5, (MT)	1.34E-03		2.07E+01	2.17E+01	2.99E+01
P2O5:24W, (MT)	1.75E-06		3.52E-03		
Pb+4, (MT)	1.10E-05		2.22E-02		
PbO2, (MT)	1.60E-04		2.46E+00	2.49E+00	3.56E+00
PO4-3, (MT)	6.85E-04		1.38E+00		
POLY, (MT)	8.04E-06		1.06E+00		4.75E-06
Pu+4, (MT)	1.84E-06		1.54E-02		
PuO2, (MT)			1.03E-03	5.11E-01	4.27E-05
Si+4, (MT)	2.66E-04		5.34E-01		
SiO2, (MT)	6.50E-05	4.25E+03	1.00E+01	4.60E+03	1.45E+00
SO3, (MT)			3.99E-05	2.03E-02	

Table A-6. Material Balance Summary for Integrated Pretreatment High-Level Waste Vitrification Flowsheet with Incomplete Solids Dissolution.

Stream Name / Solid Components	1122	1314	1318	1544	1556
SO4-2, (MT)	1.14E-05		2.29E-02		
Sr+2, (MT)	1.24E-04		2.49E-01		
SrO, (MT)	7.76E-06		1.62E-01	2.20E+01	1.73E-01
Tc2O7, (MT)	1.02E-07		6.78E-03	2.66E+00	2.26E-03
TcO4-, (MT)	1.91E-06		3.84E-03		
TiO2, (MT)			1.54E-04	3.00E-04	2.22E-04
Tot Org Carbon, (MT)	3.89E-04		7.82E-01		3.14E-08
U3O8, (MT)	3.89E-07		5.98E-03	5.97E-03	8.65E-03
UO2+2, (MT)	5.59E-03		1.12E+01		
UO3, (MT)			2.84E-02	1.45E+01	
V+5, (MT)	6.32E-07		1.27E-03		
V2O5, (MT)	1.18E-05		1.82E-01	1.84E-01	2.62E-01
WO2, (MT)			6.19E-06	3.16E-03	
WO3, (MT)	2.50E-05		3.86E-01	3.85E-01	5.58E-01
Zn+2, (MT)	3.18E-06		6.39E-03		
ZnO, (MT)	1.16E-05		1.78E-01	2.76E-01	2.58E-01
Zr+4, (MT)	9.31E-04		1.87E+00		
ZrO2, (MT)	2.54E-04		3.91E+00	9.53E+00	5.65E+00
ZrO2:2H2O, (MT)	1.37E-03		2.76E+00		

This page intentionally left blank.

Table A-6A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet. (3 sheets)

(15-Sep-95, Clean Flowsheet, LLW Vitrification, Integrated Pretreatment-HLW Vitrification Feed, EJS_B, Revision 2, 14:40:15)

The material balance summary for the LLW vitrification flowsheet (Figure C-2) is based on the LLW streams 1532 and 1556 from the integrated pretreatment/HLW vitrification flowsheet (see sheet 35A in Figure C-1) with incomplete solids dissolution.

This page intentionally left blank.

Table A-6A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Liquid Components	231	406	407	411	461
Volume, Total Liters	4.12E+06	3.10E+06			
Specific Gravity	1.24E+00	1.32E+00			
Total Mass Flow, (MT)	5.11E+05	4.09E+05			
Cs and Ba, (MCi)	1.74E-01	1.74E-01			
Total MCi	1.74E-01	1.74E-01			
Al(OH)4-, (MT)	5.96E+03	5.96E+03			
Cl-, (MT)	3.15E+02	3.15E+02			
Cr(OH)4-, (MT)	2.90E+02	2.90E+02			
Cs+, (MT)	2.12E-03	2.12E-03			
FeCN6-3, (MT)	2.96E+02	2.96E+02			
H2O, (MT)	3.72E+05	2.70E+05			
Hg, (MT)	1.92E+00	1.92E+00			
K+, (MT)	2.07E+01	2.07E+01			
Li+, (MT)	2.96E-02	2.96E-02			
MnO2, (MT)	2.16E+01	2.16E+01			
Mo+6, (MT)	1.13E+00	1.13E+00			
Na+, (MT)	6.70E+04	6.70E+04			
NH3, (MT)	2.17E+01	2.17E+01			
Ni+3, (MT)	6.88E-08	6.88E-08			
NO2-, (MT)	7.57E+02	7.57E+02			
NO3-, (MT)	1.78E+04	1.78E+04			
OH-, (MT)	4.41E+04	4.41E+04			
SO4-2, (MT)	2.75E+03	2.75E+03			
Tot Org Carbon, (MT)	7.22E-01	7.22E-01			

Table A-6A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	291	406	407	411	441
Total Mass Flow, (MT)	1.28E+04	2.05E+04	2.55E+05	3.72E+05	4.79E+05
Cs and Ba, (MCi)	3.12E-03	6.89E-03		1.81E-01	1.77E-01
Sr and Y, (MCi)	6.78E+01	6.92E+01		6.92E+01	6.78E+01
Tc, (MCi)	3.03E-03	3.10E-03		3.10E-03	3.03E-03
TRU, (MCi)	1.16E-03	1.19E-03		1.19E-03	1.16E-03
Total MCi	6.78E+01	6.92E+01		6.94E+01	6.79E+01
Ag2O, (MT)	1.08E+00	1.10E+00		1.10E+00	1.08E+00
Al2O3, (MT)	3.29E+03	3.68E+03	1.12E+04	1.86E+04	1.82E+04
Am2O3, (MT)	3.40E-05	3.47E-05		3.47E-05	3.40E-05
As2O5, (MT)	1.15E+00	1.17E+00		1.17E+00	1.15E+00
B2O3, (MT)	4.82E+00	4.93E+00		4.93E+00	4.82E+00
BaO, (MT)	2.58E+00	2.63E+00		2.63E+00	2.58E+00
BeO, (MT)	1.47E-01	1.50E-01		1.50E-01	1.47E-01
Bi2O3, (MT)	2.90E+02	2.97E+02		2.97E+02	2.90E+02
Cancrinite, (MT)	1.70E+03	1.70E+03			
CaO, (MT)	2.07E+02	9.83E+02	3.62E+04	3.72E+04	3.64E+04
CdO, (MT)	1.13E+01	1.16E+01		1.16E+01	1.13E+01
Ce2O3, (MT)	2.75E+02	2.80E+02		2.80E+02	2.75E+02
Cr2O3, (MT)	7.81E+01	8.37E+01		2.67E+02	2.61E+02
Cs2O, (MT)	4.03E-05	8.90E-05		2.33E-03	2.29E-03
CuO, (MT)	6.80E-01	6.94E-01		6.94E-01	6.80E-01
DCPD, (MT)					1.15E+05
Fe2O3, (MT)	1.40E+03	1.43E+03		1.55E+03	1.51E+03
H2O, (MT)	1.68E-05	1.72E-05		1.72E-05	1.68E-05
HgO, (MT)		4.41E-02		2.11E+00	2.07E+00
K2O, (MT)	4.47E-01	9.88E-01		2.59E+01	2.54E+01
La2O3, (MT)	2.45E+01	2.51E+01		2.51E+01	2.45E+01
Li2O, (MT)	1.14E-03	2.53E-03		6.63E-02	6.49E-02
MgO, (MT)	1.96E+01	2.00E+01		2.00E+01	1.96E+01
MnO2, (MT)	2.08E+02	2.12E+02		2.34E+02	2.29E+02
MoO3, (MT)	8.56E+00	8.78E+00		1.05E+01	1.03E+01
Na2O, (MT)	3.56E+02	2.30E+03		9.29E+04	9.10E+04
Ni2FECN6, (MT)	2.62E-03	2.62E-03			
Ni2O3, (MT)	2.44E+02	2.50E+02		2.50E+02	2.44E+02
NiO, (MT)		2.53E-05		1.21E-03	1.19E-03
NpO2, (MT)	1.12E-03	1.15E-03		1.15E-03	1.12E-03
OLIGOMER, (MT)					4.16E-03
P2O5, (MT)	3.69E+03	3.77E+03		3.77E+03	3.69E+03
PbO2, (MT)	3.56E+00	3.64E+00		3.64E+00	3.56E+00
POLY, (MT)	4.75E-06	4.75E-06			

Table A-6A. Material Balance Summary for Low-Level Waste Vitrification Flowsheet.

Stream Name Solid Components	233	406	407	411	441
PuO2, (MT)	5.28E-03	5.39E-03		5.39E-03	5.28E-03
S, (MT)					1.58E-01
SiO2, (MT)	1.79E+02	4.63E+03	2.08E+05	2.13E+05	2.09E+05
SO3, (MT)		4.90E+01		2.35E+03	2.30E+03
SrO, (MT)	2.14E+01	2.18E+01		2.18E+01	2.14E+01
Tc2O7, (MT)	2.80E-01	2.86E-01		2.86E-01	2.80E-01
TiO2, (MT)	2.75E-02	2.81E-02		2.81E-02	2.75E-02
Tot Org Carbon, (MT)	3.89E-06	3.89E-06			
U3O8, (MT)	1.07E+00	1.09E+00		1.09E+00	1.07E+00
V2O5, (MT)	2.62E-01	2.68E-01		2.68E-01	2.62E-01
WO2, (MT)	1.46E-06	1.49E-06		1.49E-06	1.46E-06
WO3, (MT)	5.58E-01	5.69E-01		5.69E-01	5.58E-01
ZnO, (MT)	3.19E+01	3.25E+01		3.25E+01	3.19E+01
ZrO2, (MT)	6.98E+02	7.13E+02		7.13E+02	6.98E+02

This page intentionally left blank.

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams. (74 sheets)

(20-Sep-95, Comparison of HLW Vitrification Flowsheet Offgas Streams, Tables A-1, A-2, A-3, A-4, A-5, A-6, 09:23:08)
(20-Sep-95, Comparison of HLW Vitrification Flowsheets, Tables A-1 Through A-6 15:51:17)
(20-Sep-95, Comparison of HLW Vitrification Flowsheets, Tables A-1 through A-6 15:15:33)
(20-Sep-95, Comparison of HLW Vitrification Flowsheets, Table A-1, A-2, A-3, A-4 15:12:30)
(20-Sep-95, Comparison of LLW Grout Flowsheet Cured Grout Streams, Tables A-1.2 and A-2.1 12:55:46)
(20-Sep-95, Comparison of HLW Vitrification Flowsheet Offgas Streams, Tables A-1, A-2, A-3, A-4 14:54:05)
(20-Sep-95, Comparison of LLW Vitrification Flowsheet Offgas Streams, Tables A-1.1, A-1.2, A-2.1, A-3.1, A-4.1 15:18:08)
(21-Sep-95, Comparison of Selected HLW and LLW Vitrification Flowsheet Waste Streams, Tables A-1, A-2, A-3, A-4, A-5, A-6 07:50:32)

The material balances for specific HLW, LLW, and offgas streams from all flowsheets are shown for comparison. These streams are described below.

126	=	HLW from cesium ion exchange
283	=	HLW from dissolution
460	=	HLW from strontium extraction
532	=	HLW from technetium ion exchange
742	=	HLW from tributyl phosphate extraction
924	=	HLW from americium/lanthanide ion exchange
1532, 1556, 233 (both)	=	LLW waste routed to glass or grout treatment
1314, 1318, 1344	=	HLW frit, melter feed, and glass product, respectively
SRCS	=	Strontium and cesium capsule feedstream
336, 1562	=	Uranium and chromium product streams, respectively
1371, 1374, 1543	=	HLW treatment offgas streams
907, 917, 15	=	LLW treatment offgas streams (glass and grout, respectively
406, 407, 411, 441	=	LLW melter feed, frit, glass, and glass/sulfur product, respectively
6	=	LLW grout product
807, 1210	=	Liquid effluent streams to treatment facility (LLW Vitrification and Integrated Pretreatment-HLW Vitrification flowsheets, respectively)

This page intentionally left blank.

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	126_A-1	126_A-2	126_A-3	126_A-4	126_A-5	126_A-6	283_A-1	283_A-2	283_A-3	283_A-4
Volume, Total Liters	1.33E+08	1.37E+08	1.33E+08	1.33E+08	1.33E+08	5.61E+07	4.61E+07	4.35E+07	4.61E+07	4.61E+07
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.33E+05	1.37E+05	1.33E+05	1.33E+05	1.33E+05	5.61E+04	4.61E+04	4.35E+04	4.61E+04	4.61E+04
Cs and Ba, (MCi)	7.48E+01	7.48E+01	7.48E+01	7.48E+01	7.48E+01	7.46E+01	2.59E-04	2.56E-04	2.57E-04	2.57E-04
Sr and Y, (MCi)							4.69E-03	4.63E-03	4.65E-03	4.65E-03
Tc, (MCi)							1.99E-07	1.97E-07	1.97E-07	1.97E-07
TRU, (MCi)							5.63E-06	5.57E-06	5.58E-06	5.58E-06
Total MCi	7.48E+01	7.48E+01	7.48E+01	7.48E+01	7.48E+01	7.46E+01	4.95E-03	4.90E-03	4.91E-03	4.91E-03
Ag+, (MT)							4.65E-05	4.60E-05	4.61E-05	4.61E-05
Al(OH)4-, (MT)							2.14E-07	2.06E-07	2.14E-07	2.14E-07
Al+3, (MT)							2.16E-02	2.14E-02	2.14E-02	2.14E-02
Am+3, (MT)							1.02E-06	1.01E-06	1.01E-06	1.01E-06
As+5, (MT)							1.68E-05	1.66E-05	1.67E-05	1.67E-05
B+3, (MT)							3.36E-05	3.32E-05	3.33E-05	3.33E-05
Ba+2, (MT)							1.05E-04	1.03E-04	1.04E-04	1.04E-04
Be+2, (MT)							2.57E-07	2.54E-07	2.55E-07	2.55E-07
Bi+3, (MT)							6.63E-03	6.55E-03	6.57E-03	6.57E-03
Carbon14, (MT)							1.53E-08	1.51E-08	1.52E-08	1.52E-08
Ca+2, (MT)							5.07E-03	5.01E-03	5.02E-03	5.02E-03
Cancrinite, (MT)							8.39E-02	8.23E-02	8.34E-02	8.34E-02
Cd+2, (MT)							2.68E-04	2.65E-04	2.66E-04	2.66E-04
Co+3, (MT)							8.04E-03	7.95E-03	7.97E-03	7.97E-03
Cl-, (MT)							1.31E-04	1.28E-04	1.30E-04	1.30E-04
CO, (MT)							4.42E-06	4.17E-06	4.42E-06	4.42E-06
CO2, (MT)							5.14E-05	5.08E-05	5.09E-05	5.09E-05
Cr(OH)4-, (MT)							5.27E-09	5.05E-09	5.27E-09	5.27E-09
Cr+3, (MT)							2.72E-03	2.69E-03	2.70E-03	2.70E-03
Cs+, (MT)	9.11E-01	9.11E-01	9.11E-01	9.11E-01	9.11E-01	9.09E-01	3.15E-06	3.12E-06	3.13E-06	3.13E-06
Cu+2, (MT)							2.52E-05	2.49E-05	2.50E-05	2.50E-05
DTPA-3, (MT)										
F-, (MT)							1.00E+01	9.44E+00	1.00E+01	1.00E+01
Fe+3, (MT)							1.60E-02	1.58E-02	1.58E-02	1.58E-02
FeCN6-3, (MT)							1.63E-05	1.54E-05	1.63E-05	1.63E-05
H+, (MT)	1.28E+02	1.32E+02	1.29E+02	1.29E+02	1.29E+02	5.40E+01	3.15E+00	2.98E+00	3.14E+00	3.14E+00
H2, (MT)							1.36E-15		1.36E-15	1.36E-15
H2O, (MT)	1.27E+05	1.31E+05	1.28E+05	1.28E+05	1.28E+05	5.36E+04	4.59E+04	4.34E+04	4.59E+04	4.59E+04
H2O2, (MT)							6.48E+00	6.04E+00	6.43E+00	6.50E+00
HCOO-, (MT)	5.74E+03	5.91E+03	5.74E+03	5.74E+03	5.74E+03	2.41E+03				
Hg+2, (MT)							3.04E-07	3.01E-07	3.02E-07	3.02E-07
Hg2, (MT)							7.61E-08	7.12E-08	7.61E-08	7.61E-08
I-, (MT)							6.83E-04	6.75E-04	6.77E-04	6.77E-04
K+, (MT)							7.11E-04	7.03E-04	7.05E-04	7.05E-04
La+3, (MT)							7.18E-04	7.10E-04	7.12E-04	7.12E-04

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	126_A-1	126_A-2	126_A-3	126_A-4	126_A-5	126_A-6	283_A-1	283_A-2	283_A-3	283_A-4
Li+, (MT)							8.32E-07	8.22E-07	8.25E-07	8.25E-07
Mg+2, (MT)							3.72E-04	3.68E-04	3.69E-04	3.69E-04
Mn+4, (MT)							4.51E-03	4.42E-03	4.48E-03	4.48E-03
MnO2, (MT)							8.11E-09	7.59E-09	8.10E-09	8.11E-09
Mo+6, (MT)							2.73E-05	2.70E-05	2.71E-05	2.71E-05
MoO4-2, (MT)							1.00E-07	9.42E-08	1.00E-07	1.00E-07
N2, (MT)							5.24E-07	5.18E-07	5.19E-07	5.19E-07
Na+, (MT)							2.97E-01	2.96E-01	2.96E-01	2.96E-01
NH2OH, (MT)								5.78E-07		
NH3, (MT)							3.32E-07	3.17E-07	3.32E-07	3.32E-07
NH4+, (MT)							7.05E-09	6.91E-09	7.00E-09	7.00E-09
Ni+3, (MT)							7.77E-04	7.67E-04	7.71E-04	7.71E-04
NO2, (MT)							4.57E-05	4.52E-05	4.53E-05	4.53E-05
NO3-, (MT)							1.60E+02	1.52E+02	1.60E+02	1.60E+02
Np+4, (MT)							3.01E-06	2.97E-06	2.98E-06	2.98E-06
O2, (MT)							2.61E-06	2.47E-06	2.61E-06	2.61E-06
Pb+4, (MT)							1.11E-04	1.10E-04	1.10E-04	1.10E-04
PO4-3, (MT)							8.02E-03	7.92E-03	7.95E-03	7.95E-03
POLY, (MT)							4.32E-04	3.99E-04	4.30E-04	4.30E-04
PTA-3, (MT)							1.81E-05	1.78E-05	1.79E-05	1.79E-05
Pu+4, (MT)							9.36E-06	9.24E-06	9.27E-06	9.27E-06
Si+4, (MT)							2.68E-03	2.65E-03	2.66E-03	2.66E-03
SO4-2, (MT)							4.29E-04	3.99E-04	4.28E-04	4.28E-04
Sr+2, (MT)							1.25E-03	1.23E-03	1.24E-03	1.24E-03
TcO4-, (MT)							1.92E-05	1.90E-05	1.90E-05	1.90E-05
Ti+4, (MT)							6.81E-06	6.79E-06	6.81E-06	6.81E-06
Tot Org Carbon, (MT)							3.91E-03	3.87E-03	3.88E-03	3.88E-03
UO2+2, (MT)							5.63E-02	5.56E-02	5.58E-02	5.58E-02
V+5, (MT)							6.35E-06	6.28E-06	6.30E-06	6.29E-06
W+6, (MT)							3.31E-11	3.18E-11	3.32E-11	3.31E-11
Zn+2, (MT)							3.20E-05	3.16E-05	3.17E-05	3.17E-05
Zr+4, (MT)							1.73E-02	1.71E-02	1.71E-02	1.71E-02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	126_A-1	126_A-2	126_A-3	126_A-4	126_A-5	126_A-6	283_A-1	283_A-2	283_A-3	283_A-4
Total Mass Flow, (MT)							5.12E+03	4.84E+03	5.12E+03	5.12E+03
Cs and Ba, (MCi)							3.69E-03	3.63E-03	3.66E-03	3.66E-03
Sr and Y, (MCi)							6.70E-02	6.62E-02	6.64E-02	6.64E-02
Tc, (MCi)							4.48E-06	2.82E-06	4.45E-06	4.45E-06
TRU, (MCi)							3.22E-04	3.07E-04	3.19E-04	3.19E-04
Total MCi							7.10E-02	7.01E-02	7.03E-02	7.03E-02
Ag+, (MT)							6.64E-04	6.58E-04	6.58E-04	6.58E-04
Ag2O, (MT)							1.42E+00	1.34E-03	1.42E+00	1.42E+00
Al+3, (MT)							2.91E+00	2.88E+00	2.88E+00	2.88E+00
Al2O3, (MT)							1.59E+02	8.49E-01	1.58E+02	1.58E+02
Am+3, (MT)							1.46E-05	1.45E-05	1.45E-05	1.45E-05
Am2O3, (MT)							1.34E-07		1.20E-07	1.20E-07
APM-, (MT)							3.47E-03	3.44E-03	3.44E-03	3.44E-03
As+5, (MT)							2.40E-04	2.38E-04	2.38E-04	2.38E-04
As2O5, (MT)							1.51E+00	1.43E-03	1.51E+00	1.51E+00
B+3, (MT)							4.80E-04	4.75E-04	4.75E-04	4.75E-04
B2O3, (MT)							5.18E-02	5.14E-05	5.17E-02	5.18E-02
Ba+2, (MT)							1.49E-03	1.48E-03	1.48E-03	1.48E-03
BaO, (MT)							9.41E-03	9.42E-06	9.41E-03	9.41E-03
Be+2, (MT)							3.67E-06	3.64E-06	3.64E-06	3.64E-06
BeO, (MT)							1.93E-01	1.82E-04	1.93E-01	1.93E-01
Bi+3, (MT)							9.45E-02	9.36E-02	9.37E-02	9.37E-02
Bi2O3, (MT)							3.12E+00	3.10E-03	3.12E+00	3.12E+00
Carbon14, (MT)							2.19E-07	2.16E-07	2.17E-07	2.17E-07
Ca+2, (MT)							7.23E-02	7.16E-02	7.16E-02	7.16E-02
Cancrinite, (MT)							1.04E+02	1.02E+02	1.03E+02	1.03E+02
CaO, (MT)							2.23E+00	2.21E-03	2.23E+00	2.23E+00
Cd+2, (MT)							3.83E-03	3.79E-03	3.79E-03	3.79E-03
CdO, (MT)							1.22E-01	1.21E-04	1.22E-01	1.22E-01
Ce+3, (MT)							1.15E-01	1.14E-01	1.14E-01	1.14E-01
Ce2O3, (MT)							2.95E+00	2.93E-03	2.95E+00	2.95E+00
Cl-, (MT)							1.68E-03	1.67E-03	1.67E-03	1.67E-03
CO3-2, (MT)							1.08E-01	1.07E-01	1.07E-01	1.07E-01
Cr+3, (MT)							3.32E-01	3.29E-01	3.29E-01	3.29E-01
Cr2O3, (MT)							8.93E-01	1.40E-01	8.93E-01	8.93E-01
Cs+, (MT)							4.46E-05	4.42E-05	4.42E-05	4.42E-05
Cs2O, (MT)							3.61E-07		3.53E-07	3.53E-07
Cu+2, (MT)							3.60E-04	3.57E-04	3.57E-04	3.57E-04
CuO, (MT)							8.98E-01	8.48E-04	8.98E-01	8.98E-01
F-, (MT)							2.88E-02	2.85E-02	2.85E-02	2.85E-02
Fe+3, (MT)							1.95E+00	1.93E+00	1.94E+00	1.94E+00
Fe2O3, (MT)							3.88E+01	3.73E-02	3.89E+01	3.89E+01
H2O, (MT)							1.10E+00	1.09E+00	1.10E+00	1.10E+00

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	126_A-1	126_A-2	126_A-3	126_A-4	126_A-5	126_A-6	283_A-1	283_A-2	283_A-3	283_A-4
Hg+2, (MT)							4.34E-06	4.30E-06	4.30E-06	4.30E-06
I-, (MT)							9.75E-03	9.65E-03	9.66E-03	9.66E-03
K+, (MT)							1.01E-02	1.00E-02	1.00E-02	1.00E-02
K2O, (MT)							1.05E-02	1.03E-05	1.05E-02	1.05E-02
La+3, (MT)							1.02E-02	1.01E-02	1.02E-02	1.02E-02
La2O3, (MT)							2.64E-01	2.62E-04	2.64E-01	2.64E-01
Li+, (MT)							1.19E-05	1.17E-05	1.17E-05	1.17E-05
Li2O, (MT)							2.68E-05	3.34E-08	2.68E-05	2.68E-05
Mg+2, (MT)							5.31E-03	5.26E-03	5.26E-03	5.26E-03
MgO, (MT)							2.11E-01	2.09E-04	2.11E-01	2.11E-01
MnO2, (MT)							1.02E-01	9.99E-02	1.01E-01	1.01E-01
Mo+6, (MT)							3.87E-04	3.83E-04	3.83E-04	3.83E-04
MoO3, (MT)							9.18E-02	9.12E-05	9.18E-02	9.18E-02
Na+, (MT)							4.22E+00	4.22E+00	4.22E+00	4.22E+00
Na2O, (MT)							1.16E+01	1.11E-02	1.16E+01	1.16E+01
Ni+3, (MT)							5.12E-03	5.07E-03	5.07E-03	5.07E-03
Ni2FECN6, (MT)							2.66E+00	2.64E+00	2.64E+00	2.64E+00
Ni2O3, (MT)							2.81E+00	2.79E-03	2.81E+00	2.81E+00
NO2-, (MT)							3.56E-02	3.53E-02	3.53E-02	3.53E-02
Np+4, (MT)							3.68E-04	3.64E-04	3.64E-04	3.64E-04
NpO2, (MT)							6.97E-05	1.10E-07	7.00E-05	7.00E-05
OH-, (MT)							4.72E+03	4.72E+03	4.72E+03	4.72E+03
P2O5, (MT)							3.95E+01	3.92E-02	3.95E+01	3.95E+01
P2O5:24W, (MT)							2.51E-04	2.49E-04	2.49E-04	2.49E-04
Pb+4, (MT)							1.58E-03	1.57E-03	1.57E-03	1.57E-03
PbO2, (MT)							4.70E+00	4.44E-03	4.70E+00	4.70E+00
PO4-3, (MT)							1.14E-01	1.13E-01	1.13E-01	1.13E-01
POLY, (MT)							5.33E-02	5.33E-02	5.33E-02	5.33E-02
Pu+4, (MT)							1.14E-03	1.13E-03	1.13E-03	1.13E-03
PuO2, (MT)							5.82E-05	7.42E-08	5.82E-05	5.82E-05
Si+4, (MT)							3.81E-02	3.78E-02	3.78E-02	3.78E-02
SiO2, (MT)							1.92E+00	1.91E-03	1.92E+00	1.92E+00
SO4-2, (MT)							1.90E-03	1.88E-03	1.88E-03	1.88E-03
Sr+2, (MT)							1.78E-02	1.76E-02	1.76E-02	1.76E-02
SrO, (MT)							4.71E-05	7.29E-08	4.74E-05	4.74E-05
Tc2O7, (MT)							1.51E-04	2.26E-07	1.51E-04	1.51E-04
TcO4-, (MT)							2.74E-04	2.71E-04	2.71E-04	2.71E-04
TiO2, (MT)							3.40E-04	3.55E-07	3.40E-04	3.40E-04
Tot Org Carbon, (MT)							5.58E-02	5.53E-02	5.53E-02	5.53E-02
U3O8, (MT)							1.15E-02	1.18E-05	1.15E-02	1.15E-02
UO2+2, (MT)							8.03E-01	7.95E-01	7.96E-01	7.96E-01
V+5, (MT)							9.06E-05	8.97E-05	8.98E-05	8.98E-05
V2O5, (MT)							3.47E-01	3.27E-04	3.47E-01	3.47E-01

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	I25_A-1	I25_A-2	I26_A-3	I25_A-4	I26_A-5	I26_A-6	283_A-1	283_A-2	283_A-3	283_A-4
WO3, (MT)							7.33E-01	6.92E-04	7.33E-01	7.33E-01
Zn+2, (MT)							4.56E-04	4.52E-04	4.52E-04	4.52E-04
ZnO, (MT)							3.41E-01	3.38E-04	3.41E-01	3.41E-01
Zr+4, (MT)							1.34E-01	1.32E-01	1.32E-01	1.32E-01
ZrO2, (MT)							7.50E+00	7.45E-03	7.50E+00	7.50E+00
ZrO2:2H2O, (MT)							1.97E-01	1.95E-01	1.95E-01	1.95E-01

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	283_A-5	283_A-6	460_A-1	460_A-2	460_A-3	460_A-4	460_A-5	460_A-6	532_A-1	532_A-2
Volume, Total Liters	4.61E+07	5.92E+07	9.80E+06	9.32E+06	9.81E+06	9.81E+06	9.78E+06	1.13E+06	1.23E+06	1.26E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	4.61E+04	5.92E+04	9.80E+03	9.32E+03	9.81E+03	9.81E+03	9.78E+03	1.13E+03	1.23E+05	1.26E+05
Cs and Ba, (MCi)	2.57E-04	3.12E-03								
Sr and Y, (MCi)	4.66E-03	5.68E-02	1.38E+02	1.38E+02	1.38E+02	1.38E+02	1.38E+02	6.88E+01		
Tc, (MCi)	1.98E-07	2.41E-06	5.87E-03	5.87E-03	5.87E-03	5.87E-03	5.87E-03	2.92E-03	2.60E-02	2.60E-02
TRU, (MCi)	5.60E-06	6.97E-05								
Total MCi	4.93E-03	6.00E-02	1.38E+02	1.38E+02	1.38E+02	1.38E+02	1.38E+02	6.88E+01	2.60E-02	2.60E-02
Ag+, (MT)	4.63E-05	5.64E-04								
Al(OH)4-, (MT)	2.15E-07	1.12E-06								
Al+3, (MT)	2.14E-02	2.53E-01								
Am+3, (MT)	1.02E-06	1.24E-05								
As+5, (MT)	1.67E-05	2.04E-04								
B+3, (MT)	3.34E-05	4.07E-04								
Ba+2, (MT)	1.04E-04	1.27E-03	3.09E+00	3.09E+00	3.09E+00	3.09E+00	3.09E+00	1.54E+00		
Be+2, (MT)	2.56E-07	3.12E-06								
Bi+3, (MT)	6.59E-03	8.03E-02								
Carbon14, (MT)	1.52E-08	1.86E-07								
Ca+2, (MT)	5.04E-03	6.14E-02								
Cancrinite, (MT)	8.36E-02	6.08E-01								
Cd+2, (MT)	2.67E-04	3.25E-03								
Ce+3, (MT)	8.00E-03	9.74E-02								
Cl-, (MT)	1.30E-04	1.44E-03								
CO, (MT)	4.41E-06	4.97E-06								
CO2, (MT)	5.11E-05	6.40E-04								
Cr(OH)4-, (MT)	5.28E-09	2.76E-08								
Cr+3, (MT)	2.71E-03	3.48E-02								
Cs+, (MT)	3.14E-06	3.81E-05								
Cu+2, (MT)	2.51E-05	3.06E-04								
DTPA-3, (MT)										
F-, (MT)	9.99E+00	1.28E+01								
Fe+3, (MT)	1.59E-02	2.04E-01								
FeCN6-3, (MT)	1.64E-05	2.93E-05								
H+, (MT)	3.15E+00	3.61E+00	4.88E+01	4.64E+01	4.89E+01	4.89E+01	4.87E+01	5.25E+00	6.70E+02	6.83E+02
H2, (MT)	1.37E-15									
H2O, (MT)	4.59E+04	5.90E+04	6.64E+03	6.31E+03	6.65E+03	6.65E+03	6.63E+03	7.50E+02	8.15E+04	8.35E+04
H2O2, (MT)	6.52E+00	3.27E+00								
HCOO-, (MT)										
Hg+2, (MT)	3.03E-07	3.69E-06								
Hg2, (MT)	7.62E-08	7.76E-08								
I-, (MT)	6.79E-04	8.28E-03								
K+, (MT)	7.07E-04	8.61E-03								
La+3, (MT)	7.14E-04	8.69E-03								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	283_A-5	283_A-6	460_A-1	460_A-2	460_A-3	460_A-4	460_A-5	460_A-6	532_A-1	532_A-2
Li+, (MT)	8.27E-07	1.01E-05								
Mg+2, (MT)	3.70E-04	4.51E-03								
Mn+4, (MT)	4.49E-03	5.44E-02								
MnO2, (MT)	8.12E-09	6.14E-09								
Mo+6, (MT)	2.71E-05	3.29E-04								
MoO4-2, (MT)	1.00E-07	1.87E-07								
N2, (MT)	5.21E-07	6.52E-06								
Na+, (MT)	2.96E-01	4.01E+00	7.99E-02	7.99E-02	7.99E-02	7.99E-02	7.99E-02	3.98E-02		
NH2OH, (MT)										
NH3, (MT)	3.33E-07	8.80E-07								
NH4+, (MT)	7.03E-09	3.80E-08								
Ni+3, (MT)	7.73E-04	7.04E-03								
NO2, (MT)	4.54E-05	5.69E-04								
NO3-, (MT)	1.60E+02	1.84E+02	3.07E+03	2.92E+03	3.07E+03	3.07E+03	3.06E+03	3.51E+02	4.12E+04	4.20E+04
Np+4, (MT)	2.99E-06	3.85E-05								
O2, (MT)	2.61E-06	3.93E-06								
Pb+4, (MT)	1.10E-04	1.34E-03								
PO4-3, (MT)	7.97E-03	8.35E-02								
POLY, (MT)	4.36E-04	1.62E-04								
PTA-3, (MT)	1.80E-05	2.18E-04								
Pu+4, (MT)	9.30E-06	1.20E-04								
Si+4, (MT)	2.66E-03	3.25E-02								
SO4-2, (MT)	4.29E-04	1.50E-03								
Sr+2, (MT)	1.24E-03	1.51E-02	3.68E+01	3.68E+01	3.68E+01	3.68E+01	3.68E+01	1.83E+01		
TcO4-, (MT)	1.91E-05	2.33E-04	5.66E-01	5.66E-01	5.66E-01	5.66E-01	5.66E-01	2.82E-01	2.51E+00	2.51E+00
Ti+4, (MT)	6.81E-06	8.79E-05								
Tot Org Carbon, (MT)	3.89E-03	4.74E-02								
UO2+2, (MT)	5.60E-02	6.81E-01								
V+5, (MT)	6.31E-06	7.69E-05								
W+6, (MT)	3.32E-11									
Zn+2, (MT)	3.18E-05	3.87E-04								
Zr+4, (MT)	1.72E-02	2.09E-01								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	283_A-5	283_A-6	460_A-1	460_A-2	460_A-3	460_A-4	460_A-5	460_A-6	532_A-1	532_A-2
Total Mass Flow, (MT)	5.12E+03	6.58E+03								
Cs and Ba, (MCi)	3.67E-03	5.13E-02								
Sr and Y, (MCi)	6.66E-02	1.31E+00								
Tc, (MCi)	4.46E-06	5.67E-05								
TRU, (MCi)	3.20E-04	4.21E-03								
Total MCi	7.06E-02	1.37E+00								
Ag+, (MT)	6.60E-04	9.30E-03								
Ag2O, (MT)	1.42E+00	7.43E-01								
Al+3, (MT)	2.89E+00	3.44E+01								
Al2O3, (MT)	1.59E+02	5.38E+02								
Am+3, (MT)	1.45E-05	2.04E-04								
Am2O3, (MT)	1.25E-07	1.22E-07								
APM-, (MT)	3.45E-03	5.13E-02								
As+5, (MT)	2.39E-04	3.37E-03								
As2O5, (MT)	1.51E+00	7.92E-01								
B+3, (MT)	4.77E-04	6.72E-03								
B2O3, (MT)	5.17E-02	2.69E-02								
Ba+2, (MT)	1.48E-03	2.09E-02								
BaO, (MT)	9.41E-03	1.44E-02								
Be+2, (MT)	3.65E-06	5.14E-05								
BeO, (MT)	1.93E-01	1.01E-01								
Bi+3, (MT)	9.40E-02	1.32E+00								
Bi2O3, (MT)	3.12E+00	1.62E+00								
Carbon14, (MT)	2.17E-07	3.06E-06								
Ca+2, (MT)	7.19E-02	1.01E+00								
Cancrinite, (MT)	1.03E+02	1.00E+03								
CaO, (MT)	2.23E+00	1.16E+00								
Cd+2, (MT)	3.80E-03	5.36E-02								
CdO, (MT)	1.22E-01	6.32E-02								
Ce+3, (MT)	1.14E-01	1.61E+00								
Ce2O3, (MT)	2.95E+00	1.53E+00								
Cl-, (MT)	1.67E-03	2.36E-02								
CO3-2, (MT)	1.08E-01	1.52E+00								
Cr+3, (MT)	3.30E-01	4.48E+00								
Cr2O3, (MT)	8.92E-01	4.36E-01								
Cs+, (MT)	4.44E-05	6.25E-04								
Cs2O, (MT)	3.52E-07	1.76E-07								
Cu+2, (MT)	3.58E-04	5.04E-03								
CuO, (MT)	8.98E-01	4.69E-01								
F-, (MT)	2.86E-02	4.03E-01								
Fe+3, (MT)	1.94E+00	2.64E+01								
Fe2O3, (MT)	3.88E+01	7.83E+00								
H2O, (MT)	1.10E+00	1.10E+00								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	283_A-5	283_A-6	460_A-1	460_A-2	460_A-3	460_A-4	460_A-5	460_A-6	532_A-1	532_A-2
Hg+2, (MT)	4.32E-06	6.08E-05								
I-, (MT)	9.69E-03	1.37E-01								
K+, (MT)	1.01E-02	1.42E-01								
K2O, (MT)	1.05E-02	2.12E-03								
La+3, (MT)	1.02E-02	1.43E-01								
La2O3, (MT)	2.64E-01	1.37E-01								
Li+, (MT)	1.18E-05	1.66E-04								
Li2O, (MT)	2.68E-05	5.42E-06								
Mg+2, (MT)	5.28E-03	7.43E-02								
MgO, (MT)	2.11E-01	1.09E-01								
MnO2, (MT)	1.01E-01	1.42E+00								
Mo+6, (MT)	3.84E-04	5.41E-03								
MoO3, (MT)	9.17E-02	4.78E-02								
Na+, (MT)	4.22E+00	6.54E+01								
Na2O, (MT)	1.16E+01	1.69E+00								
Ni+3, (MT)	5.09E-03	7.16E-02								
Ni2FECN6, (MT)	2.65E+00	4.03E+01								
Ni2O3, (MT)	2.81E+00	1.36E+00								
NO2-, (MT)	3.54E-02	4.99E-01								
Np+4, (MT)	3.65E-04	4.96E-03								
NpO2, (MT)	6.97E-05	6.26E-06								
OH-, (MT)	4.72E+03	4.79E+03								
P2O5, (MT)	3.95E+01	2.06E+01								
P2O5:24W, (MT)	2.50E-04	3.52E-03								
Pb+4, (MT)	1.57E-03	2.22E-02								
PbO2, (MT)	4.70E+00	2.46E+00								
PO4-3, (MT)	1.13E-01	1.38E+00								
POLY, (MT)	5.33E-02	1.06E+00								
Pu+4, (MT)	1.14E-03	1.54E-02								
PuO2, (MT)	5.81E-05	2.95E-05								
Si+4, (MT)	3.79E-02	5.34E-01								
SiO2, (MT)	1.92E+00	9.99E-01								
SO4-2, (MT)	1.88E-03	2.29E-02								
Sr+2, (MT)	1.77E-02	2.49E-01								
SrO, (MT)	4.72E-05	1.19E-01								
Tc2O7, (MT)	1.51E-04	1.56E-03								
TcO4-, (MT)	2.72E-04	3.84E-03								
TiO2, (MT)	3.40E-04	1.53E-04								
Tot Org Carbon, (MT)	5.55E-02	7.82E-01								
U3O8, (MT)	1.15E-02	5.97E-03								
UO2+2, (MT)	7.98E-01	1.12E+01								
V+5, (MT)	9.01E-05	1.27E-03								
V2O5, (MT)	3.47E-01	1.81E-01								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	283_A-5	283_A-6	460_A-1	460_A-2	460_A-3	460_A-4	460_A-5	460_A-6	532_A-1	532_A-2
WO3, (MT)	7.33E-01	3.85E-01								
Zn+2, (MT)	4.53E-04	6.39E-03								
ZnO, (MT)	3.40E-01	1.78E-01								
Zr+4, (MT)	1.33E-01	1.87E+00								
ZrO2, (MT)	7.50E+00	3.90E+00								
ZrO2:2H2O, (MT)	1.96E-01	2.76E+00								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	532_A-3	532_A-4	532_A-5	532_A-6	742_A-1	742_A-2	742_A-3	742_A-4	742_A-5	742_A-6
Volume, Total Liters	1.24E+08	1.24E+08	1.24E+08	5.13E+07	2.98E+08	2.84E+08	2.99E+08	2.99E+08	2.98E+08	3.80E+07
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.24E+05	1.24E+05	1.24E+05	5.13E+04	2.98E+05	2.84E+05	2.99E+05	2.99E+05	2.98E+05	3.80E+04
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.92E-06
TRU, (MCi)					1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	9.89E-02
Total MCi	2.60E-02	2.60E-02	2.60E-02	2.60E-02	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	9.89E-02
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)										
Am+3, (MT)					3.02E-06	3.02E-06	3.02E-06	3.02E-06	3.02E-06	3.00E-06
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)					1.96E-01	1.96E-01	1.96E-01	1.96E-01	1.96E-01	1.94E-01
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Co+3, (MT)					2.38E-02	2.38E-02	2.38E-02	2.38E-02	2.38E-02	2.36E-02
Cl-, (MT)										
CO, (MT)										
CO2, (MT)										
Cr(OH)4-, (MT)										
Cr+3, (MT)										
Cs+, (MT)										
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)					5.27E+01	4.99E+01	5.27E+01	5.27E+01	5.26E+01	4.63E+00
Fe+3, (MT)					7.75E-02	7.75E-02	7.75E-02	7.75E-02	7.75E-02	7.51E-02
FeCN6-3, (MT)										
H+, (MT)	6.70E+02	6.71E+02	6.71E+02	2.78E+02	1.61E+03	1.54E+03	1.62E+03	1.62E+03	1.62E+03	2.05E+02
H2, (MT)										
H2O, (MT)	8.16E+04	8.16E+04	8.16E+04	3.39E+04	1.97E+05	1.88E+05	1.98E+05	1.98E+05	1.98E+05	2.52E+04
H2O2, (MT)										
HCOO-, (MT)										
Hg+2, (MT)										
Hg2, (MT)										
I-, (MT)										
K+, (MT)										
La+3, (MT)					2.12E-03	2.12E-03	2.12E-03	2.12E-03	2.12E-03	2.11E-03

