PNNL-11206
UC-510

Hanford's Remote-Handled Transuranic and Transuranic Mixed Waste Volume Assessment: March 1996

K. J. Templeton
T. J. DeForest
K. L. Hladek

March 1996

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
by Battelle

Battelle

PNNL-11206

DISCLAIMER

PACIFIC NORTHWEST NATIONAL LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161

PNNL-11206
UC-510

Hanford's Remote-Handled Transuranic and Transuranic Mixed Waste Volume Assessment: March 1996

K. J. Templeton
T. J. DeForest
K. L. Hladek[a]

March 1996

Prepared for
the U.S. Department of Energy
and Westinghouse Hanford Company
under Contract DE-AC06-76RLO 1830

Pacific Northwest National Laboratory
Richland, Washington 99352

(a) Westinghouse Hanford Company

Executive Summary

The results of this study conducted in February and March of 1996 for the Waste Isolation Pilot Plant (WIPP) indicate the following Hanford remote-handled transuranic and transuranic mixed waste forecast volumes for the period ending in FY 2070:

Program	RH_TRU Waste Volume (m^3)	RH_TRUM Waste Volume (m^3)	Total[a]
Tank Waste Remediation System (TWRS)	920	1,770	2,690
Environmental Restoration (EM-40)	360	0	360
Pacific Northwest National Laboratory (PNNL)	175	175	350
Spent Nuclear Fuel	40	0	40
Solid Waste	0	30	30
Total	1,495	1,975	3,470

(a) The total includes forecast waste only and does not include inventory or after-processing (projected) volumes.

Of this 3,470 m^3 of remote-handled transuranic and transuranic mixed (RH_TRU[M]) forecast waste, the Environmental Restoration program is the only program generating waste (360 m^3) after the closure of the WIPP in FY 2033.

Previous forecast assessments have estimated Hanford's RH_TRU(M) waste volumes to range from 4,000 m^3 to 45,000 m^3. In FY 1995, the RH_TRU(M) waste forecast was approximately 22,200 m^3 (BIR, Rev. 2), which exceeds the WIPP remote-handled capacity. The *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary* (WHC-EP-0900) published in February 1996 stated that the baseline RH_TRU(M) waste volume was 13,350 m^3.

The primary reason for the three different estimates results from two programmatic baseline revisions: Tank Waste Remediation Systems (TWRS) and Environmental Restoration (EM-40). The difference in the TWRS programmatic baseline is due to a revised programmatic baseline for the disposition of the long-length equipment currently present in the tanks.

The difference in the Environmental Restoration programmatic baseline is due to an assessment based on recent experience that many of the facilities at Hanford will not contain RH_TRU(M) waste during decontamination and decommissioning and that for many other facilities, the RH_TRU(M) waste volumes will not be as great as previously estimated.

This study documents the results of an assessment of each Hanford program's potential RH_TRU(M) waste forecast volumes. The volumes provided in this document represent a basis for an update to the *Transuranic Waste Baseline Inventory Report, Rev.2* (1995) and the *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary* (WHC-EP-0900) published in February 1996.

Contents

Figures

Tables

Acronyms and Abbreviations

BEMR	Baseline Environmental Management Report
BIR	Baseline Inventory Report
D&D	decontamination and decommissioning
HLVP	High-Level (waste) Vitrification Plant (or Project)
HLW	high-level waste
LLVP	Low-Level (waste) Vitrification Plant
PNNL	Pacific Northwest National Laboratory
PUREX	Plutonium/Uranium Extraction (process)
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RH	remote-handled
SNF	Spent Nuclear Fuel
TPA	Tri-Party Agreement
TRU	transuranic (waste)
TRUM	transuranic mixed waste
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant

1.0 Introduction

This document, prepared by Pacific Northwest National Laboratory (PNNL) under the direction of Westinghouse Hanford Company (WHC), provides the current Hanford baseline of remote-handled transuranic and transuranic mixed (RH_TRU(M)) waste forecasted for eventual shipment to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico, through FY 2070. The major site-wide assumptions and uncertainties are also described for each program that expects to generate RH_TRU(M) waste. For the purposes of this document, only forecast volumes as generated are presented; that is, no inventory or after-processing (projections) are included.

For the past several years, Hanford's remote-handled transuranic and transuranic mixed RH_TRU(M) waste forecast assessments have ranged between 4,000 m^3 and 45,000 m^3. In FY 1995, the RH_TRU(M) waste forecast was approximately 22,200 m^3 (DOE 1995), which exceeds the WIPP remote-handled capacity. Since the current path forward for the Department of Energy's (DOE) RH_TRU(M) waste is final disposal at the WIPP, this study was initiated to report the most accurate and current baseline for the Hanford Site as of March 1996. It should be noted that the baseline plans and assumptions are continually being revised; therefore, this baseline volume forecast is subject to change as time proceeds.

In order to completely assess the amount and type of RH_TRU(M) waste that will be generated by the Hanford Site under current programmatic baselines, a systematic approach was adopted. This approach consisted of a complete review of the current baseline collected in late FY 1995 through the Baseline Environmental Management Report (BEMR) and the WHC Solid Waste Forecast Request. As a result of the review, major generators of RH_TRU(M) waste were identified for follow-up interviews. The interviews consisted of a discussion of current programmatic assumptions, uncertainties, and Site-wide planning issues. As a result of these interviews, some of the RH_TRU(M) waste forecasts supplied in BEMR and the WHC Solid Waste Forecast Request were revised to more accurately reflect the current baseline.

1.1 Key Assumptions and Definitions

The assumptions used for this report are critical in understanding the origination of the waste volumes and applying the volumes in waste management planning activities. These assumptions are outlined in the following:

- Only forecasted RH_TRU(M) waste volumes are reported (i.e., no inventory or after-processing [projected] waste volumes). Current RH_TRU(M) waste inventory is 203 m^3.
- The reported volumes reflect external container volumes, not the actual waste content. Transportation cask or shielding volumes are not included.
- Offsite waste is excluded from the waste volumes reported for Hanford. Battelle Columbus is the only offsite waste generator expected to ship RH_TRU(M) waste to Hanford prior to final disposition at the WIPP. However, this waste, which totals 80 m^3, is directly reported by Battelle Columbus to the WIPP.
- Total life-cycle waste volumes are a summation of the FY 1996 through FY 2070 annual forecasts; however, RH_TRU(M) waste is not expected to be generated after FY 2046.

- The waste volumes reflect Hanford's baseline as of March 1996. As programmatic baselines are better defined, the baseline will be revised through change control to allow traceability.

To understand and apply the waste volumes in this report, it is also essential that the following definitions are understood:

- **Forecasted waste volumes**
  Waste volumes that reflect the quantity of waste that will be generated by the Hanford Site prior to processing.

- **FY-1995 Solid Waste Forecast Request**
  A request is issued annually by the WHC Solid Waste Program. The request is submitted to approximately 70 waste generators that make up the various programs. The request asks for annual volumes, container types, physical waste forms, hazardous constituents, and radionuclide concentrations for future generated waste that will be managed by the Solid Waste program. The FY-1995 data request was issued in May 1995, and data was received by the waste generators by July 1995. See Appendix E for a copy of the forecast request.

- **Held waste**
  Held waste is existing generated waste at the generator location that does not have a shipping schedule or path forward.

- **Inventory**
  Existing waste managed by Hanford's Solid Waste Program as TRU(M) waste.

- **Program**
  The term program refers to the major program areas defined in each Hanford Site Multi-Year Program Plan. Each program has responsibility for various facilities and/or projects. The waste generating programs are 1) Tank Waste Remediation System (TWRS), 2) Transition Facilities (EM-60), 3) Liquid Effluent, 4) Pacific Northwest National Laboratory (PNNL), 5) Environmental Restoration (EM-40), 6) Analytical Services, 7) RCRA Monitoring, 8) Spent Nuclear Fuels, and 9) Solid Waste.

- **Projected waste volumes**
  Waste volumes that reflect the quantity of waste that will exist *after processing.*

- **Remote-handled transuranic waste (RH_TRU)**
  This waste has a dose rate greater than 200 mrem/h at contact with the waste container. At the time of assay, this waste contains more than 100 nCi/g of alpha-emitting isotopes with atomic numbers greater than 92 and half-lives greater than 20 years.

- **Remote-handled transuranic mixed waste (RH_TRUM)**
  TRUM waste is TRU waste that is also dangerous (hazardous) waste as defined in WAC 173-303.

- **Remote-handled transuranic and transuranic mixed waste (RH_TRU(M))**
  Short-hand description of both RH_TRU and RH_TRUM waste. For the purposes of this document, RH_TRU(M) waste will be used to encompass both types of waste.

- **Uncertainty range**
  The uncertainty range indicates the program's minimum and maximum volume fluctuations from the baseline. This range was collected in the FY-1995 Solid Waste Forecast Request.

1.2 Hanford's RH_TRU(M) Waste Baseline

The FY-1996 Hanford baseline as of March 15, 1996, estimates future-generated RH_TRU(M) waste to be approximately 3,470 m^3, a reduction of 18,730 m^3 from the FY-1995 baseline reported in the Baseline Inventory Report, Rev.2 (DOE 1995). This baseline is the waste quantity prior to processing and does not include inventory waste or offsite waste. Table 1.1 lists Hanford's RH_TRU(M) waste generators.

Table 1.1. FY-1996 Major RH_TRU(M) Waste Generators at the Hanford Site (3/15/96)

Program	Waste Generator	Life-Cycle Total $m^{3(a)}$
Tank Waste Remediation System (TWRS)	Single-Shell Tank, Long-Length Equipment	480
	High-Level Vitrification Project	1,960
	Double-Shell Tank Retrieval	250
Environmental Restoration (EM-40)	Surplus Facilities	360
Pacific Northwest National Laboratory	Pacific Northwest National Laboratory	350
Spent Nuclear Fuel	K Basins	40
Solid Waste	T Plant	30
TOTAL		3,470

(a) Life-cycle total includes forecasted waste from FY 1996 through FY 2070.

1.3 Comparison with FY-1995 Baseline

Two major programmatic baselines were revised from the FY-1995 baseline reported in the *Transuranic Waste Baseline Inventory Report, Rev.2* (DOE 1995) and the FY-1996 baseline reported in the *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary* (WHC-EP-0900) (Valero et al. 1996): Tank Waste Remediation Systems (TWRS) and Environmental Restoration (EM-40). Table 1.2 displays the FY-1995 and FY-1996 baselines.

Table 1.2. FY-1995 and FY-1996 RH_TRU(M) Waste Baseline Differences

Program	FY-1995 Baseline Volume (m^3)[a]	FY-1996 Baseline Volume (m^3)	Difference (m^3)
TWRS	12,490	2,690	9,800
Environmental Restoration	9,290	360	8,930
Other	420	420	0
Total	22,200	3,470	18,730

(a) The FY-1995 baseline is reported in the Baseline Inventory Report, Rev. 2 (DOE 1995).

The difference in the TWRS programmatic baseline is due to *a revised programmatic baseline for the disposition of the long-length equipment currently present in the tanks.* The revised baseline for the retrieval of the long-length equipment no longer includes complete removal of all equipment; in fact, the new programmatic assumption is that only that long-length equipment retrieved prior to 2003 will be managed by the Solid Waste program prior to disposal at the WIPP. This revision is based on the assumption that the long-length equipment will be disposed onsite in a manner similar to that used for the underground tanks. Decontamination is expected to occur so that most of the equipment is not considered transuranic waste. See Appendix B for a copy of the signed TWRS Decision Memorandum.

The difference in the Environmental Restoration programmatic baseline is due to *1) an assessment that many of the facilities at Hanford will not contain RH_TRU(M) waste during decontamination and decommissioning* (e.g., N Reactor, T Plant, 340 Facility) or *2) the RH_TRU(M) waste from several facilities will not be retrieved for waste disposal at WIPP (e.g, PUREX, PUREX tunnels, PFP, 327 Building).*

1.4 Organization of the Report

The remainder of the report describes the baseline for RH_TRU(M) waste generation for each program that generates RH_TRU(M) waste. The physical waste forms, hazardous constituents, and radionuclides are also discussed if applicable or available. Lastly, the major assumptions, uncertainties, and programmatic/technical contacts are provided for each program. Section 8.0 provides a discussion of programs that will not be generating RH_TRU(M) waste. The contents of the appendixes are listed below.

