ATTACHMENT F: TRANSURANIC WASTE INVENTORY UPDATE REPORT, 2003
TO
APPENDIX DATA

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ACRONYMS AND ABBREVIATIONS

AE	*Argonne National Laboratory – East site identifier*
ANL-E	*Argonne National Laboratory East*
ANL-W	*Argonne National Laboratory West*
AL	*Ames Laboratory site identifier*
AM	*ARCO Medical Products Company site identifier*
AW	*Argonne National Laboratory - West Side identifier*
BC	*Battelle Columbus Laboratory site identifier*
BAPL	*Bettis Atomic Power Laboratory*
BCL	*Battelle Columbus Laboratory*
BL	*Babcock and Wilcox Lynchberg site identifier*
BLIP	*Brookhaven Linear Isotope Production*
BT	*Bettis Atomic Power Laboratory site identifier*
C&C Agreement	*Agreement for Consultation and Cooperation between the Department of Energy and the State of New Mexico on the Waste Isolation Pilot Plant*
Ca	*Calcium*
CAO	*Carlsbad Area Office*
CBFO	*Carlsbad Field Office*
CCA	*Compliance Certification Application*
CFR	*Code of Federal Regulations*
CH	*Contact-handled*
CPR	*Cellulosic, Plastic, and Rubber Materials*
CRA-2004	*Compliance Recertification Application*
CY	*Calendar Year*
D&D	*Decontamination and Decommissioning*
DOE	*U.S. Department of Energy*
DOR	*Direct Oxide Reduction*
EDTA	*ethylenediaminetetraacetic acid*
EPA	*U.S. Environmental Protection Agency*
ER	*Environmental restoration or electro-refining (salts)*
ERMS	*Electronic Records Management System*
ET	*Energy Technology Engineering Center site identifier*
FFCAct	*Federal Facilities Compliance Act*
ft^3	*Cubic feet*
FR	*Framatome (Richland) site identifier*
GE	*General Electric Vallecitos Nuclear Center site identifier*
HEPA	*High Efficiency Particulate Air*
IDB	*Integrated Database*
IDC	*Item Description Code*
IN	*Idaho National Engineering and Environmental Laboratory site identifier*
INEEL	*Idaho National Engineering and Environmental Laboratory*
IT	*Inhalation Toxicology Research Institute (now known as Lovelace Respiratory Research Institute, LRRI) site identifier*
JASPER	*Joint Actinide Shock Physics Experimental Research*
K	*Potassium*
KA	*Knolls Atomic Power Laboratory-Schenectady site identifier*

KAPL	***Knolls Atomic Power Laboratory***
kg	***Kilograms***
KN	***Knolls Atomic Power Laboratory – Nuclear Fuels Service site identifier***
LA	***Los Alamos National Laboratory site identifier***
LANL	***Los Alamos National Laboratory***
LANL-CO	***Los Alamos National Laboratory – Carlsbad Operations***
LB	***Lawrence Berkeley National Laboratory site identifier***
LBNL	***Lawrence Berkeley National Laboratory***
LECO	***Trade name for manufacture of crucibles, furnaces and analytical instrumentation***
LL	***Lawrence Livermore National Laboratory site identifier***
LLNL	***Lawrence Livermore National Laboratory***
LRRI	***Lovelace Respiratory Research Institute***
LWA	***Land Withdrawal Act***
m^3	***cubic meters***
MC	***U.S. Army Material Command site identifier***
MgO	***Magnesium Oxide***
mrem	***Millirem***
MSE	***Molten Salt Extraction***
MU	***University of Missouri Research Reactor site identifier***
MURR	***University of Missouri Research Reactor***
NT	***Nevada Test Site site identifier***
NTS	***Nevada Test Site***
NWMP	***Nuclear Waste Management Program***
OP	***Overpack***
OR	***Oak Ridge National Laboratory site identifier***
ORIGEN2	***Oak Ridge Isotope Generation and Depletion Code***
ORNL	***Oak Ridge National Laboratory***
OSR	***Offsite Source Recovery***
ORP	***Office of River Protection***
PA	***Performance Assessment***
PA	***Paducah Gaseous Diffusion Plant site identifier (in waste profiles only)***
PCB	***Polychlorinated Biphenyls***
PE	***Polyethylene***
PGDP	***Paducah Gaseous Diffusion Plant***
POC	***Pipe Overpack Component***
Pu	***Plutonium***
PX	***Pantex Plant site identifier***
QA	***Quality Assurance***
RCRA	***Resource Conservation and Recovery Act***
RF	***Rocky Flats Environmental Technology site identifier***
RFETS	***Rocky Flats Environmental Technology Site***
RH	***Remote-handled***
RL	***Hanford (Richland Operations Office) site identifier***
RP	***Hanford (Office of River Protection) site identifier***
SA	***Sandia National Laboratories site identifier***

SBW	***Sodium-bearing waste***
SNL	***Sandia National Laboratories***
SP	***Separations Process Research Unit site identifier***
SPRU	***Separations Process Research Unit***
SQAP	***Software Quality Assurance Plan***
SR	***Savannah River Site site identifier***
SRS	***Savannah River Site***
STTP	***Source Term Test Program***
SWB	***Standard Waste Box***
TDOP	***Ten Drum Overpack***
TOC	***Total Organic Carbon***
TRU	***Transuranic***
TRUPACT II	***Transuranic Package Transporter – II***
TWBID	***Transuranic Waste Baseline Inventory Database, Rev. 2.1***
TWBIR	***Transuranic Waste Baseline Inventory Report***
TWIUR	***Transuranic Waste Inventory Update Report***
USAMC	***U.S. Army Material Command***
WAC	***Waste Acceptance Criteria***
WHO	***Waste Handling Operations***
WIPP	***Waste Isolation Pilot Plant***
WIR	***Waste Incidental to Reprocessing***
WM	***Waste Material***
WMC	***Waste Matrix Code***
WMP	***Waste Material Parameter***
WP	***WIPP repository site identifier***
WTWBIR	***WIPP Transuranic Waste Baseline Inventory Report***
WV	***West Valley Demonstration Project site identifier***
WWIS	***WIPP Waste Information System***
Zn	***Zinc***
Zn-Mg	***Zinc-Magnesium (metal alloy)***

ABBREVIATED NAMES

TWBIR Revision 3	***Transuranic Waste Baseline Inventory Report, Revision 3 (DOE 1996a)***
TWBIR Revision 2	***Transuranic Waste Baseline Inventory Report, Revision 2 (DOE 1995b)***
TWBID Revision 2.1	***Transuranic Waste Baseline Inventory Database (LANL 2003a)***
2003 Update Report	***Transuranic Waste Inventory Update Report – 2003 (this document)***
Computational Methodology	***Transuranic Waste Inventory Update Report – 2003 Computational methodology (LANL 2003b)***

PREFACE

The information in this report summarizes the U.S. Department of Energy's (DOE's) transuranic (TRU) waste inventory, projections, and characteristics, and reports emplaced waste. Revision 0 of the Waste Isolation Pilot Plant (WIPP) Transuranic Waste Baseline Inventory Report (WTWBIR) published in June 1994 (DOE 1994), was the first attempt ever made by the DOE complex to report all of its TRU waste at the waste stream level. The waste data reported in Revision 0 were considered preliminary until the DOE TRU waste generator/storage sites completed quality checks of the data. Data changes resulting from the site reviews were contained in Revision 1 of the WTWBIR (DOE 1995a). Subsequently, two additional baseline reports, Transuranic Waste Baseline Inventory Report (TWBIR) Revisions 2 and 3 (DOE 1995b and DOE 1996a), were published in 1995 and 1996 to include WIPP and non-WIPP wastes and other additional characteristic information.