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	532_A-3	532_A-4	532_A-5	532_A-6	742_A-1	742_A-2	742_A-3	742_A-4	742_A-5	742_A-6
Li+, (MT)										
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO4-2, (MT)										
N2, (MT)										
Na+, (MT)										
NH2OH, (MT)										
NH3, (MT)										
NH4+, (MT)										
Ni+3, (MT)										
NO2, (MT)										
NO3-, (MT)	4.12E+04	4.13E+04	4.13E+04	1.71E+04	9.91E+04	9.43E+04	9.95E+04	9.94E+04	9.92E+04	1.26E+04
Np+4, (MT)					1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.41E-01
O2, (MT)										
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)										
PTA-3, (MT)										
Pu+4, (MT)					4.49E-01	4.49E-01	4.49E-01	4.49E-01	4.49E-01	4.35E-01
Si+4, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
TcO4-, (MT)	2.51E+00	2.51E+00	2.51E+00	2.51E+00	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.82E-04
Ti+4, (MT)										
Tot Org Carbon, (MT)										
UO2+2, (MT)					1.76E+00	1.76E+00	1.76E+00	1.76E+00	1.76E+00	1.75E+00
V+5, (MT)										
W+6, (MT)										
Zn+2, (MT)										
Zr+4, (MT)					5.10E-01	5.10E-01	5.10E-01	5.10E-01	5.10E-01	5.07E-01

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	532_A-3	532_A-4	532_A-5	532_A-6	742_A-1	742_A-2	742_A-3	742_A-4	742_A-5	742_A-6
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag+, (MT)										
Ag2O, (MT)										
Al+3, (MT)										
Al2O3, (MT)										
Am+3, (MT)										
Am2O3, (MT)										
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)										
B+3, (MT)										
B2O3, (MT)										
Ba+2, (MT)										
BaO, (MT)										
Be+2, (MT)										
BeO, (MT)										
Bi+3, (MT)										
Bi2O3, (MT)										
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
CaO, (MT)										
Cd+2, (MT)										
CdO, (MT)										
Ce+3, (MT)										
Ce2O3, (MT)										
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)										
Cs+, (MT)										
Cs2O, (MT)										
Cu+2, (MT)										
CuO, (MT)										
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)										
H2O, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	532_A-3	532_A-4	532_A-5	532_A-6	742_A-1	742_A-2	742_A-3	742_A-4	742_A-5	742_A-6
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)										
La+3, (MT)										
La2O3, (MT)										
Li+, (MT)										
Li2O, (MT)										
Mg+2, (MT)										
MgO, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
MoO3, (MT)										
Na+, (MT)										
Na2O, (MT)										
Ni+3, (MT)										
Ni2FECN6, (MT)										
Ni2O3, (MT)										
NO2-, (MT)										
Np+4, (MT)										
NpO2, (MT)										
OH-, (MT)										
P2O5, (MT)										
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)										
PO4-3, (MT)										
POLY, (MT)										
Pu+4, (MT)										
PuO2, (MT)										
Si+4, (MT)										
SiO2, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TcO4-, (MT)										
TiO2, (MT)										
Tot Org Carbon, (MT)										
U3O8, (MT)										
UO2+2, (MT)										
V+5, (MT)										
V2O5, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	532_A-3	532_A-4	532_A-5	532_A-6	742_A-1	742_A-2	742_A-3	742_A-4	742_A-5	742_A-6
WO3, (MT)										
Zn+2, (MT)										
ZnO, (MT)										
Zr+4, (MT)										
ZrO2, (MT)										
ZrO2:2H2O, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	924_A-1	924_A-2	924_A-3	924_A-4	924_A-5	924_A-6
Volume, Total Liters	1.58E+04	1.58E+04	1.58E+04	1.58E+04	1.58E+04	1.58E+04
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.58E+01	1.58E+01	1.58E+01	1.58E+01	1.58E+01	1.58E+01
Cs and Ba, (MCi)						
Sr and Y, (MCi)						
Tc, (MCi)						
TRU, (MCi)	1.04E-01	1.04E-01	1.04E-01	1.04E-01	1.04E-01	1.03E-01
Total MCi	1.04E-01	1.04E-01	1.04E-01	1.04E-01	1.04E-01	1.03E-01
Ag+, (MT)						
Al(OH)4-, (MT)						
Al+3, (MT)						
Am+3, (MT)	3.02E-02	3.02E-02	3.02E-02	3.02E-02	3.02E-02	3.00E-02
As+5, (MT)						
B+3, (MT)						
Ba+2, (MT)						
Be+2, (MT)						
Bi+3, (MT)						
Carbon14, (MT)						
Ca+2, (MT)						
Cancrinite, (MT)						
Cd+2, (MT)						
Ce+3, (MT)	2.38E-01	2.38E-01	2.38E-01	2.38E-01	2.38E-01	2.36E-01
Cl-, (MT)						
CO, (MT)						
CO2, (MT)						
Cr(OH)4-, (MT)						
Cr+3, (MT)						
Cs+, (MT)						
Cu+2, (MT)						
DTPA-3, (MT)	2.98E-01	2.98E-01	2.98E-01	2.98E-01	2.98E-01	2.98E-01
F-, (MT)						
Fe+3, (MT)						
FeCN6-3, (MT)						
H+, (MT)						
H2, (MT)						
H2O, (MT)	1.51E+01	1.51E+01	1.51E+01	1.51E+01	1.51E+01	1.51E+01
H2O2, (MT)						
HCOO-, (MT)						
Hg+2, (MT)						
Hg2, (MT)						
I-, (MT)						
K+, (MT)						
La+3, (MT)	2.12E-02	2.12E-02	2.12E-02	2.12E-02	2.12E-02	2.11E-02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	924_A-1	924_A-2	924_A-3	924_A-4	924_A-5	924_A-6
Li+, (MT)						
Mg+2, (MT)						
Mn+4, (MT)						
MnO2, (MT)						
Mo+6, (MT)						
MoO4-2, (MT)						
N2, (MT)						
Na+, (MT)						
NH2OH, (MT)						
NH3, (MT)						
NH4+, (MT)						
Ni+3, (MT)						
NO2, (MT)						
NO3-, (MT)						
Np+4, (MT)						
O2, (MT)						
Pb+4, (MT)						
PO4-3, (MT)						
POLY, (MT)						
PTA-3, (MT)						
Pu+4, (MT)						
Si+4, (MT)						
SO4-2, (MT)						
Sr+2, (MT)						
TcO4-, (MT)						
Ti+4, (MT)						
Tot Org Carbon, (MT)						
UO2+2, (MT)						
V+5, (MT)						
W+6, (MT)						
Zn+2, (MT)	7.24E-02	7.24E-02	7.24E-02	7.24E-02	7.24E-02	7.24E-02
Zr+4, (MT)						

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	924_A-1	924_A-2	924_A-3	924_A-4	924_A-5	924_A-6
Total Mass Flow, (MT)						
Cs and Ba, (MCi)						
Sr and Y, (MCi)						
Tc, (MCi)						
TRU, (MCi)						
Total MCi						
Ag+, (MT)						
Ag2O, (MT)						
Al+3, (MT)						
Al2O3, (MT)						
Am+3, (MT)						
Am2O3, (MT)						
APM-, (MT)						
As+5, (MT)						
As2O5, (MT)						
B+3, (MT)						
B2O3, (MT)						
Ba+2, (MT)						
BaO, (MT)						
Be+2, (MT)						
BeO, (MT)						
Bi+3, (MT)						
Bi2O3, (MT)						
Carbon14, (MT)						
Ca+2, (MT)						
Cancrinite, (MT)						
CaO, (MT)						
Cd+2, (MT)						
CdO, (MT)						
Ce+3, (MT)						
Ce2O3, (MT)						
Cl-, (MT)						
CO3-2, (MT)						
Cr+3, (MT)						
Cr2O3, (MT)						
Cs+, (MT)						
Cs2O, (MT)						
Cu+2, (MT)						
CuO, (MT)						
F-, (MT)						
Fe+3, (MT)						
Fe2O3, (MT)						
H2O, (MT)						

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	924_A-1	924_A-2	924_A-3	924_A-4	924_A-5	924_A-6
Hg+2, (MT)						
I-, (MT)						
K+, (MT)						
K2O, (MT)						
La+3, (MT)						
La2O3, (MT)						
Li+, (MT)						
Li2O, (MT)						
Mg+2, (MT)						
MgO, (MT)						
MnO2, (MT)						
Mo+6, (MT)						
MoO3, (MT)						
Na+, (MT)						
Na2O, (MT)						
Ni+3, (MT)						
Ni2FECN6, (MT)						
Ni2O3, (MT)						
NO2-, (MT)						
Np+4, (MT)						
NpO2, (MT)						
OH-, (MT)						
P2O5, (MT)						
P2O5:24W, (MT)						
Pb+4, (MT)						
PbO2, (MT)						
PO4-3, (MT)						
POLY, (MT)						
Pu+4, (MT)						
PuO2, (MT)						
Si+4, (MT)						
SiO2, (MT)						
SO4-2, (MT)						
Sr+2, (MT)						
SrO, (MT)						
Tc2O7, (MT)						
TcO4-, (MT)						
TiO2, (MT)						
Tot Org Carbon, (MT)						
U3O8, (MT)						
UO2+2, (MT)						
V+5, (MT)						
V2O5, (MT)						

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	924_A-1	924_A-2	924_A-3	924_A-4	924_A-5	924_A-6
WO3, (MT)						
Zn+2, (MT)						
ZnO, (MT)						
Zr+4, (MT)						
ZrO2, (MT)						
ZrO2:2H2O, (MT)						

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1314_A-1	1314_A-2	1314_A-3	1314_A-4	1314_A-5	1314_A-6	1318_A-1	1318_A-2	1318_A-3	1318_A-4
Volume, Total Liters							2.05E+07	1.94E+07	2.05E+07	2.05E+07
Specific Gravity							1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)							2.05E+04	1.94E+04	2.05E+04	2.05E+04
Cs and Ba, (MCi)							7.48E+01	7.48E+01	7.48E+01	7.48E+01
Sr and Y, (MCi)							1.38E+02	1.38E+02	1.38E+02	1.38E+02
Tc, (MCi)							3.19E-02	3.19E-02	3.19E-02	3.19E-02
TRU, (MCi)							2.06E-01	2.06E-01	2.06E-01	3.10E-01
Total MCi							2.13E+02	2.13E+02	2.13E+02	2.14E+02
Ag+, (MT)							4.65E-05	4.60E-05	4.61E-05	4.61E-05
Al(OH)4-, (MT)							2.14E-07	2.06E-07	2.14E-07	2.14E-07
Al+3, (MT)							2.16E-02	2.14E-02	2.14E-02	2.14E-02
Am+3, (MT)							3.02E-02	3.02E-02	3.02E-02	6.04E-02
As+5, (MT)							1.68E-05	1.66E-05	1.67E-05	1.67E-05
B+3, (MT)							3.36E-05	3.32E-05	3.33E-05	3.33E-05
Ba+2, (MT)							3.09E+00	3.09E+00	3.09E+00	3.09E+00
Be+2, (MT)							2.57E-07	2.54E-07	2.55E-07	2.55E-07
Bi+3, (MT)							2.02E-01	2.02E-01	2.02E-01	1.18E+00
Carbon14, (MT)							1.53E-08	1.51E-08	1.52E-08	1.52E-08
C2O4-2, (MT)										2.25E+03
Ca+2, (MT)							5.07E-03	5.01E-03	5.02E-03	5.02E-03
Cancrinite, (MT)							8.39E-02	8.23E-02	8.34E-02	8.34E-02
Cd+2, (MT)							2.68E-04	2.65E-04	2.66E-04	2.66E-04
Ce+3, (MT)							2.70E-01	2.69E-01	2.69E-01	2.38E+02
Cl-, (MT)							1.31E-04	1.28E-04	1.30E-04	1.30E-04
Cr(OH)4-, (MT)										
Cr+3, (MT)							2.72E-03	2.69E-03	2.70E-03	2.70E-03
Cs+, (MT)							9.11E-01	9.11E-01	9.11E-01	9.11E-01
Cu+2, (MT)							2.52E-05	2.49E-05	2.50E-05	2.50E-05
DTPA-3, (MT)							2.98E-01	2.98E-01	2.98E-01	2.98E-01
F-, (MT)							6.27E+01	5.93E+01	6.27E+01	1.16E+02
Fe+3, (MT)							9.35E-02	9.33E-02	9.34E-02	1.71E-01
FeCN6-3, (MT)							1.63E-05	1.54E-05	1.63E-05	1.63E-05
H+, (MT)							1.67E+02	1.66E+02	1.68E+02	2.22E+02
H2, (MT)							8.56E-10	3.53E-08	8.51E-10	8.51E-10
H2O, (MT)							9.81E+03	8.73E+03	9.76E+03	6.79E+03
H2O2, (MT)							3.22E+02	3.00E+02	3.20E+02	3.22E+02
Hg, (MT)							5.04E-06	4.99E-06	5.00E-06	5.00E-06
Hg+2, (MT)							3.04E-07	3.01E-07	3.02E-07	3.02E-07
Hg2, (MT)							1.33E-10		1.33E-10	1.27E-10
I-, (MT)							6.83E-04	6.75E-04	6.77E-04	6.77E-04
K+, (MT)							7.11E-04	7.03E-04	7.05E-04	7.05E-04
La+3, (MT)							2.41E-02	2.41E-02	2.41E-02	2.12E+01
Li+, (MT)							8.32E-07	8.22E-07	8.25E-07	8.25E-07

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1314_A-1	1314_A-2	1314_A-3	1314_A-4	1314_A-5	1314_A-6	1318_A-1	1318_A-2	1318_A-3	1318_A-4
Mg+2, (MT)							3.72E-04	3.68E-04	3.69E-04	3.69E-04
Mn+4, (MT)							4.51E-03	4.42E-03	4.48E-03	4.48E-03
MnO2, (MT)										
Mo+6, (MT)							2.73E-05	2.70E-05	2.71E-05	2.71E-05
MoO4-2, (MT)							1.00E-07	9.42E-08	1.00E-07	1.00E-07
N2, (MT)										
Na+, (MT)							7.45E-01	7.22E-01	7.43E-01	7.47E-01
NH2OH, (MT)								5.78E-07		
NH3, (MT)							3.32E-07	3.17E-07	3.32E-07	3.32E-07
NH4+, (MT)							7.05E-09	6.91E-09	7.00E-09	7.00E-09
Ni+3, (MT)							7.77E-04	7.67E-04	7.71E-04	7.71E-04
NO2-, (MT)										
NO3-, (MT)							1.01E+04	1.00E+04	1.02E+04	1.05E+04
Np+4, (MT)							1.46E-01	1.46E-01	1.46E-01	1.52E-01
OH-, (MT)							2.73E-01	2.56E-01	2.71E-01	2.74E-01
Pb+4, (MT)							1.11E-04	1.10E-04	1.10E-04	1.10E-04
PO4-3, (MT)							8.02E-03	7.92E-03	7.95E-03	7.95E-03
POLY, (MT)							4.32E-04	3.99E-04	4.30E-04	4.30E-04
PTA-3, (MT)							1.81E-05	1.78E-05	1.79E-05	1.79E-05
Pu+4, (MT)							4.49E-01	4.49E-01	4.49E-01	4.54E-01
Si+4, (MT)							2.68E-03	2.65E-03	2.66E-03	2.66E-03
SO4-2, (MT)							4.29E-04	3.99E-04	4.28E-04	4.28E-04
Sr+2, (MT)							3.68E+01	3.68E+01	3.68E+01	3.68E+01
TcO4-, (MT)							3.07E+00	3.07E+00	3.07E+00	3.08E+00
Ti+4, (MT)							6.81E-06	6.79E-06	6.81E-06	6.81E-06
Tot Org Carbon, (MT)							3.91E-03	3.87E-03	3.88E-03	3.88E-03
UO2+2, (MT)							1.82E+00	1.82E+00	1.82E+00	1.99E+00
V+5, (MT)							6.35E-06	6.28E-06	6.30E-06	6.29E-06
Zn+2, (MT)							7.24E-02	7.24E-02	7.24E-02	7.24E-02
Zr+4, (MT)							5.28E-01	5.27E-01	5.27E-01	1.04E+00

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Solid Components	1314_A-1	1314_A-2	1314_A-3	1314_A-4	1314_A-5	1314_A-6	1318_A-1	1318_A-2	1318_A-3	1318_A-4
Total Mass Flow, (MT)	8.70E+02	8.67E+01	8.65E+02	6.76E+02	1.35E+03	6.46E+03	5.12E+03	4.84E+03	5.12E+03	5.12E+03
Cs and Ba, (MCi)							1.50E-01	1.50E-01	2.43E-01	1.50E-01
Sr and Y, (MCi)							3.37E-01	3.36E-01	3.76E-01	3.36E-01
Tc, (MCi)							6.67E-05	6.50E-05	6.67E-05	6.67E-05
TRU, (MCi)							7.27E-04	7.11E-04	7.24E-04	9.29E-04
Total MCi							4.88E-01	4.87E-01	6.20E-01	4.88E-01
Ag+, (MT)							6.64E-04	6.58E-04	6.58E-04	6.58E-04
Ag2O, (MT)							1.43E+00	1.35E-03	1.43E+00	1.43E+00
Al+3, (MT)							2.91E+00	2.88E+00	2.88E+00	2.88E+00
Al2O3, (MT)							1.60E+02	9.21E-01	1.59E+02	1.59E+02
Am+3, (MT)							1.46E-05	1.45E-05	1.45E-05	1.45E-05
Am2O3, (MT)							6.53E-05	6.52E-05	6.53E-05	1.31E-04
APM-, (MT)							3.47E-03	3.45E-03	3.45E-03	3.45E-03
As+5, (MT)							2.40E-04	2.38E-04	2.38E-04	2.38E-04
As2O5, (MT)							1.52E+00	1.43E-03	1.52E+00	1.52E+00
B+3, (MT)							4.80E-04	4.75E-04	4.75E-04	4.75E-04
B2O3, (MT)	1.21E+02	1.26E+01	1.15E+02	7.13E+01	2.33E+02	1.40E+03	2.88E-01	2.49E-02	2.77E-01	1.92E-01
Ba+2, (MT)							1.49E-03	1.48E-03	1.48E-03	1.48E-03
BaO, (MT)							1.62E-02	6.78E-03	1.62E-02	1.62E-02
Be+2, (MT)							3.67E-06	3.64E-06	3.64E-06	3.64E-06
BeO, (MT)							1.94E-01	1.83E-04	1.94E-01	1.94E-01
Bi+3, (MT)							9.45E-02	9.36E-02	9.37E-02	9.37E-02
Bi2O3, (MT)							3.13E+00	3.75E-03	3.12E+00	3.13E+00
Carbon14, (MT)							2.19E-07	2.16E-07	2.17E-07	2.17E-07
Ca+2, (MT)							7.23E-02	7.16E-02	7.16E-02	7.16E-02
Cancrinite, (MT)							1.04E+02	1.02E+02	1.03E+02	1.03E+02
CaO, (MT)							2.23E+00	2.43E-03	2.23E+00	2.23E+00
Cd+2, (MT)							3.83E-03	3.79E-03	3.79E-03	3.79E-03
CdO, (MT)							1.22E-01	1.30E-04	1.22E-01	1.22E-01
Ce+3, (MT)							1.15E-01	1.14E-01	1.14E-01	1.14E-01
Ce2O3, (MT)							2.96E+00	3.82E-03	2.96E+00	3.51E+00
Cl-, (MT)							1.68E-03	1.67E-03	1.67E-03	1.67E-03
CO3-2, (MT)							1.08E-01	1.07E-01	1.07E-01	1.07E-01
Cr+3, (MT)							3.32E-01	3.29E-01	3.29E-01	3.29E-01
Cr2O3, (MT)							8.96E-01	1.42E-01	8.95E-01	8.96E-01
Cs+, (MT)							4.46E-05	4.42E-05	4.42E-05	4.42E-05
Cs2O, (MT)							1.89E-03	1.89E-03	3.09E-03	1.89E-03
Cu+2, (MT)							3.60E-04	3.57E-04	3.57E-04	3.57E-04
CuO, (MT)							9.00E-01	8.51E-04	9.00E-01	9.00E-01
F-, (MT)							2.88E-02	2.85E-02	2.85E-02	2.85E-02
Fe+3, (MT)							1.95E+00	1.93E+00	1.94E+00	1.94E+00
Fe2O3, (MT)		1.47E+00			2.95E+01	2.73E+02	3.89E+01	4.72E-02	3.90E+01	3.90E+01
H2O, (MT)							1.10E+00	1.10E+00	1.10E+00	1.10E+00

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1314_A-1	1314_A-2	1314_A-3	1314_A-4	1314_A-5	1314_A-6	1318_A-1	1318_A-2	1318_A-3	1318_A-4
Hg+2, (MT)							4.34E-06	4.30E-06	4.30E-06	4.30E-06
I-, (MT)							9.75E-03	9.65E-03	9.66E-03	9.66E-03
K+, (MT)							1.01E-02	1.00E-02	1.00E-02	1.00E-02
K2O, (MT)							1.06E-02	3.57E-05	1.05E-02	1.06E-02
La+3, (MT)							1.02E-02	1.01E-02	1.02E-02	1.02E-02
La2O3, (MT)							2.65E-01	3.42E-04	2.65E-01	3.13E-01
Li+, (MT)							1.19E-05	1.17E-05	1.17E-05	1.17E-05
Li2O, (MT)	1.32E+01	2.53E+00	1.32E+01	1.43E+01	3.60E+01	2.91E+02	2.59E-02	4.96E-03	2.59E-02	2.81E-02
Mg+2, (MT)							5.31E-03	5.26E-03	5.26E-03	5.26E-03
MgO, (MT)							2.11E-01	2.28E-04	2.11E-01	2.11E-01
MnO2, (MT)							1.02E-01	1.00E-01	1.01E-01	1.01E-01
Mo+6, (MT)							3.87E-04	3.83E-04	3.83E-04	3.83E-04
MoO3, (MT)							9.20E-02	9.26E-05	9.19E-02	9.20E-02
Na+, (MT)							4.22E+00	4.22E+00	4.22E+00	4.22E+00
Na2O, (MT)	2.39E+01		2.40E+01	2.95E+01	8.39E+01	2.50E+02	1.17E+01	7.00E-02	1.17E+01	1.18E+01
Ni(OH)3, (MT)										
Ni+3, (MT)							5.12E-03	5.07E-03	5.07E-03	5.07E-03
Ni2FECN6, (MT)							2.66E+00	2.64E+00	2.64E+00	2.64E+00
Ni2O3, (MT)							2.82E+00	2.82E-03	2.82E+00	2.82E+00
NiO, (MT)							2.37E-03	2.35E-03	2.35E-03	2.35E-03
NO2-, (MT)							3.56E-02	3.53E-02	3.53E-02	3.53E-02
Np+4, (MT)							3.68E-04	3.64E-04	3.64E-04	3.64E-04
NpO2, (MT)							3.96E-04	3.26E-04	3.96E-04	4.09E-04
OH-, (MT)							4.72E+03	4.72E+03	4.72E+03	4.72E+03
P2O5, (MT)							3.95E+01	3.95E-02	3.95E+01	3.95E+01
P2O5:24W, (MT)							2.51E-04	2.49E-04	2.49E-04	2.49E-04
Pb+4, (MT)							1.58E-03	1.57E-03	1.57E-03	1.57E-03
PbO2, (MT)							4.71E+00	4.45E-03	4.71E+00	4.71E+00
PO4-3, (MT)							1.14E-01	1.13E-01	1.13E-01	1.13E-01
POLY, (MT)							5.33E-02	5.33E-02	5.33E-02	5.33E-02
Pu+4, (MT)							1.14E-03	1.13E-03	1.13E-03	1.13E-03
PuO2, (MT)							1.06E-03	1.00E-03	1.06E-03	1.07E-03
Si+4, (MT)							3.81E-02	3.78E-02	3.78E-02	3.78E-02
SiO2, (MT)	7.13E+02	7.00E+01	7.13E+02	5.61E+02	9.68E+02	4.25E+03	3.40E+00	2.10E-01	3.40E+00	3.10E+00
SO3, (MT)							3.79E-06	3.71E-06	3.76E-06	3.76E-06
SO4-2, (MT)							1.90E-03	1.88E-03	1.88E-03	1.88E-03
Sr+2, (MT)							1.78E-02	1.76E-02	1.76E-02	1.76E-02
SrO, (MT)							8.51E-02	8.51E-02	9.77E-02	8.51E-02
Tc2O7, (MT)							5.89E-03	5.74E-03	5.89E-03	5.89E-03
TcO4-, (MT)							2.74E-04	2.71E-04	2.71E-04	2.71E-04
TiO2, (MT)							3.41E-04	3.76E-07	3.40E-04	3.41E-04
Tot Org Carbon, (MT)							5.58E-02	5.53E-02	5.53E-02	5.53E-02
U3O8, (MT)							1.16E-02	1.18E-05	1.16E-02	1.16E-02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1314_A-1	1314_A-2	1314_A-3	1314_A-4	1314_A-5	1314_A-6	1318_A-1	1318_A-2	1318_A-3	1318_A-4
UO2+2, (MT)							8.03E-01	7.95E-01	7.96E-01	7.96E-01
UO3, (MT)							5.45E-03	5.44E-03	5.44E-03	5.80E-03
V+5, (MT)							9.06E-05	8.97E-05	8.98E-05	8.98E-05
V2O5, (MT)							3.47E-01	3.28E-04	3.47E-01	3.48E-01
WO2, (MT)							4.14E-07	4.10E-07	4.10E-07	4.10E-07
WO3, (MT)							7.34E-01	6.93E-04	7.34E-01	7.34E-01
Zn+2, (MT)							4.56E-04	4.52E-04	4.52E-04	4.52E-04
ZnO, (MT)							3.41E-01	5.17E-04	3.41E-01	3.41E-01
Zr+4, (MT)							1.34E-01	1.32E-01	1.32E-01	1.32E-01
ZrO2, (MT)							7.52E+00	9.51E-03	7.52E+00	7.52E+00
ZrO2:2H2O, (MT)							1.97E-01	1.95E-01	1.95E-01	1.95E-01