- Appendix A lists potential baseline alternatives for specific programs.
- Appendix B provides a copy of the signed TWRS Decision of Memorandum.
- Appendix C lists annual volumes by waste generator.
- Appendix D lists the last ten years of IDB/BIR input for RH_TRU(M) waste.
- Appendix E provides a copy of the FY-1995 Solid Waste Forecast Request (no data).

2.0 Issues and Uncertainties

The following section summarizes major issues and uncertainties for each Hanford program that will generate RH_TRU(M) waste. Detailed information pertaining to each program is described in the following sections; however, this section provides a broad overview of issues and uncertainties that should be understood by WIPP facility planners.

2.1 Tank Waste Remediation System (TWRS)

The TWRS program has several issues that should be clearly understood:

- TWRS' RH_TRU(M) waste forecast is approximately 2,690 m^3, a reduction of 9,800 m^3 from the volume previously forecasted in the *Transuranic Waste Baseline Inventory Report, Rev.2* (DOE 1995) and the *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary* (WHC-EP-0900) (Valero et al. 1996).

- The revised RH_TRU(M) waste forecast is based on a programmatic assumption that the long-length equipment will be disposed onsite, in a manner similar to that used for the underground tanks, after 2003. Decontamination is assumed to occur such that the long-length equipment is not considered transuranic waste.

- The current forecast estimate does not include potential waste from the decontamination and decommissioning (D&D) of the tank farms or the processing facilities; the disposition of the Cs/Sr capsules; the potential scenario of segregating the TRU and high-level waste (HLW) streams for vitrification; or failed melters from the High-Level Waste Vitrification Plant (HLVP). Potential waste volumes and categories are unknown at this time with the exception of the vitrified TRU waste stream (see Appendix A for details).

2.2 Environmental Restoration (EM-40)

The Environmental Restoration program has several issues that are listed below:

- Environmental Restoration's RH_TRU waste forecast is approximately 360 m^3 from FY 2045 through FY 2046. This waste results from retrieval of the 618 burial grounds and has not been characterized by the program since it will be handled late in Hanford's life cycle.

- The shipment schedule for the RH_TRU waste occurs in FY 2045 and FY 2046, which is after the closure of the WIPP in FY 2033.

- Environmental Restoration has assumed that the RH_TRU(M) waste that currently exists in some Hanford facilities will not be shipped to the WIPP. These RH_TRU(M) waste volumes are not in the FY-1996 baseline.

2.3 Pacific Northwest National Laboratory (PNNL)

PNNL's major issues are listed in the following:

- PNNL's RH_TRU(M) waste forecast is approximately 350 m^3 from FY 1996 through FY 2030. This quantity does not include any "held" waste at PNNL (see Section 5.2 for explanation).

- PNNL's RH_TRU(M) waste forecasts are very uncertain due to the unpredictable nature of research and development (R&D) activities. The uncertainty range provided for RH_TRU(M) waste in recent forecast submittals was quite broad: the FY-1995 Solid Waste Forecast Request was as low as 50% (175 m^3) and as high as 200% (700 m^3), and forecast estimates that were collected in the FY-1994 Solid Waste Forecast indicated that a total of 93 m^3 of RH_TRU(M) waste would be generated from FY 1995 through FY 2009 with an uncertainty range from 0 m^3 to 98 m^3.

- Based on discussions with the program and technical contacts, an option for the RH_TRU(M) "held" waste is to transfer this waste to the PUREX tunnels. This option will only be considered if the PUREX tunnels remain open for the next 18 months; however, if the tunnels are closed prior to that time, the RH_TRU(M) waste baseline will increase for PNNL.

2.4 Spent Nuclear Fuel (SNF)

The Spent Nuclear Fuel has the following issues that should be noted:

- SNF's RH_TRU waste forecast is approximately 40 m^3 in FY 1997 only. This quantity does not include any waste generated during sludge and fuel removal (see Section 6.2 and Appendix A for explanation).

- Sludge in the bottom of the K-Basins is the only significant RH_TRU(M) waste identified currently. The current path forward for the sludge is disposition in a double-shell tank (DST) within TWRS; however, an alternative is grouting the sludge for eventual disposal at WIPP (see Appendix A for potential impacts).

2.5 Solid Waste Program

The Solid Waste program had several issues that are listed below:

- The Solid Waste program currently forecasts approximately 30 m^3 of RH_TRUM waste; however, this baseline does not include any secondary waste generated while completing the M-33 milestone (see Section 7.2 for description of M-33). Estimates are not available for this waste since the technology and facilities have not been selected.

- T Plant has a high degree of uncertainty regarding its RH_TRUM waste forecast. The minimum forecast estimate is 0 m^3 to account for the possibility that the waste does not meet transuranic criteria. The maximum forecast estimate of 60 m^3 (200%) accounts for the worst case scenario.

3.0 Tank Waste Remediation System (TWRS)

Programmatic Contact: Jim Honeyman [a]
Technical Contacts: Fred Sargent and George Reddick

This section provides RH_TRU(M) waste volumes that are expected to be generated by the Tank Waste Remediation System (TWRS) program.The TWRS' program mission is to store, treat, and immobilize highly radioactive Hanford waste in an environmentally sound, safe, and cost-effective manner. The four primary activities identified for TWRS are manage tank waste, retrieve tank waste, process tank waste, and dispose of waste. Potential solid waste resulting from these activities has been forecasted with the exception of waste generated during the disposition of the Cs/Sr capsules. In addition, potential solid waste resulting from the D&D of the tank farms and the processing facilities has not been forecasted.

3.1 Tank Waste Remediation System's RH_TRU(M) Waste Volumes

Approximately 2,690 m^3 of RH_TRU(M) waste is forecast to be generated by the TWRS program and sent to WHC Solid Waste program for storage and any necessary treatment prior to shipment to the WIPP. Of this waste, 66% (1,770 m^3) is RH_TRUM waste, and 34% (920 m^3) is RH_TRU waste. Table 3.1 lists the TWRS facilities and/or projects that will generate RH_TRU(M) waste. Figure 3.1 displays the shipment schedule for the TWRS' RH_TRU(M) waste. A shipment schedule was not provided for single-shell tank (SST) Long-Length Equipment; however, the start date of FY 2000 was provided in the FY-1995 Solid Waste Forecast Request and assumed to still be applicable. The end date of FY 2003 was provided during the assessment with the technical contacts. It was assumed that waste shipments would be equal throughout this time period.

Table 3.1. TWRS FY-1995 and FY-1996 RH_TRU(M) Waste Volume Baseline

Facility/Project	FY-1995 Baseline Volume (m^3)	FY-1996 Baseline Volume (m^3)	Revised FY-1996 Baseline
SST Long-Length Equipment	10,280	480	Onsite disposal of equipment
High-Level Waste Vitrification Plant	1,960	1,960	NA
DST Retrieval	250	250	NA
TOTAL	12,490	2,690	

(a) Volumes contained in this section have been verified and the original signed by Jim Honeyman.

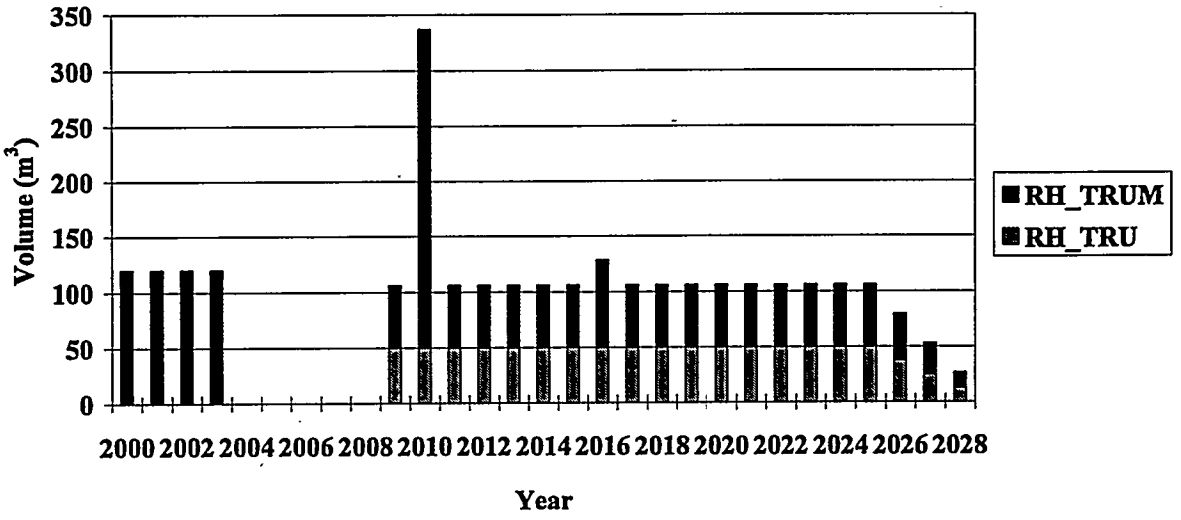


Figure 3.1. TWRS Program Annual RH_TRU(M) Waste Volumes (m^3)

The new baseline of 2,690 m^3 of RH_TRU(M) is reduced from the 9,800 m^3 previously forecasted in the FY-1995 Baseline Inventory Report of September 1995 (DOE 1995) and the *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary* (WHC-EP-0900) of February 1996 (Valero et al. 1996). The difference in the TWRS programmatic baseline is due to *a revised programmatic baseline for the disposition of the long-length equipment currently present in the tanks.* The revised baseline for retrieval of the long-length equipment no longer includes complete removal of all equipment; in fact, the new programmatic assumption is that only that long-length equipment retrieved prior to 2003 will be managed by the Solid Waste program prior to disposal at the WIPP. This revision is based on the assumption that the long-length equipment will be disposed onsite in a manner similar to that used for the underground tanks. Decontamination is expected to occur so that most of the equipment is not considered transuranic waste.

Table 3.1 provides the FY-1995 and revised FY-1996 baseline of RH_TRU(M) waste generation by TWRS facility/project. As noted in the table, only the estimate for SST long-length equipment has changed due to the assessment that was performed in March 1996.

3.1.1 RH_TRU(M) Waste Volumes by Radionuclide

Radionuclide concentrations were provided in the 1995 Solid Waste Forecast Request issued in late FY 1995. Although the volumes have been reduced since the request was issued, it is assumed that the same radionuclide concentrations will be present. Table 3.2 provides the types of radionuclides and the associated concentrations reported. Confidence in the radionuclide data was indicated as high by the technical contact for SST Long-Length Equipment since the estimates were based on sample analysis. However, the confidence in the HLVP and DST Retrieval radionuclides was indicated as low since the HLVP is not yet operational and sample analysis has not been adequate for the DSTs.

Table 3.2. FY-1995 Solid Waste Forecast RH_TRU(M) Waste Radionuclide Concentration

Waste Generator	Waste Class	Radionuclide	Concentration (Ci/m^3)
DST Retrieval	RH_TRUM	^{238,239,240,241}Pu	$1.00E^{+0}$
High-Level Waste Vitrification Project	RH_TRU	^{238,239,240,241}Pu	$1.00E^{+0}$
	RH_TRUM	^{238,239,240,241}Pu	$1.00E^{+0}$
SST Long-Length Equipment	RH_TRUM	^{241,243}Am	$4.26E^{-8}$
		^{137}Cs	$2.57E^{-2}$
		^{237}Np	$1.00E^{-10}$
		^{238,239,240,241}Pu	$8.05E^{-8}$
		^{90}Sr	$2.48E^{-2}$

3.1.2 RH_TRU Waste Volumes by Physical Waste Form

Physical waste form information was also provided in the 1995 Solid Waste Forecast Request issued in late FY 1995. It is assumed that the physical waste forms will be the same despite the volume reduction for SST Long-Length Equipment. Table 3.3 provides the types of physical waste forms that are expected from the TWRS facilities/projects. Confidence in the physical waste form data was indicated as high by the technical contact for SST Long-Length Equipment since the estimates were based on available characterization information; however, confidence for the other two generators was indicated as low since the HLVP does not currently exist and proper characterization analysis has not been performed for the DST waste.

Table 3.3. FY-1995 Solid Waste Forecast RH_TRU(M) Waste Volumes (m^3) by Physical Waste Form

Waste Generator	Physical Waste Form	RH_TRU	RH_TRUM	Total
SST Long-Length Equipment	Metal Debris	0	480	480
High-Level Waste Vitrification Project	Metal Debris	369	415	784
	Plastic/Rubber Debris	111	125	235
	Inorganic Non-Metal Debris	92	104	196
	Heterogeneous Debris	92	104	196
	Steel Shielding	92	104	196
	Lead Shielding	92	104	196
	Organic Debris	74	83	157
DST Retrieval	Void Space	0	215	215
	Metal Debris	0	25	25
	Organic Absorbed Liquid/Sludge	0	13	13
Total[a]		920	1,770	2,690

(a) Totals may not match individual values due to rounding.