This document, the Transuranic Waste Inventory Update Report, 2003, is the first update report to these baselines primarily focused on support of performance assessment (PA) in support of the Compliance Recertification Application (CRA-2004) and U.S. Environmental Protection Agency (EPA) concerns related to repository operation. The primary differences between previous data submittals and this update are:

- ***This report accounts for the Idaho National Engineering and Environmental Laboratory (INEEL) Advanced Mixed Waste Treatment Facility process by which 55-gallon drums are compacted and put into 100-gallon drums and disregards those calculations related to future waste incineration described in the TWBIR Revision 3 (DOE 1996a) that never went into operation.***

- ***This report includes 7,095 m^3 (250,595 ft^3) of stored Hanford tank waste that was added to the inventory in December 2002.***

- ***This report also addresses the waste that has been emplaced since the WIPP opened in 1999.***

Finally, this report includes updates to all site Waste Stream Profiles that were reported in TWBIR Revision 2 (DOE 1995b). The TRU waste sites provided updated Waste Stream Profiles which contain parameters that are important to the PA. The updated Waste Stream Profiles for non-WIPP, WIPP, and emplaced waste streams are given in Annexes I, J, and K, respectively. The information contained in these profiles is considered the best estimate as of the inventory date, September 30, 2002, because more TRU waste characterization data are now available. However, a caveat to the profile information is warranted because the profiles contain the TRU waste site's best estimates of their TRU waste inventory. Due to the nature of the information, some inconsistencies remain in the profiles. A thorough review of the profiles was conducted during the CRA-2004 review, resulting in identification of specific inconsistencies in the waste stream information. All inconsistencies that were identified by the CRA-2004 reviewers are anticipated to have no significant impact on the PA calculations. The TRU Waste Baseline Inventory Waste Profile forms only reflect the data as reported by the TRU Waste Sites. During the process of generating the TRU Waste Baseline Inventory Report for the CRA, priority was given to developing data on those parameters considered

important to performance assessment (PA). Work is now in progress to correct noted inconsistencies in the forms. SNL will evaluate whether any of the individual or cumulative corrections of the reported inconsistencies have an impact on PA.

DATA-F-1.0 INTRODUCTION

DATA-F-1.1 Background

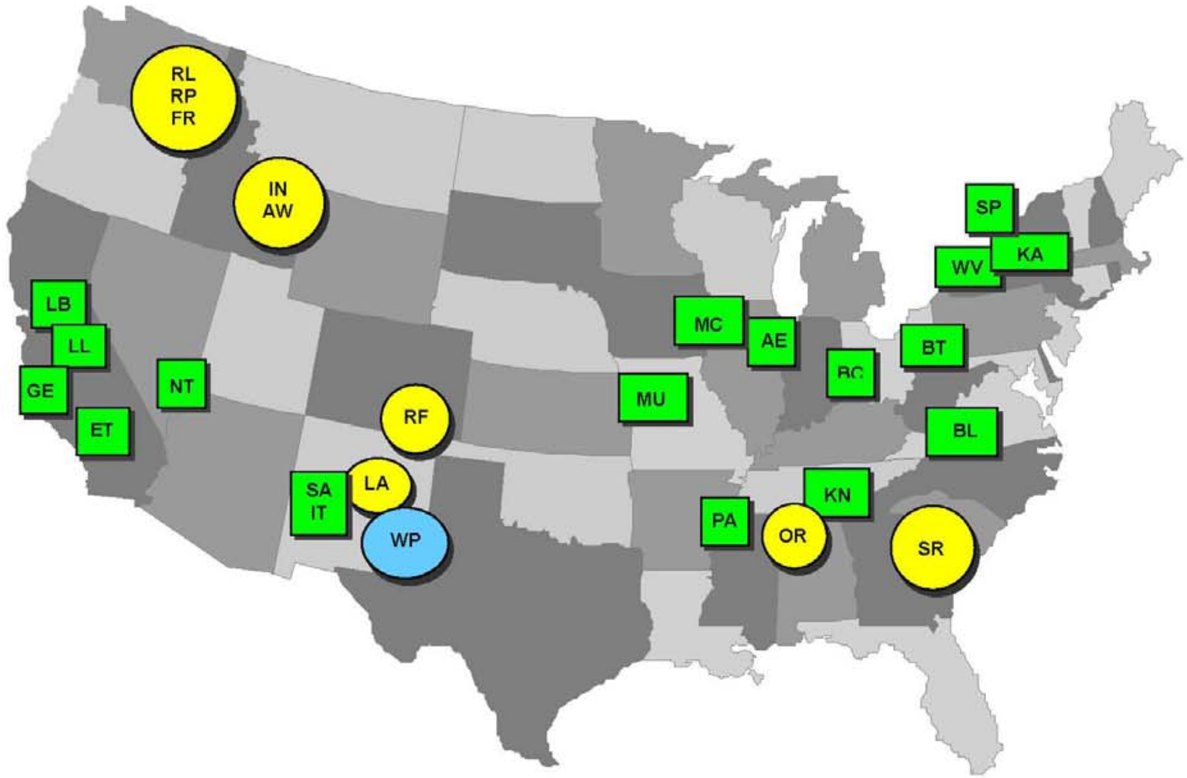
The U.S. Department of Energy's (DOE's) Waste Isolation Pilot Plant (WIPP) opened on March 26, 1999, becoming the nation's first deep geologic repository for the permanent disposal of defense-generated TRU waste. This waste is currently retrievably stored at 27 sites across the country (see Figure DATA-F-1). From the WIPP's opening through the inventory date (September 30, 2002), 1255 shipments of TRU waste were safely characterized, transported, and disposed in the WIPP.

TRU waste is defined as "…waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years…" (U.S. Congress 1996). TRU wastes are classified as either contact-handled- (CH-) waste or remote-handled- (RH-) waste, depending on the dose rate at the surface of the waste container. CH-TRU wastes are packaged TRU wastes with an external surface dose rate less than 200 millirem (mrem) per hour, while RH-TRU wastes are packaged TRU wastes with an external surface dose rate of 200 mrem or greater per hour (Pub. L. No. 102-579, 110 Stat. 2422 (1992), as amended by 104-201 (1996)). Unless otherwise indicated, for the purpose of this attachment, all references to TRU waste include TRU waste and mixed TRU waste (waste that contains both radioactive and hazardous components, as defined by the Atomic Energy Act [U.S. Congress 1954] and the Resource Conservation and Recovery Act [RCRA] as codified in Title 40 Code of Federal Regulations [CFR] Part 261.3 [EPA 1980]).

The DOE is committed to demonstrating compliance with all applicable regulations for the permanent disposal of TRU defense wastes in the WIPP repository. These regulations are the environmental standards for management and disposal of TRU defense wastes as mandated in 40 CFR Part 191 (EPA 1993) and Part 194 (EPA 1996), and the RCRA regulations. Compliance demonstration through PA calculations for CRA-2004 will be based on the inventory of existing and currently projected waste streams compiled in this document.

The purpose of the WIPP TRU Waste Baseline Inventory Report (WTWBIR) Revision 0 (DOE 1994) and Revision 1 (DOE 1995a) was to provide data to be included in the PA processes for the WIPP. The Transuranic Waste Baseline Inventory Report, Revision 2 (hereafter referred to as TWBIR Revision 2) (DOE 1995b) expanded the original purpose of Revisions 0 and 1 to include support for the WIPP Land Withdrawal Act (LWA) (Pub. L. No. 102-579, 110 Stat. 2422 (1992), as amended by 104-201 (1996)) by providing the total DOE TRU waste inventory. The TWBIR Revision 2 included a chapter and an appendix that discussed the total DOE TRU waste inventory, including nondefense, commercial, polychlorinated biphenyl (PCB)-contaminated, and buried (predominately pre-1970) TRU wastes that were not planned at the time for disposal in WIPP.

The Transuranic Waste Baseline Inventory Report, Revision 3 (hereafter referred to as TWBIR Revision 3) (DOE 1996a) was based on the TWBIR Revision 2 data, which were supplemented by data in several memoranda issued during early calendar year (CY) 1996. These memoranda summarize additional data requested by the DOE to support PA modeling.