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Liquid Components	1318_A-5	1318_A-6	1344_A-1	1344_A-2	1344_A-3	1344_A-4	1344_A-5	1344_A-6	1532_A-1	1532_A-2
Volume, Total Liters	2.05E+07	2.64E+07							1.46E+06	4.54E+04
Specific Gravity	1.00E+00	1.00E+00							1.00E+00	1.00E+00
Total Mass Flow, (MT)	2.05E+04	2.64E+04							1.46E+03	4.54E+01
Cs and Ba, (MCi)	7.48E+01	7.46E+01							6.21E-06	6.22E-06
Sr and Y, (MCi)	1.38E+02	6.89E+01								
Tc, (MCi)	3.19E-02	2.89E-02								
TRU, (MCi)	2.06E-01	2.02E-01								
Total MCi	2.13E+02	1.44E+02							6.21E-06	6.22E-06
Ag+, (MT)	4.63E-05	5.64E-04								
Al(OH)4-, (MT)	2.15E-07	1.12E-06								
Al+3, (MT)	2.14E-02	2.53E-01							1.42E+03	
Am+3, (MT)	3.02E-02	3.00E-02								
As+5, (MT)	1.67E-05	2.04E-04								
B+3, (MT)	3.34E-05	4.07E-04								
Ba+2, (MT)	3.09E+00	1.54E+00								
Be+2, (MT)	2.56E-07	3.12E-06								
Bi+3, (MT)	2.02E-01	2.75E-01								
Carbon14, (MT)	1.52E-08	1.86E-07								
C2O4-2, (MT)										
Ca+2, (MT)	5.04E-03	6.14E-02								
Cancrinite, (MT)	8.36E-02	6.08E-01								
Cd+2, (MT)	2.67E-04	3.25E-03								
Ce+3, (MT)	2.69E-01	3.57E-01								
Cl-, (MT)	1.30E-04	1.44E-03							2.98E-02	2.93E-02
Cr(OH)4-, (MT)		2.76E-08								
Cr+3, (MT)	2.71E-03	3.48E-02							1.19E-02	2.63E-03
Cs+, (MT)	9.11E-01	9.09E-01							7.57E-08	7.57E-08
Cu+2, (MT)	2.51E-05	3.06E-04								
DTPA-3, (MT)	2.98E-01	2.98E-01								
F-, (MT)	6.26E+01	1.74E+01								
Fe+3, (MT)	9.34E-02	2.79E-01								
FeCN6-3, (MT)	1.64E-05	2.93E-05								
H+, (MT)	1.68E+02	4.84E+01								
H2, (MT)	8.54E-10	8.10E-09								
H2O, (MT)	9.78E+03	2.32E+04							3.38E+01	3.35E+01
H2O2, (MT)	3.24E+02	1.63E+02								
Hg, (MT)	5.01E-06	7.00E-05								
Hg+2, (MT)	3.03E-07	3.69E-06								
Hg2, (MT)	7.62E-08	7.76E-08							1.81E-04	1.78E-04
I-, (MT)	6.79E-04	8.28E-03								
K+, (MT)	7.07E-04	8.61E-03								
La+3, (MT)	2.41E-02	3.19E-02								
Li+, (MT)	8.27E-07	1.01E-05								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Liquid Components	1318_A-5	1318_A-6	1344_A-1	1344_A-2	1344_A-3	1344_A-4	1344_A-5	1344_A-6	1532_A-1	1532_A-2
Mg+2, (MT)	3.70E-04	4.51E-03								
Mn+4, (MT)	4.49E-03	5.44E-02								
MnO2, (MT)										
Mo+6, (MT)	2.71E-05	3.29E-04								
MoO4-2, (MT)	1.00E-07	1.87E-07								
N2, (MT)										
Na+, (MT)	7.47E-01	4.22E+00							6.64E+00	6.52E+00
NH2OH, (MT)										
NH3, (MT)	3.33E-07	8.80E-07								
NH4+, (MT)	7.03E-09	4.64E-08								
Ni+3, (MT)	7.73E-04	7.04E-03								
NO2-, (MT)									8.87E-03	8.86E-03
NO3-, (MT)	1.01E+04	2.95E+03							7.94E-02	7.92E-02
Np+4, (MT)	1.46E-01	1.41E-01								
OH-, (MT)	2.74E-01	1.32E-01							4.67E+00	4.59E+00
Pb+4, (MT)	1.10E-04	1.34E-03								
PO4-3, (MT)	7.97E-03	8.35E-02								
POLY, (MT)	4.36E-04	1.62E-04								
PTA-3, (MT)	1.80E-05	2.18E-04								
Pu+4, (MT)	4.49E-01	4.35E-01								
Si+4, (MT)	2.66E-03	3.25E-02								
SO4-2, (MT)	4.29E-04	1.50E-03							6.91E-01	6.55E-01
Sr+2, (MT)	3.68E+01	1.83E+01								
TcO4-, (MT)	3.07E+00	2.79E+00								
Ti+4, (MT)	6.81E-06	8.79E-05								
Tot Org Carbon, (MT)	3.89E-03	4.74E-02							2.60E-05	2.60E-05
UO2+2, (MT)	1.82E+00	2.43E+00								
V+5, (MT)	6.31E-06	7.69E-05								
Zn+2, (MT)	7.24E-02	7.28E-02								
Zr+4, (MT)	5.27E-01	7.16E-01								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1318_A-5	1318_A-6	1344_A-1	1344_A-2	1344_A-3	1344_A-4	1344_A-5	1344_A-6	1532_A-1	1532_A-2
Total Mass Flow, (MT)	5.12E+03	6.59E+03	1.32E+03	2.53E+02	1.32E+03	1.43E+03	1.80E+03	8.22E+03	1.54E+04	1.58E+04
Cs and Ba, (MCi)	1.50E-01	1.98E-01	7.46E+01	7.46E+01	1.22E+02	7.46E+01	7.46E+01	7.45E+01	3.09E-03	3.09E-03
Sr and Y, (MCi)	3.37E-01	1.45E+00	1.37E+02	1.37E+02	1.58E+02	1.37E+02	1.37E+02	6.97E+01	1.39E-02	1.40E-02
Tc, (MCi)	6.67E-05	1.13E-04	3.17E-02	3.17E-02	3.17E-02	3.17E-02	3.17E-02	2.88E-02	1.52E-04	1.52E-04
TRU, (MCi)	7.25E-04	4.62E-03	2.06E-01	2.06E-01	2.06E-01	3.11E-01	2.06E-01	2.06E-01	1.19E-03	1.19E-03
Total MCi	4.88E-01	1.65E+00	2.12E+02	2.12E+02	2.80E+02	2.12E+02	2.12E+02	1.45E+02	1.83E-02	1.84E-02
Ag+, (MT)	6.60E-04	9.30E-03								
Ag2O, (MT)	1.43E+00	7.45E-01	1.42E+00	2.10E-03	1.42E+00	1.42E+00	1.42E+00	7.54E-01		
Al+3, (MT)	2.89E+00	3.44E+01								
Al2O3, (MT)	1.59E+02	5.40E+02	1.96E+02	3.68E+01	1.94E+02	1.94E+02	1.95E+02	9.04E+02	1.99E+03	2.64E+03
Am+3, (MT)	1.45E-05	2.04E-04								
Am2O3, (MT)	6.53E-05	6.53E-05	3.32E-02	3.32E-02	3.32E-02	6.64E-02	3.32E-02	3.32E-02	3.40E-05	3.40E-05
APM-, (MT)	3.46E-03	5.14E-02	3.47E-03	3.44E-03	3.44E-03	3.44E-03	3.45E-03	5.13E-02		
As+5, (MT)	2.39E-04	3.37E-03								
As2O5, (MT)	1.52E+00	7.94E-01	1.51E+00	1.82E-03	1.51E+00	1.51E+00	1.51E+00	7.97E-01		
B+3, (MT)	4.77E-04	6.72E-03								
B2O3, (MT)	5.10E-01	2.77E+00	1.21E+02	1.26E+01	1.15E+02	7.14E+01	2.33E+02	1.40E+03	4.80E+00	4.80E+00
Ba+2, (MT)	1.48E-03	2.09E-02								
BaO, (MT)	1.62E-02	1.78E-02	3.46E+00	3.45E+00	3.46E+00	3.46E+00	3.46E+00	1.75E+00	8.74E-01	8.73E-01
Be+2, (MT)	3.65E-06	5.14E-05								
BeO, (MT)	1.94E-01	1.02E-01	1.93E-01	1.93E-04	1.93E-01	1.93E-01	1.93E-01	1.02E-01		
Bi+3, (MT)	9.40E-02	1.32E+00								
Bi2O3, (MT)	3.12E+00	1.63E+00	3.45E+00	3.33E-01	3.45E+00	4.53E+00	3.45E+00	3.40E+00	2.90E+02	2.89E+02
Carbon14, (MT)	2.17E-07	3.06E-06								
Ca+2, (MT)	7.19E-02	1.01E+00								
Cancrinite, (MT)	1.03E+02	1.00E+03							2.59E+03	2.56E+03
CaO, (MT)	2.23E+00	1.16E+00	2.34E+00	1.09E-01	2.33E+00	2.34E+00	2.33E+00	2.66E+00	2.07E+02	2.07E+02
Cd+2, (MT)	3.80E-03	5.36E-02								
CdO, (MT)	1.22E-01	6.34E-02	1.26E-01	4.75E-03	1.26E-01	1.26E-01	1.26E-01	1.28E-01	1.13E+01	1.13E+01
Ce+3, (MT)	1.14E-01	1.61E+00								
Ce2O3, (MT)	2.96E+00	1.54E+00	3.40E+00	4.52E-01	3.40E+00	2.82E+02	3.40E+00	3.83E+00	2.74E+02	2.74E+02
Cl-, (MT)	1.67E-03	2.36E-02								
CO3-2, (MT)	1.08E-01	1.52E+00								
Cr+3, (MT)	3.30E-01	4.48E+00								
Cr2O3, (MT)	8.95E-01	4.50E-01	1.38E+00	6.25E-01	1.38E+00	1.38E+00	1.38E+00	7.04E+00	8.29E+01	7.61E+01
Cs+, (MT)	4.44E-05	6.25E-04								
Cs2O, (MT)	1.89E-03	1.89E-03	9.64E-01	9.64E-01	1.58E+00	9.64E-01	9.64E-01	9.63E-01	3.99E-05	3.99E-05
Cu+2, (MT)	3.58E-04	5.04E-03								
CuO, (MT)	9.00E-01	4.70E-01	8.99E-01	1.33E-03	8.99E-01	8.99E-01	8.98E-01	4.76E-01		
F-, (MT)	2.86E-02	4.03E-01								
Fe+3, (MT)	1.94E+00	2.64E+01								
Fe2O3, (MT)	3.90E+01	8.47E+00	4.24E+01	5.05E+00	4.24E+01	4.25E+01	7.19E+01	3.29E+02	3.60E+03	3.48E+03
H2O, (MT)	1.10E+00	1.10E+00	1.10E+00	1.09E+00	1.10E+00	1.10E+00	1.10E+00	1.10E+00		

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name: Solid Components	1318_A-5	1318_A-6	1344_A-1	1344_A-2	1344_A-3	1344_A-4	1344_A-5	1344_A-6	1532_A-1	1532_A-2
Hg+2, (MT)	4.32E-06	6.06E-05								
I-, (MT)	9.69E-03	1.37E-01								
K+, (MT)	1.01E-02	1.42E-01								
K2O, (MT)	1.05E-02	2.48E-03	2.36E-02	1.29E-02	2.34E-02	2.34E-02	2.35E-02	1.83E-01	1.15E+00	1.13E+00
La+3, (MT)	1.02E-02	1.43E-01								
La2O3, (MT)	2.65E-01	1.38E-01	3.04E-01	4.04E-02	3.04E-01	2.52E+01	3.04E-01	3.43E-01	2.45E+01	2.45E+01
Li+, (MT)	1.18E-05	1.66E-04								
Li2O, (MT)	7.06E-02	5.72E-01	1.32E+01	2.53E+00	1.32E+01	1.43E+01	3.59E+01	2.91E+02	2.94E-03	2.89E-03
Mg+2, (MT)	5.28E-03	7.43E-02								
MgO, (MT)	2.11E-01	1.10E-01	2.20E-01	9.54E-03	2.20E-01	2.20E-01	2.20E-01	2.40E-01	1.96E+01	1.96E+01
MnO2, (MT)	1.02E-01	1.42E+00	1.09E-01	1.07E-01	1.08E-01	1.08E-01	1.08E-01	1.51E+00	2.09E+02	2.06E+02
Mo+6, (MT)	3.84E-04	5.41E-03								
MoO3, (MT)	9.19E-02	4.79E-02	9.24E-02	7.06E-04	9.24E-02	9.24E-02	9.23E-02	5.64E-02	8.52E+00	8.51E+00
Na+, (MT)	4.22E+00	6.54E+01								
Na2O, (MT)	1.18E+01	2.82E+00	6.59E+01	3.00E+01	6.59E+01	7.14E+01	1.26E+02	5.75E+02	1.27E+03	1.22E+03
Ni(OH)3, (MT)										
Ni+3, (MT)	5.09E-03	7.16E-02								
Ni2FECN6, (MT)	2.65E+00	4.03E+01							1.93E-03	2.35E-03
Ni2O3, (MT)	2.82E+00	1.37E+00	2.82E+00	1.10E-02	2.82E+00	2.82E+00	2.82E+00	1.48E+00	2.61E+02	2.61E+02
NiO, (MT)	2.36E-03	3.59E-02	1.21E+00	1.20E+00	1.20E+00	1.20E+00	1.20E+00	1.83E+01		
NO2-, (MT)	3.54E-02	4.99E-01								
Np+4, (MT)	3.65E-04	4.96E-03								
NpO2, (MT)	3.96E-04	3.32E-04	1.66E-01	1.66E-01	1.66E-01	1.72E-01	1.66E-01	1.66E-01	6.46E-03	6.14E-03
OH-, (MT)	4.72E+03	4.79E+03								
P2O5, (MT)	3.95E+01	2.07E+01	3.96E+01	1.30E-01	3.95E+01	3.96E+01	3.95E+01	2.17E+01	3.66E+03	3.66E+03
P2O5:24W, (MT)	2.50E-04	3.52E-03								
Pb+4, (MT)	1.57E-03	2.22E-02								
PbO2, (MT)	4.71E+00	2.46E+00	4.71E+00	6.38E-03	4.70E+00	4.71E+00	4.70E+00	2.49E+00		
PO4-3, (MT)	1.13E-01	1.38E+00								
POLY, (MT)	5.33E-02	1.06E+00								
Pu+4, (MT)	1.14E-03	1.54E-02								
PuO2, (MT)	1.06E-03	1.03E-03	5.11E-01	5.11E-01	5.11E-01	5.16E-01	5.11E-01	5.11E-01	5.40E-03	5.40E-03
Si+4, (MT)	3.79E-02	5.34E-01								
SiO2, (MT)	3.90E+00	1.00E+01	7.52E+02	1.06E+02	7.51E+02	6.00E+02	1.01E+03	4.60E+03	1.79E+02	1.78E+02
SO3, (MT)	3.77E-06	3.99E-05	1.94E-03	1.90E-03	1.92E-03	1.92E-03	1.93E-03	2.03E-02		
SO4-2, (MT)	1.88E-03	2.29E-02								
Sr+2, (MT)	1.77E-02	2.49E-01								
SrO, (MT)	8.51E-02	1.62E-01	4.33E+01	4.33E+01	4.97E+01	4.33E+01	4.33E+01	2.20E+01	4.37E-03	4.40E-03
Tc2O7, (MT)	5.89E-03	6.78E-03	2.92E+00	2.92E+00	2.92E+00	2.92E+00	2.92E+00	2.66E+00	1.41E-02	1.40E-02
TcO4-, (MT)	2.72E-04	3.84E-03								
TiO2, (MT)	3.40E-04	1.54E-04	3.51E-04	1.17E-05	3.51E-04	3.51E-04	3.51E-04	3.00E-04	3.16E-02	3.15E-02
Tot Org Carbon, (MT)	5.55E-02	7.82E-01							2.03E-06	2.91E-06
U3O8, (MT)	1.16E-02	5.98E-03	1.15E-02	1.18E-05	1.15E-02	1.15E-02	1.15E-02	5.97E-03	1.07E+00	1.07E+00

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1318_A-5	1318_A-6	1344_A-1	1344_A-2	1344_A-3	1344_A-4	1344_A-5	1344_A-6	1532_A-1	1532_A-2
UO2+2, (MT)	7.98E-01	1.12E+01								
UO3, (MT)	5.44E-03	2.84E-02	2.78E+00	2.77E+00	2.77E+00	2.96E+00	2.77E+00	1.45E+01		
V+5, (MT)	9.01E-05	1.27E-03								
V2O5, (MT)	3.47E-01	1.82E-01	3.47E-01	4.99E-04	3.47E-01	3.47E-01	3.47E-01	1.84E-01		
WO2, (MT)	4.11E-07	6.19E-06	2.28E-04	2.26E-04	2.26E-04	2.26E-04	2.26E-04	3.16E-03		1.10E-06
WO3, (MT)	7.34E-01	3.86E-01	7.33E-01	6.92E-04	7.33E-01	7.33E-01	7.33E-01	3.85E-01		
Zn+2, (MT)	4.53E-04	6.39E-03								
ZnO, (MT)	3.41E-01	1.78E-01	4.31E-01	9.10E-02	4.31E-01	4.31E-01	4.31E-01	2.76E-01	3.16E+01	3.16E+01
Zr+4, (MT)	1.33E-01	1.87E+00								
ZrO2, (MT)	7.52E+00	3.91E+00	8.55E+00	1.05E+00	8.54E+00	9.23E+00	8.54E+00	9.53E+00	6.97E+02	6.96E+02
ZrO2:2H2O, (MT)	1.96E-01	2.76E+00								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Liquid Components	1532_A-3	1532_A-4	1532_A-5	1532_A-6	1556_A-1	1556_A-2	1556_A-3	1556_A-4	1556_A-5	1556_A-6
Volume, Total Liters	1.46E+06	1.46E+06	1.46E+06	7.52E+05	5.10E+08	5.23E+08	5.10E+08	5.10E+08	5.09E+08	5.11E+08
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.46E+03	1.46E+03	1.46E+03	7.52E+02	5.10E+05	5.23E+05	5.10E+05	5.10E+05	5.09E+05	5.11E+05
Cs and Ba, (MCi)	6.21E-06	6.21E-06	6.21E-06	6.23E-06	6.55E-02	6.67E-02	6.56E-02	6.55E-02	6.56E-02	1.74E-01
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi	6.21E-06	6.21E-06	6.21E-06	6.23E-06	6.55E-02	6.67E-02	6.56E-02	6.55E-02	6.56E-02	1.74E-01
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)	1.42E+03	1.42E+03	1.42E+03	7.35E+02	6.98E+02	2.35E+03	6.98E+02	6.98E+02	6.98E+02	9.59E+02
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)	2.98E-02	2.98E-02	2.98E-02	1.13E-02	3.15E+02	3.14E+02	3.15E+02	3.14E+02	3.15E+02	3.15E+02
Cr(OH)4-, (MT)										
Cr+3, (MT)	1.19E-02	1.19E-02	1.19E-02	4.49E-03	1.26E+02	2.83E-01	1.26E+02	1.26E+02	1.26E+02	1.25E+02
Cs+, (MT)	7.57E-08	7.57E-08	7.57E-08	7.59E-08	7.98E-04	8.13E-04	7.99E-04	7.98E-04	7.99E-04	2.12E-03
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)										
Fe+3, (MT)										
FeCN6-3, (MT)					3.20E+02	3.20E+02	3.20E+02	3.20E+02	3.20E+02	2.96E+02
H+, (MT)						8.43E-02				
H2, (MT)										
H2O, (MT)	3.39E+01	3.38E+01	3.38E+01	1.27E+01	3.74E+05	3.86E+05	3.74E+05	3.74E+05	3.74E+05	3.72E+05
H2O2, (MT)						6.92E-01				
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)	1.81E-04	1.81E-04	1.81E-04	6.83E-05	1.92E+00	1.91E+00	1.92E+00	1.92E+00	1.92E+00	1.92E+00
I-, (MT)										
K+, (MT)					2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.07E+01
La+3, (MT)										
Li+, (MT)					2.90E-02	2.89E-02	2.90E-02	2.89E-02	2.90E-02	2.96E-02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1532_A-3	1532_A-4	1532_A-5	1532_A-6	1556_A-1	1556_A-2	1556_A-3	1556_A-4	1556_A-5	1556_A-6
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)					2.14E+01	2.13E+01	2.14E+01	2.13E+01	2.14E+01	2.16E+01
Mo+6, (MT)										
MoO4-2, (MT)					1.96E+00	1.96E+00	1.96E+00	1.96E+00	1.96E+00	1.89E+00
N2, (MT)						1.88E+01				
Na+, (MT)	6.65E+00	6.65E+00	6.64E+00	2.40E+00	7.01E+04	7.00E+04	7.02E+04	7.01E+04	7.01E+04	6.70E+04
NH2OH, (MT)						1.56E+01				
NH3, (MT)					8.34E+00	8.50E+00	8.36E+00	8.35E+00	8.36E+00	2.17E+01
NH4+, (MT)					1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.55E-02
Ni+3, (MT)										
NO2-, (MT)	8.87E-03	8.87E-03	8.87E-03	8.43E-03	3.00E+02	3.06E+02	3.01E+02	3.00E+02	3.01E+02	7.57E+02
NO3-, (MT)	7.94E-02	7.94E-02	7.94E-02	6.97E-02	7.05E+03	7.18E+03	7.07E+03	7.06E+03	7.07E+03	1.78E+04
Np+4, (MT)										
OH-, (MT)	4.67E+00	4.67E+00	4.67E+00	1.74E+00	4.93E+04	4.92E+04	4.93E+04	4.93E+04	4.93E+04	4.85E+04
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)						2.23E-04				
PTA-3, (MT)					5.33E-01	5.32E-01	5.33E-01	5.33E-01	5.33E-01	5.29E-01
Pu+4, (MT)										
Si+4, (MT)										
SO4-2, (MT)	6.92E-01	6.93E-01	6.92E-01	9.65E-02	7.44E+03	7.18E+03	7.46E+03	7.46E+03	7.45E+03	2.75E+03
Sr+2, (MT)										
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)	2.60E-05	2.60E-05	2.60E-05	2.58E-05	2.74E-01	2.79E-01	2.74E-01	2.74E-01	2.74E-01	7.22E-01
UO2+2, (MT)										
V+5, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1532_A-3	1532_A-4	1532_A-5	1532_A-6	1556_A-1	1556_A-2	1556_A-3	1556_A-4	1556_A-5	1556_A-6
Total Mass Flow, (MT)	1.54E+04	1.54E+04	1.54E+04	1.08E+04	1.03E+03	9.28E-02	1.03E+03	1.03E+03	1.03E+03	1.95E+03
Cs and Ba, (MCi)	3.09E-03	3.09E-03	3.09E-03	3.10E-03	8.03E-06		8.03E-06	8.03E-06	8.03E-06	2.13E-05
Sr and Y, (MCi)	1.40E-02	1.40E-02	1.39E-02	6.72E+01	4.26E-05	4.37E-08	4.30E-05	4.30E-05	4.29E-05	5.48E-01
Tc, (MCi)	1.52E-04	1.52E-04	1.52E-04	3.01E-03	4.69E-07	4.77E-10	4.69E-07	4.69E-07	4.69E-07	2.45E-05
TRU, (MCi)	1.19E-03	1.19E-03	1.19E-03	1.16E-03	3.57E-06	3.40E-09	3.57E-06	3.57E-06	3.57E-06	9.16E-06
Total MCi	1.84E-02	1.84E-02	1.84E-02	6.72E+01	5.47E-05	4.76E-08	5.51E-05	5.50E-05	5.50E-05	5.48E-01
Ag+, (MT)										
Ag2O, (MT)					4.07E-01	3.93E-04	4.07E-01	4.07E-01	4.07E-01	1.08E+00
Al+3, (MT)										
Al2O3, (MT)	1.99E+03	1.99E+03	1.99E+03	1.42E+03	9.84E+02	8.38E-03	9.85E+02	9.84E+02	9.85E+02	1.87E+03
Am+3, (MT)										
Am2O3, (MT)	3.40E-05	3.40E-05	3.40E-05	3.38E-05	7.25E-08		7.26E-08	7.25E-08	7.26E-08	1.91E-07
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)					4.32E-01	4.18E-04	4.33E-01	4.32E-01	4.33E-01	1.15E+00
B+3, (MT)										
B2O3, (MT)	4.80E+00	4.80E+00	4.80E+00	4.78E+00	1.48E-02	1.50E-05	1.48E-02	1.48E-02	1.48E-02	3.90E-02
Ba+2, (MT)										
BaO, (MT)	8.74E-01	8.74E-01	8.74E-01	2.56E+00	2.69E-03	2.73E-06	2.69E-03	2.69E-03	2.69E-03	2.09E-02
Be+2, (MT)										
BeO, (MT)					5.52E-02	5.33E-05	5.53E-02	5.52E-02	5.53E-02	1.47E-01
Bi+3, (MT)										
Bi2O3, (MT)	2.90E+02	2.90E+02	2.90E+02	2.88E+02	8.91E-01	9.06E-04	8.92E-01	8.91E-01	8.92E-01	2.35E+00
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)	2.59E+03	2.59E+03	2.59E+03	1.68E+03	7.97E+00	8.02E-03	7.98E+00	7.97E+00	7.98E+00	1.37E+01
CaO, (MT)	2.07E+02	2.07E+02	2.07E+02	2.06E+02	6.37E-01	6.47E-04	6.37E-01	6.37E-01	6.37E-01	1.68E+00
Cd+2, (MT)										
CdO, (MT)	1.13E+01	1.13E+01	1.13E+01	1.12E+01	3.47E-02	3.53E-05	3.48E-02	3.47E-02	3.48E-02	9.15E-02
Ce+3, (MT)										
Ce2O3, (MT)	2.74E+02	2.74E+02	2.74E+02	2.72E+02	8.44E-01	8.58E-04	8.44E-01	8.44E-01	8.44E-01	2.22E+00
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)	8.29E+01	8.29E+01	8.29E+01	7.75E+01	2.55E-01	4.11E-02	2.55E-01	2.55E-01	2.55E-01	6.32E-01
Cs+, (MT)										
Cs2O, (MT)	3.99E-05	3.99E-05	3.99E-05	4.00E-05	1.04E-07		1.04E-07	1.04E-07	1.04E-07	2.76E-07
Cu+2, (MT)										
CuO, (MT)					2.57E-01	2.48E-04	2.57E-01	2.57E-01	2.57E-01	6.80E-01
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)	3.61E+03	3.61E+03	3.61E+03	1.39E+03	1.11E+01	1.09E-02	1.11E+01	1.11E+01	1.11E+01	1.13E+01
H2O, (MT)					1.74E-04	2.05E-07	2.11E-04	2.11E-04	1.98E-04	1.68E-05

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1532_A-3	1532_A-4	1532_A-5	1532_A-6	1556_A-1	1556_A-2	1556_A-3	1556_A-4	1556_A-5	1556_A-6
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)	1.15E+00	1.15E+00	1.15E+00	4.44E-01	3.00E-03	3.00E-06	3.00E-03	3.00E-03	3.00E-03	3.07E-03
La+3, (MT)										
La2O3, (MT)	2.45E+01	2.45E+01	2.45E+01	2.43E+01	7.54E-02	7.67E-05	7.55E-02	7.54E-02	7.55E-02	1.99E-01
Li+, (MT)										
Li2O, (MT)	2.94E-03	2.94E-03	2.94E-03	1.14E-03	7.67E-06	7.67E-09	7.67E-06	7.67E-06	7.67E-06	7.85E-06
Mg+2, (MT)										
MgO, (MT)	1.96E+01	1.96E+01	1.96E+01	1.94E+01	6.02E-02	6.12E-05	6.03E-02	6.02E-02	6.03E-02	1.59E-01
MnO2, (MT)	2.09E+02	2.09E+02	2.09E+02	2.06E+02	6.42E-01	6.46E-04	6.42E-01	6.42E-01	6.43E-01	1.68E+00
Mo+6, (MT)										
MoO3, (MT)	8.52E+00	8.52E+00	8.52E+00	8.49E+00	2.62E-02	2.67E-05	2.62E-02	2.62E-02	2.62E-02	6.93E-02
Na+, (MT)										
Na2O, (MT)	1.27E+03	1.27E+03	1.27E+03	3.53E+02	3.31E+00	3.23E-03	3.32E+00	3.32E+00	3.32E+00	2.44E+00
Ni(OH)3, (MT)					5.25E-08		5.25E-08	5.25E-08	5.25E-08	1.29E-07
Ni+3, (MT)										
Ni2FECN6, (MT)	2.33E-03	2.33E-03	2.19E-03	2.60E-03	5.94E-06		7.18E-06	7.17E-06	6.74E-06	2.12E-05
Ni2O3, (MT)	2.61E+02	2.61E+02	2.61E+02	2.42E+02	8.04E-01	8.17E-04	8.04E-01	8.04E-01	8.04E-01	1.98E+00
NiO, (MT)										
NO2-, (MT)										
Np+4, (MT)										
NpO2, (MT)	6.50E-03	6.50E-03	6.49E-03	1.12E-03	1.99E-05	1.92E-08	2.00E-05	2.00E-05	2.00E-05	9.09E-06
OH-, (MT)										
P2O5, (MT)	3.66E+03	3.66E+03	3.66E+03	3.66E+03	1.13E+01	1.15E-02	1.13E+01	1.13E+01	1.13E+01	2.99E+01
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)					1.34E+00	1.30E-03	1.35E+00	1.34E+00	1.35E+00	3.56E+00
PO4-3, (MT)										
POLY, (MT)					1.80E-06		1.80E-06	1.80E-06	1.80E-06	4.75E-06
Pu+4, (MT)										
PuO2, (MT)	5.40E-03	5.40E-03	5.40E-03	5.24E-03	1.66E-05	1.69E-08	1.66E-05	1.66E-05	1.66E-05	4.27E-05
Si+4, (MT)										
SiO2, (MT)	1.79E+02	1.79E+02	1.79E+02	1.78E+02	5.50E-01	5.59E-04	5.50E-01	5.50E-01	5.50E-01	1.45E+00
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)	4.40E-03	4.40E-03	4.39E-03	2.12E+01	1.34E-05	1.38E-08	1.36E-05	1.35E-05	1.35E-05	1.73E-01
Tc2O7, (MT)	1.41E-02	1.41E-02	1.41E-02	2.78E-01	4.33E-05	4.40E-08	4.33E-05	4.33E-05	4.33E-05	2.26E-03
TcO4-, (MT)										
TiO2, (MT)	3.15E-02	3.15E-02	3.16E-02	2.72E-02	9.71E-05	9.87E-08	9.72E-05	9.71E-05	9.72E-05	2.22E-04
Tot Org Carbon, (MT)	2.88E-06	2.88E-06	2.58E-06	3.86E-06	6.23E-09		8.88E-09	8.87E-09	7.95E-09	3.14E-08
U3O8, (MT)	1.07E+00	1.07E+00	1.07E+00	1.06E+00	3.29E-03	3.35E-06	3.30E-03	3.30E-03	3.30E-03	8.65E-03

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1532_A-3	1532_A-4	1532_A-5	1532_A-6	1556_A-1	1556_A-2	1556_A-3	1556_A-4	1556_A-5	1556_A-6
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)					9.91E-02	9.57E-05	9.92E-02	9.91E-02	9.92E-02	2.62E-01
WO2, (MT)	1.09E-06	1.09E-06	9.76E-07	1.46E-06						
WO3, (MT)					2.09E-01	2.02E-04	2.10E-01	2.09E-01	2.10E-01	5.58E-01
Zn+2, (MT)										
ZnO, (MT)	3.16E+01	3.16E+01	3.16E+01	3.16E+01	9.73E-02	9.90E-05	9.74E-02	9.73E-02	9.74E-02	2.58E-01
Zr+4, (MT)										
ZrO2, (MT)	6.97E+02	6.97E+02	6.97E+02	6.92E+02	2.14E+00	2.18E-03	2.15E+00	2.14E+00	2.15E+00	5.65E+00
ZrO2:2H2O, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	aces_A-1	aces_A-2	aces_A-3	aces_A-4	aces_A-5	aces_A-6	1562_A-1	1562_A-2	1562_A-3	1562_A-4
Volume, Total Liters			8.59E+03					1.35E+07		
Specific Gravity			1.00E+00					1.00E+00		
Total Mass Flow, (MT)			8.59E+00					1.35E+04		
Cs and Ba, (MCi)			4.74E+01					6.68E-06		
Sr and Y, (MCi)			2.05E+01							
Tc, (MCi)										
TRU, (MCi)										
Total MCi			6.79E+01					6.68E-06		
Ag+, (MT)										
Al(OH)4-, (MT)										
Al+3, (MT)								2.36E-01		
Am+3, (MT)										
As+5, (MT)										
B+3, (MT)										
Ba+2, (MT)										
Be+2, (MT)										
Bi+3, (MT)										
Carbon14, (MT)										
C2O4-2, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)										
Cd+2, (MT)										
Ce+3, (MT)										
Cl-, (MT)								3.15E-02		
Cr(OH)4-, (MT)										
Cr+3, (MT)								2.83E-05		
Cs+, (MT)			5.77E-01					8.14E-08		
Cu+2, (MT)										
DTPA-3, (MT)										
F-, (MT)			2.30E+00							
Fe+3, (MT)										
FeCN6-3, (MT)								3.20E-02		
H+, (MT)								4.19E-01		
H2, (MT)										
H2O, (MT)								1.35E+04		
H2O2, (MT)								3.45E+00		
Hg, (MT)										
Hg+2, (MT)										
Hg2, (MT)								1.92E-04		
I-, (MT)										
K+, (MT)								2.03E-03		
La+3, (MT)										
Li+, (MT)								2.90E-06		

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	aros_A-1	aros_A-2	aros_A-3	aros_A-4	aros_A-5	aros_A-6	1562_A-1	1562_A-2	1562_A-3	1562_A-4
Mg+2, (MT)										
Mn+4, (MT)										
MnO2, (MT)								2.14E-03		
Mo+6, (MT)										
MoO4-2, (MT)								1.96E-04		
N2, (MT)								1.89E-03		
Na+, (MT)								7.01E+00		
NH2OH, (MT)								1.56E-03		
NH3, (MT)								8.51E-04		
NH4+, (MT)								1.63E-06		
Ni+3, (MT)										
NO2-, (MT)								3.06E-02		
NO3-, (MT)			2.61E-01					2.65E+01		
Np+4, (MT)										
OH-, (MT)								4.93E+00		
Pb+4, (MT)										
PO4-3, (MT)										
POLY, (MT)								2.31E-04		
PTA-3, (MT)								5.33E-05		
Pu+4, (MT)										
Si+4, (MT)										
SO4-2, (MT)								7.19E-01		
Sr+2, (MT)			5.45E+00							
TcO4-, (MT)										
Ti+4, (MT)										
Tot Org Carbon, (MT)								2.79E-05		
UO2+2, (MT)										
V+5, (MT)										
Zn+2, (MT)										
Zr+4, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	aros_A-1	aros_A-2	aros_A-3	aros_A-4	aros_A-5	aros_A-6	1562_A-1	1562_A-2	1562_A-3	1562_A-4
Total Mass Flow, (MT)								4.32E+02		
Cs and Ba, (MCi)								3.80E-05		
Sr and Y, (MCi)								2.03E-04		
Tc, (MCi)								2.22E-06		
TRU, (MCi)								1.69E-05		
Total MCi								2.60E-04		
Ag+, (MT)										
Ag2O, (MT)								1.83E+00		
Al+3, (MT)										
Al2O3, (MT)								3.90E+01		
Am+3, (MT)										
Am2O3, (MT)								3.43E-07		
APM-, (MT)										
As+5, (MT)										
As2O5, (MT)								1.94E+00		
B+3, (MT)										
B2O3, (MT)								7.00E-02		
Ba+2, (MT)										
BaO, (MT)								1.27E-02		
Be+2, (MT)										
BeO, (MT)								2.48E-01		
Bi+3, (MT)										
Bi2O3, (MT)								4.22E+00		
Carbon14, (MT)										
Ca+2, (MT)										
Cancrinite, (MT)								3.73E+01		
CaO, (MT)								3.01E+00		
Cd+2, (MT)										
CdO, (MT)								1.64E-01		
Ce+3, (MT)										
Ce2O3, (MT)								3.99E+00		
Cl-, (MT)										
CO3-2, (MT)										
Cr+3, (MT)										
Cr2O3, (MT)								1.91E+02		
Cs+, (MT)										
Cs2O, (MT)								4.91E-07		
Cu+2, (MT)										
CuO, (MT)								1.15E+00		
F-, (MT)										
Fe+3, (MT)										
Fe2O3, (MT)								5.07E+01		
H2O, (MT)								9.55E-04		

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	srcs_A-1	srcs_A-2	srcs_A-3	srcs_A-4	srcs_A-5	srcs_A-6	1562_A-1	1562_A-2	1562_A-3	1562_A-4
Hg+2, (MT)										
I-, (MT)										
K+, (MT)										
K2O, (MT)								1.40E-02		
La+3, (MT)										
La2O3, (MT)								3.57E-01		
Li+, (MT)										
Li2O, (MT)								3.57E-05		
Mg+2, (MT)										
MgO, (MT)								2.85E-01		
MnO2, (MT)								3.01E+00		
Mo+6, (MT)										
MoO3, (MT)								1.24E-01		
Na+, (MT)										
Na2O, (MT)								1.50E+01		
Ni(OH)3, (MT)								2.49E-07		
Ni+3, (MT)										
Ni2FECN6, (MT)								3.42E-05		
Ni2O3, (MT)								3.80E+00		
NiO, (MT)										
NO2-, (MT)										
Np+4, (MT)										
NpO2, (MT)								8.95E-05		
OH-, (MT)										
P2O5, (MT)								5.34E+01		
P2O5:24W, (MT)										
Pb+4, (MT)										
PbO2, (MT)								6.04E+00		
PO4-3, (MT)										
POLY, (MT)								8.20E-01		
Pu+4, (MT)										
PuO2, (MT)								7.87E-05		
Si+4, (MT)										
SiO2, (MT)								2.60E+00		
SO3, (MT)										
SO4-2, (MT)										
Sr+2, (MT)										
SrO, (MT)								6.41E-05		
Tc2O7, (MT)								2.05E-04		
TcO4-, (MT)										
TiO2, (MT)								4.59E-04		
Tot Org Carbon, (MT)								4.24E-08		
U3O8, (MT)								1.56E-02		