3.1.3 RH_TRUM Waste Volumes by Hazardous Constituent

Hazardous constituent data were provided in the FY-1995 Solid Waste Forecast Request prior to the revision in late March 1996. However, it has been assumed that the same hazardous constituents and distribution will be present. Table 3.4 provides the hazardous constituents for mixed waste from SST Long-Length Equipment, DST Retrieval, and all but 920 m^3 of the HLVP's RH_TRU(M) waste, which is RH_TRU.

Table 3.4. FY-1995 Solid Waste Forecast RH_TRUM Waste Volumes (m^3) by Hazardous Waste Constituent

Waste Generator	Hazardous Constituent	Volume (m^3)
SST Long-Length Equipment	Organics	475
	Metals	5
High-Level Vitrification Project	Metals	623
	State Regulated	191
	Ignitables	104
	Corrosives	60
	Reactives	60
DST Retrieval	Organics	253
Total[a]		1,770
(a) Total may not match individual values due to rounding.		

3.2 Tank Waste Remediation System's Assumptions and Uncertainties

TWRS' current forecast baseline assumes that approximately 2,690 m^3 of RH_TRU(M) will be managed by WHC Solid Waste prior to disposal at the WIPP. This estimate does not include potential waste that could result from D&D of the tank farms or the processing facilities (e.g., HLVP, LLVP). Unfortunately, estimates for these volumes are not available and have not been addressed by the TWRS program since D&D will occur late in Hanford's life cycle. The estimate also does not include the potential RH_TRU(M) waste that would result if the HLW and TRU waste streams were not blended for vitrification. Appendix A discusses the volumes that would result if the waste streams remain segregated.

The major assumption that resulted in the reduction of TWRS RH_TRU(M) waste volumes is that long-length equipment will be disposed onsite after FY 2003 in a manner similar to that used for the underground tanks. It was also assessed that only 3% of the total long-length equipment could be considered RH_TRU(M) waste; however, decontamination is assumed to occur so that most of this waste will not be considered transuranic. Previous estimates were based on the assumption that 100% of the long-length equipment would be retrieved, 20% being RH_TRU(M) waste.

The HLVP has assumed a schedule that is driven by the Tri-Party Agreement (TPA) (Ecology 1989) and assumes a 20 MT/day vitrification operation. Failed melters are not included in the forecast estimate for HLVP. DST Retrieval assumes that its waste classes will be the same as DST Retrieval Systems (project W-211),that the mixer pumps will be left in place, and that the schedule will comply with the TPA.

Based on the maximum and minimum range requested in the FY-1995 Solid Waste Forecast Request, the TWRS program SST Long-Length Equipment generator indicated that RH_TRU(M) waste volumes could be as low as 290 m^3 (60%) or as high as 670 m^3 (140%). The HLVP RH_TRU(M) waste volumes indicated a range from 50% (980 m^3) to 200% (3,920 m^3). DST Retrieval provided a minimum and maximum of 50% (125 m^3) and 200% (500 m^3), respectively .

4.0 Environmental Restoration (EM-40)

Programmatic Contact: Jerry McGuire[a]
Technical Contacts: John Lawson and Brad Schilperoort

This section provides RH_TRU(M) waste volumes that are expected to be generated by the Environmental Restoration (EM-40) program. The mission of the Environmental Restoration program is to decontaminate and remediate facilities and the environment to a designated end-use state; end-use states range from unrestricted to controlled access and are generally determined on a case-by-case basis.

4.1 Environmental Restoration RH_TRU(M) Waste Volumes

Approximately 360 m^3 of RH_TRU(M) waste are forecast to be generated by the Environmental Restoration program and sent to WHC Solid Waste program for storage and any necessary treatment prior to shipment to the WIPP. Of this waste, 100% is RH_TRU; no RH_TRUM waste is expected. It is expected that 50% (180 m^3) of the waste will be shipped in FY 2045 and the remainder in FY 2046. It should be noted that the retrieval schedule for this waste occurs after the closure of the WIPP in FY 2033. This waste results from the cleanout of the 618 burial grounds.

The new baseline of 360 m^3 of RH_TRU is a reduction of 8,930 m^3 previously forecasted in the FY-1995 Baseline Inventory Report, Rev.2 (DOE 1995). The reason for the decrease is an assessment that many of the facilities at Hanford will not contain RH_TRU(M) waste during D&D (e.g., N Reactor, T Plant, 340 Facility) or that the waste in these facilities will NOT be retrieved for waste disposal at WIPP (e.g, PUREX, PUREX tunnels, PFP, 327 Building). Table 4.1 lists the facilities that were previously forecasted to contain RH_TRU(M) waste. As shown in the table, the only waste generator of RH_TRU(M) waste in the FY-1996 baseline is Surplus Facilities (e.g., retrieval of the 618 burial grounds).

4.1.1 RH_TRU Waste Volumes by Radionuclide

Radionuclide concentrations were not provided in the FY-1995 Solid Waste Forecast Request since the waste has not been characterized by the Environmental Restoration program. Characterizion of the waste has not proved necessary since the waste is scheduled for shipment so late in Hanford's life cycle (FYs 2045-2046).

4.1.2 RH_TRU Waste Volumes by Physical Waste Form

Physical waste form data was not provided in the FY-1995 Solid Waste Forecast Request for the same reason radionuclide information was not provided.

(a) Volumes in this section have been verified and the original signed by Jerry McGuire.

Table 4.1. Previous Facilities Suspect of Generating RH_TRU(M) Waste During Environmental Restoration Activities in FY 1995

Facility	FY-1995 Baseline (m^3)	FY-1996 Baseline (m^3)	Revised FY-1996 Baseline
D&D of 327 Building	1,020	0	Waste will not be retrieved for disposal
D&D of N Reactor	1,190	0	RH_TRU(M) waste will not be present [a]
D&D of PUREX	150	0	Waste will not be retrieved for disposal
D&D of PUREX tunnels	700	0	Waste will not be retrieved for disposal
Surplus Facilities	620	360	RH_TRU(M) waste will not be present as much as previously estimated [a]
D&D of 340 Facility	20	0	RH_TRU(M) waste will not be present [a]
D&D of T Plant	890	0	RH_TRU(M) waste will not be present [a]
D&D of PFP	4,700	0	Waste will not be retrieved for disposal
TOTAL	9,290	360	

(a) Previously forecasted RH_TRU(M) waste has been reclassified as contact-handled (CH)_TRU(M) waste or RH low-level mixed waste.

Table 4.2. RH_TRU Waste Radionuclide Concentration

Waste Class	Radionuclide	Concentration (Ci/m^3)
RH_TRU	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A
	N/A	N/A

4.2 Environmental Restoration Assumptions and Uncertainties

The current programmatic baseline indicates that only 360 m^3 of RH_TRU waste will be managed by the WHC Solid Waste program prior to disposal at the WIPP. The major assumption for this forecast estimate is that the facilities that currently contain RH_TRU(M) waste will be "cocooned" rather than receive complete D&D to a pristine state. Thus, previously forecasted RH_TRU(M) waste will not be shipped to the WIPP for disposal but will remain in place on the Hanford Site. Another assumption that caused a reduced RH_TRU(M) waste volume forecast resulted from the findings that many facilities will contain CH_TRU(M) waste, not RH_TRU(M) waste.

Several uncertainties are present in the current baseline, particularly with waste characterization data, since the Environmental Restoration program has not specifically addressed the 618 burial grounds. Additional uncertainty is associated with the programmatic assumption to "cocoon" the facilities with RH_TRU(M) waste. Although this is the current baseline, the program may revise estimates according to budget and/or regulatory concerns.

5.0 Pacific Northwest National Laboratory

Programmatic Contact: Gary McNair[a]
Technical Contacts: Bruce Killand and Jack Pierce

This section provides RH_TRU(M) waste volumes that are expected to be generated by Pacific Northwest National Laboratory (PNNL). PNNL is a national research laboratory that conducts research for DOE, other government agencies, and private industry to solve problems of national importance. The majority of PNNL's RH_TRU(M) waste volumes are generated due to research and development activities conducted in the 324, 325, and 327 Buildings.

5.1 PNNL RH_TRU(M) Waste Volumes

Approximately 350 m^3 of RH_TRU(M) waste are forecasted to be generated by PNNL programs and sent to the WHC Solid Waste program for storage and any necessary treatment prior to shipment to the WIPP. Of this waste, 175 m^3 (50%) are predicted to be RH_TRU and the remaining 175 m^3 are predicted to be RH_TRUM. Figure 5.1 displays the annual waste volume of RH_TRU(M) waste from FY 1996 through FY 2030. PNNL does not expect to generate RH_TRU(M) waste after FY 2030. As shown in the figure, the RH_TRU(M) waste is generated at approximately 10 m^3 per year.

5.1.1 RH_TRU(M) Waste Volumes by Radionuclide

Based on a review of the recent RH_TRU(M) waste shipments (first quarter of FY 1996) to WHC Solid Waste and the PUREX tunnels, the radionuclide distributions for the 324, 235, and 327 Buildings

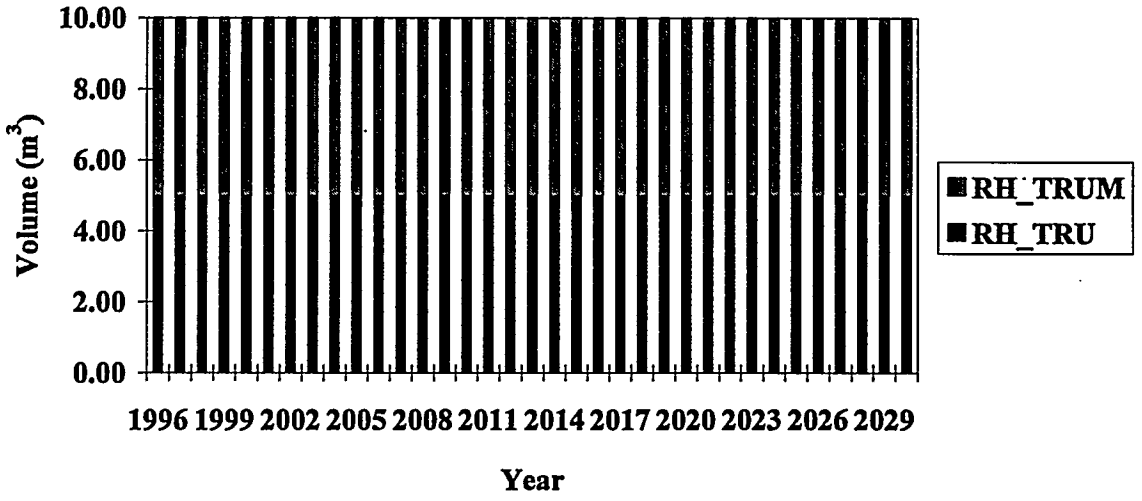


Figure 5.1. PNNL Annual RH_TRU(M) Waste Volumes

(a) Volumes in this section have been verified by and the original signed by Roger Woodruff for Gary McNair.

were assessed. Table 5.1 provides the radionuclide distribution for each building based on interviews with the PNNL technical contacts. It is assumed that the same type and scope of activities will be performed in the future; thus the radionuclide distribution provided in Table 5.1 provides a reasonable basis for the forecast radionuclide distributions. It is estimated that the contact dose rates will range from 200 to 1,000 mrem/hr.

In addition to the current review of the RH_TRU(M) waste shipments, radionuclide concentrations were also provided in the 1995 Solid Waste Forecast Request issued in late FY 1995. Table 5.2 provides the types of radionuclides and the associated concentration reported. The technical contact, B. Killand. indicated a medium confidence level since the radionuclides were based on historical shipments.