AE	Argonne National Laboratory-East
AW	Argonne National Laboratory-West
BC	Battelle Columbus Laboratories
BT	Bettis Atomic Power Laboratory
BL	Babcock & Wilcox-Lynchburg
ET	Energy Technology Engineering Center
FR	Framatome
GE	General Electric Vallecitos Nuclear Center
IN	Idaho National Engineering and Environmental Laboratory
IT	Inhalation Toxicology Research Institute (known as Lovelace Respiratory Research Institute)
KA	Knolls Atomic Power Laboratory
KN	Knolls Atomic Power Laboratory-Nuclear Fuels Services
LA	Los Alamos National Laboratory
LB	Lawrence Berkeley Laboratory
LL	Lawrence Livermore National Laboratory
MC	U.S. Army Material Command
MU	University of Missouri Research Reactor
NT	Nevada Test Site
OR	Oak Ridge National Laboratory
PA	Paducah Gaseous Diffusion Plant
RF	Rocky Flats Environmental Technology Sit
RL	Hanford Site (Richland Operations Office)
RP	Hanford Site (Office of River Protection)
SA	Sandia National Laboratories
SP	Separations Process Research Unit
SR	Savannah River Site
WV	West Valley Demonstration Project
WP	Waste Isolation Pilot Plant

Figure DATA-F-1. U.S. Department of Energy TRU Waste Sites.

The primary purpose of TWBIR Revision 3 was to provide the summary data from TWBIR Revision 2) and the supplemental information used in the PA for the development of the Compliance Certification Application (CCA) (DOE 1996b) that was delivered to the Environmental Protection Agency (EPA), and to support the LWA. The supplemental information was generated from specific data requests to the TRU waste sites since the publication of the TWBIR Revision 2. These supplemental data included: radionuclides, data estimates for complexing agents, oxyanions, and cement content in solidified waste.

DATA-F-1.2 Purpose and Objectives

The purpose of this Transuranic Waste Inventory Update Report – 2003 (hereafter referred to as the 2003 Update Report) is to document the total inventory of DOE TRU waste as defined by the DOE TRU waste sites. The primary purpose of this document is to provide the summary data and the supplemental information required for the PA in support of the CRA-2004 which is to be delivered to the EPA for the five-year recertification as required by the LWA (Pub. L. No. 102-579, 110 Stat. 2422 (1992), as amended by 104-201 (1996)). Knowing that the WIPP waste inventory numbers have changed as a result of characterization activities and improved estimation processes, the EPA has requested that an update to the CCA inventory be included in the CRA-2004. In a letter from the EPA dated August 6, 2002 (EPA 2002), one of the items requested was "Waste inventory (actual inventory to date plus revisions to the estimated inventory as expressed in the Baseline Inventory Report)." This inventory update provides these changes.

The TWBIR Revision 2 (DOE 1995b) contained the waste profiles for all waste streams reported by the generator sites at that time, including some TRU waste streams that are unacceptable for disposal at WIPP. The waste stream profiles resided in two appendices in TWBIR Revision 2: Appendix O reported the "Non-WIPP" waste streams and Appendix P reported the "WIPP" waste streams. For the 2003 Update Report, Annex I reports the Non-WIPP waste streams and Annex J reports the WIPP waste streams, and Annex K reports the "emplaced waste." Although all TRU waste streams currently reported by the sites are accounted for in the current database and are reported in the 2003 Update Report, the non-WIPP waste streams do not contribute to the volume and scaling calculations. Hence, the non-WIPP waste streams will not contribute to inventory for the CRA-2004 PA calculations.

The objectives of the 2003 Update Report are to:

1. *Define the DOE TRU waste inventory;*

2. *Provide the required information and data for use in the calculations for the CRA-2004; and*

3. *Maintain a consistent DOE complex-wide methodology for tracking TRU waste. A consistent methodology in support of the CRA-2004 provides a common frame of reference for discussion of TRU waste issues with regulatory organizations.*

DATA-F-1.3 Sources of Transuranic Waste Information

The TRU waste inventory is taken from existing information about the waste, which has been provided by the TRU waste sites. In addition, information obtained from site Acceptable Knowledge Summary Reports has been incorporated to provide the most up to date data on waste streams that are currently being shipped to WIPP. Particular focus on data collection involved discussion with TRU waste sites about changes to the inventory since the certification of WIPP. Sites visits and onsite interviews facilitated data collection and ensured data were accurately represented. At the conclusion of data collection, each site was asked to provide information concerning what had changed since the baseline data collection and why the changes took place.

The information found in the TWBIR Revision 2 (DOE 1995b) has not been updated since the publication of that document. The TWBIR Revision 3 (DOE 1996a) used the same data plus other supplemental data that were needed for PA calculations. In addition, the WIPP has been open and receiving waste since March 1999. Therefore, data from the emplaced waste through September 30, 2002, are included in this report as obtained from the WIPP Waste Information System (WWIS).

The changes to the inventory since 1996 were requested from and provided by the TRU waste sites. Each site has verified the data that were entered into the database and has been asked to explain what the changes are in their current inventory when compared to TWBIR Revision 2 and 3 and why the inventory changed.

DATA-F-1.4 Document Organization

The 2003 Update Report (Appendix DATA, Attachment F) is organized into sections of text, figures, tables, and supporting annexes that are consistent with the TWBIR Revision 3 (DOE 1996a). The contents of remaining sections in this document are summarized below:

- *Section DATA-F-2.0 presents the approach and methods used for gathering and compiling the WIPP waste disposal inventory information including the quality assurance program applied to the inventory project activities. A description of the TWBID Revision 2.1 database, analysis methods, and records used to document data and analysis results are also included in this chapter.*

- *Section DATA-F-3.0 presents summaries of inventory information including the waste volumes, waste material parameters (WMPs), packaging materials, chemical components, radiological components, discussion regarding the non-WIPP and future potential TRU waste, and discussion regarding the materials used to emplace the waste in the WIPP.*

- *Section DATA-F-4.0 provides the references used in the preparation of this document.*

DATA-F-2.0 METHODS AND APPROACH

This 2003 Update Report provides the information needed for the PA calculations to be generated as part of the completion of the WIPP CRA-2004. The work was performed by Los

Alamos National Laboratory—Carlsbad Operations (LANL-CO) and Sandia National Laboratories (SNL). The role of SNL was to perform the PA calculations and provide documented results for the CRA-2004. The role of LANL-CO was to provide the updated inventory in support of the CRA-2004 PA. The technical work performed and documentation produced were under the controls provided by the SNL Quality Assurance (QA) Program developed for the SNL Nuclear Waste Management Program (NWMP). Inventory personnel:

1. ***collected TRU waste stream information from the TRU waste sites via site visits and additional communication, as needed;***
2. ***compiled the data into a qualified electronic database;***
3. ***performed analyses of the data in support of the CRA-2004 PA; and***
4. ***published the results as official NWMP records acceptable for use in WIPP PA calculations.***

The process is illustrated in Figure DATA-F-2 along with the controlling aspects of the SNL QA program. Figure DATA-F-2 also illustrates the governing SNL QA program procedures implemented in each step of the process.

The sections below describe the four basic process steps leading to the issuance of this report. Section DATA-F-2.1 discusses data collection, compilation and verification. Section DATA-F-2.2 discusses the development of the qualified electronic database, the Transuranic Waste Baseline Inventory Database Revision 2.1 [hereafter referred to as TWBID Revision 2.1] (LANL 2003a), that contains the TRU waste inventory data as of September 30, 2002. Section DATA-F-2.3 discusses the analyses performed in support of the CRA-2004 PA, and Section DATA-F-2.4 discusses the process of documentation in the SNL WIPP Records Center.

DATA-F-2.1 Data Collection, Compilation and Verification

The sections that follow describe the process of data collection, entry, and verification used to ensure data quality was maintained throughout the TRU waste inventory process. The data requirements found in Section DATA-F-2.1.1 were specifically called out by SNL to address the PA data needs. The data were then collected from the TRU waste sites, entered into the TWBID Revision 2.1 (LANL 2003a), and independently reviewed and verified by data entry personnel and the sites themselves. The process by which data were gathered, entered, reviewed, and verified is described in Sections DATA-F-2.2.2 through DATA-F-2.2.4.

All of the activities described in this section were governed by SNL procedure SP 9-6 Baseline Inventory Report (BIR) Change Report Data Collection and Entry (SNL 2003b). A collection of the documents compiled for each site is provided in Table DATA-F-1 including their respective Electronic Records Management System number (ERMS #).

DATA-F-2.1.1 Data Requirements

The data requirements for the 2003 Update Report were called out in a series of communications shown in Annexes G and H.