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	sms_A-1	sms_A-2	sms_A-3	sms_A-4	sms_A-5	sms_A-6	1562_A-1	1562_A-2	1562_A-3	1562_A-4
UO2+2, (MT)										
UO3, (MT)										
V+5, (MT)										
V2O5, (MT)								4.45E-01		
WO2, (MT)										
WO3, (MT)								9.41E-01		
Zn+2, (MT)										
ZnO, (MT)								4.60E-01		
Zr+4, (MT)										
ZrO2, (MT)								1.01E+01		
ZrO2:2H2O, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1502_A-5	1502_A-6	336_A-1	336_A-2	336_A-3	336_A-4	336_A-5	336_A-6
Volume, Total Liters			2.29E+07	2.34E+07	2.46E+07	2.45E+07	2.16E+07	2.05E+07
Specific Gravity			1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)			2.29E+04	2.34E+04	2.46E+04	2.45E+04	2.16E+04	2.05E+04
Cs and Ba, (MCi)								
Sr and Y, (MCi)								
Tc, (MCi)								
TRU, (MCi)								
Total MCi								
Ag+, (MT)								
Al(OH)4-, (MT)								
Al+3, (MT)								
Am+3, (MT)								
As+5, (MT)								
B+3, (MT)								
Ba+2, (MT)								
Be+2, (MT)								
Bi+3, (MT)								
Carbon14, (MT)								
C2O4-2, (MT)								
Ca+2, (MT)								
Cancrinite, (MT)								
Cd+2, (MT)								
Ce+3, (MT)								
Cl-, (MT)								
Cr(OH)4-, (MT)								
Cr+3, (MT)								
Cs+, (MT)								
Cu+2, (MT)								
DTPA-3, (MT)								
F-, (MT)								
Fe+3, (MT)								
FeCN6-3, (MT)								
H+, (MT)			8.75E+01	9.05E+01	9.94E+01	9.88E+01	7.76E+01	7.06E+01
H2, (MT)								
H2O, (MT)			1.46E+04	1.49E+04	1.55E+04	1.54E+04	1.40E+04	1.36E+04
H2O2, (MT)			4.09E+02	4.17E+02	4.60E+02	4.63E+02	3.65E+02	1.31E+02
Hg, (MT)								
Hg+2, (MT)								
Hg2, (MT)								
I-, (MT)								
K+, (MT)								
La+3, (MT)								
Li+, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1502_A-5	1502_A-6	336_A-1	336_A-2	336_A-3	336_A-4	336_A-5	336_A-6
Mg+2, (MT)								
Mn+4, (MT)								
MnO2, (MT)								
Mo+6, (MT)								
MoO4-2, (MT)								
N2, (MT)								
Na+, (MT)								
NH2OH, (MT)								
NH3, (MT)								
NH4+, (MT)								
Ni+3, (MT)								
NO2-, (MT)								
NO3-, (MT)			6.14E+03	6.33E+03	6.88E+03	6.84E+03	5.54E+03	5.10E+03
Np+4, (MT)								
OH-, (MT)								
Pb+4, (MT)								
PO4-3, (MT)								
POLY, (MT)			2.76E-02	2.79E-02	3.12E-02	3.10E-02	2.47E-02	6.54E-03
PTA-3, (MT)								
Pu+4, (MT)								
Si+4, (MT)								
SO4-2, (MT)								
Sr+2, (MT)								
TcO4-, (MT)								
Ti+4, (MT)								
Tot Org Carbon, (MT)								
UO2+2, (MT)			1.66E+03	1.66E+03	1.66E+03	1.66E+03	1.66E+03	1.65E+03
V+5, (MT)								
Zn+2, (MT)								
Zr+4, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1502_A-5	1502_A-6	336_A-1	336_A-2	336_A-3	336_A-4	336_A-5	336_A-6
Total Mass Flow, (MT)								
Cs and Ba, (MCi)								
Sr and Y, (MCi)								
Tc, (MCi)								
TRU, (MCi)								
Total MCi								
Ag+, (MT)								
Ag2O, (MT)								
Al+3, (MT)								
Al2O3, (MT)								
Am+3, (MT)								
Am2O3, (MT)								
APM-, (MT)								
As+5, (MT)								
As2O5, (MT)								
B+3, (MT)								
B2O3, (MT)								
Ba+2, (MT)								
BaO, (MT)								
Be+2, (MT)								
BeO, (MT)								
Bi+3, (MT)								
Bi2O3, (MT)								
Carbon14, (MT)								
Ca+2, (MT)								
Cancrinite, (MT)								
CaO, (MT)								
Cd+2, (MT)								
CdO, (MT)								
Ce+3, (MT)								
Ce2O3, (MT)								
Cl-, (MT)								
CO3-2, (MT)								
Cr+3, (MT)								
Cr2O3, (MT)								
Cs+, (MT)								
Cs2O, (MT)								
Cu+2, (MT)								
CuO, (MT)								
F-, (MT)								
Fe+3, (MT)								
Fe2O3, (MT)								
H2O, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1502_A-5	1502_A-6	336_A-1	336_A-2	336_A-3	336_A-4	336_A-5	336_A-6
Hg+2, (MT)								
I-, (MT)								
K+, (MT)								
K2O, (MT)								
La+3, (MT)								
La2O3, (MT)								
Li+, (MT)								
Li2O, (MT)								
Mg+2, (MT)								
MgO, (MT)								
MnO2, (MT)								
Mo+6, (MT)								
MoO3, (MT)								
Na+, (MT)								
Na2O, (MT)								
Ni(OH)3, (MT)								
Ni+3, (MT)								
Ni2FECN6, (MT)								
Ni2O3, (MT)								
NiO, (MT)								
NO2-, (MT)								
Np+4, (MT)								
NpO2, (MT)								
OH-, (MT)								
P2O5, (MT)								
P2O5:24W, (MT)								
Pb+4, (MT)								
PbO2, (MT)								
PO4-3, (MT)								
POLY, (MT)								
Pu+4, (MT)								
PuO2, (MT)								
Si+4, (MT)								
SiO2, (MT)								
SO3, (MT)								
SO4-2, (MT)								
Sr+2, (MT)								
SrO, (MT)								
Tc2O7, (MT)								
TcO4-, (MT)								
TiO2, (MT)								
Tot Org Carbon, (MT)								
U3O8, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1502_A-5	1502_A-6	336_A-1	336_A-2	336_A-3	336_A-4	336_A-5	336_A-6
UO2+2, (MT)								
UO3, (MT)								
V+5, (MT)								
V2O5, (MT)								
WO2, (MT)								
WO3, (MT)								
Zn+2, (MT)								
ZnO, (MT)								
Zr+4, (MT)								
ZrO2, (MT)								
ZrO2:2H2O, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Liquid Components	233_A-1	233_A-2	233_A-3	233_A-4	233_A-5	233_A-6	406_A-1	406_A-2	406_A-3	406_A-4
Volume, Total Liters	5.11E+06	5.23E+06	5.12E+06	5.12E+06	5.11E+06	5.11E+06	4.20E+06	4.20E+06	4.20E+06	4.20E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	5.11E+05	5.23E+05	5.12E+05	5.12E+05	5.11E+05	5.11E+05	4.20E+05	4.20E+05	4.20E+05	4.20E+05
Cs and Ba, (MCi)	6.55E-02	6.68E-02	6.56E-02	6.55E-02	6.56E-02	1.74E-01	6.55E-02	6.68E-02	6.56E-02	6.55E-02
Total MCi	6.55E-02	6.68E-02	6.56E-02	6.55E-02	6.56E-02	1.74E-01	6.55E-02	6.68E-02	6.56E-02	6.55E-02
Al(OH)4-, (MT)	7.45E+03	8.28E+03	7.45E+03	7.45E+03	7.45E+03	5.96E+03	7.45E+03	8.28E+03	7.45E+03	7.45E+03
Cl-, (MT)	3.15E+02	3.14E+02	3.15E+02	3.14E+02	3.15E+02	3.15E+02	3.15E+02	3.14E+02	3.15E+02	3.14E+02
Cr(OH)4-, (MT)	2.91E+02	6.58E-01	2.91E+02	2.90E+02	2.91E+02	2.90E+02	2.91E+02	6.58E-01	2.91E+02	2.90E+02
Cs+, (MT)	7.98E-04	8.13E-04	7.99E-04	7.98E-04	7.99E-04	2.12E-03	7.98E-04	8.13E-04	7.99E-04	7.98E-04
FeCN6-3, (MT)	3.20E+02	3.20E+02	3.20E+02	3.20E+02	3.20E+02	2.96E+02	3.20E+02	3.20E+02	3.20E+02	3.20E+02
H+, (MT)		8.43E-02								
H2O, (MT)	3.74E+05	3.86E+05	3.75E+05	3.74E+05	3.74E+05	3.72E+05	2.82E+05	2.83E+05	2.83E+05	2.83E+05
Hg, (MT)	1.92E+00	1.91E+00	1.92E+00	1.92E+00	1.92E+00	1.92E+00	1.92E+00	1.91E+00	1.92E+00	1.92E+00
K+, (MT)	2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.07E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01
Li+, (MT)	2.90E-02	2.89E-02	2.90E-02	2.89E-02	2.90E-02	2.96E-02	2.90E-02	2.89E-02	2.90E-02	2.89E-02
MnO2, (MT)	2.14E+01	2.13E+01	2.14E+01	2.13E+01	2.14E+01	2.16E+01	2.14E+01	2.13E+01	2.14E+01	2.13E+01
Mo+6, (MT)	1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00	1.13E+00	1.18E+00	1.18E+00	1.18E+00	1.18E+00
N2, (MT)		1.88E+01								
Na+, (MT)	7.01E+04	7.00E+04	7.02E+04	7.02E+04	7.01E+04	6.70E+04	7.01E+04	7.00E+04	7.02E+04	7.02E+04
NH2OH, (MT)		1.56E+01								
NH3, (MT)	8.36E+00	8.51E+00	8.38E+00	8.37E+00	8.38E+00	2.17E+01	8.36E+00	8.51E+00	8.38E+00	8.37E+00
Ni+3, (MT)	2.81E-08		2.81E-08	2.81E-08	2.81E-08	6.88E-08	2.81E-08		2.81E-08	2.81E-08
NO2-, (MT)	3.00E+02	3.06E+02	3.01E+02	3.00E+02	3.01E+02	7.57E+02	3.00E+02	3.06E+02	3.01E+02	3.00E+02
NO3-, (MT)	7.05E+03	7.18E+03	7.07E+03	7.06E+03	7.07E+03	1.78E+04	7.06E+03	7.18E+03	7.07E+03	7.06E+03
OH-, (MT)	4.38E+04	4.33E+04	4.38E+04	4.38E+04	4.38E+04	4.41E+04	4.38E+04	4.33E+04	4.38E+04	4.38E+04
POLY, (MT)		2.23E-04						2.23E-04		
SO4-2, (MT)	7.44E+03	7.18E+03	7.46E+03	7.46E+03	7.45E+03	2.75E+03	7.44E+03	7.18E+03	7.46E+03	7.46E+03
Tot Org Carbon, (MT)	2.74E-01	2.79E-01	2.74E-01	2.74E-01	2.74E-01	7.22E-01	2.74E-01	2.79E-01	2.74E-01	2.74E-01

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Solid Components	233_A-1	233_A-2	233_A-3	233_A-4	233_A-5	233_A-6	406_A-1	406_A-2	406_A-3	406_A-4
Total Mass Flow, (MT)	1.64E+04	1.58E+04	1.65E+04	1.65E+04	1.64E+04	1.28E+04	2.47E+04	2.40E+04	2.47E+04	2.47E+04
Cs and Ba, (MCi)	3.09E-03	3.09E-03	3.09E-03	3.09E-03	3.10E-03	3.12E-03	4.56E-03	4.58E-03	4.56E-03	4.56E-03
Sr and Y, (MCi)	1.39E-02	1.40E-02	1.40E-02	1.40E-02	1.40E-02	6.78E+01	1.42E-02	1.43E-02	1.43E-02	1.43E-02
Tc, (MCi)	1.53E-04	1.52E-04	1.53E-04	1.53E-04	1.53E-04	3.03E-03	1.56E-04	1.55E-04	1.56E-04	1.56E-04
TRU, (MCi)	1.20E-03	1.19E-03	1.20E-03	1.20E-03	1.20E-03	1.16E-03	1.22E-03	1.22E-03	1.22E-03	1.22E-03
Total MCi	1.83E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02	6.78E+01	2.01E-02	2.02E-02	2.02E-02	2.02E-02
Ag2O, (MT)	4.07E-01	3.93E-04	4.07E-01	4.07E-01	4.07E-01	1.06E+00	4.15E-01	4.01E-04	4.16E-01	4.15E-01
Al2O3, (MT)	2.97E+03	2.64E+03	2.97E+03	2.97E+03	2.97E+03	3.29E+03	3.38E+03	3.05E+03	3.38E+03	3.38E+03
Am2O3, (MT)	3.41E-05	3.40E-05	3.41E-05	3.41E-05	3.41E-05	3.40E-05	3.48E-05	3.48E-05	3.48E-05	3.48E-05
As2O5, (MT)	4.32E-01	4.18E-04	4.33E-01	4.32E-01	4.33E-01	1.15E+00	4.41E-01	4.27E-04	4.42E-01	4.41E-01
B2O3, (MT)	4.82E+00	4.80E+00	4.82E+00	4.82E+00	4.82E+00	4.82E+00	4.92E+00	4.90E+00	4.92E+00	4.92E+00
BaO, (MT)	8.76E-01	8.73E-01	8.76E-01	8.76E-01	8.76E-01	2.58E+00	8.95E-01	8.92E-01	8.95E-01	8.95E-01
BeO, (MT)	5.52E-02	5.33E-05	5.53E-02	5.52E-02	5.53E-02	1.47E-01	5.64E-02	5.45E-05	5.64E-02	5.64E-02
Bi2O3, (MT)	2.90E+02	2.89E+02	2.90E+02	2.90E+02	2.90E+02	2.90E+02	2.97E+02	2.95E+02	2.97E+02	2.97E+02
Cancrinite, (MT)	2.60E+03	2.56E+03	2.60E+03	2.60E+03	2.60E+03	1.70E+03	2.60E+03	2.56E+03	2.60E+03	2.60E+03
CaO, (MT)	2.08E+02	2.07E+02	2.08E+02	2.08E+02	2.08E+02	2.07E+02	1.03E+03	1.03E+03	1.03E+03	1.03E+03
CdO, (MT)	1.13E+01	1.13E+01	1.13E+01	1.13E+01	1.13E+01	1.13E+01	1.16E+01	1.15E+01	1.16E+01	1.16E+01
Ce2O3, (MT)	2.75E+02	2.74E+02	2.75E+02	2.75E+02	2.75E+02	2.75E+02	2.81E+02	2.80E+02	2.81E+02	2.81E+02
Cr2O3, (MT)	8.31E+01	7.61E+01	8.31E+01	8.31E+01	8.31E+01	7.81E+01	8.88E+01	7.77E+01	8.88E+01	8.88E+01
Cs2O, (MT)	4.00E-05	3.99E-05	4.00E-05	4.00E-05	4.00E-05	4.03E-05	5.88E-05	5.91E-05	5.89E-05	5.88E-05
CuO, (MT)	2.57E-01	2.48E-04	2.57E-01	2.57E-01	2.57E-01	6.80E-01	2.62E-01	2.53E-04	2.62E-01	2.62E-01
DCPD, (MT)										
Fe2O3, (MT)	3.61E+03	3.48E+03	3.62E+03	3.62E+03	3.62E+03	1.40E+03	3.69E+03	3.56E+03	3.70E+03	3.70E+03
H2O, (MT)	1.74E-04	2.05E-07	2.11E-04	2.11E-04	1.98E-04	1.68E-05	1.78E-04	2.10E-07	2.16E-04	2.16E-04
HgO, (MT)							4.41E-02	4.41E-02	4.41E-02	4.41E-02
K2O, (MT)	1.15E+00	1.13E+00	1.15E+00	1.15E+00	1.15E+00	4.47E-01	1.70E+00	1.67E+00	1.70E+00	1.70E+00
La2O3, (MT)	2.46E+01	2.45E+01	2.46E+01	2.46E+01	2.46E+01	2.45E+01	2.51E+01	2.50E+01	2.51E+01	2.51E+01
Li2O, (MT)	2.95E-03	2.89E-03	2.95E-03	2.95E-03	2.95E-03	1.14E-03	4.34E-03	4.28E-03	4.34E-03	4.34E-03
MgO, (MT)	1.96E+01	1.96E+01	1.96E+01	1.96E+01	1.96E+01	1.96E+01	2.00E+01	2.00E+01	2.00E+01	2.00E+01
MnO2, (MT)	2.09E+02	2.06E+02	2.09E+02	2.09E+02	2.09E+02	2.08E+02	2.14E+02	2.11E+02	2.14E+02	2.14E+02
MoO3, (MT)	8.55E+00	8.51E+00	8.55E+00	8.55E+00	8.55E+00	8.56E+00	8.77E+00	8.73E+00	8.77E+00	8.77E+00
Na2O, (MT)	1.27E+03	1.22E+03	1.28E+03	1.28E+03	1.27E+03	3.56E+02	3.33E+03	3.27E+03	3.33E+03	3.33E+03
Ni2FECN6, (MT)	1.94E-03	2.35E-03	2.34E-03	2.34E-03	2.20E-03	2.62E-03	1.94E-03	2.35E-03	2.34E-03	2.34E-03
Ni2O3, (MT)	2.62E+02	2.61E+02	2.62E+02	2.62E+02	2.62E+02	2.44E+02	2.68E+02	2.67E+02	2.68E+02	2.68E+02
NiO, (MT)							1.87E-05	2.27E-05	2.26E-05	2.26E-05
NpO2, (MT)	6.48E-03	6.14E-03	6.52E-03	6.52E-03	6.51E-03	1.12E-03	6.62E-03	6.27E-03	6.66E-03	6.66E-03
OLIGOMER, (MT)										
P2O5, (MT)	3.68E+03	3.66E+03	3.68E+03	3.68E+03	3.68E+03	3.69E+03	3.75E+03	3.74E+03	3.75E+03	3.75E+03
PbO2, (MT)	1.34E+00	1.30E-03	1.35E+00	1.34E+00	1.35E+00	3.56E+00	1.37E+00	1.33E-03	1.37E+00	1.37E+00
POLY, (MT)	1.80E-06		1.80E-06	1.80E-06	1.80E-06	4.75E-06	1.80E-06		1.80E-06	1.80E-06
PuO2, (MT)	5.42E-03	5.40E-03	5.42E-03	5.42E-03	5.42E-03	5.28E-03	5.53E-03	5.51E-03	5.53E-03	5.53E-03
S, (MT)										
SiO2, (MT)	1.79E+02	1.78E+02	1.79E+02	1.79E+02	1.79E+02	1.79E+02	4.78E+03	4.78E+03	4.78E+03	4.78E+03

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Solid Components	233_A-1	233_A-2	233_A-3	233_A-4	233_A-5	233_A-6	406_A-1	406_A-2	406_A-3	406_A-4
SO3, (MT)							1.32E+02	1.28E+02	1.33E+02	1.33E+02
SrO, (MT)	4.38E-03	4.40E-03	4.41E-03	4.41E-03	4.40E-03	2.14E+01	4.47E-03	4.49E-03	4.51E-03	4.51E-03
Tc2O7, (MT)	1.41E-02	1.40E-02	1.41E-02	1.41E-02	1.41E-02	2.80E-01	1.44E-02	1.43E-02	1.44E-02	1.44E-02
TiO2, (MT)	3.17E-02	3.15E-02	3.16E-02	3.16E-02	3.16E-02	2.75E-02	3.23E-02	3.22E-02	3.23E-02	3.23E-02
Tot Org Carbon, (MT)	2.03E-06	2.91E-06	2.89E-06	2.89E-06	2.59E-06	3.89E-06	2.03E-06	2.91E-06	2.89E-06	2.89E-06
U3O8, (MT)	1.07E+00	1.07E+00	1.08E+00	1.08E+00	1.07E+00	1.07E+00	1.10E+00	1.09E+00	1.10E+00	1.10E+00
V2O5, (MT)	9.91E-02	9.57E-05	9.92E-02	9.91E-02	9.92E-02	2.62E-01	1.01E-01	9.78E-05	1.01E-01	1.01E-01
WO2, (MT)		1.10E-06	1.09E-06	1.09E-06	9.76E-07	1.46E-06	7.68E-14	1.13E-06	1.11E-06	1.11E-06
WO3, (MT)	2.09E-01	2.02E-04	2.10E-01	2.09E-01	2.10E-01	5.58E-01	2.14E-01	2.07E-04	2.14E-01	2.14E-01
ZnO, (MT)	3.17E+01	3.16E+01	3.17E+01	3.17E+01	3.17E+01	3.19E+01	3.24E+01	3.23E+01	3.24E+01	3.24E+01
ZrO2, (MT)	6.99E+02	6.96E+02	6.99E+02	6.99E+02	6.99E+02	6.98E+02	7.14E+02	7.11E+02	7.14E+02	7.14E+02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	406_A-5	406_A-6	407_A-1	407_A-2	407_A-3	407_A-4	407_A-5	407_A-6	411_A-1	411_A-2
Volume, Total Liters	4.19E+08	4.09E+08								
Specific Gravity	1.00E+00	1.00E+00								
Total Mass Flow, (MT)	4.19E+05	4.09E+05								
Cs and Ba, (MCi)	6.56E-02	1.74E-01								
Total MCi	6.56E-02	1.74E-01								
Al(OH)4-, (MT)	7.45E+03	5.96E+03								
Cl-, (MT)	3.15E+02	3.15E+02								
Cr(OH)4-, (MT)	2.91E+02	2.90E+02								
Cs+, (MT)	7.99E-04	2.12E-03								
FeCN6-3, (MT)	3.20E+02	2.96E+02								
H+, (MT)										
H2O, (MT)	2.82E+05	2.70E+05								
Hg, (MT)	1.92E+00	1.92E+00								
K+, (MT)	2.02E+01	2.07E+01								
Li+, (MT)	2.90E-02	2.96E-02								
MnO2, (MT)	2.14E+01	2.16E+01								
Mo+6, (MT)	1.18E+00	1.13E+00								
N2, (MT)										
Na+, (MT)	7.01E+04	6.70E+04								
NH2OH, (MT)										
NH3, (MT)	8.38E+00	2.17E+01								
Ni+3, (MT)	2.81E-08	6.88E-08								
NO2-, (MT)	3.01E+02	7.57E+02								
NO3-, (MT)	7.07E+03	1.78E+04								
OH-, (MT)	4.38E+04	4.41E+04								
POLY, (MT)										
SO4-2, (MT)	7.45E+03	2.75E+03								
Tot Org Carbon, (MT)	2.74E-01	7.22E-01								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Total Components	406_A-5	406_A-6	407_A-1	407_A-2	407_A-3	407_A-4	407_A-5	407_A-6	451_A-1	451_A-2
Total Mass Flow, (MT)	2.47E+04	2.05E+04	2.64E+05	2.64E+05	2.65E+05	2.65E+05	2.64E+05	2.55E+05	3.94E+05	3.93E+05
Cs and Ba, (MCi)	4.56E-03	6.89E-03							7.00E-02	7.12E-02
Sr and Y, (MCi)	1.43E-02	6.92E+01							1.42E-02	1.43E-02
Tc, (MCi)	1.56E-04	3.10E-03							1.56E-04	1.55E-04
TRU, (MCi)	1.22E-03	1.19E-03							1.22E-03	1.22E-03
Total MCi	2.02E-02	6.92E+01							8.55E-02	8.68E-02
Ag2O, (MT)	4.16E-01	1.10E+00							4.15E-01	4.01E-04
Al2O3, (MT)	3.38E+03	3.68E+03	1.15E+04	1.14E+04	1.16E+04	1.15E+04	1.15E+04	1.12E+04	1.97E+04	1.96E+04
Am2O3, (MT)	3.48E-05	3.47E-05							3.48E-05	3.48E-05
As2O5, (MT)	4.42E-01	1.17E+00							4.41E-01	4.27E-04
B2O3, (MT)	4.92E+00	4.93E+00							4.92E+00	4.90E+00
BaO, (MT)	8.95E-01	2.63E+00							8.95E-01	8.92E-01
BeO, (MT)	5.64E-02	1.50E-01							5.64E-02	5.45E-05
Bi2O3, (MT)	2.97E+02	2.97E+02							2.97E+02	2.95E+02
Cancrinite, (MT)	2.60E+03	1.70E+03								
CaO, (MT)	1.03E+03	9.83E+02	3.83E+04	3.83E+04	3.84E+04	3.84E+04	3.83E+04	3.62E+04	3.94E+04	3.93E+04
CdO, (MT)	1.16E+01	1.16E+01							1.16E+01	1.15E+01
Ce2O3, (MT)	2.81E+02	2.80E+02							2.81E+02	2.80E+02
Cr2O3, (MT)	8.88E+01	8.37E+01							2.73E+02	7.82E+01
Cs2O, (MT)	5.89E-05	8.90E-05							9.04E-04	9.20E-04
CuO, (MT)	2.62E-01	6.94E-01							2.62E-01	2.53E-04
DCPD, (MT)										
Fe2O3, (MT)	3.70E+03	1.43E+03							3.81E+03	3.68E+03
H2O, (MT)	2.02E-04	1.72E-05							1.78E-04	2.10E-07
HgO, (MT)	4.41E-02	4.41E-02							2.11E+00	2.11E+00
K2O, (MT)	1.70E+00	9.88E-01							2.61E+01	2.61E+01
La2O3, (MT)	2.51E+01	2.51E+01							2.51E+01	2.50E+01
Li2O, (MT)	4.34E-03	2.53E-03							6.67E-02	6.66E-02
MgO, (MT)	2.00E+01	2.00E+01							2.00E+01	2.00E+01
MnO2, (MT)	2.14E+02	2.12E+02							2.36E+02	2.32E+02
MoO3, (MT)	8.77E+00	8.78E+00							1.05E+01	1.05E+01
Na2O, (MT)	3.33E+03	2.30E+03							9.84E+04	9.82E+04
Ni2FECN6, (MT)	2.20E-03	2.62E-03								
Ni2O3, (MT)	2.68E+02	2.50E+02							2.68E+02	2.67E+02
NiO, (MT)	2.13E-05	2.53E-05							8.97E-04	1.09E-03
NpO2, (MT)	6.65E-03	1.15E-03							6.62E-03	6.27E-03
OLIGOMER, (MT)										
P2O5, (MT)	3.75E+03	3.77E+03							3.75E+03	3.74E+03
PbO2, (MT)	1.37E+00	3.64E+00							1.37E+00	1.33E-03
POLY, (MT)	1.80E-06	4.75E-06								
PuO2, (MT)	5.53E-03	5.39E-03							5.53E-03	5.51E-03
S, (MT)										
SiO2, (MT)	4.77E+03	4.63E+03	2.14E+05	2.14E+05	2.15E+05	2.15E+05	2.14E+05	2.08E+05	2.20E+05	2.20E+05

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	406_A-5	406_A-6	407_A-1	407_A-2	407_A-3	407_A-4	407_A-5	407_A-6	411_A-1	411_A-2
SO3, (MT)	1.33E+02	4.90E+01							6.34E+03	6.11E+03
SrO, (MT)	4.50E-03	2.18E+01							4.47E-03	4.49E-03
Tc2O7, (MT)	1.44E-02	2.86E-01							1.44E-02	1.43E-02
TiO2, (MT)	3.23E-02	2.81E-02							3.23E-02	3.22E-02
Tot Org Carbon, (MT)	2.59E-06	3.89E-06								
U3O8, (MT)	1.10E+00	1.09E+00							1.10E+00	1.09E+00
V2O5, (MT)	1.01E-01	2.68E-01							1.01E-01	9.78E-05
WO2, (MT)	9.97E-07	1.49E-06							7.77E-12	1.13E-06
WO3, (MT)	2.14E-01	5.69E-01							2.14E-01	2.07E-04
ZnO, (MT)	3.24E+01	3.25E+01							3.24E+01	3.23E+01
ZrO2, (MT)	7.14E+02	7.13E+02							7.14E+02	7.11E+02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	431_A-3	431_A-4	431_A-5	431_A-6	441_A-1	441_A-2	441_A-3	441_A-4	441_A-5	441_A-6
Volume, Total Liters										
Specific Gravity										
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Total MCi										
Al(OH)4-, (MT)										
Cl-, (MT)										
Cr(OH)4-, (MT)										
Cs+, (MT)										
FeCN6-3, (MT)										
H+, (MT)										
H2O, (MT)										
Hg, (MT)										
K+, (MT)										
Li+, (MT)										
MnO2, (MT)										
Mo+6, (MT)										
N2, (MT)										
Na+, (MT)										
NH2OH, (MT)										
NH3, (MT)										
Ni+3, (MT)										
NO2-, (MT)										
NO3-, (MT)										
OH-, (MT)										
POLY, (MT)										
SO4-2, (MT)										
Tot Org Carbon, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	411_A-3	411_A-4	411_A-5	411_A-6	441_A-1	441_A-2	441_A-3	441_A-4	441_A-5	441_A-6
Total Mass Flow, (MT)	3.94E+05	3.94E+05	3.94E+05	3.72E+05	5.07E+05	5.06E+05	5.08E+05	5.07E+05	5.07E+05	4.79E+05
Cs and Ba, (MCi)	7.00E-02	7.00E-02	7.00E-02	1.81E-01	6.85E-02	6.97E-02	6.86E-02	6.85E-02	6.86E-02	1.77E-01
Sr and Y, (MCi)	1.43E-02	1.43E-02	1.43E-02	6.92E+01	1.39E-02	1.40E-02	1.40E-02	1.40E-02	1.40E-02	6.78E+01
Tc, (MCi)	1.56E-04	1.56E-04	1.56E-04	3.10E-03	1.53E-04	1.52E-04	1.53E-04	1.53E-04	1.53E-04	3.03E-03
TRU, (MCi)	1.22E-03	1.22E-03	1.22E-03	1.19E-03	1.20E-03	1.19E-03	1.20E-03	1.20E-03	1.20E-03	1.16E-03
Total MCi	8.57E-02	8.56E-02	8.57E-02	6.94E+01	8.38E-02	8.50E-02	8.39E-02	8.39E-02	8.39E-02	6.79E+01
Ag2O, (MT)	4.16E-01	4.15E-01	4.16E-01	1.10E+00	4.07E-01	3.93E-04	4.07E-01	4.07E-01	4.07E-01	1.08E+00
Al2O3, (MT)	1.97E+04	1.97E+04	1.97E+04	1.86E+04	1.93E+04	1.92E+04	1.93E+04	1.93E+04	1.93E+04	1.82E+04
Am2O3, (MT)	3.48E-05	3.48E-05	3.48E-05	3.47E-05	3.41E-05	3.40E-05	3.41E-05	3.41E-05	3.41E-05	3.40E-05
As2O5, (MT)	4.42E-01	4.41E-01	4.42E-01	1.17E+00	4.32E-01	4.18E-04	4.33E-01	4.32E-01	4.33E-01	1.15E+00
B2O3, (MT)	4.92E+00	4.92E+00	4.92E+00	4.93E+00	4.82E+00	4.80E+00	4.82E+00	4.82E+00	4.82E+00	4.82E+00
BaO, (MT)	8.95E-01	8.95E-01	8.95E-01	2.63E+00	8.76E-01	8.73E-01	8.76E-01	8.76E-01	8.76E-01	2.58E+00
BeO, (MT)	5.64E-02	5.64E-02	5.64E-02	1.50E-01	5.52E-02	5.33E-05	5.53E-02	5.52E-02	5.53E-02	1.47E-01
Bi2O3, (MT)	2.97E+02	2.97E+02	2.97E+02	2.97E+02	2.90E+02	2.89E+02	2.90E+02	2.90E+02	2.90E+02	2.90E+02
Cancrinite, (MT)										
CaO, (MT)	3.94E+04	3.94E+04	3.94E+04	3.72E+04	3.85E+04	3.85E+04	3.86E+04	3.86E+04	3.85E+04	3.64E+04
CdO, (MT)	1.16E+01	1.16E+01	1.16E+01	1.16E+01	1.13E+01	1.13E+01	1.13E+01	1.13E+01	1.13E+01	1.13E+01
Ce2O3, (MT)	2.81E+02	2.81E+02	2.81E+02	2.80E+02	2.75E+02	2.74E+02	2.75E+02	2.75E+02	2.75E+02	2.75E+02
Cr2O3, (MT)	2.73E+02	2.73E+02	2.73E+02	2.67E+02	2.67E+02	7.65E+01	2.67E+02	2.67E+02	2.67E+02	2.61E+02
Cs2O, (MT)	9.04E-04	9.04E-04	9.04E-04	2.33E-03	8.85E-04	9.01E-04	8.86E-04	8.85E-04	8.86E-04	2.29E-03
CuO, (MT)	2.62E-01	2.62E-01	2.62E-01	6.94E-01	2.57E-01	2.48E-04	2.57E-01	2.57E-01	2.57E-01	6.80E-01
DCPD, (MT)					1.22E+05	1.21E+05	1.22E+05	1.22E+05	1.22E+05	1.15E+05
Fe2O3, (MT)	3.82E+03	3.82E+03	3.82E+03	1.55E+03	3.73E+03	3.60E+03	3.74E+03	3.74E+03	3.74E+03	1.51E+03
H2O, (MT)	2.16E-04	2.16E-04	2.02E-04	1.72E-05	1.74E-04	2.05E-07	2.11E-04	2.11E-04	1.98E-04	1.68E-05
HgO, (MT)	2.11E+00	2.11E+00	2.11E+00	2.11E+00	2.07E+00	2.07E+00	2.07E+00	2.07E+00	2.07E+00	2.07E+00
K2O, (MT)	2.61E+01	2.61E+01	2.61E+01	2.59E+01	2.55E+01	2.55E+01	2.55E+01	2.55E+01	2.55E+01	2.54E+01
La2O3, (MT)	2.51E+01	2.51E+01	2.51E+01	2.51E+01	2.46E+01	2.45E+01	2.46E+01	2.46E+01	2.46E+01	2.45E+01
Li2O, (MT)	6.67E-02	6.66E-02	6.67E-02	6.63E-02	6.53E-02	6.52E-02	6.53E-02	6.52E-02	6.53E-02	6.49E-02
MgO, (MT)	2.00E+01	2.00E+01	2.00E+01	2.00E+01	1.96E+01	1.96E+01	1.96E+01	1.96E+01	1.96E+01	1.96E+01
MnO2, (MT)	2.36E+02	2.36E+02	2.36E+02	2.34E+02	2.31E+02	2.28E+02	2.31E+02	2.31E+02	2.31E+02	2.29E+02
MoO3, (MT)	1.05E+01	1.05E+01	1.05E+01	1.05E+01	1.03E+01	1.03E+01	1.03E+01	1.03E+01	1.03E+01	1.03E+01
Na2O, (MT)	9.85E+04	9.85E+04	9.84E+04	9.29E+04	9.64E+04	9.61E+04	9.65E+04	9.64E+04	9.63E+04	9.10E+04
Ni2FECN6, (MT)										
Ni2O3, (MT)	2.68E+02	2.68E+02	2.68E+02	2.50E+02	2.62E+02	2.61E+02	2.62E+02	2.62E+02	2.62E+02	2.44E+02
NiO, (MT)	1.08E-03	1.08E-03	1.02E-03	1.21E-03	8.78E-04	1.06E-03	1.06E-03	1.06E-03	9.97E-04	1.19E-03
NpO2, (MT)	6.66E-03	6.66E-03	6.65E-03	1.15E-03	6.48E-03	6.14E-03	6.52E-03	6.52E-03	6.51E-03	1.12E-03
OLIGOMER, (MT)					4.40E-03	4.39E-03	4.41E-03	4.41E-03	4.40E-03	4.16E-03
P2O5, (MT)	3.75E+03	3.75E+03	3.75E+03	3.77E+03	3.68E+03	3.66E+03	3.68E+03	3.68E+03	3.68E+03	3.69E+03
PbO2, (MT)	1.37E+00	1.37E+00	1.37E+00	3.64E+00	1.34E+00	1.30E-03	1.35E+00	1.34E+00	1.35E+00	3.56E+00
POLY, (MT)										
PuO2, (MT)	5.53E-03	5.53E-03	5.53E-03	5.39E-03	5.42E-03	5.40E-03	5.42E-03	5.42E-03	5.42E-03	5.28E-03
S, (MT)					1.67E-01	1.67E-01	1.68E-01	1.68E-01	1.67E-01	1.58E-01
SiO2, (MT)	2.20E+05	2.20E+05	2.20E+05	2.13E+05	2.16E+05	2.16E+05	2.16E+05	2.16E+05	2.15E+05	2.09E+05

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	411_A-3	411_A-4	411_A-5	411_A-6	441_A-1	441_A-2	441_A-3	441_A-4	441_A-5	441_A-6
SO3, (MT)	6.35E+03	6.35E+03	6.34E+03	2.35E+03	6.20E+03	5.99E+03	6.22E+03	6.22E+03	6.21E+03	2.30E+03
SrO, (MT)	4.51E-03	4.51E-03	4.50E-03	2.18E+01	4.38E-03	4.40E-03	4.41E-03	4.41E-03	4.40E-03	2.14E+01
Tc2O7, (MT)	1.44E-02	1.44E-02	1.44E-02	2.86E-01	1.41E-02	1.40E-02	1.41E-02	1.41E-02	1.41E-02	2.80E-01
TiO2, (MT)	3.23E-02	3.23E-02	3.23E-02	2.81E-02	3.17E-02	3.15E-02	3.16E-02	3.16E-02	3.16E-02	2.75E-02
Tot Org Carbon, (MT)										
U3O8, (MT)	1.10E+00	1.10E+00	1.10E+00	1.09E+00	1.07E+00	1.07E+00	1.08E+00	1.08E+00	1.07E+00	1.07E+00
V2O5, (MT)	1.01E-01	1.01E-01	1.01E-01	2.68E-01	9.91E-02	9.57E-05	9.92E-02	9.91E-02	9.92E-02	2.62E-01
WO2, (MT)	1.11E-06	1.11E-06	9.97E-07	1.49E-06	7.62E-12	1.10E-06	1.09E-06	1.09E-06	9.76E-07	1.46E-06
WO3, (MT)	2.14E-01	2.14E-01	2.14E-01	5.69E-01	2.09E-01	2.02E-04	2.10E-01	2.09E-01	2.10E-01	5.58E-01
ZnO, (MT)	3.24E+01	3.24E+01	3.24E+01	3.25E+01	3.17E+01	3.16E+01	3.17E+01	3.17E+01	3.17E+01	3.19E+01
ZrO2, (MT)	7.14E+02	7.14E+02	7.14E+02	7.13E+02	6.99E+02	6.96E+02	6.99E+02	6.99E+02	6.99E+02	6.98E+02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas-Streams.