Table 5.1. RH_TRU(M) Waste Radionuclide Distribution by PNNL Building

	324 Building	325 Building	327 Building
Primary Combinations	70-92% ^{239}Pu (with ^{238}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu)	89-93% ^{239}Pu (with ^{238}Pu, ^{240}Pu, ^{241} Pu, ^{242}Pu, ^{228}Th, ^{241}Am, ^{242}Am, ^{237}Np, ^{243}Cm, ^{244}Cm)	76% ^{239}Pu (with ^{238}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu
		85% ^{241}Am (with ^{241}Pu)	
		99% ^{241}Am (with ^{244}Cm)	
Secondary Radionuclides	^{243}Cm, ^{241}Am	^{252}Cf, ^{243}Cm	^{241}Am

Table 5.2. FY-1995 Solid Waste Forecast RH_TRU(M) Waste Radionuclide Concentration

Waste Class	Radionuclide	Concentration (Ci/m^3)
RH_TRU	^{90}Sr	4.0E^{-4}
	^{137}Cs	6.0E^{-4}
	^{238}U	4.0E^{0}
	^{238,239,240,241}Pu	1.0E^{0}
RH_TRUM	^{90}Sr	4.0E^{-4}
	^{137}Cs	6.0E^{-4}
	^{238}U	2.0E^{-5}
	^{238,239,240,241}Pu	4.3E^{-3}

5.1.2 RH_TRU(M) Waste Volumes by Physical Waste Form

Physical waste form data were also obtained in the FY-1995 Solid Waste Forecast Request. Table 5.3 provides a description of the physical waste forms expected in PNNL's forecasted RH_TRU(M) waste. The technical contact, B. Killand, indicated a medium level of confidence since the physical waste form data were based on historical shipments.

Table 5.3. FY-1995 Solid Waste Forecast RH_TRU(M) Waste Volumes (m^3) by Physical Waste Form

Physical Waste Form	RH_TRU	RH_TRUM	Total
Lead Shielding	123	44	166
Organic Particulates	0	53	53
Inorganic Particulates	0	53	53
Organic Debris	35	0	35
Steel Shielding	0	26	26
Metal Debris	18	0	18
Total	175	175	350

5.1.3 RH_TRU(M) Waste Volumes by Hazardous Constituent

Hazardous constituent data were also provide for RH_TRUM waste in the FY-1995 Solid Waste Forecast Request. Table 5.4 lists the hazardous constituents that are expected to be present in the RH_TRUM waste that PNNL will generate. The technical contact, B. Killand, indicated a medium level of confidence in the hazardous constituent data since the estimates were based on historical data.

Table 5.4. 1995 Solid Waste Forecast RH_TRUM Waste Volumes (m3) by Hazardous Constituent

Hazardous Constituent	Volume
Reactives, metals with mercury, organics, State regulated	105
Metals without mercury	70
Total	175

5.2 PNNL Assumptions and Uncertainties

PNNL's current forecast baseline assumes that 350 m^3 of RH_TRU(M) waste will be managed by WHC Solid Waste prior to disposal at the WIPP. This baseline does not include any "held" waste, which is existing generated waste that does not have a shipping schedule, or path forward. In past forecast submittals, PNNL has indicated that 5.0 m^3 of RH_TRU(M) waste exists; however, 70 m^3 of

CH_TRU(M) waste was also designated as held waste. The estimate of held waste is currently being revised due to new waste management strategies and it is likely that the held RH_TRU(M) waste volume will increase since this waste is constantly being generated by PNNL researchers.

Based on discussions with the program and technical contacts, some of this "held" waste is now (FY 1996) being transferred to the PUREX tunnels. To date, eight shipments of approximately 2.5 m^3 have been transferred to the tunnels. If this option remains open for an additional 18 months, the remainder of the "held" RH_TRU(M) waste will also be transferred to the tunnels, causing a decrease in forecasted volumes from PNNL. If this scenario is realized, then the held volumes will not be reported by any program since the current baseline for the PUREX tunnels does not include retrieval of the temporary stored waste for eventual shipment to the WIPP. However, if the tunnels close within the next three months, this "held" waste will be included in PNNL's baseline, causing an increase of unknown magnitude since the current held volume is unknown.

Additionally, it is expected that the 324 and 327 Buildings will be transferred from PNNL to the new Site contractor in FY 1997. The baseline forecasted volumes do not reflect this transfer of ownership; however, the waste will still be generated with responsibility shifting to the new contractor. In short, the volumes reported by PNNL may decrease but the new contractor's RH_TRU(M) waste volumes will increase due to the transfer of responsibility.

Based on the maximum and minimum range requested in the FY-1995 Solid Waste Forecast Request, PNNL has a high degree of uncertainty regarding their RH_TRU(M) waste forecasts. This uncertainty is due to the highly unpredictable nature of R&D activities. Therefore, PNNL has indicated a range from 50-200% from the baseline forecast of 350 m^3.

6.0 Spent Nuclear Fuel

Programmatic Contact: Joe Swenson[a]
Technical Contacts: Carol Alderman, Noel Hinojosa, and Darrel Duncan

This section provides RH_TRU(M) waste volumes that are expected to be generated by the Spent Nuclear Fuel (SNF) Program. SNF's mission is to provide safe storage of spent nuclear fuel; remedy unsafe conditions; design, construct, operate, and maintain interim storage facilities until final disposition of SNF is determined; and stage the SNF for final disposition once further direction is received. The current program mission, as defined in the Multi-Year Program Plan (WHC 1995a), addresses the SNF stored at the K Basins only. RH_TRU(M) waste will be generated during the disposition of the spent fuel at K Basins.

6.1 Spent Nuclear Fuel's RH_TRU(M) Waste Volumes

Approximately 40 m^3 (35.7 m^3) of RH_TRU(M) waste is forecast to be generated by the SNF program and sent to WHC Solid Waste program for storage and any necessary treatment prior to shipment to the WIPP. Of this waste, 100% is RH_TRU; no RH_TRUM is forecast as secondary waste. All forecasted RH_TRU waste from SNF is expected in FY 1997 from K Basin operations.

6.1.1 RH_TRU(M) Waste Volumes by Radionuclide

Radionuclide concentrations were provided in the 1995 Solid Waste Forecast Request issued in late FY 1995. Table 6.1 provides the types of radionuclides and the associated concentrations. Confidence in the radionuclide data was indicated as high by the technical contact, N. Hinojosa, since the estimates were based on sample analysis.

Table 6.1. 1995 Solid Waste Forecast RH_TRU Waste Radionuclide Concentration

Waste Class	Radionuclide	Concentration (Ci/m^3)
RH_TRU	^{99}Tc	$1.8E^{-4}$
	$^{238, 239, 240, 241}Pu$	$2.9E^{-1}$
	^{237}Np	$4.6E^{-5}$
	^{238}U	$2.2E^{-3}$
	Am	$1.4E^{-2}$
	^{137}Cs	$1.2E^{0}$
	^{90}Sr	$8.9E^{-1}$

(a) Volumes in this section have been verified and the original document signed by Joe Swenson.

6.1.2 RH_TRU Waste Volumes by Physical Waste Form

Physical waste form information was also provided in the 1995 Solid Waste Forecast Request issued in late FY 1995. Table 6.2 provides the types of physical waste forms that are expected from SNF in FY 1997. The RH_TRU waste results primarily from ion exchange columns and cartridge filters. Confidence in the physical waste form data was indicated as medium by the technical contact, N. Hinojosa, since the estimates were based on past shipments records.

Table 6.2. 1995 Solid Waste Forecast RH_TRU(M) Waste Volumes (m^3) by Physical Waste Form

Physical Waste Form	RH_TRU	RH_TRUM	Total
Organic Particulates	18	0	18
Concrete Shielding	11	0	11
Metal Debris	7	0	7
Total	36	0	36

6.2 Spent Nuclear Fuel's Assumptions and Uncertainties

SNF's current forecast baseline assumes that approximately 40 m^3 (35.7 m^3) of RH_TRU will be managed by WHC Solid Waste prior to disposal at the WIPP. Past forecast estimates from SNF have not included RH_TRU(M) waste: however, revised calculations on cartridge filters and ion exchange modules indicated that some of these wastes are RH_TRU.

This baseline does not reflect any fuel and sludge removal activities that will occur in within the next five years since disposition alternatives, schedule, and funding profiles are currently being negotiated. Analysis of the types of waste streams arising from fuel and sludge removal indicate that the only significant RH_TRU(M) waste generating activity would be sludge removal. The sludge is assumed to be RH_TRU(M) waste and has two potential paths: storage in a DST within the TWRS program or storage within the Solid Waste program after grouting, with eventual shipment to the WIPP. The current programmatic baseline assumes that the sludge will be shipped to TWRS (WHC 1995a). A discussion of the impacts of sending the sludge to the Solid Waste program and eventually the WIPP is included as Appendix A.

Based on the maximum and minimum range requested in the FY-1995 Solid Waste Forecast Request, the SNF program K Basin Operations waste generator indicated that RH_TRU waste volumes could be as low as 30 m^3 (85%) or as high as 43 m^3 (120%).

7.0 Solid Waste Program

Programmatic Contact: Dale McKenney[a]
Technical Contacts: Ken Hladek and Glen Triner

This section provides RH_TRU(M) waste volumes that are expected to be generated by the Solid Waste program. The Solid Waste program's mission is to receive, store, treat, decontaminate, and dispose of solid radioactive and nonradioactive hazardous waste in a safe, cost-effective, and environmentally compliant manner. The only Solid Waste program facility that is expected to generate RH_TRU(M) waste is T Plant.

7.1 Solid Waste's RH_TRU(M) Waste Volumes

Approximately 30 m^3 (28.4 m^3) of RH_TRU(M) waste are forecasted to be generated by the T Plant facility for storage and any necessary treatment prior to shipment to the WIPP. Of this waste, 100% is RH_TRUM; no RH_TRU waste is expected. The RH_TRUM waste will be generated during deactivation of the T Plant Canyon tanks. Figure 7.1 displays the annual waste volume of RH_TRUM waste from FY 1997 through FY 2000. As shown in the figure, the RH_TRUM waste is generated at a rate of approximately 7 m^3 per year.

7.1.1 RH_TRUM Waste Volumes by Radionuclide

Radionuclide concentrations were provided by T Plant in the FY-1995 Solid Waste Forecast Request, and Table 7.1 provides the types of radionuclides and the associated concentration reported. The technical contact, G. Triner, indicated a medium confidence level since the radionuclides were based on the T Plant Waste Characterization Plan (WHC-SD-WM-PLN-059) (WHC 1995b). It was assumed that the radioactive contamination would be evenly distributed throughout the waste.

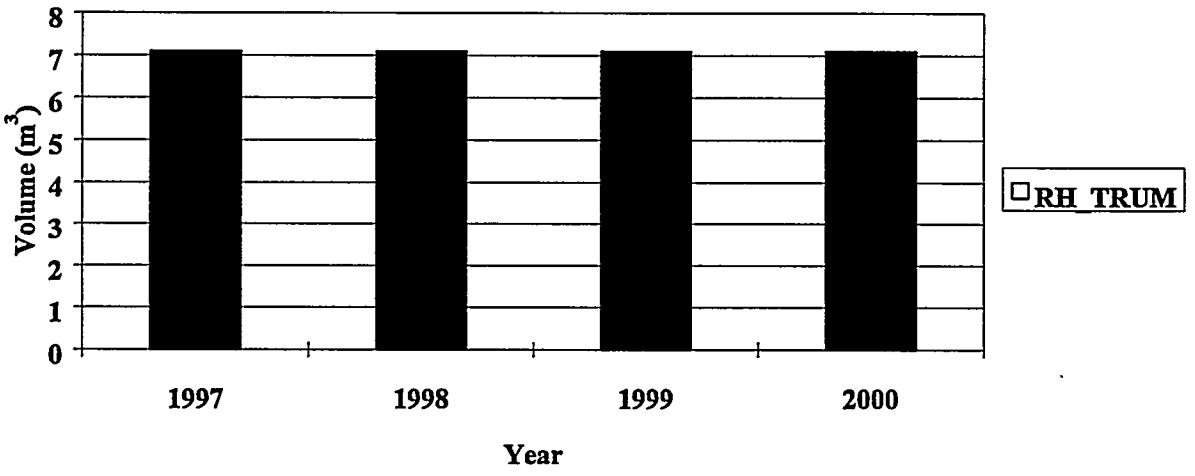


Figure 7.1. Solid Waste's Annual RH_TRUM Waste Volumes

(a) Volumes in this section have been verified by and the original document signed by Dale McKenney.