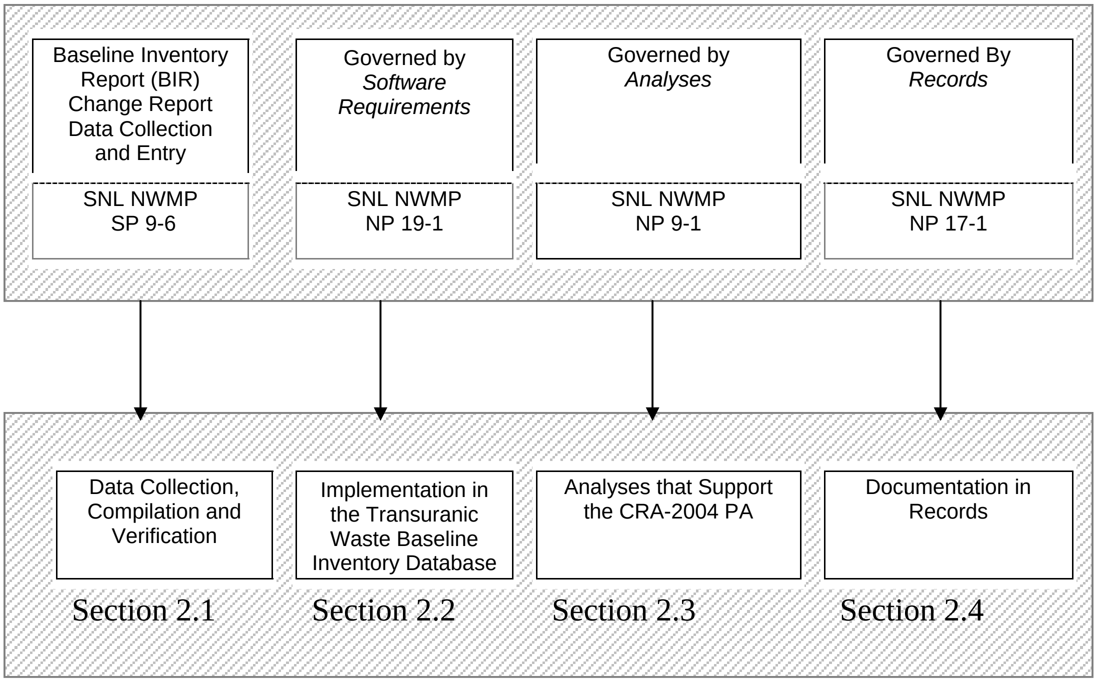


Figure DATA-F-2. Quality Methods for Generating the Transuranic Waste Inventory Update Report – 2003

Specifically, the data requirements for PA were given in Giambalvo (2002) and include the following:

- ***Waste stream volumes;***
- ***Inventory of radionuclides on a waste stream basis for both CH- and RH-TRU waste and that the radionuclides reported be decayed to a common base year;***
- ***Inventory of all non-radioactive waste material parameters that were previously tracked in the TWBIR Revision 3 (DOE 1996a). In addition, identify whether waste streams contain pyrochemical salts;***
- ***Inventory of any other non-radioactive waste materials that are discovered to account for a significant portion of a waste stream as a result of changes to the inventory;***
- ***Inventory of cellulosic, plastic, and rubber (CPR) materials, and other biodegradable materials used to facilitate emplacement of waste and MgO in the WIPP;***
- ***Inventory of organic complexing agents and oxyanions (sulfate, nitrate, and phosphate; and***
- ***Waste stream level inventories of radionuclides and non-radioactive waste material parameters for waste currently emplaced in the WIPP.***

In addition to the seven data requirements listed above, the following was requested:

- ***A breakdown of the volume of the waste in the inventory into categories of stored, projected, and anticipated.***

DATA-F-2.1.2 Collection Method

The EPA is mainly concerned with what has changed in the TRU waste inventory since the CCA (DOE 1996b) that resulted in the certification of the WIPP. To appropriately capture these changes, each TRU waste site was sent a copy of their data (in the form of waste profiles from the TWBIR Revision 2 (DOE 1995b) that they had submitted in 1995 for the CCA (DOE 1996b). With this transmittal to the site, guidance was provided delineating what the sites needed to address. The sites were requested to mark the changes on these profiles. The data were provided, followed by discussions focused on clarifying questions to ensure the data were correct. The data were entered into the electronic database, the TWBID Revision 2.1 (LANL 2003a), and qualified under SNL NP 19-1, Software Requirements (SNL 2002a). Upon completion of data entry, each site was provided with a signature sheet requesting that the DOE site representative responsible for TRU waste verify the data.

The methodology used to collect data and enter data into the TWBID Revision 2.1 (LANL 2003a) from DOE TRU waste sites is captured in procedure SP-9-6, Baseline Inventory Report (BIR) Change Report Data Collection and Entry (SNL 2003b). The process described in this procedure was initiated by a data call based on a request for modification of waste profile information that was included in the TWBIR Revision 2 (DOE 1995b). This data call was followed by a second data call specifically requesting data required by SNL (Giambalvo 2002). During the time these data calls were issued, LANL-CO visited sites to facilitate data collection and worked with the sites to assist with questions and issues as they came up.

DATA-F-2.1.3 Implementation in the Transuranic Waste Baseline Inventory Database, Revision 2.1

Preliminary data collected from the sites included database disks, notes from discussions with waste management personnel, email correspondence, site literature, and data spreadsheets. After data were gathered, they were submitted to the SNL WIPP Records Center.

These data were used to update the TWBID Revision 2.1 (LANL 2003a) by deletion of waste streams that were no longer maintained, modification of waste streams, and addition of new waste streams. Waste stream profile information was modified for sites that either had additional information or had modified TWBIR Revision 2 (DOE 1995b) waste streams. When data discrepancies were found or sites requested changes to data after preliminary data were entered into the database, change information was collected on forms found in procedure SP-9-6, Baseline Inventory Report (BIR) Change Report Data Collection and Entry (SNL 2003b). The database was changed to reflect this new information, accordingly.

DATA-F-2.1.4 Validation and Verification of Data

Upon completion of data entry, an independent review of all changes that were made to the database was conducted. This review was documented in the database. When all changes were completed, the database record was sent back to the sites for final verification and

authentication by the site DOE representative. The verified results were entered into the SNL WIPP Records Center, as were the signed forms from each of the DOE TRU waste sites.

Additional records were collected from the DOE TRU waste sites after the inventory was verified and authenticated by DOE site representatives. Records were received from each site explaining changes that had occurred with their inventory since the baseline data collection was performed in 1995. These records were also entered into the SNL WIPP Records Center.

DATA-F-2.2 Transuranic Waste Baseline Inventory Database

Data tables included in this report were generated by a Microsoft Access 2000 database application known as the TWBID Revision 2.1 (LANL 2003a). TWBID Revision 2.1 was used to manage, maintain, and perform calculations on inventory data.

The sections that follow describe the database and its development. Section DATA-F-2.2.1 describes the origins of the database. Section DATA-F-2.2.2 describes the database in general terms. Section DATA-F-2.2.3 describes configuration control.

All of the activities described in this section were governed by the SNL QA procedure, NP 19-1 Software Requirements (SNL 2002a).

DATA-F-2.2.1 Origins of the Transuranic Waste Baseline Inventory Database

The database used to generate TWBIR Revision 3 (DOE 1996a) (TWBIR.mdb, dated 1/29/1996) was used as a baseline for TWBID Revision 2.1 (LANL 2003a). The database was originally provided in Microsoft® Access 2.0 format, and was subsequently converted to Microsoft® Access 2000 format. Structural changes were then made to the new version to accommodate new requirements. These changes were captured in Microsoft® Visual Source Safe (see Section DATA-F-2.2.3, below).

Development of the TWBID Revision 2.1 (LANL 2003a) was governed by the SNL QA procedure, NP 19-1 Software Requirements (SNL 2002a). NP 19-1 outlines a process whereby a software QA plan (the SQAP) is written for the software product. Following the SQAP, the requirements for the product are defined and documented, the design of the product is created and documented, the product is implemented and its implementation is documented, a plan for testing the product is written, the product is tested and its verification and validation is documented, and the installation of the product is documented. The product and its documentation are reviewed at each step in this process by a technical, QA, and management reviewer.