Stream Name Liquid Components	6_A-1B	6_A-2B
Volume, Total Liters	1.36E+06	1.37E+06
Specific Gravity	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.36E+03	1.37E+03
Cs and Ba, (MCi)	8.62E-05	8.77E-05
Total MCi	8.62E-05	8.77E-05
Al+3, (MT)	2.78E+00	3.09E+00
Cl-, (MT)	4.13E-01	4.13E-01
Cr+3, (MT)	1.65E-01	3.75E-04
Cs+, (MT)	1.05E-06	1.07E-06
FeCN6-3, (MT)	3.20E+02	3.20E+02
H+, (MT)		5.28E-06
H2O, (MT)	8.26E+02	8.24E+02
H2O2, (MT)		6.92E-01
Hg2, (MT)	1.92E+00	1.91E+00
K+, (MT)	2.66E-02	2.66E-02
Li+, (MT)	3.80E-05	3.80E-05
MnO2, (MT)	2.13E+01	2.13E+01
MoO4-2, (MT)	1.96E+00	1.96E+00
Na+, (MT)	9.22E+01	9.20E+01
NH2OH, (MT)		1.55E+01
NH3, (MT)	8.36E+00	8.49E+00
NH4+, (MT)	1.63E-02	1.63E-02
NO2-, (MT)	3.95E-01	4.02E-01
NO3-, (MT)	9.29E+00	9.44E+00
OH-, (MT)	6.48E+01	6.47E+01
POLY, (MT)		2.92E-07
PTA-3, (MT)	7.00E-04	6.99E-04
SO4-2, (MT)	9.81E+00	9.44E+00
Tot Org Carbon, (MT)	3.60E-04	3.66E-04

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas-Streams.

Stream Name Solid Components	6_A-1B	6_A-2B
Total Mass Flow, (MT)	7.81E+05	7.78E+05
Ca and Ba, (MCi)	6.86E-02	6.98E-02
Sr and Y, (MCi)	1.40E-02	1.40E-02
Tc, (MCi)	1.53E-04	1.52E-04
TRU, (MCi)	1.20E-03	1.19E-03
Total MCi	8.39E-02	8.50E-02
Ag2O, (MT)	4.07E-01	3.93E-04
Al+3, (MT)	2.11E+03	2.35E+03
Al2O3, (MT)	2.97E+03	2.64E+03
Am2O3, (MT)	3.41E-05	3.40E-05
As2O5, (MT)	4.33E-01	4.18E-04
B2O3, (MT)	4.82E+00	4.80E+00
BaO, (MT)	8.76E-01	8.73E-01
BeO, (MT)	5.53E-02	5.33E-05
Bi2O3, (MT)	2.90E+02	2.89E+02
Cancrinite, (MT)	2.60E+03	2.56E+03
CaO, (MT)	2.08E+02	2.07E+02
CdO, (MT)	1.13E+01	1.13E+01
Ce2O3, (MT)	2.75E+02	2.74E+02
Cl-, (MT)	3.14E+02	3.14E+02
Cr+3, (MT)	1.26E+02	2.85E-01
Cr2O3, (MT)	8.31E+01	7.61E+01
Cs+, (MT)	7.98E-04	8.12E-04
Cs2O, (MT)	4.00E-05	3.99E-05
CuO, (MT)	2.57E-01	2.48E-04
Fe2O3, (MT)	3.62E+03	3.48E+03
H+, (MT)		8.43E-02
H2O, (MT)	6.28E+05	6.26E+05
K+, (MT)	2.02E+01	2.02E+01
K2O, (MT)	1.15E+00	1.13E+00
La2O3, (MT)	2.46E+01	2.45E+01
Li+, (MT)	2.89E-02	2.89E-02
Li2O, (MT)	2.95E-03	2.89E-03
MgO, (MT)	1.96E+01	1.96E+01
MnO2, (MT)	2.09E+02	2.06E+02
MoO3, (MT)	8.55E+00	8.51E+00
Na+, (MT)	7.01E+04	6.99E+04
Na2O, (MT)	1.28E+03	1.22E+03
Ni(OH)3, (MT)	5.25E-08	
Ni2FECN6, (MT)	2.34E-03	2.35E-03
Ni2O3, (MT)	2.62E+02	2.61E+02
NO2-, (MT)	3.00E+02	3.05E+02
NO3-, (MT)	7.06E+03	7.17E+03

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas-Streams.

Stream Name Solid Components	6_A-1B	6_A-2B
NpO2, (MT)	6.52E-03	6.14E-03
OH-, (MT)	4.93E+04	4.91E+04
P2O5, (MT)	3.68E+03	3.66E+03
PbO2, (MT)	1.35E+00	1.30E-03
POLY, (MT)	1.80E-06	2.22E-04
PTA-3, (MT)	5.32E-01	5.32E-01
PuO2, (MT)	5.42E-03	5.40E-03
SiO2, (MT)	1.79E+02	1.78E+02
SO4-2, (MT)	7.46E+03	7.17E+03
SrO, (MT)	4.41E-03	4.40E-03
Tc2O7, (MT)	1.41E-02	1.40E-02
TiO2, (MT)	3.16E-02	3.15E-02
Tot Org Carbon, (MT)	2.74E-01	2.78E-01
U3O8, (MT)	1.08E+00	1.07E+00
V2O5, (MT)	9.92E-02	9.57E-05
WO2, (MT)	1.09E-06	1.10E-06
WO3, (MT)	2.10E-01	2.02E-04
ZnO, (MT)	3.17E+01	3.16E+01
ZrO2, (MT)	6.99E+02	6.96E+02

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1371_A-1	1371_A-2	1371_A-5	1371_A-4	1371_A-5	1371_A-6	1374_A-1	1374_A-2	1374_A-3	1374_A-4
Volume, Total Liters	1.50E+07	1.49E+07	1.50E+07	1.77E+07	1.50E+07	2.12E+07	4.07E+05	3.96E+05	4.08E+05	3.93E+05
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	1.50E+04	1.49E+04	1.50E+04	1.77E+04	1.50E+04	2.12E+04	4.07E+02	3.96E+02	4.08E+02	3.93E+02
Cs and Ba, (MCi)							3.74E-05	3.74E-05	6.11E-05	3.74E-05
Sr and Y, (MCi)							6.92E-05	6.92E-05	7.94E-05	6.92E-05
Tc, (MCi)							1.59E-08	1.59E-08	1.59E-08	1.59E-08
TRU, (MCi)							1.03E-07	1.03E-07	1.03E-07	1.55E-07
Total MCi							1.07E-04	1.07E-04	1.41E-04	1.07E-04
Al+3, (MT)							1.08E-08	1.07E-08	1.07E-08	1.07E-08
Am+3, (MT)							1.51E-08	1.51E-08	1.51E-08	3.02E-08
Ba+2, (MT)							1.54E-06	1.54E-06	1.54E-06	1.54E-06
Bi+3, (MT)							1.01E-07	1.01E-07	1.01E-07	5.87E-07
C2H3O3, (MT)										
C2O4-2, (MT)										1.12E-03
Ca+2, (MT)							2.53E-09	2.51E-09	2.51E-09	2.51E-09
Cancrinite, (MT)							4.20E-08	4.12E-08	4.17E-08	4.17E-08
Ce+3, (MT)							1.35E-07	1.35E-07	1.35E-07	1.19E-04
Cl-, (MT)										
Cl2, (MT)	1.81E-03	1.80E-03	1.80E-03	1.80E-03	1.80E-03	2.50E-02				
CO2, (MT)	2.61E+00	2.59E+00	2.60E+00	2.25E+03	2.60E+00	1.44E+03				
Cr+3, (MT)							1.36E-09	1.34E-09	1.35E-09	1.35E-09
Cs+, (MT)							4.55E-07	4.55E-07	7.44E-07	4.55E-07
F-, (MT)							3.14E-05	2.97E-05	3.25E-05	5.78E-05
F2, (MT)	6.27E+01	5.93E+01	6.51E+01	1.16E+02	6.26E+01	1.78E+01				
Fe+3, (MT)							4.67E-08	4.67E-08	4.67E-08	8.54E-08
H+, (MT)	9.61E-05	9.56E-05	9.66E-05	9.98E-05	9.64E-05	2.84E-05	8.37E-05	8.31E-05	8.41E-05	1.11E-04
H2, (MT)							8.56E-10	3.53E-08	8.51E-10	8.51E-10
H2O, (MT)	3.97E+03	3.96E+03	3.98E+03	4.46E+03	3.98E+03	1.57E+04	4.07E+02	3.95E+02	4.08E+02	3.92E+02
H2O2, (MT)	2.50E-02	2.33E-02	2.48E-02	2.50E-02	2.51E-02	1.26E-02				
Hg, (MT)	4.38E-09	4.34E-09	4.34E-09	4.34E-09	4.35E-09	6.08E-08	2.27E-08	2.25E-08	2.25E-08	2.25E-08
Hg2, (MT)										
I-, (MT)										
I2, (MT)	1.04E-02	1.03E-02	1.03E-02	1.03E-02	1.04E-02	1.45E-01				
K+, (MT)										
La+3, (MT)							1.20E-08	1.20E-08	1.20E-08	1.06E-05
Mg+2, (MT)										
Mn+4, (MT)							2.26E-09	2.21E-09	2.24E-09	2.24E-09
N2, (MT)	5.52E+02	5.49E+02	5.55E+02	5.73E+02	5.54E+02	1.62E+02				
N2O, (MT)								3.76E-07		
Na+, (MT)							3.73E-07	3.61E-07	3.72E-07	3.74E-07
NH3, (MT)	1.11E+01	1.10E+01	1.12E+01	1.15E+01	1.11E+01	3.24E+00	1.64E-09	1.56E-09	1.64E-09	1.64E-09
Ni+3, (MT)										
NO, (MT)	3.65E+03	3.63E+03	3.67E+03	3.79E+03	3.66E+03	1.08E+03				

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Liquid Components	1371_A-1	1371_A-2	1371_A-3	1371_A-4	1371_A-5	1371_A-6	1374_A-1	1374_A-2	1374_A-3	1374_A-4
NO2, (MT)	7.32E+00	7.21E+00	7.27E+00	7.27E+00	7.29E+00	8.03E+01				
NO2-, (MT)										
NO3-, (MT)	5.91E-03	5.88E-03	5.95E-03	6.14E-03	5.93E-03	1.75E-03	3.78E-01	3.76E-01	3.80E-01	3.93E-01
Np+4, (MT)							7.29E-08	7.29E-08	7.29E-08	7.57E-08
O2, (MT)	6.72E+03	6.69E+03	6.74E+03	6.47E+03	6.73E+03	2.70E+03				
OH-, (MT)							1.37E-07	1.28E-07	1.36E-07	1.37E-07
PO4-3, (MT)							4.01E-09	3.96E-09	3.97E-09	3.97E-09
Pu+4, (MT)							2.25E-07	2.25E-07	2.25E-07	2.27E-07
Si+4, (MT)							1.34E-09	1.32E-09	1.33E-09	1.33E-09
SO2, (MT)										
SO4-2, (MT)										
Sr+2, (MT)							1.84E-05	1.84E-05	2.11E-05	1.84E-05
TcO4-, (MT)							1.54E-06	1.54E-06	1.54E-06	1.54E-06
Tot Org Carbon, (MT)							1.57E-08	1.55E-08	1.55E-08	1.55E-08
UO2+2, (MT)							9.09E-07	9.09E-07	9.09E-07	9.97E-07
Zn+2, (MT)							3.62E-08	3.62E-08	3.62E-08	3.62E-08
Zr+4, (MT)							2.64E-07	2.64E-07	2.64E-07	5.19E-07

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1371_A-1	1371_A-2	1371_A-3	1371_A-4	1371_A-5	1371_A-6	1374_A-1	1374_A-2	1374_A-3	1374_A-4
Total Mass Flow, (MT)	1.03E-07	1.96E-08	1.03E-07	1.11E-07	1.40E-07	6.39E-07	1.28E-06	1.21E-06	1.28E-06	1.28E-06
Cs and Ba, (MCi)	5.81E-09	5.81E-09	9.49E-09	5.81E-09	5.81E-09	5.80E-09				
Sr and Y, (MCi)	1.07E-08	1.07E-08	1.23E-08	1.07E-08	1.07E-08	5.42E-09	8.42E-11	8.40E-11	9.41E-11	8.41E-11
Tc, (MCi)	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.24E-12				
TRU, (MCi)	1.60E-11	1.60E-11	1.60E-11	2.42E-11	1.60E-11	1.60E-11				
Total MCi	1.65E-08	1.65E-08	2.18E-08	1.65E-08	1.65E-08	1.12E-08	8.42E-11	8.40E-11	9.41E-11	8.41E-11
Ag+, (MT)										
Ag2O, (MT)	1.11E-10		1.11E-10	1.11E-10	1.11E-10	5.86E-11	3.57E-10		3.57E-10	3.57E-10
Al+3, (MT)							7.27E-10	7.20E-10	7.20E-10	7.20E-10
Al2O3, (MT)	1.52E-08	2.86E-09	1.51E-08	1.51E-08	1.52E-08	7.03E-08	3.99E-08	2.30E-10	3.96E-08	3.96E-08
Am2O3, (MT)	2.58E-12	2.58E-12	2.58E-12	5.16E-12	2.58E-12	2.58E-12				
APM-, (MT)						3.99E-12				
As+5, (MT)										
As2O5, (MT)	1.18E-10		1.18E-10	1.18E-10	1.18E-10	6.20E-11	3.79E-10		3.79E-10	3.79E-10
B+3, (MT)							1.20E-13	1.19E-13	1.19E-13	1.19E-13
B2O3, (MT)	9.37E-09	9.82E-10	8.93E-09	5.55E-09	1.81E-08	1.09E-07	7.21E-11	6.21E-12	6.93E-11	4.80E-11
Ba+2, (MT)										
BaO, (MT)	2.69E-10	2.68E-10	2.69E-10	2.69E-10	2.69E-10	1.37E-10	4.05E-12	1.70E-12	4.05E-12	4.05E-12
BeO, (MT)	1.50E-11		1.50E-11	1.50E-11	1.50E-11	7.90E-12	4.84E-11		4.84E-11	4.84E-11
Bi+3, (MT)							2.36E-11	2.34E-11	2.34E-11	2.34E-11
Bi2O3, (MT)	2.68E-10	2.59E-11	2.68E-10	3.53E-10	2.68E-10	2.65E-10	7.81E-10		7.81E-10	7.82E-10
Ca+2, (MT)							1.81E-11	1.79E-11	1.79E-11	1.79E-11
Cancrinite, (MT)							2.59E-08	2.54E-08	2.57E-08	2.57E-08
CaO, (MT)	1.82E-10	8.51E-12	1.82E-10	1.82E-10	1.82E-10	2.07E-10	5.58E-10	6.07E-13	5.58E-10	5.58E-10
Cd+2, (MT)										
CdO, (MT)	9.81E-12	3.70E-13	9.81E-12	9.81E-12	9.81E-12	9.96E-12	3.04E-11		3.04E-11	3.04E-11
Ce+3, (MT)							2.87E-11	2.84E-11	2.84E-11	2.84E-11
Ce2O3, (MT)	2.65E-10	3.51E-11	2.65E-10	2.19E-08	2.65E-10	2.98E-10	7.40E-10		7.40E-10	8.76E-10
Cl-, (MT)							4.21E-13	4.17E-13	4.17E-13	4.17E-13
CO3-2, (MT)							2.71E-11	2.68E-11	2.68E-11	2.68E-11
Cr+3, (MT)							8.31E-11	8.22E-11	8.23E-11	8.23E-11
Cr2O3, (MT)	1.08E-10	4.86E-11	1.07E-10	1.07E-10	1.07E-10	5.47E-10	2.24E-10	3.54E-11	2.24E-10	2.24E-10
Cs2O, (MT)	7.50E-11	7.50E-11	1.23E-10	7.50E-11	7.50E-11	7.49E-11				
Cu+2, (MT)										
CuO, (MT)	6.99E-11		6.99E-11	6.99E-11	6.99E-11	3.70E-11	2.25E-10		2.25E-10	2.25E-10
F-, (MT)							7.20E-12	7.13E-12	7.13E-12	7.13E-12
Fe+3, (MT)							4.88E-10	4.84E-10	4.84E-10	4.84E-10
Fe2O3, (MT)	3.30E-09	3.93E-10	3.30E-09	3.31E-09	5.59E-09	2.56E-08	9.72E-09	1.18E-11	9.74E-09	9.74E-09
H2O, (MT)	8.52E-11	8.51E-11	8.52E-11	8.52E-11	8.52E-11	8.52E-11	2.74E-10	2.74E-10	2.74E-10	2.74E-10
I-, (MT)							2.44E-12	2.41E-12	2.41E-12	2.41E-12
K+, (MT)							2.53E-12	2.51E-12	2.51E-12	2.51E-12
K2O, (MT)	1.83E-12	1.01E-12	1.82E-12	1.82E-12	1.83E-12	1.43E-11	2.64E-12		2.64E-12	2.64E-12
La+3, (MT)							2.56E-12	2.54E-12	2.54E-12	2.54E-12

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Solid Components	1371_A-1	1371_A-2	1371_A-3	1371_A-4	1371_A-5	1371_A-6	1374_A-1	1374_A-2	1374_A-3	1374_A-4
La2O3, (MT)	2.37E-11	3.14E-12	2.37E-11	1.96E-09	2.37E-11	2.66E-11	6.61E-11		6.61E-11	7.84E-11
Li2O, (MT)	1.03E-09	1.96E-10	1.03E-09	1.11E-09	2.80E-09	2.27E-08	6.48E-12	1.24E-12	6.48E-12	7.02E-12
Mg+2, (MT)							1.33E-12	1.31E-12	1.32E-12	1.32E-12
MgO, (MT)	1.71E-11	7.42E-13	1.71E-11	1.71E-11	1.71E-11	1.87E-11	5.28E-11		5.28E-11	5.28E-11
MnO2, (MT)	8.48E-12	8.31E-12	8.41E-12	8.41E-12	8.43E-12	1.17E-10	2.55E-11	2.50E-11	2.53E-11	2.53E-11
Mo+6, (MT)										
MoO3, (MT)	7.19E-12		7.18E-12	7.19E-12	7.18E-12	4.39E-12	2.30E-11		2.30E-11	2.30E-11
Na+, (MT)							1.06E-09	1.06E-09	1.06E-09	1.06E-09
Na2O, (MT)	5.13E-09	2.34E-09	5.13E-09	5.55E-09	9.79E-09	4.47E-08	2.93E-09	1.75E-11	2.93E-09	2.94E-09
Ni+3, (MT)							1.28E-12	1.27E-12	1.27E-12	1.27E-12
Ni2FECN6, (MT)							6.66E-10	6.60E-10	6.61E-10	6.61E-10
Ni2O3, (MT)	2.19E-10	8.57E-13	2.19E-10	2.19E-10	2.19E-10	1.15E-10	7.05E-10		7.05E-10	7.05E-10
NiO, (MT)	9.40E-11	9.32E-11	9.32E-11	9.32E-11	9.35E-11	1.42E-09				
NO2-, (MT)							8.90E-12	8.81E-12	8.82E-12	8.82E-12
NpO2, (MT)	1.29E-11	1.29E-11	1.29E-11	1.34E-11	1.29E-11	1.29E-11				
OH-, (MT)							1.18E-06	1.18E-06	1.18E-06	1.18E-06
P2O5, (MT)	3.08E-09	1.01E-11	3.08E-09	3.08E-09	3.08E-09	1.69E-09	9.89E-09	9.86E-12	9.88E-09	9.89E-09
Pb+4, (MT)										
PbO2, (MT)	3.66E-10	4.96E-13	3.66E-10	3.66E-10	3.66E-10	1.93E-10	1.18E-09		1.18E-09	1.18E-09
PO4-3, (MT)							2.85E-11	2.82E-11	2.82E-11	2.82E-11
POLY, (MT)							1.33E-11	1.33E-11	1.33E-11	1.33E-11
Pu+4, (MT)										
PuO2, (MT)	3.97E-11	3.97E-11	3.97E-11	4.01E-11	3.97E-11	3.97E-11				
Si+4, (MT)							9.53E-12	9.44E-12	9.44E-12	9.44E-12
SiO2, (MT)	5.85E-08	8.25E-09	5.84E-08	4.66E-08	7.83E-08	3.58E-07	8.50E-10	5.26E-11	8.50E-10	7.75E-10
SO3, (MT)						1.58E-12				
SO4-2, (MT)										
Sr+2, (MT)							4.44E-12	4.40E-12	4.40E-12	4.40E-12
SrO, (MT)	3.37E-09	3.37E-09	3.87E-09	3.37E-09	3.37E-09	1.71E-09	2.13E-11	2.13E-11	2.44E-11	2.13E-11
Tc2O7, (MT)	2.27E-10	2.27E-10	2.27E-10	2.28E-10	2.27E-10	2.07E-10				
Tot Org Carbon, (MT)							1.40E-11	1.38E-11	1.38E-11	1.38E-11
UO2+2, (MT)							2.01E-10	1.99E-10	1.99E-10	1.99E-10
UO3, (MT)	2.16E-10	2.15E-10	2.15E-10	2.30E-10	2.16E-10	1.13E-09				
V2O5, (MT)	2.70E-11		2.70E-11	2.70E-11	2.70E-11	1.43E-11	8.69E-11		8.68E-11	8.69E-11
WO3, (MT)	5.70E-11		5.70E-11	5.70E-11	5.70E-11	2.99E-11	1.84E-10		1.84E-10	1.84E-10
Zn+2, (MT)										
ZnO, (MT)	3.35E-11	7.08E-12	3.35E-11	3.35E-11	3.35E-11	2.15E-11	8.54E-11		8.53E-11	8.54E-11
Zr+4, (MT)							3.34E-11	3.31E-11	3.31E-11	3.31E-11
ZrO2, (MT)	6.65E-10	8.16E-11	6.65E-10	7.18E-10	6.65E-10	7.41E-10	1.88E-09	2.38E-12	1.88E-09	1.88E-09
ZrO2:2H2O, (MT)							4.93E-11	4.88E-11	4.88E-11	4.88E-11

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1374_A-5	1374_A-6	1543_A-1	1543_A-2	1543_A-3	1543_A-4	1543_A-5	1543_A-6	
Volume, Total Liters	4.08E+05	1.85E+05	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	1.03E+10	
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	
Total Mass Flow, (MT)	4.08E+02	1.85E+02	1.03E+07	1.03E+07	1.03E+07	1.03E+07	1.03E+07	1.03E+07	
Cs and Ba, (MCi)	3.74E-05	3.73E-05							
Sr and Y, (MCi)	6.92E-05	3.44E-05							
Tc, (MCi)	1.59E-08	1.45E-08							
TRU, (MCi)	1.03E-07	1.01E-07							
Total MCi	1.07E-04	7.19E-05							
Al+3, (MT)	1.07E-08	1.27E-07							
Am+3, (MT)	1.51E-08	1.50E-08							
Ba+2, (MT)	1.54E-06	7.69E-07							
Bi+3, (MT)	1.01E-07	1.37E-07							
C2H3O3, (MT)		4.76E-03							
C2O4-2, (MT)									
Ca+2, (MT)	2.52E-09	3.07E-08							
Cancrinite, (MT)	4.18E-08	3.04E-07							
Ce+3, (MT)	1.35E-07	1.79E-07							
Cl-, (MT)		7.21E-10							
Cl2, (MT)									
CO2, (MT)			3.63E+04	3.50E+04	3.65E+04	3.65E+04	3.64E+04	1.10E+04	
Cr+3, (MT)	1.35E-09	1.74E-08							
Cs+, (MT)	4.55E-07	4.55E-07							
F-, (MT)	3.13E-05	8.71E-06							
F2, (MT)			2.93E+04	2.78E+04	2.93E+04	2.93E+04	2.92E+04	3.58E+03	
Fe+3, (MT)	4.67E-08	1.40E-07							
H+, (MT)	8.39E-05	2.42E-05							
H2, (MT)	8.54E-10	8.10E-09							
H2O, (MT)	4.07E+02	1.85E+02	6.20E+05	6.20E+05	6.20E+05	6.20E+05	6.20E+05	6.17E+05	
H2O2, (MT)									
Hg, (MT)	2.26E-08	3.15E-07							
Hg2, (MT)			5.03E-08	4.94E-08	5.03E-08	5.03E-08	5.03E-08	1.90E-08	
I-, (MT)		4.14E-09							
I2, (MT)			5.66E+02	5.66E+02	5.66E+02	5.66E+02	5.66E+02	5.66E+02	
K+, (MT)		4.30E-09							
La+3, (MT)	1.20E-08	1.59E-08							
Mg+2, (MT)		2.25E-09							
Mn+4, (MT)	2.24E-09	2.72E-08							
N2, (MT)			7.37E+06	7.37E+06	7.37E+06	7.37E+06	7.37E+06	7.36E+06	
N2O, (MT)									
Na+, (MT)	3.74E-07	2.11E-06							
NH3, (MT)	1.64E-09	4.34E-09	3.81E+00	3.81E+00	3.81E+00	3.81E+00	3.81E+00	3.80E+00	
Ni+3, (MT)		3.52E-09							
NO, (MT)									

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1324_A-5	1324_A-6	1543_A-1	1543_A-2	1543_A-3	1543_A-4	1543_A-5	1543_A-6	
NO2, (MT)			1.54E+02	1.55E+02	1.55E+02	1.55E+02	1.55E+02	1.54E+02	
NO2-, (MT)			1.23E-03	1.23E-03	1.23E-03	1.23E-03	1.23E-03	1.17E-03	
NO3-, (MT)	3.80E-01	1.12E-01	3.70E-02	3.70E-02	3.71E-02	3.71E-02	3.71E-02	3.56E-02	
Np+4, (MT)	7.29E-08	7.06E-08							
O2, (MT)			2.26E+06	2.26E+06	2.26E+06	2.26E+06	2.26E+06	2.27E+06	
OH-, (MT)	1.37E-07								
PO4-3, (MT)	3.99E-09	4.18E-08							
Pu+4, (MT)	2.25E-07	2.18E-07							
Si+4, (MT)	1.33E-09	1.62E-08							
SO2, (MT)			4.80E+02	4.55E+02	4.81E+02	4.81E+02	4.80E+02	6.71E+01	
SO4-2, (MT)			9.00E-04	8.53E-04	9.02E-04	9.02E-04	9.01E-04	1.26E-04	
Sr+2, (MT)	1.84E-05	9.15E-06							
TcO4-, (MT)	1.54E-06	1.40E-06							
Tot Org Carbon, (MT)	1.56E-08	1.90E-07							
UO2+2, (MT)	9.09E-07	1.22E-06							
Zn+2, (MT)	3.62E-08	3.64E-08							
Zr+4, (MT)	2.64E-07	3.58E-07							

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1324_A-5	1324_A-6	1543_A-1	1543_A-2	1543_A-3	1545_A-4	1545_A-5	1545_A-6	
Total Mass Flow, (MT)	1.28E-06	1.58E-06							
Cs and Ba, (MCi)									
Sr and Y, (MCi)	8.41E-11	3.63E-10							
Tc, (MCi)									
TRU, (MCi)		8.75E-13							
Total MCi	8.41E-11	3.64E-10							
Ag+, (MT)		2.33E-12							
Ag2O, (MT)	3.56E-10	1.86E-10							
Al+3, (MT)	7.22E-10	8.59E-09							
Al2O3, (MT)	3.97E-08	1.35E-07							
Am2O3, (MT)									
APM-, (MT)									
As+5, (MT)		8.41E-13							
As2O5, (MT)	3.79E-10	1.98E-10							
B+3, (MT)	1.19E-13	1.68E-12							
B2O3, (MT)	1.28E-10	6.93E-10							
Ba+2, (MT)		5.22E-12							
BaO, (MT)	4.05E-12	4.46E-12							
BeO, (MT)	4.84E-11	2.54E-11							
Bi+3, (MT)	2.35E-11	3.31E-10							
Bi2O3, (MT)	7.81E-10	4.07E-10							
Ca+2, (MT)	1.80E-11	2.53E-10							
Cancrinite, (MT)	2.58E-08	2.51E-07							
CaO, (MT)	5.58E-10	2.90E-10							
Cd+2, (MT)		1.34E-11							
CdO, (MT)	3.04E-11	1.59E-11							
Ce+3, (MT)	2.85E-11	4.02E-10							
Ce2O3, (MT)	7.40E-10	3.85E-10							
Cl-, (MT)	4.18E-13	5.90E-12							
CO3-2, (MT)	2.69E-11	3.79E-10							
Cr+3, (MT)	8.25E-11	1.12E-09							
Cr2O3, (MT)	2.24E-10	1.13E-10							
Cs2O, (MT)									
Cu+2, (MT)		1.26E-12							
CuO, (MT)	2.25E-10	1.18E-10							
F-, (MT)	7.15E-12	1.01E-10							
Fe+3, (MT)	4.85E-10	6.59E-09							
Fe2O3, (MT)	9.74E-09	2.12E-09							
H2O, (MT)	2.74E-10	2.75E-10							
I-, (MT)	2.42E-12	3.41E-11							
K+, (MT)	2.52E-12	3.55E-11							
K2O, (MT)	2.63E-12								
La+3, (MT)	2.55E-12	3.59E-11							

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1374_A-5	1374_A-6	1543_A-1	1543_A-2	1543_A-3	1543_A-4	1543_A-5	1543_A-6	
La2O3, (MT)	6.61E-11	3.44E-11							
Li2O, (MT)	1.77E-11	1.43E-10							
Mg+2, (MT)	1.32E-12	1.86E-11							
MgO, (MT)	5.28E-11	2.75E-11							
MnO2, (MT)	2.54E-11	3.56E-10							
Mo+6, (MT)		1.35E-12							
MoO3, (MT)	2.30E-11	1.20E-11							
Na+, (MT)	1.06E-09	1.63E-08							
Na2O, (MT)	2.96E-09	7.04E-10							
Ni+3, (MT)	1.27E-12	1.79E-11							
Ni2FECN6, (MT)	6.62E-10	1.01E-08							
Ni2O3, (MT)	7.04E-10	3.42E-10							
NiO, (MT)		8.98E-12							
NO2-, (MT)	8.84E-12	1.25E-10							
NpO2, (MT)									
OH-, (MT)	1.18E-06	1.13E-06							
P2O5, (MT)	9.88E-09	5.17E-09							
Pb+4, (MT)		5.54E-12							
PbO2, (MT)	1.18E-09	6.16E-10							
PO4-3, (MT)	2.83E-11	3.44E-10							
POLY, (MT)	1.33E-11	2.65E-10							
Pu+4, (MT)		3.86E-12							
PuO2, (MT)									
Si+4, (MT)	9.47E-12	1.34E-10							
SiO2, (MT)	9.75E-10	2.51E-09							
SO3, (MT)									
SO4-2, (MT)		5.71E-12							
Sr+2, (MT)	4.41E-12	6.22E-11							
SrO, (MT)	2.13E-11	4.06E-11							
Tc2O7, (MT)									
Tot Org Carbon, (MT)	1.39E-11	1.96E-10							
UO2+2, (MT)	2.00E-10	2.81E-09							
UO3, (MT)		7.11E-12							
V2O5, (MT)	8.68E-11	4.54E-11							
WO3, (MT)	1.84E-10	9.64E-11							
Zn+2, (MT)		1.60E-12							
ZnO, (MT)	8.53E-11	4.46E-11							
Zr+4, (MT)	3.32E-11	4.68E-10							
ZrO2, (MT)	1.88E-09	9.79E-10							
ZrO2:2H2O, (MT)	4.90E-11	6.90E-10							

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	907_A-1A	907_A-2A	907_A-3A	907_A-4A	907_A-5A	907_A-6A	15_A-1B	15_A-2B	
Volume, Total Liters	2.98E+09	2.97E+09	2.98E+09	2.98E+09	2.98E+09	2.83E+09	5.30E+07	5.35E+07	
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	
Total Mass Flow, (MT)	2.98E+06	2.97E+06	2.98E+06	2.98E+06	2.98E+06	2.83E+06	5.30E+04	5.35E+04	
Cs and Ba, (MCi)							3.36E-03	3.42E-03	
Total MCi							3.36E-03	3.42E-03	
Al+3, (MT)							1.08E+02	1.21E+02	
Cl-, (MT)							1.61E+01	1.61E+01	
Cl2, (MT)	3.15E+02	3.14E+02	3.15E+02	3.14E+02	3.15E+02	3.15E+02			
CO, (MT)	1.75E+03	1.75E+03	1.76E+03	1.76E+03	1.75E+03	1.71E+03			
CO2, (MT)	1.36E+05	1.36E+05	1.36E+05	1.36E+05	1.35E+05	1.32E+05			
Cr+3, (MT)							6.45E+00	1.46E-02	
Cs+, (MT)							4.09E-05	4.17E-05	
FeCN6-3, (MT)							1.25E+04	1.25E+04	
H+, (MT)	3.45E-05	3.45E-05	3.45E-05	3.45E-05	3.45E-05	3.49E-05		2.06E-04	
H2, (MT)		9.49E-01							
H2O, (MT)	4.94E+04	4.95E+04	4.95E+04	4.95E+04	4.94E+04	5.39E+04	3.22E+04	3.21E+04	
H2O2, (MT)								2.70E+01	
Hg2, (MT)							7.47E+01	7.46E+01	
K+, (MT)							1.04E+00	1.04E+00	
Li+, (MT)							1.48E-03	1.48E-03	
MnO2, (MT)							8.32E+02	8.32E+02	
MoO4-2, (MT)							7.66E+01	7.64E+01	
N2, (MT)	2.20E+06	2.19E+06	2.20E+06	2.20E+06	2.20E+06	2.08E+06			
N2O, (MT)		1.04E+01							
Na+, (MT)							3.60E+03	3.59E+03	
NH2OH, (MT)								6.06E+02	
NH3, (MT)	3.64E+01	3.70E+01	3.65E+01	3.64E+01	3.65E+01	8.51E+01	3.26E+02	3.31E+02	
NH4+, (MT)							6.36E-01	6.35E-01	
NO, (MT)	8.12E+00	8.24E+00	8.13E+00	8.12E+00	8.13E+00	1.90E+01			
NO2, (MT)	6.21E+01	6.31E+01	6.22E+01	6.21E+01	6.22E+01	1.45E+02			
NO2-, (MT)							1.54E+01	1.57E+01	
NO3-, (MT)	2.14E-03	2.14E-03	2.14E-03	2.14E-03	2.14E-03	2.16E-03	3.62E+02	3.68E+02	
O2, (MT)	5.95E+05	5.94E+05	5.95E+05	5.95E+05	5.95E+05	5.61E+05			
OH-, (MT)							2.53E+03	2.52E+03	
POLY, (MT)								1.14E-05	
PTA-3, (MT)							2.73E-02	2.73E-02	
SO4-2, (MT)							3.83E+02	3.68E+02	
Tot Org Carbon, (MT)							1.41E-02	1.43E-02	