Table 7.1. FY-1995 Solid Waste Forecast RH_TRUM Waste Radionuclide Concentration

Waste Generator	Waste Class	Radionuclide	Concentration (Ci/m^3)
T Plant	RH_TRUM	^{241,243}Am	1.19E^{-1}
		^{14}C	5.72E^{-5}
		^{137}Cs	6.53E^{-2}
		^{237}Np	2.69E^{-1}
		^{238,239,240,241}Pu	2.57E^{-2}
		^{90}Sr	1.22E^{+1}
		^{99}Tc	1.57E^{-3}

7.1.2 RH_TRUM Waste Volumes by Physical Waste Form

Physical waste form data were also obtained in the FY-1995 Solid Waste Forecast Request. Table 7.2 provides a description of the physical waste forms expected in T Plant's forecasted RH_TRUM waste. The technical contact, G. Triner, indicated a medium level of confidence since the physical waste form data were based on best available knowledge of T Plant waste streams.

Table 7.2. FY-1995 Solid Waste Forecast RH_TRUM Waste Volumes (m^3) by Physical Waste Form

Physical Waste Form	RH_TRU	RH_TRUM	Total
Inorganic Absorbed Liquid/Sludge	0	27	27
Lead Shielding	0	1	1
Total	0	28	28

7.1.3 RH_TRUM Waste Volumes by Hazardous Constituent

Hazardous constituent data were also provided for RH_TRUM waste in the FY-1995 Solid Waste Forecast Request. Table 7.3 lists the hazardous constituents that are expected to be present in the RH_TRUM waste that T Plant will generate. The technical contact, G. Triner, indicated a medium level of confidence in the hazardous constituent data since the estimates were based on best available knowledge of T Plant waste streams.

Table 7.3. FY-1995 Solid Waste Forecast RH_TRUM Waste Volumes (m^3) by Hazardous Constituent

Hazardous Constituent	Volume
Metals without mercury	15
Organics	13
Total	28

7.2 Solid Waste Assumptions and Uncertainties

The Solid Waste program currently forecasts that approximately 30 m^3 of RH_TRUM waste will be stored and treated (if necessary) prior to disposal at the WIPP. This baseline does not include waste brought to T Plant for repackaging or decontamination by other facilities since the respective facilities are responsible for forecasting this waste.

The TPA required DOE to submit a change package that would specify additional milestones for the acquisition of new facilities and modification of existing or planned facilities for storage, processing and/or disposal of solid waste and materials, based on the results of the "Site-Wide Systems Analysis" effort. Included in the waste and material is RH_TRU(M) waste.

The study identified five alternatives to provide the necessary facilities to satisfy the statement of TPA Milestone M-33-00. The facilities for the RH_TRU(M) waste portion of the M-33 scope included capabilities to handle waste items that require unique and special considerations during processing. Selection of the alternative has not been accomplished as of this date, and negotiations for new milestones addressing RH_TRU(M) waste processing are currently in process.

This assessment of future RH_TRU(M) waste volumes does not include secondary waste that would result from processing the RH_TRU(M) waste, regardless of the alternative that is selected.

Based on the maximum and minimum range requested in the FY-1995 Solid Waste Forecast Request, T Plant has a high degree of uncertainty regarding their RH_TRUM waste forecast. The minimum forecast estimate is 0 m^3, to account for the possibility that the waste does not meet transuranic criteria; the maximum forecast estimate of 60 m^3 (200%) accounts for the worst case scenario.

8.0 Non-Participating Programs

This section provides a description of the Hanford programs that are not expected to generate RH_TRU(M) waste. The following programs will be discussed: Facility Transitions, Liquid Effluent, Analytical Services, and RCRA Monitoring.

8.1 Facility Transitions (EM-60)

Programmatic Contact: Ron Borisch[a]
Technical Contact: Greg LeBaron (PUREX) and *Gary Backlund (PFP)*

The Facility Transitions' mission is to manage the deactivation activities of those facilities that are no longer in the operational phase. As stored material and wastes are removed, the facilities will be deactivated and transferred to the Environmental Restoration program (EM-40). Only six facilities are currently within the scope of the Facility Transitions program: the Plutonium Finishing Plant (PFP), PUREX, B Plant, the Fast Flux Test Facility (FFTF), 300 Area Fuel Supply, and the 105-DR Large Sodium Fire Facility.

Forecast data were obtained for the facilities within the Facility Transitions program through the FY-1995 Solid Waste Forecast Request. No RH_TRU(M) waste was forecasted by these generators. Past forecasts indicate that RH_TRU(M) waste has never been forecasted by these six facilities; however, during the February and March 1996 assessment, PUREX and PFP were identified as having existing RH_TRU(M) waste.

PUREX was assessed to have approximately 500 m^3 of RH_TRU(M) existing waste in its A-F cells in the form of metal tank dissolvers; however, the current programmatic plan is to leave this RH_TRU(M) waste in place. The technical contact, G. LeBaron, stated that there are no plans to remove this waste for eventual shipment to the WIPP while the facility is in the deactivation phase. Additional RH_TRU(M) waste exists in the PUREX tunnels that has been assessed at approximately 700 m^3. As is the case with the RH_TRU(M) waste within PUREX, this waste will also be left in place with no plans to transfer it to the WIPP while it is in the deactivation phase. The Environmental Restoration program plans for disposition of the PUREX and PUREX tunnel wastes have not been determined.

The PFP facility was also assessed to have approximately 730 m^3 of RH_TRU(M) waste in some of its gloveboxes and hoods located in the 236-Z Canyon, the McCluskey Room, the 241-Z Room, and the 2736-Z Room. Although this estimate was indicated as high by the technical and programmatic contacts, it serves as an order of magnitude estimate. The programmatic contact, R. Borisch, indicated that this waste will be left in place during PFP's deactivation phase. The Environmental Restoration program plans for disposition of this waste are undetermined.

(a) The volumes in this section have been verified and the original document signed by Ron Borisch.

8.2 Liquid Effluent

Programmatic Contact: Steve Lowe[a]
Technical Contacts: Bill Bachmann (200 ETF) and Roger Szelmeczka (300 TEDF)

The mission of the Liquid Effluent program is to eliminate the use of the soil column for liquid effluent treatment and to manage current and future liquid effluent streams in a safe, responsible, cost-effective, and legally compliant manner. The program generates solid waste during treatment of liquid effluents from the TWRS 242-A Evaporator and from the 300 and 200 Areas. The Liquid Effluent program has three waste generating facilities: 200 Area Effluent Treatment Facility, 300 Area Treated Effluent Disposal Facility, and the Waste Neutralization Facility.

Forecast data were collected for the three facilities within the Liquid Effluent program through the FY-1995 Solid Waste Forecast Request. No RH_TRU(M) waste was forecasted for these facilities. In fact, no TRU(M) waste has ever been forecasted by these facilities, and this is expected to remain the baseline. Only CH_LLMW and CH_LLW are generated during the operational phases of these facilities.

8.3 Analytical Services

Programmatic Contact: Rob Marshall[b]
Technical Contact: Jay Warwick

The mission of the Analytical Services program is to provide analytical field support and process development services to other site programs using onsite and offsite analytical laboratories. Two facilities comprise the Analytical Services program: the 222-S Laboratory and the Waste Sampling and Characterization Facility (WSCF).

The FY-1995 Solid Waste Forecast Request contained forecast data for the Analytical Services program. RH_TRU(M) waste was not forecasted by the two waste generators within this program; however, CH_TRU(M) waste is forecasted by the 222-S Laboratory. Past forecast submittals indicate that 20 m^3 of RH_TRU(M) waste was previously forecasted by 222-S Laboratory; however, this waste was assessed to actually be contact-handled. In short, no RH_TRU(M) waste is expected to be generated by this program.

(a) The volumes reported in this section have been verified and the original document signed by Steve Lowe.

(b) The volumes reported in this section have been verified and the original document signed by Rob Marshall.

8.4 RCRA Monitoring

Programmatic Contact: Rex Thompson[a]
Technical Contact: Scott Myers

The mission of the RCRA Monitoring program is to monitor groundwater for potential contamination and to ensure that radioactive and hazardous materials do not leave the site. Only one waste generator, Well Drilling, is within this program. Well Drilling forecasts that solid waste generated during general operations will be debris, soil from spills, laboratory wastes, and the like.

Forecast data provided in the FY-1995 Solid Waste Forecast Request indicated that no RH_TRU(M) waste would be generated in the future by this program. In fact, only LLW and LLMW are expected from this program. Previous forecast submittals support the assessment that no RH_TRU(M) waste will be generated by the Well Drilling project.

(a) The volumes reported in this section have been verified and the original document signed by Rex Thompson.

9.0 References

Ecology, EPA, and DOE. 1989. *Hanford Federal Facility Agreement and Consent Order.* Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington, as amended.

WHC. 1995a. *Spent Nuclear Fuel Multi-Year Program Plan.* WHC-SP-1104, Westinghouse Hanford Company, Richland, Washington.

WHC. 1995b. *T Plant Characterization Plan.* WHC-SD-WM-PLN-059, Westinghouse Hanford Company, Richland, Washington.

DOE. 1995. *Transuranic Waste Baseline Inventory Report Rev.2.* DOE/CAO-95-1121, U.S. Department of Energy, Carlsbad, New Mexico (Hanford's submittal in 9/95).

Valero, O. J., K. J. Templeton, and T. J. DeForest. 1996. *FY-1996 Solid Waste Integrated Life-Cycle Forecast Volume Summary.* WHC-EP-0900, Westinghouse Hanford Company, Richland, Washington.

Appendix A

Potential RH_TRU(M) Waste

Appendix A

Potential RH_TRU(M) Waste

Alternatives to program baselines are being considered that could result in additional volumes of RH_TRU(M) waste. The wastes resulting from these alternatives have not been included in the estimates for shipment to WIPP because they are currently not part of the baseline strategy of the respective Hanford program. These wastes include potential TRU vitrified tank waste and grouted slurries from the K Basins. This section describes these alternatives and provides estimates for the volumes from each source of waste. Waste characteristic information has also been included where available.

Waste Volumes

Table A.1 shows approximately 9,040 m^3 of RH_TRU(M) waste that could be generated under alternative strategies to program baselines. In addition, several activities are listed for which volume estimates are currently not available. EM-40, TWRS, and Spent Nuclear Fuel could potentially generate large quantities of additional RH_TRU(M) waste. A small amount of additional waste may also be generated by PNNL.

Table A.1. Potential RH_TRU(M) Waste Volumes from Alternatives to Baseline Planning

Program	Facility/Project/Waste Description	Potential Volume (m^3)
EM-40	D&D of PFP	4,700
	D&D of PNNL 327 Building	1,020
	PUREX Tunnels	700
	D&D of PUREX	150
TWRS	Vitrified Tank Waste	1,300
	D&D of Waste Processing Facilities	NA
	D&D of Tank Farms	NA
	Disposition of Cs/Sr Capsules	NA
Spent Nuclear Fuel	K Basin Grouted Slurries[a]	1,170
PNNL	Held Waste	NA
Total		9,040

(a) Drums will be placed in 322-l overpacks, resulting in a total storage volume of 1,580 m^3.

EM-40

Large volumes of RH_TRU(M) volumes were reported in the past for several Hanford Site facilities for which no RH_TRU(M) waste volume is currently forecasted. The current expectation by the EM-40 program is that these facilities either no longer contain RH_TRU(M) waste or this waste will not be retrieved. The EM-60 program, however, has indicated that substantial quantities of TRU waste will remain in PFP, PUREX, the PUREX Tunnels, and PNNL's 327 Building when they are transitioned to EM-40. Therefore, the previously reported estimates for these facilities have been included in Table A.1. Detailed waste characteristics data are not available for these wastes.

TWRS

There are four potential sources of additional RH_TRU(M) waste within the TWRS program: vitrified tank waste, D&D of the waste processing facilities (particularly the High-Level Vitrification Project), D&D of the tank farms themselves, and disposition of the Cs/Sr capsules. Estimates are currently only available for the vitrified tank waste. The current TWRS baseline for potentially TRU tank waste is to blend this waste with non-TRU wastes, resulting in a final waste form with TRU radionuclides below 100 nCi/g. There is a potential, however, that the TRU tank waste will be vitrified and disposed of with greater than 100 nCi/g. Under this option, 1,300 m^3 of RH_TRU(M) waste are expected to be sent to WIPP. The final waste form would be a vitrified glass matrix. Estimates for radionuclide concentrations and hazardous constituents are not currently available.