Each of these steps was completed for the TWBID Revision 2.1 (LANL 2003a). Table DATA-F-3 provides references and ERMS identifiers for the QA documents for the TWBID Revision 2.1 (LANL 2003a).

DATA-F-2.2.2 Database Description

The TWBID Revision 2.1 (LANL 2003a) consists of two main interface database files that link to a third, common data file. The first interface file, TWBID.mdb, contains the interface *forms that data entry personnel use to browse, add, modify, or delete waste streams and related information. Users must log in to this interface in order to gain access to modify the data. A central file, TWBID.mdw, which contains username, password, and permission information, manages authentication. The second interface file, REPORTS.mdb, contains the database objects (tables, queries, reports, macros, and modules) required to generate the tables and reports used within the 2003 Update Report. The third file, TWBID_Data.mdb, contains the raw data used by both the TWBID.mdb and REPORTS.mdb databases. This data file is "linked" to the other two by using the table-linking feature intrinsic to Microsoft® Access 2000. By utilizing linked tables, a multiple-user, client-server environment was established for the TWBID Revision 2.1.*

The Microsoft® Access Database files are hosted on a Windows NT 4.0 Server, and are protected by a Windows NT File System permission structure, allowing only approved database users to have access to the files. In addition, there are database-level access controls established using the Workgroup security function inherent in Microsoft® Access.

The tables in the database have no predefined relationships using primary and foreign key values to automatically associate data existing in separate tables. All functionality that relates and manipulates data across tables is established through table joins specified within the database queries themselves.

DATA-F-2.2.3 Configuration Management

The TWBID Revision 2.1 (LANL 2003a) software was placed under configuration control on November 17, 2002 as version 3.01. TWBID Revision 2.1 has undergone several iterative revisions and has been under strict configuration control since that date. The current version of the TWBID Revision 2.1 software is 3.12 (at the point of the publication of this document).

In addition, the data used by the TWBID is also under strict configuration control. Versions of the data were captured at designated points throughout the data entry process. At the point of publication of this document, the current data version was D.4.09.

The tool used to maintain configuration control of the TWBID Revision 2.1 is Microsoft® Visual SourceSafe Version 6.0. The Visual SourceSafe database maintains an archive of all revisions to the TWBID Revision 2.1 software, and allows for easy retrieval of any revision throughout the development and data entry processes. All changes to the TWBID Revision 2.1 database software (not the source code) were approved per procedure NP 19-1, Software Requirements (SNL 2002a). A hardcopy printout of the data from the database was generated for each version update and entered in the SNL WIPP Records Center.

DATA-F-2.3 Analysis Methods

In addition to collecting and processing data from the TRU waste sites and securing the site data in a qualified database for future use, analyses were performed on the data to support the CRA-2004 PA. For example, in preparation of this report, volume data from waste streams was rolled up into stored, projected, and anticipated categories; WMPs were rolled up to provide average waste material densities in the repository; radionuclides were decay-corrected *to the end of calendar year 2001; and radionuclide activities were scaled for the full repository.*

All of the analyses performed in support of the CRA-2004 PA were governed by SNL procedure NP 9-1 Analyses (SNL 2001). NP 9-1 requires that an analysis plan governing the work is written. The analysis plan governing the analysis in support of the CRA-2004 PA is AP-092, Analysis Plan for Transuranic Waste Inventory Update Report, 2003 (SNL 2002b). AP-092 specifies that the first step in the analyses in support of the CRA-2004 PA is documentation of the computational methods that will be used to perform the required analyses. Those methods were documented in Transuranic Waste Inventory Update Report, 2003 Computational Methodology [hereafter referred to as the Computational Methodology] (LANL 2003b).

The sections that follow describe the radionuclide decay calculations (Section DATA-F-2.3.1), the roll-up and scaling calculations (Section DATA-F-2.3.2), and calculations of chemical components in the repository (Section DATA-F-2.3.3).

DATA-F-2.3.1 Radionuclide Decay Calculations

One of the data requirements for the radionuclide inventory (see Section DATA-F-2.1.1) for the PA is that all radionuclides reported by waste stream in TWBID Revision 2.1 (LANL 2003a) will be decayed to a common base year. However, the site-provided data consisted of radionuclide activity concentrations at the date of assay for the waste stream (if the waste stream was assayed) or at the date that the site calculated the activity concentrations. Therefore, the radionuclide activity concentration data reported by the sites was exported from the TWBID Revision 2.1 into an external application that performed the radionuclide decay calculations and then imported back into the TWBID Revision 2.1 for storage.

The process of exporting the data from TWBID Revision 2.1 so that it can be decayed and importing the decayed data back into TWBID Revision 2.2 was governed by SNL procedure NP 9-1 Analyses: Appendix C, Routine Calculations (SNL 2001). Documentation of that calculation is provided in Unit Conversion and Data Transfer Between the TWBID Revision 2.1 Version 3.12 and ORIGEN2, Version 2.2 for the Transuranic Waste Inventory Update Report, 2003 (LANL 2003c).

The external application used for the radionuclide decay calculations was ORIGEN 2.2. The software code, ORIGEN 2.2 (Croff 1983; Croff 1980) is an isotope generation and depletion code that uses the matrix exponential solution method. The software was developed and is distributed by the Radiation Safety Information Computational Center at the Oak Ridge National Laboratory (ORNL).

The software was acquired to calculate the inventory of radionuclides decayed to the common base year, December 31, 2001. Qualification of ORIGEN 2.2 in support of these analyses was performed under SNL procedure, NP 19-1 Software Requirements (SNL 2002a). The steps involved in qualification of software under NP 19-1 were described in Section DATA-F-2.2.1. Each of the steps was completed for ORIGEN 2.2. Table DATA-F-4 gives the reader references and ERMS identifiers for the QA documents for ORIGEN 2.2. While the ORIGEN

2.2 software has many capabilities, the qualification of ORIGEN 2.2 (Croff 1983; Croff 1980) under the SNL QA program is limited to radionuclide buildup and decay calculations.

DATA-F-2.3.2 Roll-up and Scaling Calculations

The roll-up and scaling calculations performed in support of this report were performed within the TWBID Revision 2.1 (LANL 2003a). As discussed in Section DATA-F-2.2.2, TWBID Revision 2.1 was qualified as software under SNL procedure NP 19-1, Software Requirements. That qualification included the qualification of the queries and reports designed to produce the roll-up and scaled information specified in Giambalvo (2002).

The computational methods that apply to the roll-up and scaling calculations were defined in the Computational Methodology (LANL 2003b). This document was used as the basis for drafting the design documentation required for software qualification of TWBID Revision 2.1. The queries that have been qualified for use in TWBID Revision 2.1 produce the data that are tabulated throughout this report and documented in records submitted to the SNL WIPP Records Center.

DATA-F-2.3.3 Chemical Component Calculations

A final requirement set forth in Giambalvo (2002) is that this report supply information about the chemical components of the waste like that supplied in support of the CCA PA in the TWBIR Revision 3 (DOE 1996a). This includes a calculation of the mass of organic ligands (complexing agents), the mass of oxyanions (nitrate, sulfate, and phosphate), and the mass of cement expected in the disposal volume for WIPP.

The calculation of the mass of organic ligands, oxyanions, and cement in the disposal volume for WIPP was governed by SNL procedure NP 9-1, Analyses. Each of these masses was calculated by hand following the processes outlined in NP 9-1 and each is documented in reports that were reviewed by three reviewers (technical, management, and QA), and then submitted to the SNL WIPP Records Center. The reports are discussed briefly in Sections DATA-F-3.2.3.1, DATA-F-3.2.3.2, and DATA-F-3.2.3.3. Appendix DATA, Attachment F, Annex A contains the results of an analysis of the inventory for pyrochemical salts.

Table DATA-F-5 gives the reader ERMS identifiers for the reports on organic ligands, oxyanions, and cement.