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	907_A-1A	907_A-2A	907_A-3A	907_A-4A	907_A-5A	907_A-6A	15_A-1B	15_A-2B	
Total Mass Flow, (MT)	9.73E-07	9.71E-07	9.74E-07	9.74E-07	9.73E-07	9.19E-07	1.44E+09	1.44E+09	
Cs and Ba, (MCi)	1.73E-13	1.76E-13	1.73E-13	1.73E-13	1.73E-13	4.47E-13			
Sr and Y, (MCi)	3.51E-14	3.52E-14	3.54E-14	3.54E-14	3.53E-14	1.71E-10			
Tc, (MCi)	3.86E-16	3.84E-16	3.86E-16	3.86E-16	3.86E-16	7.66E-15			
TRU, (MCi)	3.02E-15	3.01E-15	3.02E-15	3.02E-15	3.02E-15	2.94E-15			
Total MCi	2.12E-13	2.15E-13	2.12E-13	2.12E-13	2.12E-13	1.72E-10			
Ag2O, (MT)	1.03E-12	9.92E-16	1.03E-12	1.03E-12	1.03E-12	2.72E-12			
Al2O3, (MT)	4.87E-08	4.86E-08	4.87E-08	4.87E-08	4.86E-08	4.60E-08			
Am2O3, (MT)	8.61E-17	8.59E-17	8.61E-17	8.61E-17	8.61E-17	8.58E-17			
As2O5, (MT)	1.09E-12	1.05E-15	1.09E-12	1.09E-12	1.09E-12	2.90E-12			
B2O3, (MT)	1.22E-11	1.21E-11	1.22E-11	1.22E-11	1.22E-11	1.22E-11			
BaO, (MT)	2.21E-12	2.20E-12	2.21E-12	2.21E-12	2.21E-12	6.51E-12			
BeO, (MT)	1.39E-13	1.35E-16	1.40E-13	1.39E-13	1.40E-13	3.71E-13			
Bi2O3, (MT)	7.33E-10	7.30E-10	7.33E-10	7.33E-10	7.33E-10	7.33E-10			
BO2-, (MT)							1.96E+06	1.96E+06	
CaO, (MT)	9.73E-08	9.71E-08	9.74E-08	9.74E-08	9.73E-08	9.19E-08			
CdO, (MT)	2.86E-11	2.85E-11	2.86E-11	2.86E-11	2.86E-11	2.86E-11			
Ce2O3, (MT)	6.94E-10	6.92E-10	6.94E-10	6.94E-10	6.94E-10	6.93E-10			
CO2O3H, (MT)							7.58E+06	7.61E+06	
Cr2O3, (MT)	6.74E-10	1.93E-10	6.74E-10	6.74E-10	6.74E-10	6.60E-10			
Cs2O, (MT)	2.23E-15	2.27E-15	2.24E-15	2.23E-15	2.24E-15	5.77E-15			
CuO, (MT)	6.48E-13	6.26E-16	6.49E-13	6.48E-13	6.49E-13	1.72E-12			
Fe2O3, (MT)	9.43E-09	9.09E-09	9.45E-09	9.45E-09	9.44E-09	3.82E-09			
H2O, (MT)	4.40E-16	5.18E-19	5.33E-16	5.33E-16	5.00E-16	4.25E-17			
HgO, (MT)	5.23E-12	5.22E-12	5.23E-12	5.23E-12	5.23E-12	5.23E-12			
K2O, (MT)	6.45E-11	6.44E-11	6.45E-11	6.45E-11	6.45E-11	6.41E-11			
La2O3, (MT)	6.21E-11	6.18E-11	6.21E-11	6.21E-11	6.21E-11	6.20E-11			
Li2O, (MT)	1.65E-13	1.65E-13	1.65E-13	1.65E-13	1.65E-13	1.64E-13			
MgO, (MT)	4.96E-11	4.94E-11	4.96E-11	4.96E-11	4.96E-11	4.95E-11			
MnO2, (MT)	5.82E-10	5.75E-10	5.82E-10	5.82E-10	5.82E-10	5.79E-10			
MoO3, (MT)	2.60E-11	2.60E-11	2.60E-11	2.60E-11	2.60E-11	2.59E-11			
Na2O, (MT)	2.43E-07	2.43E-07	2.44E-07	2.44E-07	2.43E-07	2.30E-07			
Ni2O3, (MT)	6.62E-10	6.59E-10	6.62E-10	6.62E-10	6.62E-10	6.17E-10			
NiO, (MT)	2.22E-15	2.69E-15	2.68E-15	2.68E-15	2.52E-15	3.00E-15			
NpO2, (MT)	1.64E-14	1.55E-14	1.65E-14	1.65E-14	1.64E-14	2.84E-15			
P2O5, (MT)	9.28E-09	9.25E-09	9.28E-09	9.28E-09	9.28E-09	9.33E-09			
PbO2, (MT)	3.39E-12	3.28E-15	3.40E-12	3.39E-12	3.40E-12	9.00E-12			
PuO2, (MT)	1.37E-14	1.36E-14	1.37E-14	1.37E-14	1.37E-14	1.33E-14			
SiO2, (MT)	5.44E-07	5.44E-07	5.45E-07	5.45E-07	5.44E-07	5.27E-07			
SO3, (MT)	1.57E-08	1.51E-08	1.57E-08	1.57E-08	1.57E-08	5.80E-09			
SrO, (MT)	1.11E-14	1.11E-14	1.11E-14	1.11E-14	1.11E-14	5.39E-11			
SrOH, (MT)							4.85E+08	4.86E+08	
Tc2O7, (MT)	3.56E-14	3.55E-14	3.56E-14	3.56E-14	3.56E-14	7.07E-13			

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	907_A-1A	907_A-2A	907_A-3A	907_A-4A	907_A-5A	907_A-6A	15_A-1B	15_A-2B	
TiO2, (MT)	7.99E-14	7.96E-14	7.99E-14	7.99E-14	7.99E-14	6.94E-14			
U3O8, (MT)	2.71E-12	2.70E-12	2.71E-12	2.71E-12	2.71E-12	2.70E-12			
V2O5, (MT)	2.50E-13	2.42E-16	2.50E-13	2.50E-13	2.50E-13	6.63E-13			
WO2, (MT)	1.92E-23	2.79E-18	2.76E-18	2.76E-18	2.47E-18	3.69E-18			
WO3, (MT)	5.29E-13	5.11E-16	5.29E-13	5.29E-13	5.29E-13	1.41E-12			
ZnO, (MT)	8.01E-11	7.98E-11	8.01E-11	8.01E-11	8.01E-11	8.05E-11			
ZrO2, (MT)	1.76E-09	1.76E-09	1.76E-09	1.76E-09	1.76E-09	1.76E-09			

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	1210_A-1	1210_A-2	1210_A-3	1210_A-4	1210_A-5	1210_A-6	807_A-1A	807_A-2A	807_A-3A	807_A-4A
Volume, Total Liters	8.75E+09	8.55E+09	8.67E+09	8.68E+09	8.85E+09	5.30E+09	8.87E+08	8.97E+08	8.87E+08	8.87E+08
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	8.75E+06	8.55E+06	8.67E+06	8.68E+06	8.85E+06	5.30E+06	8.87E+05	8.97E+05	8.87E+05	8.87E+05
H+, (MT)	2.69E+02	2.67E+02	2.64E+02	2.66E+02	2.74E+02	9.45E+01				
H2O, (MT)	8.73E+06	8.53E+06	8.65E+06	8.67E+06	8.83E+06	5.29E+06	8.87E+05	8.97E+05	8.87E+05	8.87E+05
H2O2, (MT)	2.27E+03	2.19E+03	2.24E+03	2.26E+03	2.31E+03	5.44E+02				
N2, (MT)										
Na+, (MT)							6.26E-13	6.26E-13	6.26E-13	6.26E-13
NO3-, (MT)	1.66E+04	1.64E+04	1.63E+04	1.64E+04	1.69E+04	5.81E+03				
O2, (MT)										
OH-, (MT)							4.63E-13	4.63E-13	4.63E-13	4.63E-13
POLY, (MT)	1.53E-01	1.46E-01	1.51E-01	1.52E-01	1.57E-01	2.72E-02				

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1210_A-1	1210_A-2	1210_A-3	1210_A-4	1210_A-5	1210_A-6	307_A-1A	307_A-2A	307_A-3A	307_A-4B
Total Mass Flow, (MT)										
Cs and Ba, (MCi)										
Sr and Y, (MCi)										
Tc, (MCi)										
TRU, (MCi)										
Total MCi										
Ag2O, (MT)										
Al2O3, (MT)										
Am2O3, (MT)										
As2O5, (MT)										
B2O3, (MT)										
BaO, (MT)										
BeO, (MT)										
Bi2O3, (MT)										
CaO, (MT)										
CdO, (MT)										
Ce2O3, (MT)										
Cr2O3, (MT)										
CsO, (MT)										
CuO, (MT)										
Fe2O3, (MT)										
H2O, (MT)										
HgO, (MT)										
K2O, (MT)										
La2O3, (MT)										
Li2O, (MT)										
MgO, (MT)										
MnO2, (MT)										
MoO3, (MT)										
Na2O, (MT)										
Ni2O3, (MT)										
NiO, (MT)										
NpO2, (MT)										
P2O5, (MT)										
PbO2, (MT)										
PuO2, (MT)										
SiO2, (MT)										
SO3, (MT)										
SrO, (MT)										
Tc2O7, (MT)										
TiO2, (MT)										
U3O8, (MT)										
V2O5, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	1210_A-1	1210_A-2	1210_A-3	1210_A-4	1218_A-5	1210_A-6	207_A-1A	207_A-2A	207_A-3A	207_A-4B
WO2, (MT)										
WO3, (MT)										
ZnO, (MT)										
ZrO2, (MT)										

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Liquid Components	907_A-5A	807_A-6A	917_A-1A	917_A-2A	917_A-3A	917_A-4A	917_A-5A	917_A-6B
Volume, Total Liters	8.86E+06	8.58E+06	4.85E+06	4.83E+06	4.85E+06	4.85E+06	4.84E+06	4.58E+06
Specific Gravity	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Total Mass Flow, (MT)	8.86E+05	8.58E+05	4.85E+05	4.83E+05	4.85E+05	4.85E+05	4.84E+05	4.58E+05
H+, (MT)								
H2O, (MT)	8.86E+05	8.58E+05						
H2O2, (MT)								
N2, (MT)			3.83E+05	3.82E+05	3.83E+05	3.83E+05	3.83E+05	3.62E+05
Na+, (MT)	6.26E-13	6.26E-13						
NO3-, (MT)								
O2, (MT)			1.02E+05	1.02E+05	1.02E+05	1.02E+05	1.02E+05	9.61E+04
OH-, (MT)	4.63E-13	4.63E-13						
POLY, (MT)								

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name / Solid Components	807_A-5A	807_A-6A	917_A-1A	917_A-2A	917_A-3A	917_A-4A	917_A-5A	917_A-6A
Total Mass Flow, (MT)			1.95E-01	1.94E-01	1.95E-01	1.95E-01	1.95E-01	1.84E-01
Cs and Ba, (MCi)			3.46E-08	3.53E-08	3.47E-08	3.46E-08	3.47E-08	8.95E-08
Sr and Y, (MCi)			7.03E-09	7.05E-09	7.08E-09	7.08E-09	7.06E-09	3.43E-05
Tc, (MCi)			7.72E-11	7.69E-11	7.72E-11	7.72E-11	7.72E-11	1.53E-09
TRU, (MCi)			6.04E-10	6.02E-10	6.04E-10	6.04E-10	6.04E-10	5.89E-10
Total MCi			4.23E-08	4.30E-08	4.24E-08	4.24E-08	4.24E-08	3.44E-05
Ag2O, (MT)			2.06E-07	1.99E-10	2.06E-07	2.06E-07	2.06E-07	5.44E-07
Al2O3, (MT)			9.74E-03	9.72E-03	9.75E-03	9.75E-03	9.74E-03	9.20E-03
Am2O3, (MT)			1.72E-11	1.72E-11	1.72E-11	1.72E-11	1.72E-11	1.72E-11
As2O5, (MT)			2.19E-07	2.11E-10	2.19E-07	2.19E-07	2.19E-07	5.80E-07
B2O3, (MT)			2.44E-06	2.43E-06	2.44E-06	2.44E-06	2.44E-06	2.44E-06
BaO, (MT)			4.43E-07	4.41E-07	4.43E-07	4.43E-07	4.43E-07	1.30E-06
BeO, (MT)			2.79E-08	2.70E-11	2.79E-08	2.79E-08	2.79E-08	7.43E-08
Bi2O3, (MT)			1.47E-04	1.46E-04	1.47E-04	1.47E-04	1.47E-04	1.47E-04
CaO, (MT)			1.95E-02	1.94E-02	1.95E-02	1.95E-02	1.95E-02	1.84E-02
CdO, (MT)			5.72E-06	5.70E-06	5.72E-06	5.72E-06	5.72E-06	5.72E-06
Ce2O3, (MT)			1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04
Cr2O3, (MT)			1.35E-04	3.87E-05	1.35E-04	1.35E-04	1.35E-04	1.32E-04
Cs2O, (MT)			4.47E-10	4.55E-10	4.48E-10	4.47E-10	4.48E-10	1.16E-09
CuO, (MT)			1.30E-07	1.25E-10	1.30E-07	1.30E-07	1.30E-07	3.44E-07
Fe2O3, (MT)			1.89E-03	1.82E-03	1.89E-03	1.89E-03	1.89E-03	7.65E-04
H2O, (MT)			8.80E-11	1.04E-13	1.07E-10	1.07E-10	1.00E-10	8.50E-12
HgO, (MT)			1.05E-06	1.05E-06	1.05E-06	1.05E-06	1.05E-06	1.05E-06
K2O, (MT)			1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.28E-05
La2O3, (MT)			1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05
Li2O, (MT)			3.30E-08	3.30E-08	3.30E-08	3.30E-08	3.30E-08	3.28E-08
MgO, (MT)			9.92E-06	9.88E-06	9.92E-06	9.92E-06	9.92E-06	9.91E-06
MnO2, (MT)			1.17E-04	1.15E-04	1.17E-04	1.17E-04	1.17E-04	1.16E-04
MoO3, (MT)			5.21E-06	5.20E-06	5.21E-06	5.21E-06	5.21E-06	5.19E-06
Na2O, (MT)			4.87E-02	4.86E-02	4.88E-02	4.88E-02	4.87E-02	4.60E-02
Ni2O3, (MT)			1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.32E-04	1.24E-04
NiO, (MT)			4.44E-10	5.38E-10	5.36E-10	5.36E-10	5.04E-10	6.01E-10
NpO2, (MT)			3.28E-09	3.10E-09	3.30E-09	3.30E-09	3.29E-09	5.68E-10
P2O5, (MT)			1.86E-03	1.85E-03	1.86E-03	1.86E-03	1.86E-03	1.87E-03
PbO2, (MT)			6.79E-07	6.57E-10	6.80E-07	6.80E-07	6.80E-07	1.80E-06
PuO2, (MT)			2.74E-09	2.73E-09	2.74E-09	2.74E-09	2.74E-09	2.67E-09
SiO2, (MT)			1.09E-01	1.09E-01	1.09E-01	1.09E-01	1.09E-01	1.06E-01
SO3, (MT)			3.14E-03	3.03E-03	3.14E-03	3.14E-03	3.14E-03	1.16E-03
SrO, (MT)			2.21E-09	2.22E-09	2.23E-09	2.23E-09	2.23E-09	1.08E-05
Tc2O7, (MT)			7.13E-09	7.10E-09	7.13E-09	7.13E-09	7.13E-09	1.42E-07
TiO2, (MT)			1.60E-08	1.59E-08	1.60E-08	1.60E-08	1.60E-08	1.39E-08
U3O8, (MT)			5.43E-07	5.41E-07	5.43E-07	5.43E-07	5.43E-07	5.41E-07
V2O5, (MT)			5.01E-08	4.84E-11	5.01E-08	5.01E-08	5.01E-08	1.33E-07

Table A-7. Material Balance Summary for Comparison of Specific High-Level Waste, Low-Level Waste, and Offgas Streams.

Stream Name Solid Components	907_A-5A	907_A-6A	917_A-1A	917_A-3A	917_A-5A	917_A-4A	917_A-5A	917_A-6A
WO2, (MT)				5.58E-13	5.52E-13	5.52E-13	4.94E-13	7.40E-13
WO3, (MT)			1.06E-07	1.02E-10	1.06E-07	1.06E-07	1.06E-07	2.82E-07
ZnO, (MT)			1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.61E-05
ZrO2, (MT)			3.53E-04	3.52E-04	3.53E-04	3.53E-04	3.53E-04	3.53E-04

APPENDIX B

EQUIPMENT LISTS

This page intentionally left blank.

APPENDIX B

EQUIPMENT LISTS AND EQUIPMENT SIZING CALCULATIONS

This appendix includes the equipment list tables listed below.

Table B-1. Integrated Extensive Separations Pretreatment and High-Level Waste Vitrification Treatment Facility Equipment List.

Table B-2. Low-Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Table B-3. Low-Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for Low-Level Waste Option B.

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for High-Level Waste Option 2.

The tables provide equipment lists for the Integrated Extensive Separations Pretreatment and High-Level Waste Vitrification Treatment Facility, the detached low-level waste vitrification treatment facility grout (salt grout) treatment facility for LLW Option B, and the cesium and strontium capsule cut up cell for HLW Option 2, respectively. Accompanying facility layouts are in Appendix E. The equipment lists include capacity/flow rate, physical size, material of construction, and power requirements.

Jansen (1995) contains equipment sizing calculations for the Integrated Extensive Separations Pretreatment and High-Level Waste Vitrification Treatment Facility. The calculations consist of the following:

1. Verified Calculation (EIS-001) of Equipment Sizing for HLW Vitrification System
2. Verified Calculation (EIS-005) for Centrifuge Selection
3. Verified Calculation (EIS-006) of Equipment Sizing for Fractionator, Absorbers, Reboiler, and Condensor
4. Verified Calculation (EIS-007) of Equipment Sizing for Ion Exchange Columns
5. Verified Calculation (EIS-008) of Equipment Sizing for Tanks (General)
6. Verified Calculation (EIS-009) of Equipment Sizing for Bulk, Preparation, and Feed Cold Chemical Tanks

7. Verified Calculation (EIS-011) of Equipment Sizing for Evaporators, Condensers, Tanks, Decanters, and Filters

8. Verified Calculation (EIS-012) of Equipment Sizing for Organics Destruction System

Jansen (1995) also contains the following equipment sizing calculations for the Low Activity Waste Grout (Salt Grout) Treatment Facility:

Verified Calculation (EIS-017) of LLW Grout Facility Throughput and Equipment Sizes

Jansen, G., 1995, *Equipment Sizing Calculation for the Extensive Separations Alternative Engineering Data Package*, WHC-SD-WM-DP-130, Westinghouse Hanford Company, Richland, Washington.

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Receipt/sample vault tanks	TK-1A-F	6	380 m^3	6.9 x 10.3	SS	223.7	0	0	0	1	S
SW centrifuge feed tank	TK-2A & B	2	78 m^3	4.0 x 6.0	SS	14.9	0	0	0	1	S
SW polyelectrolyte tank	TK-234	1	2 m^3	1.0 x 1.4	SS	0.2	0	0	0	1	S
SW inertial filter	FL-1A & B	2	1182 lpm	1.2 x 2.7	SS	0	0	0	0	2	
SW centrifuge	G-1A & B	2	138 lpm	2.1 x 3.0	SS	0	0	0	0	2	
SW centrifuge catch tank	TK-3A & B	2	10 m^3	2.0 x 3.0	SS	2	0	0	0	2	S
SW solids slurry tank	TK-4	1	10 m^3	2.0 x 3.0	SS	1	0	0	0	2	S
SW solids slurry sample tank	TK-5	1	6 m^3	1.6 x 2.4	SS	0.6	0	0	0	2	S
SW solids slurry transfer tank	TK-6	1	10 m^3	2.0 x 3.0	SS	1	0	0	0	2	S
SW centrate receiver tank	TK-7A & B	2	86 m^3	4.2 x 6.3	SS	17.2	0	0	0	2	S
SW inertial filter feed tank	TK-8A & B	2	88 m^3	4.2 x 6.3	SS	17.5	0	0	0	2	S
SW inertial filter catch tank	TK-9A & B	2	84 m^3	4.2 x 6.2	SS	16.8	0	0	0	2	S
OD injection pump	P-1A & B	2	220 lpm	TBD	Hastelloy	0	0	0	0	3	High pressure
OD high pressure vapor-liquid separator	T-3A & B	2	6.6 m^3	1.8 x 2.7	Hastelloy	0	0	0	0	3	1050 ppm HF

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
OD low pressure vapor-liquid separator	T-4A & B	2	6.6 m^3	1.8 x 2.7	Hastelloy	0	0	0	0	3	1050 ppm HF
Heat exchanger	E-10A & B	2	7130 kW	TBD	Hastelloy	0	0	0	7130	3	
OD booster heater	E-11A & B	2	445 kW	TBD	Hastelloy	0	0	0	445	3	
OD feed tank	TK-80A & B	2	133 m^3	4.8 x 7.2	Hastelloy	26.1	0	0	0	3	S, R
Organic destruction	TK-81A & B	2	0.26 m^3	0.6 x 1.8	Hastelloy	0	0	0	0	3	R
OD centrifuge feed tank	TK-83A & B	2	133 m^3	4.8 x 7.2	Hastelloy	26.1	0	0	0	3	S, R
OD condenser	EC-102A & B	2	3 kW (each)	0.2 x 1.2	SS	0	6	10	0	3	R
OD inertial filter	FL-4A & B	2	1812 lpm	1.2 x 2.7	Hastelloy	0	0	0	0	4	
OD centrifuge	G-4A & B	2	223 lpm	2.1 x 3.0	Hastelloy	0	0	0	0	4	
OD centrifuge catch tank	TK-84A & B	2	6 m^3	1.6 x 2.4	SS	1.1	0	0	0	4	S
OD centrate receiver tank	TK-85A & B	2	130 m^3	4.8 x 7.2	Hastelloy	26.1	0	0	0	4	S. 1030 ppm HF
OD inertial filter feed tank	TK-86A & B	2	130 m^3	4.8 x 7.2	Hastelloy	26.1	0	0	0	4	S
OD inertial filter catch tank	TK-87A & B	2	130 m^3	4.8 x 7.2	Hastelloy	26.1	0	0	0	4	S
OD solids slurry tank	TK-88	1	10 m^3	2.0 x 3.0	Hastelloy	1	0	0	0	4	S
IX evaporator feed tank	TK-89	1	96 m^3	4.3 x 6.5	Hastelloy	9.3	0	0	0	4	S
OD polyelectrolyte tank	TK-235A & B	2	2 m^3	1.1 x 1.7	Hastelloy	0.4	0	0	0	4	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
IX feed evaporator	EV-0	1	4070 kW	See comments	Hastelloy	0	0	0	4070	5	Env.size: 5.6 M L x 8.5 M
Sand filter	FS-1	1	74 lpm	1.2 x 2.4	Hastelloy	0	0	0	0	5	1900 ppm HF
Cesium ion-exchange columns	X-1A-D	4	11 m^3	2.1 x 3.1	Hastelloy	0	0	0	0	5	
Condenser	EC-2	1	3514 kW	0.7 x 3.0	Hastelloy	0	3514	6076	0	5	Cond.catch Vessel: 1.4 M
Cs IX feed sample tank	TK-10	1	42 m^3	3.3 x 4.9	Hastelloy	4.1	0	0	0	5	S
Cs IX feed tank	TK-11	1	42 m^3	3.3 x 4.9	Hastelloy	4.1	0	0	0	5	S
Cs IX acid regen. feed tank	TK-12	1	22 m^3	2.7 x 4.0	SS	2.2	0	0	0	5	S
Cs IX caustic regen. feed tank	TK-13	1	6 m^3	1.6 x 2.4	SS	0	0	0	0	5	
Cs IX caustic eluant catch tank	TK-14	1	16 m^3	2.4 x 3.5	SS	1.6	0	0	0	5	S
Cs IX waste tank	TK-16	1	42 m^3	3.3 x 4.9	Hastelloy	4.1	0	0	0	5	S
Cesium eluant formic acid (1.0M)	TK- 201	1	54 m^3	3.6 x 5.4	SS	5.4	0	0	0	5	S
NaOH regen. tank (2.0M)	TK- 204	1	16 m^3	2.4 x 3.6	SS	1.7	0	0	0	5	S
Water storage tank	TK- 302	1	606 m^3	8.0 x 12.0	SS	0	0	0	0	5	Also found on sh#6,7,20,23
Bulk NaOH		1	84 m^3	4.2 x 6.2	SS	0	0	0	0	5	Tank will have a vent roof. Also found on sh#7,20

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Bulk formic acid	TK-309	1	18 m^3	2.5 x 3.7	SS	0	0	0	0	5	Tank will have a vent condenser or a floating roof.
Sand filter	FS-6	1	74 lpm	1.2 x 2.4	Hastelloy	0	0	0	0	6	
Sr ion-exchange columns	X-6A-D	4	13 m^3	2.3 x 3.4	Hastelloy	0	0	0	0	6	
Sr IX feed tank	TK-152	1	42 m^3	3.3 x 4.9	Hastelloy	4.1	0	0	0	6	S
Loaded silicotitanate catch tank	TK-153	1	56 m^3	3.6 x 5.5	SS	5.6	0	0	0	6	S
Sr absorber waste tank	TK-154	1	50 m^3	3.5 x 5.2	Hastelloy	0	0	0	0	6	
Slurry water tank	TK-203	1	52 m^3	3.5 x 5.3	SS	0	0	0	0	6	
Fresh silicotitanate slurry tank	TK-204	1	22 m^3	2.6 x 3.9	Hastelloy	1.6	0	0	0	6	S
Silicotitanate storage tank	TK-306	1	6 m^3	1.6 x 2.5	SS	0	0	0	0	6	
Sand filter	FS-2	1	130 lpm	1.2 x 2.4	Hastelloy	0	0	0	0	7	
Technetium ion-exchange columns	X-2A-D	4	34 m^3	3.1 x 4.6	SS	0	0	0	0	7	
Fractionator	T-5	1	1.2 kg/hr	0.8 x 12	SS	0	0	0	0	7	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Technetium concentrator	EV-10	1	1412 kW	See comments	SS	0	0	0	1412	7	Env.size: 4.6 M L x 6.7 M H x 2.4 M W
Fractionator condenser	EC-11	1	1060 kW	1 x 6	SS	0	1060	1826	0	7	
Product condenser	EC-11A	1	1350 kW	0.6 x 3.6	SS	0	1350	2325	0	7	
Fractionator reboiler	EV-11	1	580 kW	0.8 x 4.3	SS	0	0	0	580	7	
Tc IX feed tank	TK-93	1	74 m^3	4.0 x 6.0	Hastelloy	7.5	0	0	0	7	S
Tc ion-exchange recycle tank	TK-94	1	88 m^3	4.2 x 6.3	SS	8.9	0	0	0	7	S
Tc IX acid feed tank	TK-95	1	76 m^3	4.0 x 6.0	SS	7.5	0	0	0	7	S
Tc IX caustic feed tank	TK-96	1	26 m^3	2.8 x 4.2	SS	0	0	0	0	7	
Tc IX water scrub catch tank	TK-97	1	44 m^3	3.4 x 5.0	SS	4.5	0	0	0	7	S
Technetium eluant catch tank	TK-98	1	64 m^3	3.8 x 5.6	SS	6.3	0	0	0	7	S
Technetium IX waste tank	TK-99	1	74 m^3	4.0 x 6.0	Hastelloy	7.5	0	0	0	7	S
Tc IX waste sample tank	TK-100	1	74 m^3	4.0 x 6.0	Hastelloy	7.5	0	0	0	7	S
Tc IX recycle acid tank	TK-101	1	24 m^3	2.7 x 4.0	SS	2.2	0	0	0	7	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Technetium concentrate catch tank	TK-102	1	2 m^3	1.0 x 1.3	SS	0.2	0	0	0	7	S
Tc IX nitric acid scrub tank 0.25M	TK-231A & B	2	266 m^3	6.1 x 9.1	SS	52.2	0	0	0	7	S
Tc startup nitric acid 6.0M	TK-232	1	78 m^3	4.1 x 6.1	SS	7.5	0	0	0	7	S
Tc IX NaOH scrub tank 1.0M	TK-233A & B	2	88 m^3	4.2 x 6.4	SS	17.9	0	0	0	7	S
Leach centrifuge	G-2	1	55 lpm	2.1 x 3.0	SS	0	0	0	0	8	
Caustic leach tank	TK-31	1	28 m^3	2.8 x 4.3	SS	2.8	0	0	0	8	S
Leach centrifuge feed tank	TK-32	1	26 m^3	2.8 x 4.2	SS	2.6	0	0	0	8	S
Leach centrifuge leach catch tank	TK-33	1	50 m^3	3.4 x 5.2	SS	4.8	0	0	0	8	S
Leach solids slurry tank	TK-34	1	40 m^3	3.2 x 4.8	SS	4.1	0	0	0	8	S
Leach centrate receiver tank	TK-36	1	42 m^3	3.3 x 4.9	SS	4.1	0	0	0	8	S
Leach polyelectrolyte tank	TK-236A & B	2	136 m^3	4.8 x 7.2	SS	26.1	0	0	0	8	S. Also found in sh#10,12
Down draft condenser	T-1A & B	2	25 kW	0.3 x 5	SS	0	25	86	0	9	R
Scrubber	T-2A & B	2	3.8 m^3/hr	0.3 x 5	SS	0	0	0	0	9	
Solids dissolver	TK-29A & B	2	58 m^3	3.6 x 5.4	Hastelloy	11.2	0	0	0	9	S
Scrubber catch tank	TK-30A & B	2	2 m^3	1.2 x 1.8	SS	0.4	0	0	0	9	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Oxalic acid tank	TK-209	1	90 m^3	4.2 x 6.3	SS	8.9	0	0	0	9	S. Also found in sh#18 as TK-211
Bulk HNO_3	TK-301A-D	4	476 m^3	7.4 x 11.1	SS	186.4	0	0	0	9	S. tank will have a vent condenser or a floating roof. Also found in sh#7,11,1
Dissolver centrifuge	G-3A & B	2	152 lpm	2.1 x 3.0	SS	0	0	0	0	10	
Dissolver inertial filter	FL-5A & B	2	1287 lpm	1.2 x 2.7	SS	0	0	0	0	10	
Dissolver centrifuge catch tank	TK-103A & B	2	16 m^3	2.4 x 3.5	SS	3.7	0	0	0	10	S
Dissolver solids slurry tank	TK-104	1	18 m^3	2.5 x 3.7	SS	1.9	0	0	0	10	S
Dissolver solids slurry sample tank	TK-105	1	18 m^3	2.5 x 3.7	SS	1.9	0	0	0	10	S
Dissolver centrate receiver tank	TK-107A & B	2	86 m^3	4.1 x 6.2	SS	17.2	0	0	0	10	S
Dissolver inertial filter feed tank	TK-108A & B	2	86 m^3	4.1 x 6.2	SS	17.2	0	0	0	10	S
Dissolver inertial filter catch tank	TK-109A & B	2	84 m^3	4.1 x 6.1	SS	16.4	0	0	0	10	S
Down draft condenser	T-8A & B	2	25 kW	0.3 x 5	SS	0	25	86	0	11	R
Scrubber	T-9A & B	2	0.2 m^3/hr	0.3 x 5	SS	0	0	0	0	11	
solids dissolver	TK-110A & B	2	30 m^3	2.9 x 4.4	Hastelloy	6	0	0	0	11	S
Scrubber catch tank	TK-111A & B	2	2 m^3	1.2 x 1.8	SS	0.4	0	0	0	11	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
HF tank	TK-210	1	2 m^3	1.2 x 1.8	Hastelloy	0.2	0	0	0	11	S
Dissolver centrifuge	G-5A & B	2	42 lpm	2.1 x 3.0	Hastelloy	0	0	0	0	12	0.34% HF
Dissolver inertial filter	FL-6A & B	2	379 lpm	1.2 x 2.7	Hastelloy	0	0	0	0	12	0.34% HF
Dissolver centrifuge catch tank	TK-113A & B	2	8 m^3	1.9 x 2.8	Hastelloy	1.5	0	0	0	12	S
Dissolver solids slurry tank	TK-114	1	12 m^3	2.2 x 3.2	SS	1.3	0	0	0	12	S.100 ppm HF
Dissolver solids Slurry sample tank	TK-115	1	12 m^3	2.2 x 3.2	SS	1.3	0	0	0	12	S.100 ppm HF
Dissolver solids slurry transfer tank	TK-116	1	12 m^3	2.2 x 3.2	SS	1.3	0	0	0	12	S.100 ppm HF
Dissolver centrate receiver tank	TK-117A & B	2	30 m^3	2.9 x 4.4	SS	6	0	0	0	12	S.100 ppm HF
Dissolver inertial filter feed tank	TK-118A & B	2	30 m^3	2.9 x 4.4	SS	6	0	0	0	12	S
Dissolver inertial filter catch tank	TK-119A & B	2	36 m^3	3.1 x 4.6	SS	7.5	0	0	0	12	S
Decanter	D-1	1	12 m^3	2.1 x 3.2	SS	0	0	0	0	13	
Am/La separation feed concentrator	EV-1	1	7802 kW	See comments	SS	0	0	0	7802	13	Env.size: 6.7 M L x 9.9 M H x 3.9 M W
TBP extraction (contactors)	CB-5A-F	6		1.8 x 0.6 x 1.5	Hastelloy	0	0	0	0	13	442 ppm HF

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
TBP scrub (contactors)	CB-5A-F	6		1.8 x 0.6 x 1.5	SS	0	0	0	0	13	1 ppm HF
TBP feed adjustment tank	TK-120	1	116 m^3	4.5 x 6.8	Hastelloy	11.2	0	0	0	13	S
TBP feed tank	TK-121	1	116 m^3	4.5 x 6.8	Hastelloy	11.2	0	0	0	13	S
TBP raffinate tank	TK-122	1	190 m^3	5.4 x 8.0	SS	18.6	0	0	0	13	S
TBP tank	TK-214	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	13	Also found in sh#17,18
Diluent tank	TK-215	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	13	Also found in sh#17,18
TBP solvent makeup tank	TK-216	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	13	S
Hydroxylamine nitrate	TK-242	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	13	
TBP scrub makeup tank	TK-244A & B	2	78 m^3	4.0 x 6.0	SS	14.9	0	0	0	13	S
TBP turbo mixer tank	TM-4	1	36 m^3	3.1 x 4.6	Hastelloy	3.7	0	0	0	14	S
TBP strip 2 (contactors)	CB-6A-D	4		1.5 x 0.6 x 1.5	SS	0	0	0	0	14	
Strip 2 (contactors)	CB-6A-D	4		1.5 x 0.6 x 1.5	SS	0	0	0	0	14	
TBP strip 1 (contactors)	CB-6A-E	5	276 lpm	1.5 x 0.6 x 1.5	SS	0	0	0	0	14	
Decanter	D-12	1	4 m^3	1.5 x 2.3	SS	0	0	0	0	14	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Condenser	EC-12	1	2399 kW	0.6 x 3.0	SS	0	2399	4131	0	14	Cond.catch Vessel: 1.2 M D x 1.2 M H
TRU concentrator	EV-12	1	2451 kW	See comments	SS	0	0	0	2451	14	4 ppm HF. Env.size: 5.2 M L x 7.9 M H x 2.9 M W
TRU product catch tank	TK-123	1	42 m^3	3.3 x 4.9	SS	4.5	0	0	0	14	S. 4 ppm HF
TRU concentrate catch tank	TK-124	1	6 m^3	1.7 x 2.6	SS	0.6	0	0	0	14	S. 32 ppm HF
TRU sample tank	TK-125	1	6 m^3	1.7 x 2.6	SS	0.6	0	0	0	14	S. 32 ppm HF
TBP wash raffinate sample tank	TK-127	1	36 m^3	3.1 x 4.6	SS	3.7	0	0	0	14	S
TBP solvent feed tank	TK-128	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	14	S
TBP strip 2 makeup tank	TK-246A & B	2	40 m^3	3.2 x 4.8	SS	8.2	0	0	0	14	S
Strip 2 makeup tank	TK-247A & B	2	50 m^3	3.4 x 5.2	SS	9.7	0	0	0	14	S
TBP solvent wash makeup tank	TK-248	1	34 m^3	3.0 x 4.5	SS	3.4	0	0	0	14	S
Decanter	D-13	1	4 m^3	1.5 x 2.2	SS	0	0	0	0	15	
Condenser	EC-13	1	2014 kW	0.5 x 3.0	SS	0	2014	3468	0	15	Cond.catch Vessel: 1.2 M H x 1.2 M D
Uranium recovery feed concentrator	EV-13	1	2205 kW	See comments	SS	0	0	0	2205	15	Env.size: 5.1 M L x 7.4 M H x 2.8 M W