K Basin Sludge

The baseline option for the slurries in the K Basins is to send them to the tank farms for vitrification with the high-level waste stream. An alternative option is to put the slurries in a form appropriate for solid waste storage and/or disposal (WHC 1996). Packaging the slurry as TRU waste would result in 4,500 208-L drums overpacked in 322-L drums. The overpack is necessary to reduce surface dose rates to less than 100 mRem/hr as required for storage in CWC or TRUSAF.

Characterization of slurry samples has shown differing amounts of fuel fragments, heavy metals, corrosion products from fuel and basin structures, soil particles, silicates from the basin walls, and debris.

Table A.2 lists a composite of the total radionuclides in the 105-K East basin. Little characterization data exist for the K-West basin slurries; but these slurries are expected to have fewer radionuclides than those in the K East basin.

PNNL

PNNL currently has some RH_TRU(M) waste classified as "Held Waste." This held waste is waste for which no decision has been made concerning its final disposition. One potential option for this waste is shipment to WIPP for disposal. Estimates for the volume and characteristics of this waste are not available.

Table A.2. 105-K East Basin Radionuclide Totals

Radionuclide	Activity - decay date 5/1/93 (Ci)	Activity - decay date 1/1/95 (Ci)	Mass - decay date 1/1/95 (kg)	Heat Generation - decay date 5/1/93 (Btu/hr)
^{3}H	Not Available	Not Available	Not Available	Not Available
^{60}Co	$2.86E^{+1}$	$2.30E^{+1}$	$2.3E^{-5}$	$1.21E^{+0}$
^{90}Sr	$1.33E^{+3}$	$1.28E^{+3}$	$9.38E^{-3}$	$5.07E^{+0}$
^{90}Y	$1.33E^{+3}$	$1.28E^{+3}$	$2.35E^{-6}$	$2.42E^{+1}$
^{137}Cs	$1.01E^{+3}$	$9.72E^{+2}$	$1.12E^{-2}$	$3.67E^{+0}$
^{137m}Ba	$9.55E^{+2}$	$9.20E^{+2}$	$1.71E^{-9}$	$1.23E^{+1}$
154Eu	$2.98E^{+1}$	$2.61E^{+1}$	$9.67E^{-5}$	$7.97E^{-1}$
155Eu	$1.70E^{+1}$	$1.35E^{+1}$	$2.9E^{-5}$	$3.35E^{-2}$
^{238}Pu	$6.60E^{+1}$	$6.51E^{+1}$	$3.86E^{-3}$	$7.47E^{+0}$
^{239}Pu	$2.6E^{+2}$	$2.60E^{+2}$	$4.18E^{+0}$	$2.74E^{+1}$
^{240}Pu	$1.43E^{+2}$	$1.43E^{+2}$	$6.28E^{-1}$	$1.52E^{+1}$
^{241}Pu	$5.66E^{+3}$	$5.22E^{+3}$	$5.50E^{-2}$	$5.99E^{-1}$
^{242}Pu	$4.36E^{-2}$	$4.36E^{-2}$	$1.15E^{-2}$	$4.39E^{-3}$
^{241}Am	$7.69E^{+2}$	$7.82E^{+2}$	$2.28E^{-1}$	$8.87E^{+1}$
Total	$1.16E^{+4}$	$1.10E^{+4}$	$5.13E^{+0}$	$1.87E^{+2}$

Reference

WHC. 1996. *Solidified Slurry Technology Assessment.* WHC-SC-SNF-TA-011, prepared by Applied Geotechnical Engineering and Construction Inc. for Westinghouse Hanford Company, Richland, Washington.

Appendix B

Tank Waste Remediation System Decision Memorandum

ATTACHMENT

DECISION MEMORANDUM - REMOTE HANDLED TRANSURANIC (RH-TRU) PROJECTIONS FROM TWRS

TITLE: Hanford Tank Waste Remediation System (TWRS)/Disposal of TWRS Generated Solid Radioactive Waste

ISSUE:

What should be used as the planning basis for forecasting RH-TRU solid waste volumes from TWRS? The volume of RH-TRU solid waste previously forecasted to be sent from Hanford to the Waste Isolation Pilot Plant (WIPP) during the next 30 years exceeds the WIPP legal limit of 7,080 m^3. TWRS alone has forecasted more than 12,000 m^3 of RH-TRU of which 10,000m^3 is long-length equipment removed from Single-Shell Tanks (SST) during waste retrieval.

BACKGROUND:

Every year, a 30-year forecast of solid waste quantities to be shipped from Hanford is provided by the solid waste generators. The RH-TRU in the forecast will eventually be shipped to WIPP. The forecast includes mixed solid (RH-TRU[M]) and non-mixed solid waste. Hanford has in storage 200 m^3 of RH-TRU waste. The latest 30-year forecast (Fiscal Year (FY) 1996 through FY 2025) is 12,782 m^3 (Valero, 1996). The legal limit for RH-TRU waste at WIPP is 7,080 m^3 from all U.S. Department of Energy sites.

The latest Hanford forecast includes both RH-TRU mixed waste (11,662 m^3) and RH-TRU waste (1,120 m^3). The generators of this forecasted waste are:

SST Long-length Equipment(TWRS)	10,277 m^3
High Level Vitrification(TWRS)	1,802
Double-Shell Tanks (DST) Retrieval(TWRS)	253
Other Hanford	450
Total	12,782

The amount of RH-TRU generated during the life cycle of the proposed operations will generate a few more hundred m^3 than the 30-year estimate because operations continue beyond 2025. (Ref. WHC-EP-0900)

Most of the RH-TRU from TWRS is the Long Length Contaminated Equipment removed from the tanks during waste retrieval. The equipment consists of pumps, thermocouple trees, airlift circulators, air lances, specific gravity probes, and other equipment. The previous forecast assumes 20 percent of the equipment removed is classified as RH-TRU. The forecast is based on retrieval of tank waste using a mechanical waste removal method.

In addition to forecasted RH-TRU(M) solid wastes, TWRS is considering disposal of some of the chemical waste as RH-TRU(M) if acceptable for WIPP disposal and significantly cheaper than disposal as High-Level Waste (HLW) (letter from J. E. Kinzer, RL, to A. L. Trego, WHC, 95-TWR-129, dated September 28, 1995).

Classification of the waste in as many as 10 tanks as TRU may be possible. The estimated volume of the vitrified RH-TRU(M) waste for disposal is about 1,300 m^3.

PROPOSED PLANNING POSITION:

The proposed planning position is that the disposal of equipment used by TWRS be disposed on site. All equipment other than TRU contaminated equipment is disposed on site in burial grounds. Some equipment removed from tanks and other TWRS facilities may be TRU. The TRU equipment would be subjected to additional decontamination to become non-TRU waste or disposed in the same manner used for disposal of the TWRS tanks (currently planned as in situ).

SENSITIVITIES:

The current solid waste regulations require that when something is removed from the tanks, it becomes a waste stream (generated) and must be managed as a regulated waste. The closure plan is not agreed to and won't be until 2004.

The Savannah River Site (SRS) plans to minimize the amount of RH-TRU generated by waste storage and waste disposal operations. SRS is currently forecasting less than 100 m^3 of RH-TRU solid waste. SRS will provide decontamination capability as required to minimize or eliminate equipment from being RH-TRU.

The underground waste tanks, after removal of the chemical wastes, are not expected to be dug up and sent off site for disposal. A method of disposing in-tank equipment in situ along with tanks may be acceptable. For in situ disposal, the in-tank equipment is cleaned in a manner similar to the methods used to clean the tank and the equipment is disposed in tanks.

Equipment which has been removed from the tanks and equipment which has not been removed from tanks could be included in the closure plan for the tanks and would require the same approvals required for the tanks. At least one closure alternative will require the removal of equipment from the tanks before filling with aggregate.

Storage of equipment in tanks until tank disposal operations begin reduces the amount of on site storage space required for TRU waste. If closure of the tanks requires tank removal and disposal occurs elsewhere, the disposal of in-tank equipment occurs at the same time and in a similar manner. The amount of waste associated with disposal of the equipment is small compared to the volume of waste generated by disposal of the tanks.

STAKEHOLDER ASSESSMENT:

Stakeholders and regulators are very concerned about what is disposed on site. If in situ disposal is acceptable for tanks (and any equipment left in the tanks), stakeholders and regulators will be involved in determining how clean the tanks and equipment must be.

OPTIONS:

Option 1: Continue the current practice of forecasting a percentage of the equipment removed from tanks as RH-TRU and requiring WIPP disposal. TRU equipment would be packaged and sent to WIPP with no further decontamination. The volume of RH-TRU equipment combined with other Hanford RH-TRU could exceed the legal limit for the volume allocated at WIPP.

Option 2: Propose that TWRS equipment be disposed on site. The TRU equipment would be subjected to additional decontamination to become non-TRU or disposed in the same manner as the underground tanks. With additional decontamination, most of the equipment is expected to be non-TRU. Equipment which has not been removed from tanks would be included in the closure plans for the tanks.

RECOMMENDATION:

Accept Option 2 as a planning base; the amount of RH-TRU equipment generated by waste retrieval operations is expected to be very small. TWRS will need to provide decontamination capabilities for long-length equipment and other equipment removed from tanks and other facilities.

The expected volume of RH-TRU for this option is as given below. This volume is well below the WIPP legal limit of 7080 m^3.

SST Long-length Equipment (TWRS)	500 m^3 (1)
High-Level Vitrification (TWRS)	1,800(2)
DST Retrieval (TWRS)	250
Disposal of TRU tank waste (TWRS)	1,300(3)
Other Hanford	450
Total	4,300

(1) The volume of RH-TRU(M) from long-length equipment through 2003 is estimated to be 480 m^3. Any equipment removed after 2003 will be handled according to the recommended option 2.

(2) This volume is from forecasts prior to the plan to privatize HLW vitrification. Provision of waste minimization incentives should reduce the forecasts for this number.

(3) This waste may or may not be sent to WIPP.

ACTION FOR DOE: Accept the recommendation as the basis for the TWRS technical baseline.

The following signatures indicates concurrence with this memorandum.

D. E. McKenney, Manager
Restoration and Upgrade Programs,
Solid Waste Disposal Division

R. J. Merlin FOR
J. O. Honeyman, Manager
Disposal Programs
Tank Waste Remediation System

D D Wodrich
D. D. Wodrich, Senior Technical Advisor for
the Office of Tank Waste Remediation System

for Mr. J. E. Kinzer, Assistant Manager
of the Office of Tank Waste Remediation System

Section 3.0 reports a life-cycle total of 2,690 m^3 of RH_TRU(M) waste to be generated by the Tank Waste Remediation System (TWRS) Program. All other programs are expected to generate 780 m^3 of RH_TRU(M) waste. These volumes conflict with the volumes reported in the Decision Memorandum issued by E.J. Kosiancic on April 1, 1996 (furthermore referred to as the "white paper"). Table B.1 displays the reason for the difference in RH_TRU(M) volumes reported by the white paper and this document.