DATA-F-2.4 Records

The entire process of data collection, database development, and analysis leading up to the publication of this report has been documented in the SNL WIPP Records Center. The following sections give the reader a roadmap for the official records that support this body of work. All records have been submitted to the SNL WIPP Records Center in accordance with SNL procedure NP 17-1, Records (SNL 2003a).

DATA-F-2.4.1 Records Related to Data

The most extensive set of records pertaining to this body of work are the records related to the data collected from the sites. These data were collected as described in Section DATA-F-2.1, with the initial data call being issued to the sites by CBFO (Gist 2002). This initial data call is stored in the SNL WIPP Records Center under identifiers listed in Table DATA-F-1. The site responses were collected and reviewed to ensure the data were authenticated by signature and date prior to submittal to the SNL WIPP Records Center with the ERMS numbers shown in Table DATA-F--1.

A technical review of these records and a subsequent accuracy check to make sure that the data had been entered correctly into the TWBID Revision 2.1 (LANL 2003a) were then performed. Any modifications made at the time of this review were documented in the site data records listed in Table DATA-F-1.

Upon completion of the technical review that determined that site data had been entered correctly in the TWBID Revision 2.1, a final series of checks was performed to ascertain the completeness and consistency of the data. The methods applied for the completeness and consistency checks were based on a number of database queries documented in the corrections packages listed in Table DATA-F-2. The corrections for completeness and consistency were made incrementally in a series of three steps. Before each step, the proposed changes were reviewed. Then they were implemented. Verification of the changes was printed and submitted as authenticated records to the SNL WIPP Records Center as shown in Table DATA-F-1.

Finally when the accuracy and completeness checks on the database were complete, an electronic file of the data from the TWBID Revision 2.1 was sent to the sites for final verification and authentication. Their concurrence with the data in the TWBID Revision 2.1 was also submitted to records.

DATA-F-2.4.2 Records Related to Software Qualification

The records related to the qualification of the TWBID Revision 2.1 (LANL 2003a) are listed in Table DATA-F-3. The records related to qualification of ORIGEN 2.2 are listed in Table DATA-F-4.

DATA-F-2.4.3 Records Related to Analyses

The records related to analyses have been discussed individually in Section 2.3 of this attachment and are listed for the reader's convenience in Table DATA-F-5.

DATA-F-3.0 TRANSURANIC WASTE INVENTORY

This section presents the TRU waste inventory that was collected on behalf of the DOE in support of CRA-2004. The data are stored in an electronic database, the TWBID Revision 2.1 Version 3.12 (LANL 2003a), which has been qualified for use in PA calculations as discussed in Section 2 of this attachment.

Table DATA-F-1. Records Related to Data Collection and Processing for the Transuranic Waste Inventory Update Report 2003

Document	ERMS#
Initial Memorandum for Data Call-Gist 2002	525955, 525962, 526065, 526077, 526094, 526113, 526167, 526410, 526598, 526526, 526540, 526558, 526568, 526592, 526609, 526679, 526698, 526739, 526768, 526782, 526428, 526447, 525956, 526054
Data Package For Ames	525948
Data Package For ARCO	526059
Data Package For Mound	525953 and 525958
Data Package For Pantex	525937
Data Package For Teledyne Brown	525934
Data Package For MURR	526555
Data Package For AW	526407 and 528082
Data Package For BC	526424
Data Package For BT	526164 and 528084
Data Package For BL	526051
Data Package For ET	526444 and 528054
Data Package For FR	525983
Data Package For IN	526765 (CH), 526179 (RH) and 528085
Data Package For KA	526087
Data Package For KN	525960 and 526104
Data Package For LA	526504 and 528065
Data Package For LB	526523
Data Package For LL	526536
Data Package For MC	525940
Data Package For NT (Jasper)	526576
Data Package For NT	526565
Data Package For OR	526589 and 528046
Data Package For PA	526074
Data Package For RF	526779 and 528074
Data Package For RL	526736
Data Package For RP	526473
Data Package For SA/IT	526606 and 526799
Data Package For SP	526063
Data Package For SR	526680
Data Package For GE	526463
Data Package For WV	526695
Data Package For WP	528118

Table DATA-F-2. Records Related to Computational Methods

Document Type	ERMS #
Transuranic Waste Inventory Update Report, 2003 Computational Methodology Revision 2	527821
Data Corrections in the TWBID Revision 2.1 Database – Data Screening Package	528538
Data Corrections in the TWBID Revision 2.1 Databases – Volume Package	528542
Data Corrections in the TWBID Revision 2.1 Databases – Waste Material Parameter Package	529603 and 529596
Data Corrections in the TWBID Revision 2.1 Databases – Radionuclide Package	528543

Table DATA-F-3. QA Documents for the TWBID Revision 2.1 (Records Package 526290)

Document Type	ERMS #
Software QA Plan	526292
Requirements Document	526293
Design Document	530621
Implementation Document	530621
Verification and Validation Plan	530623
Validation Document	530623
User's Manual	530622

Table DATA-F-4. QA Documents for ORIGEN2 Version 2.2 (Records Package 525783)

Document Type	ERMS #
Access Control Memorandum	528200
Requirements Document	525785
Code Classification of ORIGEN2, Version 2.2	525790
Implementation Document	525788
Verification and Validation Plan	525786
Validation Document	525786

Table DATA-F-5. Records Related to Inventory Analyses in Support of the CRA-2004 PA (Records Package 525272)

Document Type	*ERMS #*
Analysis Plan Governing Work	*525797*
Documentation of Waste Material Parameter Roll-up	*530767*
Documentation of Radionuclide Inventory Roll-up	*530992*
Calculation of Organic Ligand Masses	*531319*
Calculation of Oxyanion Masses	*530984*
Calculation of Cement Masses	*531562*

This presentation of the TRU waste inventory for CRA-2004 consists of summaries of the inventory information collected from the generator sites and the information calculated from the data submitted by the sites in support of the PA calculations for CRA-2004. Section DATA-F-3.1 presents the volume information provided by the sites for CH- and RH-TRU waste and the volume roll-ups to the WIPP repository capacity needed for PA. Section DATA-F-3.2 presents the non-radiological waste inventory as reported by the sites and as needed for PA. This includes roll-ups of the waste materials (Section DATA-F-3.2.1), roll-ups of the packaging materials (Section DATA-F-3.2.2), and information about the chemical components of the waste (Section DATA-F-3.2.3). Section DATA-F-3.3 presents the radionuclide inventory reported by the sites and WIPP-level roll-ups of the radionuclide data needed for PA.

Section DATA-F-3.4 presents a discussion of the non-WIPP and future potential waste, and provides the total volumes of the non-WIPP wastes, with the exception of the pre-1970 buried waste. Waste profiles are provided for these waste streams in Appendix DATA, Attachment F, Annex I. Appendix DATA, Attachment F, Section DATA-F-3.5 provides data for the materials used to facilitate waste emplacement at the WIPP. The material in Appendix DATA, Attachment F, Sections DATA-F-3.4 and DATA-F-3.5 is provided for completeness but is not used to support the WIPP PA.

In addition to the summary information presented in this section, a complete TRU waste inventory for all waste streams at all of the sites has been prepared in support of the CRA. That inventory is presented in Appendix DATA, Attachment F, Annexes I, J, and K. Appendix DATA, Attachment F, Annex I presents individual waste stream profiles for all of the waste streams that have been designated as Non-WIPP waste streams, as discussed in Appendix DATA, Attachment F, Section DATA-F-3.4. Annex J presents individual waste stream profiles for all WIPP waste streams planned for emplacement in the WIPP. Appendix DATA, Attachment F, Annex K presents individual waste stream profiles for all WIPP waste streams that were emplaced in the WIPP as of September 30, 2002.

Annex B presents the comparisons of 2003 volume, WMP, and radionuclide data to TWBIR Revision 3 data. Appendix DATA, Attachment F, Annex C presents the crosswalk of waste streams between TWBIR Revision 2 and the 2003 Update Report, and explanations for these changes. Appendix DATA, Attachment F, Annex D presents the packaging materials.