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Uranium recovery feed tank	TK-129	1	42 m^3	3.3 x 4.9	SS	4.5	0	0	0	15	S
Uranium scrub (contactors)	CB-3A-D	4	84 lpm	1.2 x 0.6 x 1.5	SS	0	0	0	0	16	
Uranium extraction (contactors)	CB-3A-F	6	231 lpm	1.8 x 0.6 x 1.5	SS	0	0	0	0	16	
Uranium strip	CB-3A-H	8	239 lpm	2.4 x 0.6 x 1.5	SS	0	0	0	0	16	
Condenser	EC-6	1	19611 kW	1.5 x 4.6	SS	0	19611	33775	0	16	Cond.catch Vessel: 2.5 M D x 2.5 M H
Uranium product evaporator	EV-6	1	19614 kW	See comments	SS	0	0	0	19614	16	Env.size: 9.2 M L x 14.5 M H x 5.9 M W
Uranium raffinate catch tank	TK-51	1	60 m^3	3.7 x 5.5	SS	6	0	0	0	16	S
Uranium condensate receiver tank	TK-53	1	242 m^3	5.8 x 8.7	SS	23.9	0	0	0	16	S
Uranium receiver tank	TK-54	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	16	S
Uranium sample tank	TK-55	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	16	S
Uranium storage tank	TK-56A & B	2	2 m^3	1.2 x 1.8	SS	0.4	0	0	0	16	S
Uranium scrub makeup tank	TK-221A & B	2	16 m^3	2.4 x 3.5	SS	3.4	0	0	0	16	S
Uranium recovery turbo mixer	TM-2	1	134 m^3	4.8 x 7.2	SS	13.4	0	0	0	17	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Decanter	D-14	1	4 m^3	1.5 x 2.3	SS	0	0	0	0	17	
Condenser	EC-14	1	2355 kW	0.6 x 3.0	SS	0	2355	4056	0	17	Cond.catch Vessel: 1.2 M D x 1.2 M H
Back cycle evaporator	EV-14	1	2613 kW	See comments	SS	0	0	0	2613	17	Env.size: 5.2 M L x 7.8 M H x 2.9 M W
Uranium solvent storage tank	TK-57	1	108 m^3	4.4 x 6.7	SS	10.8	0	0	0	17	S
Uranium waste neutralization and transfer tank	TK-58	1	8 m^3	1.9 x 2.8	SS	0.9	0	0	0	17	S
Acid-side feed	TK-130	1	24 m^3	2.7 x 4.1	SS	2.4	0	0	0	17	S
NPH tank	TK-215	1	TBD			0	0	0	0	17	
Uranium HNO_3 tank	TK-222	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	17	S
Uranium solvent wash makeup tank	TK-228	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	17	S
CMPO scrub 1	CB-1A-D	4		1.2 x 0.6 x 1.5	SS	0	0	0	0	18	
CMPO scrub 2	CB-1A-F	6		1.8 x 0.6 x 1.5	SS	0	0	0	0	18	
CMPO extraction	CB-1A-F	6		1.8 x 0.6 x 1.5	Hastelloy	0	0	0	0	18	720 ppm HF
CMPO feed adjustment tank	TK-39	1	82 m^3	4.1 x 6.1	Hastelloy	8.2	0	0	0	18	S.720 ppm HF
CMPO raffinate tank	TK-41	1	170 m^3	5.2 x 7.7	SS	16.8	0	0	0	18	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
CMPO scrub 2 makeup tank	TK-212A & B	2	68 m^3	3.8 x 5.7	SS	13.4	0	0	0	18	S
CMPO tank	TK-213	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	18	
CMPO solvent makeup tank	TK-218	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	18	S
Aluminum nitrate tank	TK-238	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	18	
CMPO scrub 1 makeup tank	TK-239A & B	2	8 m^3	1.9 x 2.8	SS	19	0	0	0	18	S
CMPO turbo mixer tank	TM-1	1	84 m^3	4.1 x 6.1	SS	8.6	0	0	0	19	S
CMPO strip 2	CB-2A-D	4	103 lpm	1.2 x 0.6 x 1.5	SS	0	0	0	0	19	
CMPO strip 1	CB-2A-E	5	50 lpm	1.5 x 0.6 x 1.5	SS	0	0	0	0	19	
Decanter	D-4	1	8 m^3	1.8 x 2.8	SS	0	0	0	0	19	
Condenser	EC-4	1	4220 kW	0.8 x 3.0	SS	0	4220	7268	0	19	Cond.catch Vessel: 1.5 M H x 1.5 M D
Am, Ce, Sm concentrator	EV-4	1	4224 kW	See comments	SS	0	0	0	4224	19	Env.size: 6.1 M L x 9.2 M H x 3.6 M W
CMPO product catch tank	TK-42	1	64 m^3	3.7 x 5.6	SS	6.3	0	0	0	19	S
Am, Ce, Sm concentrate catch tank	TK-43	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	19	S
CMPO neutralization and transfer tank	TK-45	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	19	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
CMPO wash raffinate sample tank	TK-46	1	30 m^3	2.9 x 4.4	SS	3	0	0	0	19	S
CMPO solvent feed tank	TK-47	1	48 m^3	3.4 x 5.1	SS	4.8	0	0	0	19	S
CMPO strip 1 makeup tank	TK-217A & B	2	36 m^3	3.1 x 4.6	SS	7.5	0	0	0	19	S
CMPO solvent Wash makeup tank	TK-219	1	28 m^3	2.8 x 4.3	SS	2.8	0	0	0	19	S
CMPO strip 2 makeup tank	TK-241A & B	2	2 m^3	1.2 x 1.8	SS	0.4	0	0	0	19	S
Sand filter	FS-3	1	19 lpm	1.2 x 2.4	SS	0	0	0	0	20	
Am, La band displacement	X-3A-H	8	19 lpm	0.8 x 1.2	SS	0	0	0	0	20	
Ion-exchange columns											
Am, La IX feed tank	TK-157	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	20	S
Am, La IX eluant catch tank	TK-158	1	4 m^3	1.5 x 2.3	SS	0.4	0	0	0	20	S
Am, La IX waste tank	TK-160	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	20	S
Am, La IX sample tank	TK-161	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	20	S
Acid regen. feed tank	TK-170	1	4 m^3	1.5 x 2.3	SS	0.4	0	0	0	20	S
Caustic regen feed tank	TK-171	1	6 m^3	1.7 x 2.6	SS	0.6	0	0	0	20	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
DTPA tank (0.3M)	TK-256	1	6 m^3	1.7 x 2.6	SS	0.6	0	0	0	20	S
DTPA tank (0.05M)	TK-257	1	6 m^3	1.7 x 2.6	SS	0.6	0	0	0	20	S
Zinc nitrate (1.5M)	TK-258	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	20	S
Na scrub nitric acid (6.0M)	TK-259	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	20	S
Bulk NO_3 DTPA	TK-304	1	12 m^3	2.2 x 3.2	SS	0	0	0	0	20	Tank will have a vent condenser or a floating roof
Bulk $Zn(NO_3)_2$	TK-305	1	4 m^3	1.5 x 2.3	SS	0	0	0	0	20	Tank will have a vent condenser or a floating roof
Sr extraction (contactors)	CB-4A-F	6	129 lpm	2.1 x 0.6 x 1.5	SS	0	0	0	0	21	
Sr scrub (contactors)	CB-4A-F	6	129 lpm	1.8 x 0.6 x 1.5	SS	0	0	0	0	21	
Sr strip (contactors)	CB-4A-F	6	175 lpm	2.1 x 0.6 x 1.5	Hastelloy	0	0	0	0	21	
Decanter	D-7	1	7 m^3	1.8 x 2.7	SS	0	0	0	0	21	
Condenser	EC-7	1	5472 kW	0.7 x 3.0	SS	0	5472	9424	0	21	Cond.catch Vessel: 1.5 M D x 1.5 M H
SREX feed stripper	EV-7	1	6629 30 kW	See comments	Hastelloy	0	0	0	6629	21	460 ppm HF. Env.size: 6.5 M L x 9.9 M H x 3.8 M W
Decanter	D-8	1	3 m^3	1.4 x 2.1	SS	0	0	0	0	21	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Condenser	EC-8	1	1523 kW	0.5 x 3.0	SS	0	1523	2624	0	21	Cond.catch Vessel: 1.1 MD x 1.1 M H
Sr concentrator	EV-8	1	1546 kW	See comments	Hastelloy	0	0	0	1546	21	Env.size: 4.7 M L x 7 M H x 2.5 M W
SREX feed tank	TK-59	1	100 m^3	4.3 x 6.5	Hastelloy	10.1	0	0	0	21	S
Raffinate tank	TK-60	1	118 m^3	4.6 x 6.9	SS	11.9	0	0	0	21	S
Sr product catch tank	TK-61	1	24 m^3	2.7 x 4.1	SS	2.4	0	0	0	21	S
Sr concentrator catch tank	TK-62	1	4 m^3	1.5 x 2.2	SS	0.4	0	0	0	21	S
SREX scrub tank	TK-223A & B	2	18 m^3	2.5 x 3.7	SS	3.7	0	0	0	21	S
SREX strip tank	TK-224A & B	2	24 m^3	2.7 x 4.1	SS	4.8	0	0	0	21	S
Crown ether tank	TK-225	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	21	
SREX diluent tank	TK-226	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	21	
SREX solvent makeup tank	TK-227	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	21	S
SREX turbo mixer tank	TM-3	1	72 m^3	3.9 x 5.8	SS	7.1	0	0	0	22	S
Decanter	D-9	1	3 m^3	1.4 x 2.1	SS	0	0	0	0	22	
Condenser	EC-9	1	1891 kW	0.5 x 3.0	SS	0	1891	3257	0	22	Cond.catch Vessel: 1.1 M D x 1.1 M H

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
SREX raffinate evaporator	EV-9	1	2966 kW	See comments	SS	0	0	0	2966	22	Env.size: 4.9 M L x 7.0 M H x 2.5 M W
SREX solvent wash water sample tank	TK-65	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	22	S
SREX solvent feed tank	TK-66	1	64 m^3	3.7 x 5.6	SS	6.3	0	0	0	22	S
SREX raffinate concentrate tank	TK-67	1	90 m^3	4.2 x 6.3	SS	8.9	0	0	0	22	S
SREX solvent wash makeup tank	TK- 229	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	22	S
Sand filter	FS-5	1	159 lpm	1.2 x 2.4	Hastelloy	0	0	0	0	23	800 ppm HF
Cs absorption columns	X-6A-D	4	159 lpm	1.7 x 2.6	Hastelloy	0	0	0	0	23	800 ppm HF
Water rinse feed tank	TK-131	1	14 m^3	2.3 x 3.5	SS	0	0	0	0	23	
IX bed regen feed tank	TK-132	1	60 m^3	3.7 x 5.5	SS	0	0	0	0	23	
APM IX feed tank	TK-133	1	88 m^3	4.2 x 6.3	Hastelloy	8.9	0	0	0	23	S. 800 ppm HF
AMP IX waste tank	TK-134	1	88 m^3	4.2 x 6.3	Hastelloy	8.9	0	0	0	23	S. 800 ppm HF
AMP Waste Sample tank	TK-135	1	88 m^3	4.2 x 6.3	Hastelloy	8.9	0	0	0	23	S. 800 ppm HF
Al2O3 tank	TK-260	1	60 m^3	3.7 x 5.5	SS	6	0	0	0	23	S
APM tank	TK-261	1	60 m^3	3.7 x 5.5	SS	6	0	0	0	23	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Bulk aluminate	TK-307	1	30 m^3	2.9 x 4.4	SS	0	0	0	0	23	Tank will have a vent condenser or a floating roof
Bulk ammonium	TK-308	1	120 m^3	4.7 x 7.1	SS	0	0	0	0	23	Tank will have a vent condenser or a floating roof
Condenser	EC-16	1	41 kW	0.2 x 1.2	SS	0	41	70	0	24	Cond.catch Vessel: 0.3 M D x 0.3 M H
HLW evaporator	EV-16	1	117 kW	See comments	SS	0	0	0	117	24	Env.size: 2.7 M L x 3.0 M H x 0.7 M W. 24 ppm HF
Evaporator feed tank	TK-141	1	8 m^3	1.9 x 2.8	SS	0.9	0	0	0	24	S
Evaporator catch tank	TK-148	1	8 m^3	1.9 x 2.8	SS	0.9	0	0	0	24	S
Denitration tank	TK-149	1	12 m^3	2.2 x 3.2	SS	1.3	0	0	0	24	S
Sample tank	TK-150	1	12 m^3	2.2 x 3.2	SS	1.3	0	0	0	24	S
Sugar tank	TK-251	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	24	S
Absorber	T-7	1	4 lpm	0.7 x 8.5	SS	0	0	0	0	25	
Condenser	EC-20	1	3817 kW	0.8 x 3.0	SS	0	3817	6574	0	25	Cond.catch Vessel: 1.4 M D x 1.4 M H
Acidic LLW evaporator	EV-20	1	4393 kW	See comments	Hastelloy	0	0	0	4393	25	Env.size: 5.6 M L x 8.3 M H x 3.1 M W

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Evaporator overheads receiver	TK-142	1	188 m^3	5.3 x 8.0	SS	18.6	0	0	0	25	S
Evaporator feed tank	TK-175	1	100 m^3	4.3 x 6.5	Hastelloy	10.1	0	0	0	25	S
Hydrogen peroxide tank	TK-253	1	2 m^3	1.2 x 1.8	SS	0	0	0	0	25	
Condenser	EC-15	1	1532 kW	0.5 x 2.4	SS	0	1532	2639	0	26	Cond.catch Vessel: 1.1 M H x 1.1 M D
Basic-side LLW evaporator	EV-15	1	1534 kW	See comments	Hastelloy	0	0	0	1534	26	Env.size: 4.7 M L x 7 M H x 2.5 M W 1000 ppm HF
Evaporator feed tank	TK-139	1	78 m^3	4.0 x 6.0	Hastelloy	7.5	0	0	0	26	S, 1000 ppm HF
Basic evaporator overheads receiver tank	TK-143	1	24 m^3	2.7 x 4.1	SS	2.4	0	0	0	26	S
Slightly acidic evaporator overheads receiver	TK-144	1	402 m^3	6.9 x 10.3	SS	39.9	0	0	0	26	S
Dissolution and wash water tank	TK-145	1	414 m^3	6.9 x 10.4	SS	41	0	0	0	26	S
Centrifuge feed tank	TK-302A & B	2	14 m^3	2.2 x 3.3	SS	3	0	0	0	27	S, 18 ppm HF
Centrifuge solids catch tank	TK-304A & B	2	2 m^3	1.2 x 1.8	SS	0.4	0	0	0	27	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Centrifuge	G-305A & B	2	6 kg/hr solids	2.1 x 3.0	SS	37	0	0	0	27	19 lpm
Centrate catch tank	TK-307A & B	2	14 m^3	2.2 x 3.3	SS	3	0	0	0	27	S
HLW evaporator feed tank	TK-309	1	14 m^3	2.2 x 3.3	SS	1.5	0	0	0	27	S
HLW feed evaporator	EV-311	1	783 kW	See comments	SS	0	0	0	783	27	Env.size: 4.1 M L x 5.8 M H x 2.0 M W
Condenser	EC-312	1	779 kW	0.3 x 3.0	SS	0	779	1342	0	27	Cond.catch Vessel: 0.9 M D x 0.9 M H
HLW evaporator catch tank	TK-313	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	27	S
Feed sample and accumulation tanks	TK-317A-F	6	380 m^3	6.7 x 10.05	SS	223.7	0	0	0	27	S
HLW melter feed tank	TK-318A & B	2	10 m^3	2 x 3	SS	2.2	0	0	0	28	S
Head bin	B-319	1	3.6 m^3	1.5 x 3.2	CS	0	0	0	0	28	
Weigh feeder	MF-321	1	16.5 kg/hr		CS	0	0	0	0	28	
Rotary star feeder	M-322	1	16.5 kg/hr		Hastelloy	0	0	0	0	28	
HLW melter	EM-323	1	42 kg/hr	3.3 x 3.2 x 3	SS/Ref	0	0	0	0	28	1 MT/day melter
Glycolic acid tank	TK-327	1	8 m^3	1.9 x 1.85	SS	0	0	0	0	28	
Condenser	EC-328	1	5.13 W	0.3 x 2.4	SS	0	0	0	0	28	
Feed adjustment recators	TK-332A & B	2	4 m^3	1.5 x 2.3	SS	0.7	0	0	0	28	S, R

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Off-gas quench tower and line reamer	T-600	1	1157 kW	1.0 x 3.6	SS	0	1157	860	0	29	
Chiller	EC-601	1	1157 kW	0.3 x 2.4	SS	0	1157	1104	0	29	
HLW venturi scrubber	SC-602	1	TBD		SS	0	0	0	0	29	
HLW separator	S-603	1	0.67 m^3/hr	0.9 x 1.3	SS	0	0	0	0	29	
Chiller	EC-604	1	6.82 kW	0.3 x 2.4	SS	0	7	7	0	29	
HLW demister	DE-605	1	0.09 m^3/sec	0.6 x 1.2	SS	0	0	0	0	29	
HLW scrub solution tank	TK-608	1	20 m^3	2.5 x 3.75	SS	2.1	0	0	0	29	S
Scrub solution makeup tank	TK-619	1	20 m^3	2.5 x 3.75	SS	2.1	0	0	0	29	S
Condenser off gas scrubber	S-1	1	0.03 m^3/s	0.6 x 4.0	SS	0	39	0	0	30	
Secondary waste evaporator	EV-300	1	93 kW	See comments	Hastelloy	0	0	0	93	30	Env.size: 2.8 M L x 4.2 M H x 0.8 M W
Hg knockout chiller	EC-339	1	5.13 W	0.3 x 2.4	SS	0	0	0	0	30	
Condenser	EC-340	1	49 kW	0.2 x 1.2	SS	0	49	84	0	30	Cond.catch Vessel: 0.3 M D x 0.3 M H
Condenser	EC-341	1	5.13 W	0.3 x 2.4	SS	0	0	0	0	30	
Condensate collection tank	TK-600	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	30	S

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Ammonia destruction reactor tank	TK-601	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	30	S
Salt waste adjustment tank	TK-602	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	30	S
Salt waste holding tank	TK-603	1	2 m^3	1.2 x 1.8	SS	0.2	0	0	0	30	S
Supply air conditioning unit	ACU-700	9	20 m^3/s (each)	6 x 3 x 2	Mild steel	405	0	0	0	31	All running
Cell inlet filter housings	IFH-701	15	1.6 m^3/s (each)	1.6 x 1.8 x 1.9	Mild steel	0	0	0	0	31	
Cell inlet filters	FL-702	60	0.95 m^3/s (each)	0.5 x .624	Glass fiber	0	0	0	0	31	
Zone 3 extract Fans	K-703	6	26 m^3/s (each)	2.15 x 1.66 x 2.8	Mild steel	324	0	0	0	31	All running
Zone 2 extract Fans	K-704	3	21 m^3/s (each)	1.32 x 1.65 x 2.2	Mild steel	50	0	0	0	31	2 running, 1 standby
Zone 1 extract Fans	K-705	2	24 m^3/s (each)	1.32 x 1.65 x 2.2	SS	50	0	0	0	31	1 running, 1 standby
Zone 3 extract filter housings	FLH-706	42	156 m^3/s (each)	1.6 x 1.8 x 1.9	Mild steel	0	0	0	0	31	
Zone 3 extract filters	FL-707	168	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	31	
Zone 2 extract filter housings	FLH-708	6	21 m^3/s (each)	1.6 x 1.8 x 1.9	Mild steel	0	0	0	0	31	
Zone 2 extract filters	FL-709	24	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	31	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Zone 1 metal filters	FL-710	2	24 m^3/s (each)	1.37 x 3	SS	0	0	0	0	31	
Zone 1 secondary filter housings	FLH-711	6	24 m^3/s (each)	1.6 x 1.8 x 1.9	SS	0	0	0	0	31	
Zone 1 secondary HEPA filters	FL-712	24	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	31	
Vessel ventilation fans	K-713	2	10 m^3/s (each)	0.75 x 0.825 x 0.9	SS	10	0	0	0	31	1 running, 1 standby
Vessel ventilation metal filters	FL-714	2	10 m^3/s (each)	0.41 x 2.5	SS	0	0	0	0	31	
Vessel ventilation secondary filter housing	FLH-715	3	10 m^3/s (each)	0.9 x 1.8 x 1.9	SS	0	0	0	0	31	
Vessel ventilation secondary filters	FL-716	12	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	31	
Melter off-gas Fans	K-717	2	0.15 m^3/s (each)	0.75 x 0.825 x 0.9	SS	1	0	0	0	31	1 running, 1 standby
Melter off-gas metal filters	FL-718	2	0.54 m^3/s (each)	0.41 x 2.5	SS	0	0	0	0	31	
Melter off-gas secondary filter housing	FLH-719	1	0.15 m^3/s	0.9 x 1.8 x 1.9	SS	0	0	0	0	31	
Melter off-gas secondary filters	FL-720	2	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	31	
Zone 3 pneumatic fan isolation dampers	D-721	6	26 m^3/s (each)	0.6 x 1.35 X	Mild steel	0	0	0	0	31	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Zone 2 pneumatic fan isolation dampers	D-722	5	21 m^3/s (each)	0.6 x 0.95 X	Mild steel	0	0	0	0	31	
Zone 1 pneumatic fan isolation dampers	D-723	2	24 m^3/s (each)	0.6 x 1.1 x 1.1	SS	0	0	0	0	31	
Vessel ventilation pneumatic fan isolation dampers	D-724	2	0.28 m^3/s (each)	0.3 x 0.4 x 0.4	SS	0	0	0	0	31	
Melter off-gas pneumatic fan isolation dampers	D-725	2	0.54 m^3/s (each)	0.3 x 0.15 X	SS	0	0	0	0	31	
Zone 3 manual fan isolation dampers	D-726	6	36.2 m^3/s (each)	0.6 x 1.35 X	Mild steel	0	0	0	0	31	
Zone 2 manual fan isolation dampers	D-727	5	21 m^3/s (each)	0.6 x 0.95 X	Mild steel	0	0	0	0	31	
Zone 1 manual fan isolation dampers	D-728	2	24 m^3/s (each)	0.6 x 2.0 x 1.0	SS	0	0	0	0	31	
Vessel ventilation manual fan isolation dampers	D-729	2	0.28 m^3/s (each)	0.3 x 0.4 x 0.4	SS	0	0	0	0	31	
Melter off-gas manual fan isolation dampers	D-730	2	0.54 m^3/s (each)	0.3 x 0.15 X	SS	0	0	0	0	31	
Zone 3 filters manual isolation dampers	D-731	84	3.8 m^3/s (each)	0.3 x 0.2 x 0.2	Mild steel	0	0	0	0	31	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M HL)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Zone 2 filters manual isolation dampers	D-732	24	3.8 m^3/s (each)	0.3 x 0.2 x 0.2	Mild steel	0	0	0	0	31	
Zone 1 filters pneumatic isolation dampers	D-733	4	24 m^3/s (each)	0.6 x 2.0 x 1.0	SS	0	0	0	0	31	
Zone 1 filters manual isolation dampers	D-734	16	3.8 m^3/s (each)	0.3 x 0.5 x 0.5	SS	0	0	0	0	31	
Vessel ventilation filters pneumatic isolation dampers	D-735	4	0.28 m^3/s (each)	0.3 x 0.15 x 0.15	SS	0	0	0	0	31	
Vessel ventilation filters manual isolation dampers	D-736	4	3.8 m^3/s (each)	0.3 x 0.5 x 0.5	SS	0	0	0	0	31	
Melter off-gas filters pneumatic isolation dampers	D-737	4	0.54 m^3/s (each)	0.3 x 0.225 x 0.225	SS	0	0	0	0	31	
Vessel ventilation filters manual isolation dampers	D-738	4	3.8 m^3/s (each)	0.3 x 0.5 x 0.5	SS	0	0	0	0	31	
Zone 1 inlet filters isolation dampers	D-739	30	1.6 m^3/s (each)	0.3 x 1.0 x 1.0	SS	0	0	0	0	31	
Inlet louvers	L-740	1	180 m^3/s	0.15 x 10 x 20	Mild steel	0	0	0	0	31	
Metal filters catch tank	TK-741	1	17 m^3	2.4 x 4.4	SS	0	0	0	0	31	
Metal filters catch tank pump	P-742	1	1 lpm		SS	0	0	0	0	31	

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Vessel ventilation charcoal filter	FL-743	2	10 m^3/s (each)		Charcoal	0	0	0	0	31	
Melter off-gas charcoal filter	FL-744	2	0.15 m^3/s (each)		Charcoal	0	0	0	0	31	
Vessel ventilation heater	E-745	1	TBD	0.6 x 3.0 x 2.0	SS	0	0	0	20	31	Best guess
Melter off-gas heater	E-746	1	TBD	0.6 x 2.0 x 2.0	SS	0	0	0	20	31	Best guess
Batch mixer	MM-1030	1	3.6 m^3/ Batch	2.3 x 3.5	CS	0	0	0	0	33	R
Total power, cooling load, and heating load in kw:						2531	60653		70647		
Total cooling water in lpm:								102476			

Table B-1. Integrated Extensive Separations Pretreatment and High Level Waste Vitrification Treatment Facility Equipment List.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H.)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments

Notes:

APM	=	ammonium phosphomolybdate	lpm	=	liters per minute
C	=	centrifugal	m^3	=	cubic meter
CL	=	coil	M	=	meter
CSA	=	cross sectional area	NPH	=	normal paraffin hydrocarbon
D	=	diameter	O/H	=	overall height
DTPA	=	diethylene-triamine-penta-acetic acid	OD	=	organic destruction
F	=	fluidic	ppm	=	parts per million
H	=	height	R	=	revised since last revision
HEDA	=	high-effeciency particulate air (filter)	S	=	stirrer
HF	=	hydrofluoric acid	s	=	second
Hg	=	mercury	Sr	=	strontium
hr	=	hour	SREX	=	strontium extraction
HLW	=	high-level waste	SS	=	stainless steel
ID	=	internal diameter	STD	=	standard
IX	=	ion-exchange	SW	=	sludge wash
kg	=	kilogram	TBD	=	to be determined
kW	=	kilowatt hour	te/H	=	metric ton/hour
L	=	length	W	=	width

See Jansen, G., 1955, *Equipment Sizing Calculations for the Extensive Separations Alternatives Engineering Data Package*, WHC-SD-WM-DP-130, Rev. 0, Westinghouse Hanford Company, Richland, Washington. Table B-1 is based upon the following calculations.

1. Verified Calculation (EIS-001) of Equipment Sizing for HLW Vitrification System
2. Verified Calculation (EIS-005) for Centrifuge Selection
3. Verified Calculation (EIS)-006) of Equipment Sizing for Fractionator, Absorbers, Reboiler, and Condensor
4. Verified Calculation (EIS-007) of Equipment Sizing for Ion Exchange Columns
5. Verified Calculation (EIS-008) of Equipmnent Sizing for Tanks (General)
6. Verified Calculation (EIS-009) of Equipment Sizing for Bulk, Preparation, and Feed Cold Chemicl Tanks
7. Verified Calculation (EIS-011) of Equipment Sizing for Evaporators, Condensers, Tanks, Decanters, and Filters
8. Verified Calculation (EIS-012) of Equipment Sizing for Organics Destruction System

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Receipt/sample tanks	TK-131A, B, C, D, E, F	6	200 m^3 each	6.40 x 6.40	316 SS	30	3858	9990	0	SH-20	S, CL; Power estimated.
Receipt/sample tank pumps	P-132A, B, C, D, E, F	6	95 lpm @ 3.52 kg/cm^2	-	316 SS	23	0	0	0	SH-20	F. Capacity is for each pump. Power estimated.
LLW evaporator feed tanks	TK-400A and B	2	213 m^3 (each)	6.5 x 8	316 SS	10	1370	1770	0	SH-20	S, CL; Power estimated.
LLW evaporator feed tanks	P-401A and B	2	142 lpm @ 3.52 kg/cm^2	-	316 SS	12	0	0	0	SH-20	Capacity is for each pump. Power estimated.
LLW feed evaporators	EV-402	1	8132 kW	1 D x 3.0 L	Hastelloy-C	0	0	0	8132	SH-20	R. Envelope: 3.5 x 5 x 100/H; Demister: D(max) = 3.4 M, O/H = 4.5M; Tube bundle: 1.0 MD
Condensers	EC-403	1	6750 kW	1.4D x 8.1L	Hastelloy-C	0	6750	6750	0	SH-20	R, CL
LLW melter feed adjustment	TK-404A and B	2	76 m^3 (each)	4.0D x 7.0 O/H	316 SS	30	440	568	0	SH-20	S, CL
LLW melter feed adjustment tank pumps	P-405A and B	2	70 lpm @ 3.52 kg/cm^2	-	316 SS	7.4	0	0	0	SH-20	Capacity is for each pump. Power estimated.
LLW melter feed tanks	TK-406A and B	2	76 m^3 (each)	4.0D x 7.0 O/H	316 SS	30	440	380	0	SH-20	R, S, CL.
LLW melter feed tank pumps	P-407A and B	2	70 lpm @ 3.52 kg/cm^2	-	316 SS	7.4	0	0	0	SH-20	R. Capacity is for each pump. Power estimated.

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Head bins	B-408A and B	2	2.3 m^3 (each)	See comments	316 SS	0	0	0	0	SH-21	Upper Cylinder 1.3 D x 1.3 H. O/H = 2.43 M cone base
Rotary star feeders	M-409A and B	2	3 te/H (each)	-	316 SS	0.5	0	0	0	SH-21	
Weigh feeders	MF-410A and B	2	3 te/H (each)	See comments	316 SS	0	0	0	0	SH-21	Belt width 0.36 M.O/A length = 3 M.O/A D = 1 M
Rotary star feeders	M-411A and B	2	3 te/H (each)	-	316 SS	1	0	0	0	SH-21	
LLW melters	EM-412A and B	2	4.2 te/H (each)	8.4H4.52L3.35W	316 SS	0	0	0	0	SH-21	Vortec combustor Ref. Memo 12/2/92 J.S. Patten
Glass separators	S-413A and B	2	4.2 te/H (each)	8.4H4.52L3.35W	316 SS	0	0	0	0	SH-21	Vortec combustor Ref. Memo 12/2/92 J.S. Patten
Quench flumes	MQ-414A and B	2	TBD	0.6D x 3.0L	316 SS	0	0	0	0	SH-21	
Roll crushers	MC-415A and B	2	See comments	2 x 0.15D rolls	316 SS	20	0	0	0	SH-21	Each roll 0.2 M L. (Excludes motor, drive and maintenance accessory)
LLW cullet catch tank	TK-416A, B and C	3	30 m^3 (each)	3.5D x 4.0 O/H	316 SS	12	660	852	0	SH-21	S, CL
Condensers	EC-417A and B	2	600 kW (each)	0.6D x 3.7L	Hastelloy-C	0	1200	1670	0	SH-21	R, CL
LLW cullet catch tank pumps	P-418A, B and C	3	1400 lpm @ 3.52 kg/cm^2	-	316 SS	51	0	0	0	SH-21	Power estimated. Capacity is for each pump.

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total Cool load kW	Total Cool water lpm	Total Heat load kW	Drawing number	Comments
Chillers	EC-419A and B	2	7400 kW (each)	1.6D x 6.1L	316 SS	0	14800	21340	0	SH-21	CL
LLW quench water recycle tank	P-420A and B	2	1400 lpm @ 3.52 kg/cm^2	-	316 SS	34	0	0	0	SH-21	R. Power estimated. Capacity is for each pump.
LLW quench water recycle	TK-421A and B	2	58 m^3 (each)	3.5D x 7.0 O/H	316 SS	8	420	568	0	SH-21	R, S, CL
Screens	FS-422A, B and C	3	1400 lpm (each)	Grid A =.65 m^2	316 SS	0	0	0	0	SH-22	R. Frame size = 1.2 L x 1.2 W x 1 H
Screen pumps	P-423A, B and C	3	1400 lpm @ 3.52 kg/cm^2	-	316 SS	51	0	0	0	SH-22	R. Power estimated. Capacity is for each pump.
LLW filter catch tank pumps	P-424A and B	2	1400 lpm @ 3.52 kg/cm^2	-	316 SS	23	0	0	0	SH-22	R. Power estimated. Capacity is for each pump.
LLW filter catch tank pumps	P-425A and B	2	7 lpm @ 3.52 kg/cm^2	-	316 SS	1.5	0	0	0	SH-22	R. Capacity is for each pump. Power estimated.
LLW filter catch tanks	TK-426A and B	2	58 m^3 (each)	3.5D x 7.0 O/H	316 SS	8	420	568	0	SH-22	R, CL
LLW cullet lag storage	B-427	18	38 m^3 (each)	4 D x 5 O/H	316 SS	0	0	0	0	SH-22	
Condenser	EC-428	1	400 kW (each)	0.54D x 3L	Hastalloy-C	0	400	585	0	SH-22	R, CL
LLW condensate catch tank	TK-429	1	5 m^3	1.8D x 1.8 O/H	316 SS	0	3	67	0	SH-22	CL
LLW condensate catch tank pump	P-430	1	1400 lpm @ 3.52 kg/cm^2	-	316 SS	17	0	0	0	SH-22	Power estimated.