Table B.1 White Paper and RH_TRU(M) Report Volume Comparison

Waste Generator	White Paper Volume (m^3)	RH_TRU(M) Report Volume (m^3)	Reason for difference
SST LLE	500	480	NA
HLVP	1,800	1,960	White paper used 30-year; RH report used life-cycle
DST Retrieval	250	250	NA
TRU Vitrified Waste	1,300	0	Not in official baseline; reported in Appendix A under alternatives
Other Hanford	450	780	White paper used 30-year; RH report used life-cycle
Total	4,300	3,470	

Appendix C

Forecasted RH_TRU(M) Solid Waste Volumes (m^3) by Generator

Table C.1 Forecasted RH_TRU(M) Solid Waste Volumes (m^3) by Generator

Waste Generator	Waste Class	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
EM-40	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EM-40 Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PNNL	RH_TRU	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	RH_TRUM	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
PNNL Total		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
DST Retrieval	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DST Retrieval Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HLVP	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HLVP Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K Basin Operations	RH_TRU	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K Basin Operations Total		0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SST Long-Length Equipment	RH_TRUM	0.0	0.0	0.0	0.0	120.0	120.0	120.0	120.0	0.0	0.0	0.0	0.0	0.0
SST Long-Length Equipment Total		0.0	0.0	0.0	0.0	120.0	120.0	120.0	120.0	0.0	0.0	0.0	0.0	0.0
T Plant	RH_TRUM	0.0	7.1	7.1	7.1	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T Plant Total		0.0	7.1	7.1	7.1	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total		10.0	52.8	17.1	17.1	137.1	130.0	130.0	130.0	10.0	10.0	10.0	10.0	10.0

Table C.1 Forecasted RH_TRU(M) Solid Waste Volumes (m^3) by Generator

Waste Generator	Waste Class	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
EM-40	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EM-40 Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PNNL	RH_TRU	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	RH_TRUM	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
PNNL Total		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
DST Retrieval	RH_TRUM	0.0	230.8	0.0	0.0	0.0	0.0	0.0	22.3	0.0	0.0	0.0	0.0	0.0
DST Retrieval Total		0.0	230.8	0.0	0.0	0.0	0.0	0.0	22.3	0.0	0.0	0.0	0.0	0.0
HLVP	RH_TRU	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9	49.9
	RH_TRUM	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1	56.1
HLVP Total		106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0
K Basin Operations	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
K Basin Operations Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SST Long-Length Equipment	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SST Long-Length Equipment Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T Plant	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
T Plant Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total		116.0	346.8	116.0	116.0	116.0	116.0	116.0	138.3	116.0	116.0	116.0	116.0	116.0

Table C.1 Forecasted RH_TRU(M) Solid Waste Volumes (m^3) by Generator

Waste Generator	Waste Class	2022	2023	2024	2025	2026	2027	2028	2029	2030	2045	2046	Total
EM-40	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.0	180.0	360.0
EM-40 Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.0	180.0	360.0
PNNL	RH_TRU	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.0	0.0	175.0
	RH_TRUM	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.0	0.0	175.0
PNNL Total		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0	350.0
DST Retrieval	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	253.1
DST Retrieval Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	253.1
HLVP	RH_TRU	49.9	49.9	49.9	49.9	37.4	25.0	12.5	0.0	0.0	0.0	0.0	923.2
	RH_TRUM	56.1	56.1	56.1	56.1	42.1	28.1	14.0	0.0	0.0	0.0	0.0	1,037.9
HLVP Total		106.0	106.0	106.0	106.0	79.5	53.1	26.5	0.0	0.0	0.0	0.0	1,961.1
K Basin Operations	RH_TRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.7
K Basin Operations Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.7
SST Long-Length Equipment	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	480.0
SST Long-Length Equipment Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	480.0
T Plant	RH_TRUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.4
T Plant Total		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.4
Grand Total		116.0	116.0	116.0	116.0	89.5	63.1	36.5	10.0	10.0	180.0	180.0	3,468.3

Appendix D

Historical Forecasts for Hanford RH_TRU(M) Solid Waste

Table D.1 Historical Forecasts for Hanford RH_TRU(M) Solid Waste

Data Source	Date Published	Volume (m^3)	Comments
IWOP	9/86	1,061	Included HWVP spent melters and fuel hulls from shear leach at PUREX
IDB Rev 3	9/87	810	
IDB Rev 4	9/88	614	
IDB Rev 5	9/89	1,035	
IDB Rev 6	9/90	3,535	SST long-length equipment added
IDB Rev 7	9/91	4,037	
IDB Rev 8	9/92	4,739	WIPP closure extended from 2013 to 2018
IDB Rev 9	10/93	4,905	
IDB Rev 10	12/94	41,282	DST Process tests added, D&D of canyon facilities added
BIR Rev 1	2/95	46,000[1]	WIPP closure extended to 2023
BIR Rev 2	2/96	22,000	DST Process test cancelled

[1]The forecast of 46,000 m^3 is the estimate submitted to WIPP by Hanford, WIPP actually reported 3,000 m^3.

IWOP = Integrated (Transuranic) Work-off Plan
IDB = Integrated Data Base
BIR = Baseline Inventory Report

Appendix E

Solid Waste Information Forecasting Tool

Appendix E

Solid Waste Information Forecasting Tool

For the past six years, a waste volume forecast has been collected annually from onsite and offsite generators that are currently shipping or are planning to ship waste to the Hanford Solid Waste program's Central Waste Complex (CWC). The waste is generated from ongoing operations and maintenance activities, deactivation activities, decontamination and decommissioning (D&D) of facilities, and environmental restoration (ER) activities. The generators provide details about the amount of waste to be generated each year, the containers that will be used to ship the waste, and the specific waste characteristics that help determine the proper treatment, storage, and disposal (TSD) requirements for the waste.

This year's data collection effort included the first-time use of an electronic data collection tool, the Solid Waste Information Forecast Tool (SWIFT), which contains five primary data input screens, one for each of data type collected:

- waste volumes
- container percentages
- physical waste form (PWF) percentages
- hazardous constituent percentages
- radionuclide concentrations

In addition to the above data, each input screen allows generators to specify any "Notes" of clarification they would like to include with their data. Descriptions and examples of the primary input screens are provided below.

Forecasted Solid Waste External Package Volumes

Figure E.1 shows the input screen for collecting waste volumes. Volumes are collected by waste generator and waste class. The key information collected by this screen includes

- waste class
- external package volumes in cubic meters
- annual volumes (previously for 30 years but is being expanded to a life-cycle basis)
- minimum and maximum percent ranges
- Held waste volumes (waste for which a schedule cannot be estimated).

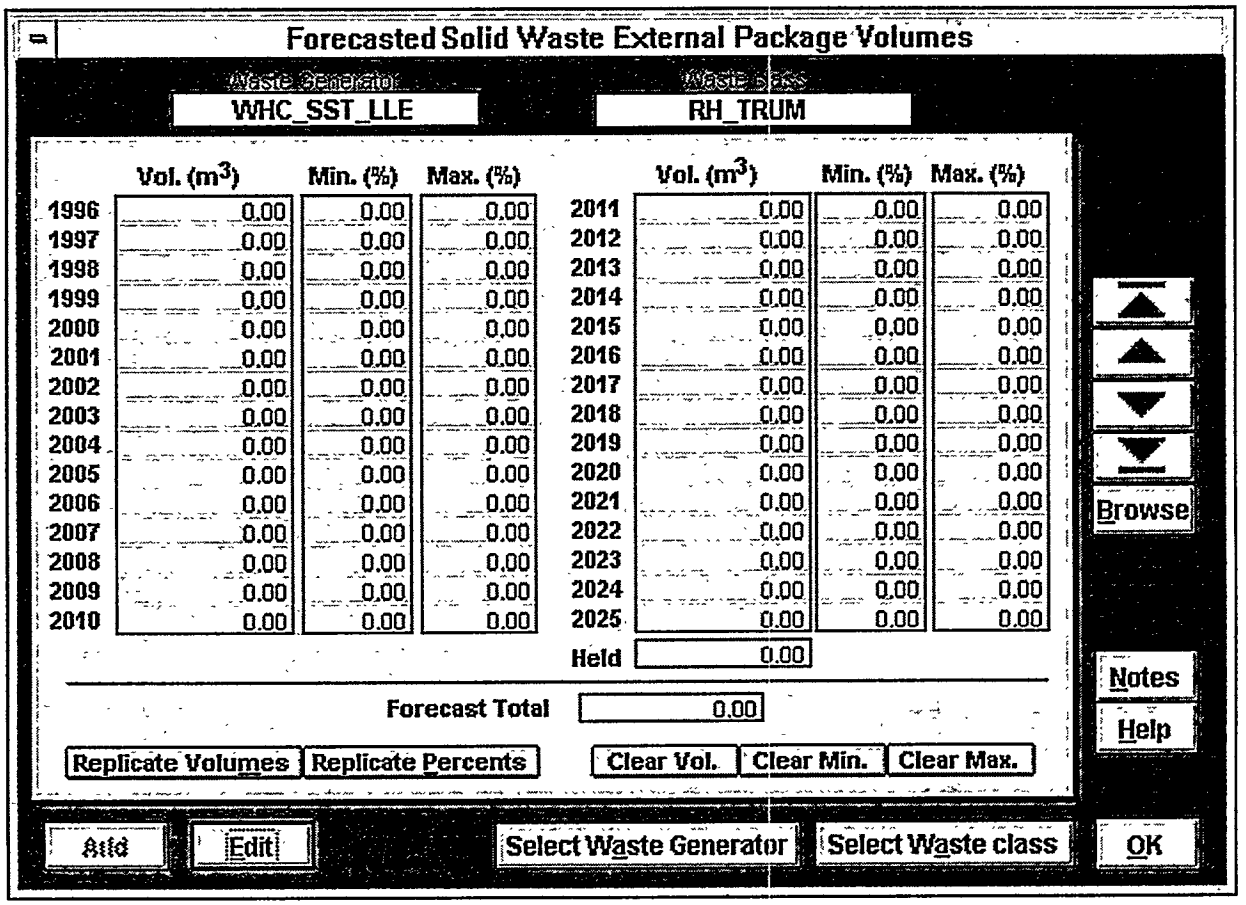
Container Percentages

Figure E.2 displays SWIFT's container percentage screen. This screen allows generators to describe the types of containers they plan to ship waste and the percent of the total volume expected in each container. Data requested by this screen include

- volume percent of waste expected for both commonly used containers and non-standard containers
- applicable years for which the current data apply
- descriptions of non-standard containers.

Percentages are required for each forecasted waste class.

Figure E.1. SWIFT Waste Volume Screen



Physical Waste Form Data

Figure E.3 shows the physical waste form percentage screen. This screen captures the volume percent of each waste form by container type. The requested waste forms were derived from the treatability group matrix developed by DOE-HQ. The selection criterion for these waste forms was based on the needs of future treatment facilities at the Hanford Site. Key data collected by this screen include:

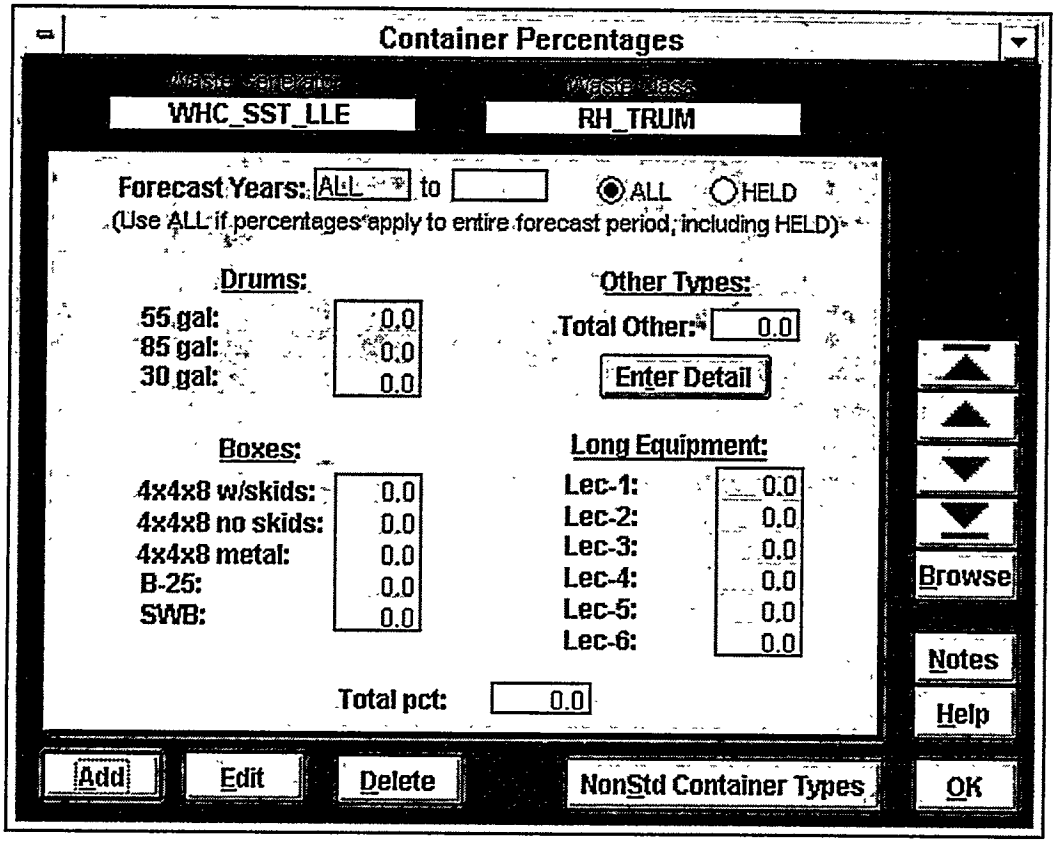
- volume percent of each physical waste form
- applicable years for which the current data apply
- waste form segregation (indicates whether or not waste forms will be segregated into separate containers or placed in the same container)

Percentages are required for each waste class and/or container combination forecasted.