DATA-F-3.1 Transuranic Waste Volume Inventory

The volume information requested from the sites was broken down as follows:

- ***stored waste – waste that currently exists at the site, regardless of whether it is in its final form, and***
- ***projected waste – waste that will be generated in the future.***

Data for emplaced wastes were obtained from the WWIS. The total waste stream volume collected from the sites included stored (v_s) and projected (v_p) components as applicable for each TRU waste stream. The sites also reported both "As Generated" and "Final Form" waste volumes for their waste streams (see Glossary for definitions). This "Final Form" volume accounts for the entire waste container (the volume the waste container occupies in the repository). Since PA only considers the waste volume that will be disposed in the WIPP, only the "Final Form" volumes were used in the calculation of actual (reported by the site) and scaled (used in PA) waste volumes.

Table DATA-F-6 presents the CH-TRU waste anticipated inventory volumes reported by the sites. Table DATA-F-7 presents the RH-TRU waste anticipated inventory volume reported by the sites. The data presented in Tables DATA-F-6 and DATA-F-7 were derived by summing the waste-stream-level data into a site-level roll-up. For each site, all stored waste stream volumes (v_s) were summed to arrive at the total stored volume for the site, V_s. All projected waste stream volumes (v_p) were summed to arrive at the total projected volume for the site, V_p. The sum of the total stored volume and the total projected volume is the anticipated volume, V_a.

$$V_s + V_p = V_a, \qquad (1)$$

Where

V_a ***is the total anticipated volume at the site***
V_s ***is the total stored volume at the site***
V_p ***is the total projected volume at the site.***

DATA-F-3.1.1 Waste Isolation Pilot Plant-Level Roll-Up of Waste Inventory for Performance Assessment

Performance assessments conducted in support of the WIPP have been predicated on the assumption that the WIPP repository will be filled to its design capacity at the time of closure. The design capacity for WIPP is 175,564 m^3 (6,200,000 ft^3) (U.S. Congress 1996) with a limit of 7079 m^3 (250,000 ft^3) for RH-TRU waste as imposed by the Consultation and Cooperation Agreement (DOE and State of New Mexico 1981). The volume of anticipated plus emplaced (CH-TRU and RH-TRU) waste reported by the sites in support of the CRA-2004 is less than and more than, respectively, the design capacity for WIPP. Therefore, scaling the CH- and RH-TRU waste volumes (up and down, respectively) to the design capacity for each in the WIPP is necessary for PA. The scaled inventory for PA is referred to as the disposal volume

Table DATA-F-6. WIPP CH-TRU Waste Anticipated Inventory By Site

TRU Waste Site	*Stored Volumes (m^3)*	*Projected Volumes (m^3)*	*Anticipated Volumes (m^3)*
Argonne National Laboratory - East	1.1×10^{2}	7.9×10^{1}	1.9×10^{2}
Argonne National Laboratory - West	6.0×10^{0}	3.8×10^{1}	4.4×10^{1}
Battelle Columbus Laboratories	5.2×10^{0}	0.0×10^{0}	5.2×10^{0}
Bettis Atomic Power Laboratory	1.9×10^{1}	0.0×10^{0}	1.9×10^{1}
Energy Technology Engineering Center	2.3×10^{0}	0.0×10^{0}	2.3×10^{0}
Hanford (Richland-RL)	1.3×10^{4}	1.3×10^{4}	2.5×10^{4}
Hanford (River Protection-RP)	3.9×10^{3}	0.0×10^{0}	3.9×10^{3}
Idaho National Engineering & Environmental Laboratory	6.1×10^{4}	1.2×10^{2}	6.1×10^{4}
Knolls Atomic Power Laboratory - Nuclear Fuel Services	5.5×10^{1}	1.7×10^{2}	2.3×10^{2}
Lawrence Livermore National Laboratory	3.5×10^{2}	2.1×10^{3}	2.4×10^{3}
Los Alamos National Laboratory	1.2×10^{4}	3.3×10^{3}	1.5×10^{4}
Nevada Test Site	6.2×10^{2}	4.6×10^{2}	1.1×10^{3}
Oak Ridge National Laboratory	0.0×10^{0}	4.5×10^{2}	4.5×10^{2}
Paducah Gaseous Diffusion Plant	5.7×10^{0}	5.7×10^{0}	1.1×10^{1}
Rocky Flats Environmental Technology Site	5.4×10^{3}	2.7×10^{3}	8.1×10^{3}
Sandia National Laboratories - Albuquerque	2.4×10^{1}	0.0×10^{0}	2.4×10^{1}
Savannah River Site (SRS)	1.3×10^{4}	2.4×10^{3}	1.5×10^{4}
U.S. Army Material Command	2.5×10^{0}	0.0×10^{0}	2.5×10^{0}
University of Missouri Research Reactor	1.5×10^{0}	0.0×10^{0}	1.5×10^{0}
Totals	1.1×10^{5}	2.5×10^{4}	1.3×10^{5}
Emplaced Volume			
Waste Isolation Pilot Plant	7.7×10^{3}	0.0×10^{0}	7.7×10^{3}
Grand Totals	1.2×10^{5}	2.5×10^{4}	$1.4 x 10^{5}$

as described in the Glossary. The CH-TRU waste was scaled up since the anticipated volume is less than the allowable capacity. The RH-TRU waste was scaled down because the anticipated volume of RH-TRU waste exceeded the allowable limit. Scaling is performed only on projected waste.

Table DATA-F-8 presents the volume scaling factors. The following sections discuss the calculation of the WIPP-level roll-up for CH- and RH-TRU waste.

DATA-F-3.1.1.1 Calculation of Waste Isolation Pilot Plant-Level Roll-Up for Contact-Handled- Transuranic Waste

The WIPP disposal limit for CH-TRU waste is 168,485 m^3 (5,950,000 ft^3). Since the total reported volume of CH-TRU waste is less than the WIPP limit, the projected volume was scaled so the total volume equaled the CH-TRU waste disposal limit for WIPP. The scaling

Table DATA-F-7. WIPP RH-TRU Waste Anticipated Inventory By Site

TRU Waste Site	*Stored Volumes (m^3)*	*Projected Volumes (m^3)*	*Anticipated Volumes (m^3)*
Argonne National Laboratory – East	1.5×10^1	1.0×10^2	1.2×10^2
Argonne National Laboratory - West	2.4×10^1	6.9×10^1	9.3×10^1
Battelle Columbus Laboratories	4.4×10^1	1.8×10^0	4.6×10^1
Bettis Atomic Power Laboratory	2.0×10^0	0.0×10^0	2.0×10^0
Energy Technology Engineering Center	5.0×10^0	0.0×10^0	5.0×10^0
Hanford (Richland-RL)	3.8×10^2	9.4×10^3	9.8×10^3
Hanford (River Protection-RP)	4.5×10^3	0.0×10^0	4.5×10^3
Idaho National Engineering & Environmental Laboratory	2.2×10^2	0.0×10^0	2.2×10^2
Knolls Atomic Power Laboratory - Schenectady	0.0×10^0	1.4×10^2	1.4×10^2
Los Alamos National Laboratory	1.2×10^2	0.0×10^0	1.2×10^2
Oak Ridge National Laboratory	0.0×10^0	6.6×10^2	6.6×10^2
Sandia National Laboratories - Albuquerque	4.6×10^0	0.0×10^0	4.6×10^0
Savannah River Site	0.0×10^0	2.3×10^1	2.3×10^1
Totals	5.3×10^3	1.0×10^4	1.6×10^4

factor for CH-TRU waste was calculated using the following equation applied to WIPP waste streams .

The CH-TRU waste volume scaling factor was calculated as follows:

$$SF_{CH} = (\text{CH-TRU Design Capacity in } m^3 - V_s - V_e)/V_p, \qquad (2)$$

where

SF_{CH}	***is the scaling factor for the CH-TRU waste volume***
V_s	***is the total stored volume over all waste streams and all sites for CH-TRU waste***
V_p	***is the total projected volume over all waste streams and all sites for CH-TRU waste***
V_e	***is the total emplaced volume for CH-TRU waste over all waste streams and all sites as of September 30, 2002.***

The disposal inventory for a single CH-TRU waste stream was obtained by multiplying the CH-TRU waste projected volume by the appropriate scaling factor and adding that value to the stored and emplaced volumes for each waste stream.

$$v_{CH\text{-}Disposal} = SF_{CH}\,(v_p) + v_s + v_e, \qquad (3)$$

where

$v_{CH\text{-}Disposal}$ is the disposal volume for CH-TRU waste for a single waste stream
SF_{CH} is the scaling factor for the CH-TRU waste volume
v_p is the projected inventory volume for a single CH-TRU waste stream before scaling
v_s is the stored inventory volume for a single CH-TRU waste stream before scaling
v_e is the emplaced inventory volume for a CH-TRU single waste stream before scaling.