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Cyclone with sintered metal	FC-432	1	TBD	1.33D x 5.3 O/H	316 SS	0	0	0	0	SH-23	Data on particle size required to check operation.
Rotart star feeder	M-433	1	11 te/H	-	316 SS	0.5	0	0	0	SH-23	
Day bin	B-434	1	75 m^3	4D x 9.5 O/H	316 SS	0	0	0	0	SH-23	1 day holdup
Rotart star feeder	M-435	1	11 te/H	-	316 SS	0.5	0	0	0	SH-23	
Recovered sulfur storage tank	TK-436	1	0.2 m^3	0.6 D x 0.9 O/H	316 SS	0	1	2	0	SH-23	CL
Recovered sulfur storage tank pump	P-437	1	17 lpm @ 3.52 kg/cm^2	-	316 SS	3.7	0	0	0	SH-23	Power estimated.
Sulfur cement mixing tanks	TK-438A and B	2	50 m^3 (each)	3.9D x 5.9 O/H	316 SS	56	12	840	0	SH-23	S, CL
Sulfur cement mixing tanks	P-439A and B	2	3.8 te/H normal	-	316 SS	9	0	0	0	SH-23	Capacity 11 te/H (max) during start-up. Power estimated for all pumps.
Mixer	MM-440	1	See comments	0.4D x 9.6L	316 SS	0	0	0	0	SH-23	Based on Ko-Kneades design
Surge tank	TK-441	1	0.3 m^3	0.67D x 1.25O/H	316 SS	0	0	0	0	SH-23	Upper cylinder H = 0.67 M. Cone H = 0.58 M
Sulfur tank pump	P-442	1	16.5 te/H	-	316 SS	20	0	0	0	SH-23	Molten sulfur plus glass; Power estimated.
Decanted molten sulfur vault	TK-443	1	20 m^3	2.9D x 4.4 O/H	316 SS	0	0	0	0	SH-23	

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Filter wash catch tank	TK-445	1	17 m^3	2.4 D x 4.6 O/H	316 SS	7.5	55	75	0	SH-28	CL
Filter wash catch tank pump	P-446	1	1 lpm @ 3.52 kg/cm^2	-	316 SS	0.25	0	0	0	SH-28	Power estimated.
Air conditioning unit	ACU- 450	1	860,320 lpm	6.7 x 2.4 x 8.5	316 SS	0	0	0	0	SH-28	R. Operating unit.
Pneumatic isolation dumpers	D-450	2	860,320 lpm	1.4 m^2	CS	0	0	0	0	SH-28	R
Heater (ACU-450)	E-450	1	TBD	5.7 m^2	316 SS	0	0	0	0	SH-28	R
Air intake louvers (ACU-450)	EV-450	1	860,320 lpm	5.7 m^2	CS	0	0	0	0	SH-28	R
HEPA filters (ACU-450)	FH-450A1	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACU-450)	FH-450A2	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACU-450)	FP-450	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Low efficiency prefilters (ACU-450)	FP-450	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blowers (ACU-450)	MB-450	1	860,320 lpm	-	316 SS	75	0	0	0	SH-28	R
Air conditioning unit	ACU-451	1	860,320 lpm	6.7 x 2.4 x 8.5	316 SS	0	0	0	0	SH-28	R. Standby unit.

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Pneumatic isolation dumpers (ACU-451)	D-451	2	860,320 lpm	1.4 m^2	CS	0	0	0	0	SH-28	R
Heater (ACU-451)	E-451	1	TBD	5.7 M^2	316 SS	0	0	0	0	SH-28	R
Air intake louvers (ACU-451)	EV-451	1	860,320 lpm	5.7 m^2	CS	0	0	0	0	SH-28	R
HEPA filters (ACU-451)	FH-451A1	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACU-451)	FH-451A2	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACU-451)	FP-451	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Low efficiency prefilters	FP-451	30	28,680 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blowers (ACU-451)	MB-451	1	860,320 lpm	-	316 SS	75	0	0	0	SH-28	R
Cyclone with sintered metal	FC-500-2	1	See comments	1.33D x 5.3 O/H	316 SS	0	0	0	0	SH-24	Data on particle size required to check operation.
Rotart star feeder	M-501-2	1	11 te/H	TBD	316 SS	0.5	0	0	0	SH-24	
Roll crusher	MC-502-2	1	See comments	.3D x 2L rolls	316 SS	0.5	0	0	0	SH-24	Each roll 1.2 M L. (Excludes motor, drive and maintenance access)
Recycle cullet catch tank	TK-503-2	1	116 m^3	5 D x 7 O/H	316 SS	0	373	970	0	SH-24	S, CL

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Recycle cullet catch tank	P-504-2	1	5 lpm @ 3.52 kg/cm^2	-	316 SS	0.25	0	0	0	SH-24	Power estimated.
LLW quench towers	T-609A and B	2	TBD	3.25 x 6.6 O/H	316 SS	0	0	0	0	SH-25	
Chillers	EC-610A and B	2	1,500 Ton (each)	7.3 x 5.5 x 4.3	CS	0	19220	27340	0	SH-25	R, CL
LLW scrub filter tank	TK-611A and B	2	6 m^3 (each)	1.8 x 3.24 O/H	316 SS	4.4	130	168	0	SH-25	S, CL
LLW scrub solution tank pumps	P-612A and B	2	10 lpm @ 3.52 kg/cm^2	-	316 SS	1.5	0	0	0	SH-25	R. Power estimated.
LLW scrub solution tank pumps	P-613A and B	2	100 lpm @ 3.52 kg/cm^2	-	316 SS	7.4	0	0	0	SH-25	R. Power estimated.
LLW scrub solution tanks	TK-614A and B	2	40 m^3 (each)	3.6 x 5.4 O/H	316 SS	30	1291	1668	0	SH-25	S, CL
LLW Venturi scrubber	SC-615A and B	2	See comments	TBD	316 SS	0	0	0	0	SH-25	2,800 Kg/H (gas), 220 lpm
LLW separator	S-616A and B	2	27,340 lpm (each)	0.39 x 1.9 O/H	316 SS	0	0	0	0	SH-25	Packed upper section
Chillers	EC-617A and B	2	1,500 Ton (each)	7.3 x 5.5 x 4.3	CS	0	46	70	0	SH-25	CL
LLW demister	DE-618A and B	2	27,340 lpm (each)	0.46D x 2.8 O/H	316 SS	0	0	0	0	SH-25	Chevron/Kailmast sections
Scrub solution makeup tanks	TK-619A and B	2	10 m^3 (each)	1.8 x 4.6 O/H	316 SS	7.4	233	150	0	SH-25	S, CL

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
LLW Scrub filter tank pump	P-620A and B	2	10 lpm @ 3.52 kg/cm^2	-	316 SS	1.5	0	0	0	SH-25	R. Power estimated.
Metal HEPA filter	FM-625A	1	30,000 STD lpm	1 x 2.4	316 SS	0	0	0	0	SH-28	R
Metal HEPA filter	FM-625B	1	30,000 STD lpm	1 x 2.4	316 SS	0	0	0	0	SH-28	R
Metal HEPA filter	FM-625C	1	30,000 STD lpm	1 x 2.4	316 SS	0	0	0	0	SH-28	R
Blower	MB-625A	1	64 m^3/min	2 x 2	316 SS	8	0	0	0	SH-28	R
Blower	MB-625B	1	64 m^3/min	2 x 2	316 SS	8	0	0	0	SH-28	R
LLW melter filter wash catch	TK-626	1	17 m^3	2.4D x 4.6 O/H	316 SS	7.5	55	145	0	SH-28	CL
LLW melter filter wash catch	P-627	1	76 lpm @ 3.52 kg/cm^2	-	316 SS	3.7	0	0	0	SH-28	Power estimated.
Melter offgas heat exchanger	EC-628-2	1	600 kW	1 x 5	316 SS	0	0	0	600	SH-26	
Heater	E-629-2	1	600 kW	TBD	316 SS	0	0	0	600	SH-26	
SO2 absorber	R-630-2	1	90% efficiency	3 x 2	316 SS	0	0	0	0	SH-26	
Heater	R-631-2	1	600 kW	TBD	316 SS	0	0	0	600	SH-26	R
NOx catalytic reactor	R-632-2	1	99% efficiency	1.2 x 2	316 SS	0	0	0	0	SH-26	
Sulfate reduction	R-633-2	1	90% efficiency	3 x 2	316 SS	0	0	0	0	SH-26	
NH3 cracker	R-634-2	1	99.995% efficiency	2 x 4.5	316 SS	0	0	0	65	SH-26	

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
SO2 absorber regeneration	R-635-2	1	TBD	TBD	316 SS	0	0	0	0	SH-26	R
Combustion chamber	EB-636-2	1	99% efficiency	1.2 x 2	316 SS	0	0	0	0	SH-27	
Heat exchanger	EC-637-2	1	25 kW	See comments	316 SS	0	0	0	25	SH-27	Air Flow Reqd. 3000 m^3/H (STP).O/H = 2.5 M; W = 0.6 M; Tube bundle = 2M x 0.3M x 0.3M
Air heat exchanger	EC-638-2	1	5 kW	See comments	316 SS	0	0	0	5	SH-27	Air Flow Reqd. 600 m^3/H (STP).O/H = 2.5 M; W = 0.6 M; Tube bundle = 2M x 0.3M x 0.3M
Air heat exchanger	EC-639-2	1	6 kW	See comments	316 SS	0	0	0	6	SH-27	Air Flow Reqd. 720 m^3/H (STP). O/H = 2.5 M; W = 0.6 M; Tube bundle = 2M x 0.3M x 0.3M
Claus reactor	R-640-2	1	95% efficiency	0.4 x 2	316 SS	0	0	0	0	SH-27	
Claus reactor	R-641-2	1	95% efficiency	0.4 x 2	316 SS	0	0	0	0	SH-27	

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Air heat exchanger	EC-642-2	1	3 kW	See comments	316 SS	0	0	0	3	SH-27	Air Flow Reqd. 360 m^3/H (STP).O/H = 2.5 M; W = 0.6 M; Tube bundle = 2M x 0.3M x 0.3M
Sulfur trap	TR-643-2	1	TBD	TBD	316 SS	0	0	0	0	SH-27	
CVOG/VOG filter wash catch	TK-702	1	20 m^3	3 x 3 O/H	316 SS	0	64	170	0	SH-28	CL
CVOG/VOG filter wash catch	P-703	1	50 lpm @ 3.52 kg/cm^2	-	316 SS	1.12	0	0	0	SH-28	Power estimated.
Primary air cleaning unit	ACL-704	1	679,600 lpm	2.4 x 5.2 x 5.5	316 SS	0	0	0	0	SH-28	R. Operating unit.
Charcoal filter (ACL-704)	CF-704	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-704	2	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-704)	E-704	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-704)	FH-704A1	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-704)	FH-704A2	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-704)	MB-704	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Metal HEPA filters	FM-705A, B, C, D, E, F	6	849,500 lpm	-	316 SS	0	0	0	0	SH-28	R. Delta P = 4 in. water
Primary air cleaning unit	ACL-706	1	679,600 lpm	2.4 x 5.2 x 5.5	316 SS	0	0	0	0	SH-28	R. Operating unit.
Charcoal filter (ACL-706)	CF-706	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-706	2	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-706)	E-706	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-706)	FH-706A1	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-706)	FH-706A2	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-706)	MB-706	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Primary air cleaning unit	ACL-708	1	679,600 lpm	2.4 x 5.2 x 5.5	316 SS	0	0	0	0	SH-28	R. Operating unit.
Charcoal filter (ACL-708)	CF-708	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-708	2	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-708)	E-708	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
HEPA filters (ACL-708)	FH-708A1	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-708)	FH-708A2	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-708)	MB-708	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Primary air cleaning unit	ACL-710	1	679,600 lpm	2.4 x 5.2 x 5.5	316 SS	0	0	0	0	SH-28	R. Standby unit.
Charcoal filter (ACL-710)	CF-710	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-710	2	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-710)	E-710	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-710)	FH-710A1	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-710)	FH-710A2	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-710)	MB-710	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Process condensate recycle	TK-800 A, B and C	3	35 m^3 (each)	3.5 x 4	316 SS	0	339	900	0	SH-29	CL
Process condensate recycle	P-801A, B and C	3	400 lpm @ 3.52 kg/cm^2	-	316 SS	22.5	0	0	0	SH-29	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H)	Material	Power kW	Total Cool load kW	Total Cool water lpm	Total Heat load kW	Drawing number	Comments
Process condensate recycle	P-802A, B and C	3	400 lpm @ 3.52 kg/cm^2	-	316 SS	22.5	0	0	0	SH-29	R. Power estimated.
pH adjustment tank	TK-803	1	50 m^3	4 x 4.5	316 SS	4.5	161	420	0	SH-29	S, CL; Power estimated.
pH adjustment tank pump	P-804	1	400 lpm @ 3.52 kg/cm^2	-	316 SS	7.5	0	0	0	SH-29	Power estimated.
pH adjustment tank pump	P-805	1	400 lpm @ 3.52 kg/cm^2	-	316 SS	7.5	0	0	0	SH-29	Power estimated.
Air conditioning unit	ACU-900	1	2,850,000 lpm	7.3 x 7 x 13.4	316 SS	0	0	0	0	SH-28	R. Operating unit.
Pneumatic isolation dumpers	D-900	2	2,850,000 lpm	5 m^2	CS	0	0	0	0	SH-28	R
Heater (ACU-900)	E-900	1	TBD	19 m^2	316 SS	0	0	0	0	SH-28	R
Air intake louvers (ACU-900)	EV-900	1	2,850,000 lpm	19 m^2	CS	0	0	0	0	SH-28	R
HEPA filters (ACU-900)	FH-900A1	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACU-900)	FH-900A2	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Prefilters low efficiency	FP-900	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Prefilters medium efficiency	FP-900	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACU-900)	MB-900	1	2,850,000 lpm	-	316 SS	224	0	0	0	SH-28	R
Air conditioning unit	ACU-901	1	2,850,000 lpm	7.3 x 7 x 13.4	316 SS	0	0	0	0	SH-28	R. Standby unit.
Pneumatic isolation dumpers	D-901	2	2,850,000 lpm	5 m^2	CS	0	0	0	0	SH-28	R
Heater (ACU-901)	E-901	1	TBD	19 m^2	316 SS	0	0	0	0	SH-28	R
Air intake louvers (ACU-901)	EV-901	1	2,850,000 lpm	19 m^2	CS	0	0	0	0	SH-28	R
HEPA filters (ACU-901)	FH-901A1	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACU-901)	FH-901A2	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Prefilters medium efficiency	FP-901	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Prefilters low efficiency	FP-901	100	28,500 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACU-901)	MB-901	1	2,850,000 lpm	-	316 SS	224	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Secondary air exhaust unit	ACL-902	1	679,600 lpm	5.5 x 2.4 x 6.4	316 SS	0	0	0	0	SH-28	R. Operating unit
Charcoal filters (ACL-902)	CF-902	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-902	3	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-902)	E-902	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-902)	FH-902	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-902)	FH-902	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACL-902)	FP-902	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-902)	MB-902	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Secondary air exhaust unit	ACL-905	1	679,600 lpm	5.5 x 2.4 x 6.4	316 SS	0	0	0	0	SH-28	R. Operating unit
Charcoal filters (ACL-905)	CF-905	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-905	3	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-905)	E-905	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-905)	FH-905	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
HEPA filters (ACL-905)	FH-905	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACL-905)	FP-905	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-905)	MB-905	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Secondary air exhaust unit	ACL-906	1	679,600 lpm	5.5 x 2.4 x 6.4	316 SS	0	0	0	0	SH-28	R. Operating unit
Charcoal filters (ACL-906)	CF-906	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic isolation dumpers	D-906	3	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-906)	E-906	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-906)	FH-906	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-906)	FH-906	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACL-906)	FP-906	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-906)	MB-906	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Secondary air exhaust unit	ACL-907	1	679,600 lpm	5.5 x 2.4 x 6.4	316 SS	0	0	0	0	SH-28	R. Operating unit
Charcoal filters (ACL-907)	CF-907	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total Cool load kW	Total Cool water lpm	Total Heat load kW	Drawing number	Comments
Pneumatic isolation dumpers	D-907	3	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-907)	E-907	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-907)	FH-907	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-907)	FH-907	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
Prefilters (ACL-907)	FP-907	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-907)	MB-907	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Secondary air exhaust unit	ACL-908	1	679,600 lpm	5.5 x 2.4 x 6.4	316 SS	0	0	0	0	SH-28	R. Standby unit.
Charcoal filters (ACL-908)	CF-908	1	679,600 lpm	-	Charcoal	0	0	0	0	SH-28	R
Pneumatic Isolation Dumpers	D-908	3	679,600 lpm	1.1 m^2	CS	0	0	0	0	SH-28	R
Heater (ACL-908)	E-908	1	TBD	4.5 m^2	316 SS	0	0	0	0	SH-28	R
HEPA filters (ACL-908)	FH-908	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R
HEPA filters (ACL-908)	FH-908	24	28,317 lpm	0.6 x 0.6 x 0.2	Fib. glass	0	0	0	0	SH-28	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		
Prefilters (ACL-908)	FP-908	24	28,317 lpm	0.6 x 0.6 x 0.3	Fib. glass	0	0	0	0	SH-28	R
Blower (ACL-908)	MB-908	1	679,600 lpm	-	316 SS	75	0	0	0	SH-28	R
Sand storage bin	B-1023	1	50 m^3 (EST)	4 x 4 Cylinder	316 SS	0	0	0	0	SH-30	
Al2O3 storage bin	B-1024	1	50 m^3 (EST)	4 x 4 Cylinder	316 SS	0	0	0	0	SH-30	
B2O3 storage bin	B-1026	1	50 m^3 (EST)	4 x 4 Cylinder	316 SS	0	0	0	0	SH-30	
CaO storage bin	B-1028	1	50 m^3 (EST)	4 x 4 Cylinder	316 SS	0	0	0	0	SH-30	
Batch mixer	MM-1031	1	12.5 m^3 (EST)	2.5 x 2.5	316 SS	0	0	0	0	SH-30	
Service water tank	TK-1553	1	20 m^3	3 x 3 O/H	CS	0	0	0	0	SH-31	R. 1 day holdup.
Service water tank pumps	P-1554A and B	2	523 lpm @ 5.6 kg/cm^2	-	CS	30	0	0	0	SH-31	R. Capacity is for each pump. Power estimated.
Water cooled chiller package	EC-1566A and B	2	3,000 Ton (each)	11 x 7.3 x 5.5	CS	0	0	0	0	SH-32	R
Water cooled chiller package	EC-1566C and D	2	2,800 Ton (each)	See EC-1566A,B	CS	0	0	0	0	SH-32	R
Water cooled chiller package	EC-1566E and F	2	2,200 Ton (each)	See EC-1566A,B	CS	0	0	0	0	SH-32	R
Air cooled chiller package	EC-1566G and H	2	10 Tons (each)	See EC-1566A,B	CS	0	0	0	0	SH-32	R
Demin water tank	TK-1573	1	20 m^3	3 x 3 O/H	CS	0	0	0	0	SH-32	R

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H.)	Material	Power kW	Total Cool load kW	Total Cool water lpm	Total Heat load kW	Drawing number	Comments
Demin water tank pump	P-1574	1	19 lpm @ 3.52 kg/cm^2	-	CS	0.25	0	0	0	SH-32	R. Power estimated.
Chilled water circulating pump	P-1575A and B	2	TBD	-		0	0	0	0	SH-32	
Closed expansion tank	TK-1576	1	TBD	TBD	CS	0	0	0	0	SH-32	R
Boiler	BR-1585	1	35,000 lb/hr	3.7 x 4.3 x 6.1	CS	0	0	0	0		150 psig saturated steam. Weight = 60,000 lbs.
Total power, cooling load, and heating load in kW:						1924	52741		10036		
Total cooling water in lpm:								78026			

Table B-2. Low Activity Waste Vitrification-Sulfur Matrix Treatment Facility Equipment List.

Equipment Description	Equipment	No. of Items	Capacity/Flow	Physical size (M dia x M H;)	Material	Power kW	Total			Drawing number	Comments
							Cool load kW	Cool water lpm	Heat load kW		

Notes:

APM	=	ammonium phosphomolybdate	lpm	=	liters per minute
C	=	centrifugal	M	=	meter
cm^2	=	cubic centimeter	m^3	=	cubic meter
CL	=	coil	M	=	minute
CSA	=	cross sectional area	m^2	=	square meter
dia	=	diameter	NPH	=	normal paraffin hydrocarbon
DTPA	=	diethylene-triamine-penta-acetic acid	O/H	=	overall height
F	=	fluidic	OD	=	organic destruction
H	=	height	ppm	=	parts per million
H	=	hour	R	=	revised since last revision
HF	=	hydrofluoric acid	S	=	stirrer
HEPA	=	high-efficiency particulate air	Sr	=	strontium
Hg	=	mercury	SREX	=	strontium extraction
ID	=	internal diameter	SS	=	stainless steel
IX	=	ion-exchange	STD	=	standard
kg	=	kilogram	SW	=	sludge wash
L	=	length	TBD	=	to be determined
lb	=	pound	te/H	=	metric ton/hour
LLW	=	low-level waste	W	=	width

INITIAL PRETREATMENT MODULE: FOR CASE 2A: DETACHED LLW TREATMENT LOW SOURCE TERM EQUIPMENT LIST DOCUMENT IDENTIFIER: E/B-SD-W236B-EL-003-REV D, DATE: 05/12/1994 DATA FOR COSTING AND PRELIMINARY LAYOUT PURPOSES ONLY.

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Portland cement day storage sillo	TK-1A and B	2	60 m^3	3.65 M dia x 7.5 M (1.5 m H cone)	C.S	0	0	0	0	0	Part of MU-8
Pulverised fly ash day storage silo	TK-2	1	60 m^3	3.65 M dia x 7.5 M (1.5 M H cone)	C.S	0	0	0	0	0	Part of MU-8
Blast furnace slag day storage silo	TK-3	1	60 m^3	3.65 M dia x 7.5 M (1.5 m H cone)	C.S	0	0	0	0	0	Part of MU-8
Powder blending tank	TK-4A and B	2	8 m^3	2 M dia x 3.5 M (0.8 M H cone)	C.S	0	0	0	0	0	S; part of MU-8
Air receiver	TK-5	1	TBD	TBD	C.S	0	0	0	0	0	Part of MU-8
Dense phase pump	P-6A and B	2	TBD	TBD	C.S	0	0	0	0	0	Part of MU-8
Powder blending weigh unit	WU-7A and B	2				0	0	0	0	0	Part of MU-8
Mobile powder receipt and blend unit	MU-8	1		13 M W x 18 M L x 18.5 M H	C.S	0	0	0	0	0	Total of 2 required for the 14 grout facilities
Mobile grout unit	MU-9	1		16 M W x 16.7 M L x 18.5 M H	C.S	0	0	0	0	0	Total of 1 required for the 14 grout facilities
Blended powder day bin	TK-10A and B	2	8 m^3	2 M dia x 3.5 M (0.8 M H cone)	C.S	0	0	0	0	0	Part of MU-9
Day bin weigh unit	WU-11A and B	2				0	0	0	0	0	Part of MU-9
Screw conveyor	MC-12A and B	2	10 m^3/hr		C.S	0	0	0	0	0	Part of MU-9

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Pug mill	MC-13	1	10 m^3/hr	1.1 M W x 4.5 M L x 1.8 M H	316 SS	0	0	0	0	0	Part of MU-9 nuclearized scott pugmill model PM 3610
Surge tank	TK-14	1	2 m^3	1.2 M dia x 2 M	316 SS	0	0	0	0	0	Part of MU-9
Grout feed pump	P-15	1	10 m^3/hr		316 SS	0	0	0	0	0	Part of MU-9 moyno type
Grout washings tank	TK-16	1	2 m^3	1.2 M dia x 2 M	316 SS	0	0	0	0	0	S; part of MU-9
Grout washings return pump	P-17	1	3 m^3/hr		316 SS	0	0	0	0	0	Part of MU-9
Active connection bulge	GB-18	1		1.5 M W x 3 M L x 2 M H	SS/Pb	0	0	0	0	0	Part of MU-2 ut.frm
Grout mix and connection bulge	GB-19	1		2 M W x 5.5 M L x 8.5 M H	SS/Pb	0	0	0	0	0	Part of MU-9
Inactive services connection	GB-20	1		1 M W x 3 M L x 2 M H	316 SS	0	0	0	0	0	Part of MU-9
Powder receipt connection	GB-21	1		1 M W x 2 M L x 2 M H	C.S	0	0	0	0	0	Part of MU-9
LLW grout storage tube	GT-22	0	1350 tubes required	2 M OD x 0.3 M ID x 12 M H	C.S	0	0	0	0	0	
Tube guide	GT-23	0	1350 guides required		C.S	0	0	0	0	0	Fixed to vault floor
Grout distribution manifold	GT-24	38		75 M M dia tube -331 m of tube required	C.S	0	0	0	0	0	

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Vault floor plug	FX-25	0	1350 plugs required	2.3 M dia x 1 M H	CONC/ C.S	0	0	0	0	0	
Grout distribution manifold	VL-26	0	54/manifold required	75 M M N.S	C.S	0	0	0	0	0	54 actuators required
Valves				Easi-sleeve plug							Actuators will be reused on next manifold
Supply air handling unit	ACU- 700	3	26 m^3/s (each)	6 M L x 3 M W x 2 M H	C.S	130	0	0	0	0	2 run 1 standby (located in centralized facility)
Cell inlet filter housings	IFH- 701	14	1.6 m^3/s (each)	1.6 M L x 1.8 M W x 1.9 M H	C.S	0	0	0	0	0	(located in grout facility)
Cell inlet filters	FL- 702	56	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	0	(located in grout facility)
Zone 1 exhaust fans	K- 703	3		2.4 M L x 2.2 M W x 3.2 M H	C.S	130	0	0	0	0	(located in centralized facility
Zone 1 primary filter housings	FH- 704	28	52 m^3/s (each)	1.6 M L x 1.8 M W x 1.9 M H	C.S	0	0	0	0	0	100% standby (located in centralized facility)
Zone 1 secondary filters housings	FH- 705	28	52 m^3/s (each)	1.6 M L x 1.8 M W x 1.9 M H	C.S	0	0	0	0	0	100% standby (located in centralized facility)

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Zone 1 primary filters	FL- 706	112	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	0	100% standby (located in centralized facility)
Zone 1 secondary filters	FL- 707	112	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	0	100% standby (located in centralized facility)
Zone 1 exhaust fans	K- 708	2	2 m^3/s (each)	0.9 M L x 1.8 M W x 1.9 M H	C.S	36	0	0	0	0	1 run 1 standby (located in grout facility
Zone 1 primary filter housings	FH- 709	1	2 m^3/s	0.8 M L x 1.8 M W x 1.9 M H	C.S	0	0	0	0	0	100% standby in unit (located in grout facility)
Zone 1 secondary filter housings	FH- 710	1	2 m^3/s	0.8 M L x 1.8 M W x 1.9 M H	C.S	0	0	0	0	0	100% standby in unit (located in grout facility)
Zone 1 primary filters	FL- 711	4	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	0	100% standby (located in grout facility)
Zone 1 secondary filters	FL- 712	4	0.95 m^3/s (each)	0.5 x 0.624	Glass fiber	0	0	0	0	0	100% standby (located in grout facility)
Zone 1 filters manual fan	D- 713	3	26 m^3/s (each)	0.6 M L x 1.5 M W	C.S	0	0	0	0	0	(located in centralized facility)

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Zone 1 filters pneumatic isolation dampers	D- 714	3	26 m^3/s (each)	0.6 M L x 2 M W x 1 M H	C.S	0	0	0	0	0	(located in centralized facility)
Zone 1 manual fan isolation dampers	D- 715	2	2 m^3/s (each)	0.6 M L x 0.5 M W x 0.5 M H	C.S	0	0	0	0	0	(located in grout facility)
Zone 1 filters pneumatic isolation dampers	D- 716	2	2 m^3/s (each)	0.6 M L x 0.5 M W x 0.5 m H	C.S	0	0	0	0	0	(located in grout facility)
Zone 1 filters manual isolation dampers	D- 717	56	3.8 m^3/s (each)	0.3 M L x 1 M W x 0.2 M H	C.S	0	0	0	0	0	(located in centralized facility)
Zone 1 filters manual isolation dampers	D- 718	56	3.8 m^3/s (each)	0.3 M L x 1 M W x 0.2 M H	C.S	0	0	0	0	0	(located in grout facility)
Zone 1 inlet filter isolation dampers	D- 719	28	1.6 m^3/s (each)	0.3 M L x 1 M W x 1 M H	C.S	0	0	0	0	0	(located in grout facility)
inlet louvers	L- 720	1	52 m^3/s	4 M L x 0.15 M W x 4 M H	C.S	0	0	0	0	0	(located in centralized facility)
Total power, cooling load, and heating load in kW:						296	0		0		
total cooling water in lpm:								0			

Table B-3. Low Activity Waste Grout (Salt Grout) Treatment Facility Equipment List for LLW Option B.

Equipment Description	Equipment Id	No. of Items	Capacity/ flow	Physical Size (M dia x M H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments

Notes:

APM	=	ammonium phosphomolybdate
C	=	centrifugal
CL	=	coil
CSA	=	cross sectional area
dia	=	diameter
DTPA	=	diethylene-triamine-penta-acetic acid
F	=	fluidic
H	=	height
hr	=	hour
HF	=	hydrofluoric acid
Hg	=	mercury
ID	=	internal diameter
IX	=	ion-exchange
L	=	length
lpm	=	liters per minute
LLW	=	low-level waste
m^3	=	cubic meter
M	=	meter
NPH	=	normal paraffin hydrocarbon
s	=	sec
O/H	=	overall height
OD	=	organic destruction
ppm	=	parts per million
R	=	revised since last revision
S	=	stirrer
Sr	=	strontium
SREX	=	strontium extraction
SS	=	stainless steel
STD	=	standard
SW	=	sludge wash
TBD	=	to be determined
te/H	=	metric ton/hour
W	=	width

See Jansen, G., 1955, *Equipment Sizing Calcutions for the Extensive Separations Alternatives Engineering Data Package*, WHC-SD-WM-DP-130, Rev. 0, Westinghouse Hanford Company, Richland, Washinton. Table B-3 is based up the following calculation.

Verified Calculation (EIS-017) of LLW Grout Facility Throughput and Equpment Sizes.

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for HLW Option 2.

Equipment Description	Equipment Id	No. of Items	Capacity/Flow	Physical Size (m dia. x m H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Gamma gate (import)	GG-1	1		Basket size clear opening, approx. 1m dia. x 1m H		0	0	0	0	0	BUSS cask docking station
BUSS cask bogie	CC-2	1				0	0	0	0	0	BUSS cask import docking station
Basket stand	ST-3	2				0	0	0	0	0	One each for the outer and inner capsule ending cells
Cooling rack	RK-4	1	7 capsules, .3m centers minute			0	0	0	0	0	
Outer capsule end cutting machine	FX-5	1				0	0	0	0	0	w/capsule tilt
Shielded turnstile (capsule transfer machine)	GG-6	1		1.2m dia. x .2m H		0	0	0	0	0	
Inner capsule nd cutting machine	FX-7	1				0	0	0	0	0	Cuts both ends of the inner capsule
Roll crusher	FX-8	1				0	0	0	0	0	This unit located on the end cutting and press table
Hull and end decontaminati on basket	BB-9	2	7 capsules	.5m dia. x .6m O/H	304L SS	0	0	0	0	0	

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for HLW Option 2.

Equipment Description	Equipment Id	No. of Items	Capacity/Flow	Physical Size (m dia. x m H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Decontamination tank shielded tank cover	GG-10	2		.7m dia. clear opening	304L SS	0	0	0	0	0	
Cs rinse tank shielded tank cover	GG-11	1		.7m dia. clear opening	304L SS	0	0	0	0	0	w/cover and spray rings
Jib hoist (.75 Te capacity)	CN-12	2				0	0	0	0	0	One each for the outer and inner capsule hull ending cells
Capsule shredder	FX-13	1				0	0	0	0	0	Includes basket dumping mechanism and hopper cover
Waste drum export bogie	CC-14	1				0	0	0	0	0	
Buss cask lid/delid machine	CN-15	1				0	0	0	0	0	Lid and delid the BUSS cask
Shielded windows	WN-16	8				0	0	0	0	0	
CCTV cameras and associated equipment	TV-17	2				0	0	0	0	0	One each for the outer and inner capsule ending cells
Waste drum export shield	GG-18	2		1.5m W x 2m O/H		0	0	0	0	0	Waste drum export cell
Doors											gamma gates

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for HLW Option 2.

Equipment Description	Equipment Id	No. of Items	Capacity/Flow	Physical Size (m dia. x m H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Buss cask import shield door	GG-19	1		2.1m W x 2.75m O/H		0	0	0	0	0	
SrF_2 slurry tank	TK-20	1	.75 m^3	.8m dia. x 1.5m O/H	304L SS	0	0	0	0	0	
Cs rinse tank	TK-21	1	.28 m^3	.6m dia. x 1m O/H	304L SS	0	0	0	0	0	
Cs collection tank	TK-22	1	.75 m^3	.8m dia. x 1.5m O/H	304L SS	0	0	0	0	0	
Drain tank	TK-23	1	.75 m^3	.8m dia. x 1.5m O/H	304L SS	0	0	0	0	0	
Decon tank	TK-24	1		.9m dia. x 1.5m O/H	304L SS	0	0	0	0	0	Travels under the outer and inner capsule ending cells on rails
Cl IX Column	IX-25	1		.1m dia. x 1m H	304L SS	0	0	0	0	0	
Pump	P-26	6	TBD		304L SS	0	0	0	0	0	All pumps remote maintainable, 3 each fluidic, 3 each centrifugal
Valves	VL-27	8	50mm dia.		304L SS	0	0	0	0	0	Remote maintainable
Nitric acid tank	TK-28	1	.38 m^3	.7m dia. x 1m H	304L SS	0	0	0	0	0	
Decontamination solution tank	TK-29	1	.38 m^3	.7m dia. x 1m H	304L SS	0	0	0	0	0	

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for HLW Option 2.

Equipment Description	Equipment Id	No. of Items	Capacity/Flow	Physical Size (m dia. x m H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Sodium hydroxide tank	TK-30	1	.38 m^3	.7m dia. x 1 mm^3	304L SS	0	0	0	0	0	
Spare chemical tank	TK-31	1	.38 m^3	.7m dia. x 1m H	304L SS	0	0	0	0	0	
Crane, monorail	CN-32	1	1 Te			0	0	0	0	0	Located in the maintenance cell
Engineered floor plugs	GG-33	12	.3m dia. stepped to .25m dia.			0	0	0	0	0	
Floor/wall Boxes	BX-34	3	6 connections/ box	1m x 1m		0	0	0	0	0	
Jib hoist maint bulges	GG-35	2				0	0	0	0	0	
Vertical shield door bulges	GG-36	1				0	0	0	0	0	6 in. nom. CS plate for shielding, for the BUSS
Shielded personnel Doors	GG-37	4		1m W x 2.2m O/H clear opening		0	0	0	0	0	
Waste drum lid/delid machine	CN-38	1				0	0	0	0	0	Lid and delid the waste drums
SrF_2 press	FX-39	1				0	0	0	0	0	55mm dia. x 1m stroke
Waste drum cask	FL-40	1		Internal dims of .65m dia. x 1.5m H		0	0	0	0	0	Of sufficient size to flask 55 gallon waste drums

Table B-4. Cesium and Strontium Capsule Cut Up Cell Equipment List for HLW Option 2.

Equipment Description	Equipment Id	No. of Items	Capacity/Flow	Physical Size (m dia. x m H)	Material	Power kW	Total Cool Load kW	Total Cool Water lpm	Total Heat Load kW	Sheet No.	Comments
Vertical shield door bulges	GG-41	2				0	0	0	0	0	No bulge above the floor level, these are for the waste drum export area.
Manipulators	CN-42	4				0	0	0	0	0	2 each for the inner and outer ending cells
Total power, cooling load, and heating load in kW.						0	0		0		
Total cooling water in lpm:								0			

Notes:

dia.	=	diameter
H	=	height
Id.	=	identification
in.	=	inch
kW	=	kilowatt
lpm	=	liters per min.
mm^3	=	cubic millimeter
M	=	meter
m^3	=	cubic meters
O/H	=	overall height
TBD	=	to be determined
W	=	width

APPENDIX C

PROCESS FLOW DIAGRAMS

This page intentionally left blank.

APPENDIX C

PROCESS FLOW DIAGRAMS

This appendix includes the following process flow diagrams.

Figure C-1. Extensive Separations Pretreatment and High-Level Waste Treatment Process Flow Diagram.

Figure C-2. Low-Level Waste Vitrification Process Flow Diagram.

Figure C-3. Low-Level Waste Grout Process Flow Diagram.

Figures C-1 through C-4 provide process flow diagrams for the extensive separations pretreatment and high-level waste vitrification treatment process, low-level waste vitrification treatment process, low-level waste grout treatment process, and cesium and strontium capsule pretreatment, disassembly, and metathesis process, respectively. The flowsheet material balances for Figures C-1 through C-3 are in Appendix A; Appendix D provides unit process descriptions. The resulting cesium/strontium capsule process stream (Figure C-4) is represented by a $CsNO_3$ and SrF_2 stream added to the high-level waste melter feed stream in the main flowsheet for the extensive separations pretreatment and high-level waste vitrification treatment process.

This page intentionally left blank.