Hazardous Constituents

Figure E.4 shows the hazardous constituent descriptor (HCD) percentage screen. This screen is used to obtain the percent of the waste volume contaminated by various hazardous constituent groups that are a concern for future Hanford Site treatment facilities. The hazardous constituents may contaminate a waste volume individually or as a combination or mixture of constituents. Combinations of hazardous

Figure E.2. SWIFT Container Percentages Screen



constituents are specified using the "Mixed HCD Types" feature. The combined total for the individual HCDs and the "Mixed HCD Types" must equal 100%. The following information is obtained by this screen:

- volume percent of waste contaminated by each hazardous constituent or combination of hazardous constituents
- applicable years for which the current data apply.

Percentages are required for each waste class, container, and/or physical waste form combination forecasted.

Radionuclide Concentrations

Figure E.5 displays the radionuclide concentrations screen. The radionuclides requested are common at the Hanford Site and are important for performance assessment activities. This screen captures the following information:

- concentration in curies per cubic meter of specific radionuclides in the waste
- applicable years for which the current data apply

Percentages are required for each waste class, container, and/or physical waste form combination forecasted.

Figure E.3. SWIFT Physical Waste Form Screen

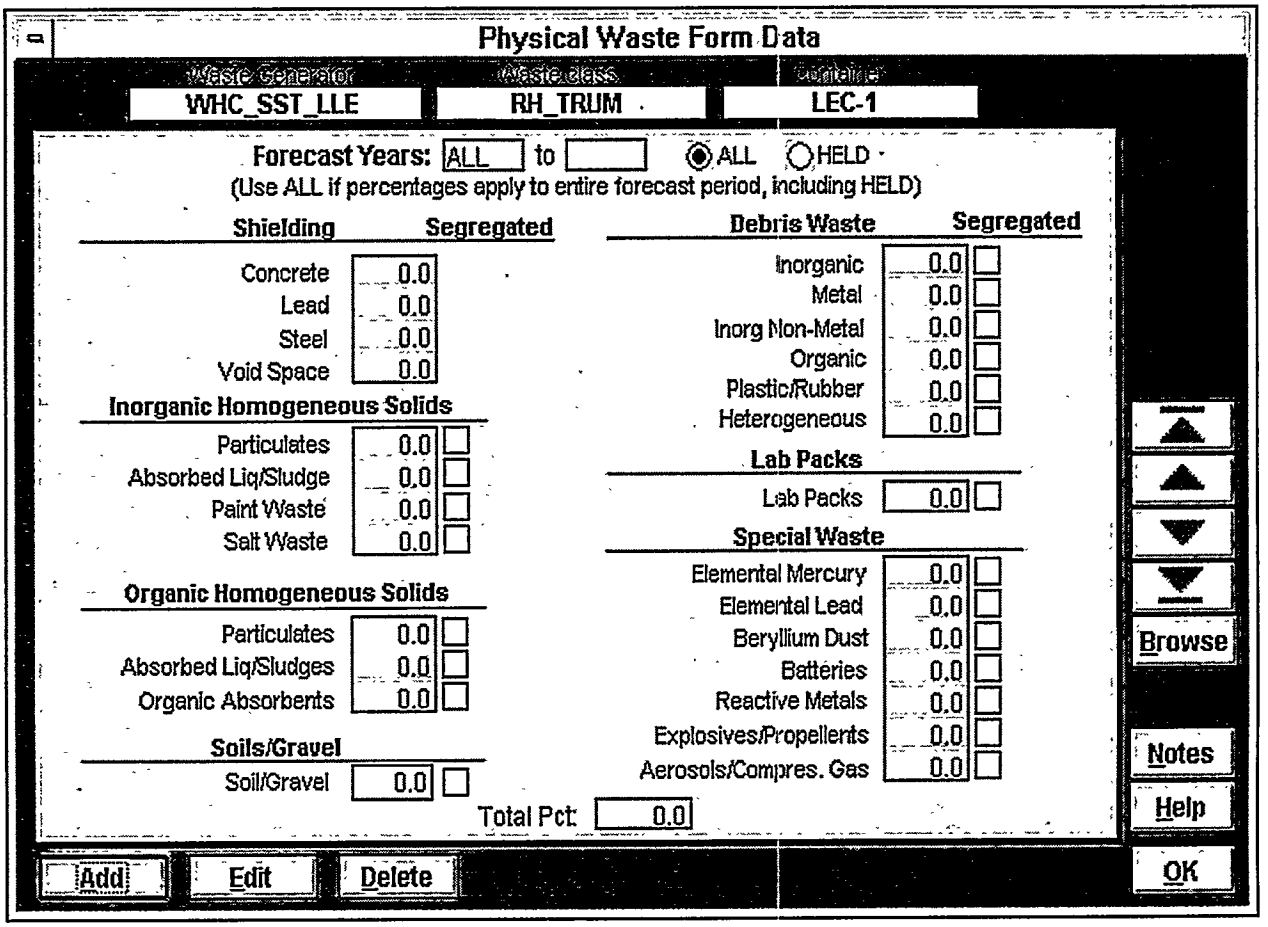


Figure E.4. SWIFT Hazardous Constituent Screen

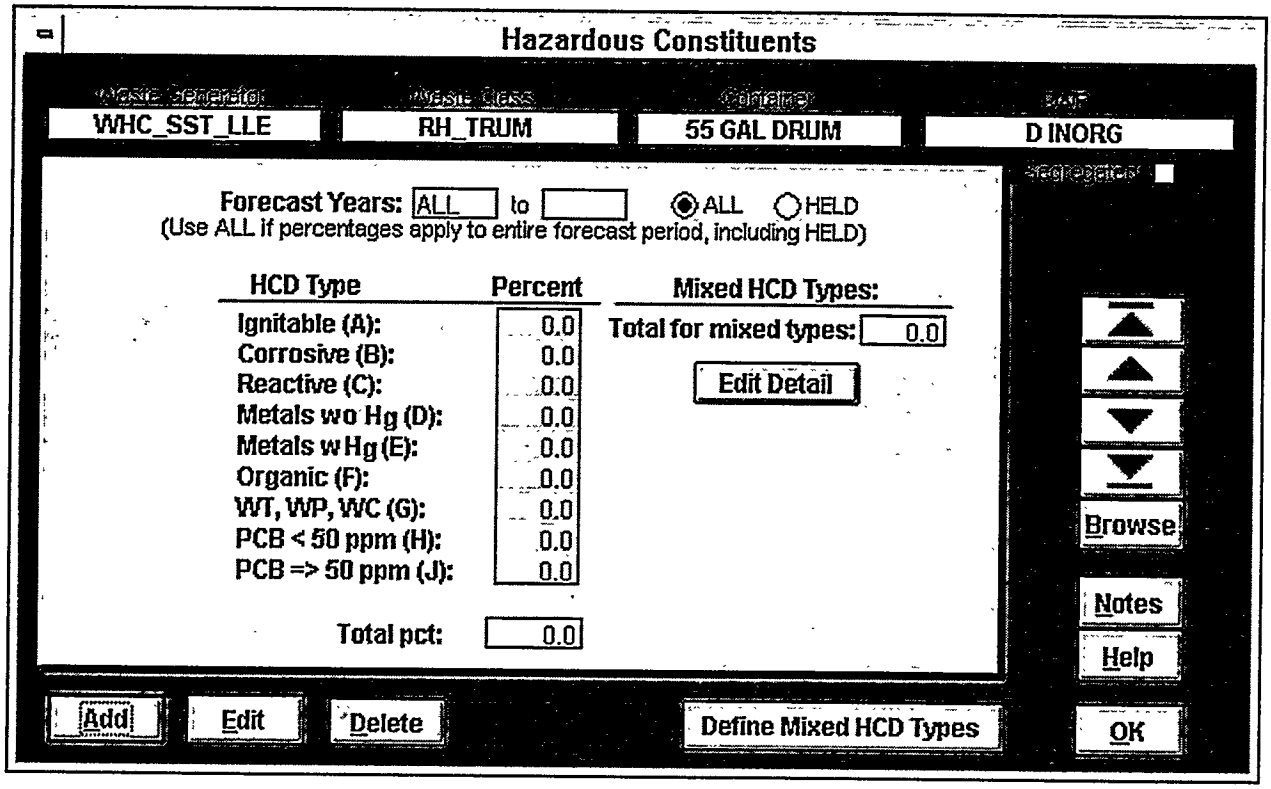
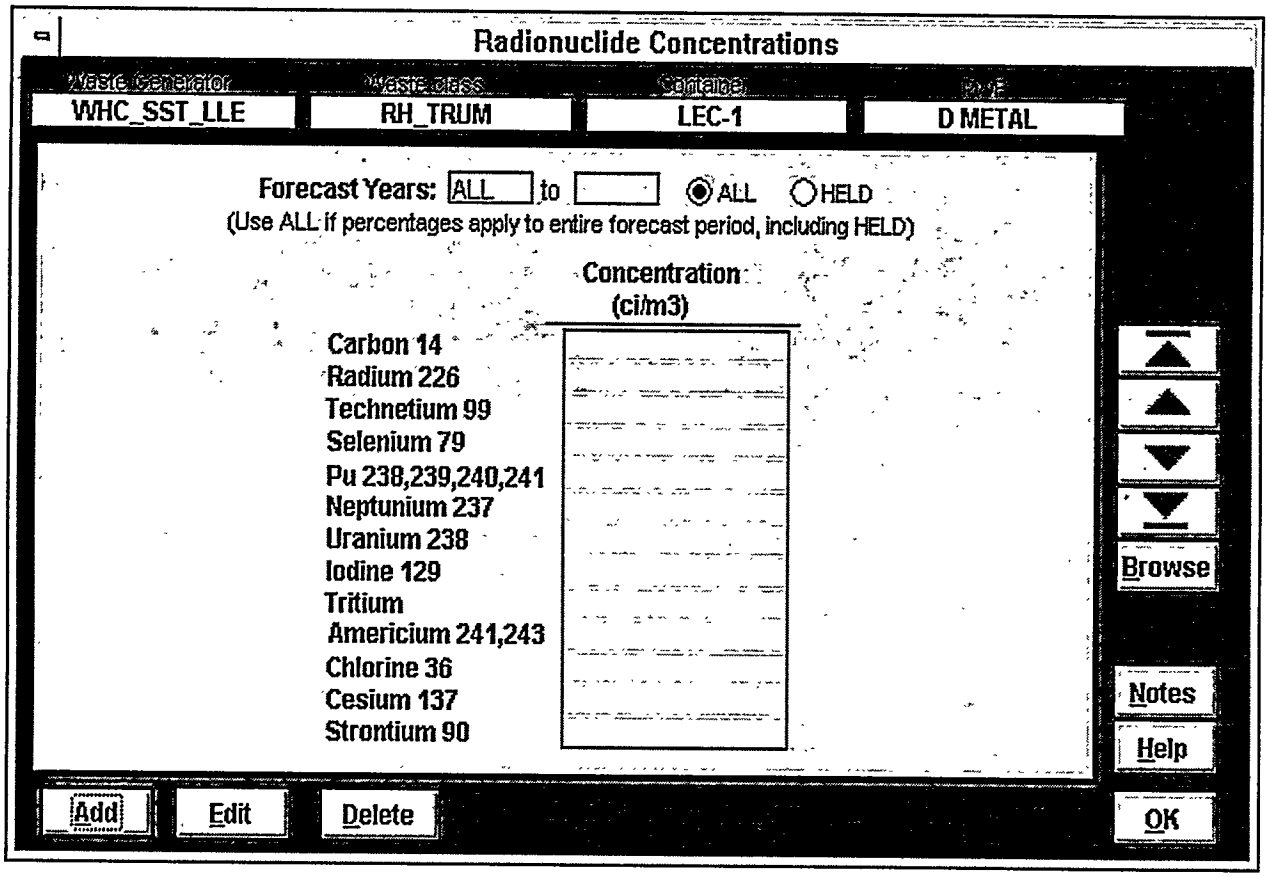


Figure E.5. SWIFT Radionuclide Screen



Earl

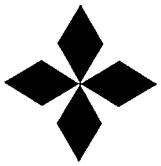
GA–C19462
Rev. 1

UPDATED DIII–D EXPERIMENTAL PLAN FOR FY–1989

by
FUSION DIVISION STAFF
J.L. LUXON, EDITOR

Prepared under
Contract No. DE–AC03–89ER51114
for the San Francisco Operations Office
U.S. Department of Energy

AUGUST 1989



GENERAL ATOMICS

DISCLAIMER