Table DATA-F-8 shows the calculation for the CH-TRU waste scaling factor and the CH-TRU waste volumes. The total CH-TRU waste disposal inventory, $V_{CH\text{-}Disposal}$, is the sum of the scaled CH-TRU waste stream volumes. The scaled waste stream volumes for the CH-TRU waste streams included in the estimate of volume for PA are given in Appendix DATA, Attachment F, Annex E, Table DATA-F-E-1. All volume and scaling calculated results were derived from the data and information that were reported in the updated TWBID Revision 2.1 (LANL 2003a) for each CH-TRU waste stream. The volume rollups and scaling calculations were performed under the SNL QA program as described in the Computational Methodology (LANL 2003b).

DATA-F-3.1.1.2 Calculation of Waste Isolation Pilot Plant-level Roll-up for Remote-Handled Transuranic Waste

The WIPP disposal limit for RH-TRU waste is 7,079 m^3 (250,000 ft^3) (U.S. DOE and State of New Mexico 1981). The reported volume of stored RH-TRU waste is less than the disposal limit but the sum of the stored and projected volumes is greater than the disposal limit. Since the total reported volume of RH-TRU waste is greater than the WIPP limit, the projected volume was scaled down so the total volume for PA equaled the RH-TRU waste disposal limit for WIPP. The scaling factor for RH-TRU waste was obtained after RH-TRU waste streams designated as Non-WIPP waste streams were removed for WIPP waste streams.

The scaling factor for RH-TRU waste was calculated using the following equation:

$$SF_{RH} = (\text{RH-TRU Design Capacity in } m^3 - V_s - V_e) / V_p, \qquad (4)$$

where

SF_{RH} is the scaling factor for the RH-TRU waste volume
V_s is the total stored volume over all waste streams and all sites for RH-TRU waste
V_e is the total emplaced volume over all waste streams and all sites for RH-TRU waste
V_p is the total projected volume over all waste streams and all sites for RH waste.

There is currently no RH-TRU waste emplaced in the WIPP, so the total RH-TRU waste emplaced volume, V_e, is zero.

The disposal inventory for a single RH-TRU waste stream was then obtained by multiplying the RH-TRU waste projected volume by the appropriate scaling factor and adding that value to the stored and emplaced volumes for each waste stream.

$$v_{RH\text{-}Disposal} = SF_{RH}\,(v_p) + v_s + v_e, \qquad (5)$$

where

$v_{RH\text{-}Disposal}$	*is the disposal volume for RH-TRU waste for a single waste stream*
SF_{RH}	*is the scaling factor for the RH-TRU waste volume*
v_s	*is the stored inventory volume for a single RH-TRU waste stream before scaling*
v_e	*is the emplaced inventory volume for a single RH-TRU waste stream before scaling*
v_p	*is the projected inventory volume for a single RH-TRU waste stream before scaling*

Table DATA-F-8 shows the calculation for the RH-TRU waste scaling factor and the RH-TRU waste volumes. The total RH-TRU waste disposal inventory, $V_{RH\text{-}Disposal}$, is the sum of the scaled RH-TRU waste stream inventories. The scaled waste stream volumes for the RH-TRU waste streams included in the estimate of volume for PA is given in Appendix DATA, Attachment F, Annex E, Table DATA-F-E-2. All volume and scaling calculated results were derived from the data and information that were reported in the updated TWBID Revision 2.1 (LANL 2003a) for each RH-TRU waste stream. The volume rollups and scaling calculations were performed under the SNL QA program as described in the Computational Methodology (LANL 2003b).

The total disposal inventory for the WIPP repository is the sum of the disposal volumes for CH- and RH-TRU wastes for all waste streams after scaling ($V_{CH\text{-}Disposal}$ and $V_{RH\text{-}Disposal}$).

DATA-F-3.2 Non-Radiological Transuranic Waste Inventory

This section presents the non-radiological TRU waste inventory that was collected on behalf of the DOE in support of the CRA. Section DATA-F-3.2.1 presents the inventory of waste materials. Section DATA-F-3.2.2 presents the inventory of packaging materials, and DATA-F-3.2.3 presents the inventory of chemical components.

The DOE has many reasons for obtaining and tracking non-radiological information about the TRU waste inventory destined for WIPP. For example, the DOE tracks the waste materials that go into the repository (i.e., CPR materials) because they may affect gas generation in the repository. As another example, the DOE tracks the chemical components of the waste going into the repository because they affect the solubility of actinides in the waste. The DOE needs to know the non-radiological properties of the waste not only for PA but also to support safe and economical transportation of the waste and operation of the facility.

Table DATA-F-8. Volume Scaling Factors

CH-WASTE	
WIPP capacity for waste	$1.68 \times 10^{5}\ m^{3}$
Total stored volume	$1.09 \times 10^{5}\ m^{3}$
Total projected volume	$2.48 \times 10^{4}\ m^{3}$
Total emplaced volume	$7.72 \times 10^{3}\ m^{3}$
Volume scaling factor (SF_{CH})	2.11×10^{0}
Note: $\frac{\left(1.68\times10^{5}\right)-\left(\left(1.09\times10^{5}\right)+\left(7.72\times10^{3}\right)\right)}{\left(2.48\times10^{4}\right)}=2.11\times10^{0}$	
RH-WASTE	
WIPP capacity for waste	$7.08 \times 10^{3}\ m^{3}$
Total stored volume	$5.29 \times 10^{3}\ m^{3}$
Total projected volume	$1.04 \times 10^{4}\ m^{3}$
Total emplaced volume	$0.00 \times 10^{0}\ m^{3}$
Volume scaling factor (SF_{RH})	1.72×10^{-1}
Note: $\frac{\left(7.08\times10^{3}\right)-\left(\left(5.29\times10^{3}\right)+\left(0.00\times10^{0}\right)\right)}{\left(1.04\times10^{4}\right)}=1.72\times10^{-1}$	

The DOE has established a system of tracking the non-radiological waste inventory destined for WIPP. It involves a description of the waste streams in terms of their waste matrix codes (WMCs), their WMPs, and their final waste forms.

The WMPs, final waste forms, and WMCs are defined in the Glossary, and were previously described in the TWBIR Revision 2 (DOE 1995b). The final waste forms and WMCs are also described in detail in the DOE Waste Treatability Group Guidance (DOE 1995c).

The following WMP descriptions were excerpted from the TWBIR Revision 2 and are operative in this document:

- ***Iron-base metal/alloys – This designation is meant to include iron and steel alloys in the waste and does not include the waste container materials. This also includes an iron-base metallic phase associated with any vitrification process, if applicable;***

- ***Aluminum-base metal/alloys – Aluminum or aluminum-base alloys in the waste materials;***

- ***Other metal/alloys – All other metals found in the waste materials (e.g., copper, lead, zirconium, tantalum, etc.). The lead portion of lead rubber gloves/aprons is also included in this category;***

- ***Other inorganic material – Includes inorganic non-metal waste materials such as concrete, glass, firebrick, ceramics, graphite, sand, and inorganic sorbents;***
- ***Vitrified material – This refers to waste that has been melted or fused at high temperatures with glass forming additives such as soil or silica in appropriate proportions to result in a homogeneous glass-like matrix. (Note that any unoxidized metallic phases, if present, are included in the iron-base metal/alloys waste material parameter.);***
- ***Cellulosic material – Includes those materials generally derived from high polymer plant carbohydrates. Examples are paper, cardboard, kimwipes, wood, cellophane, cloth, etc;***
- ***Rubber material – Includes natural or manmade elastic latex materials. Examples are Hypalon®, neoprene, surgeons' gloves, leaded-rubber gloves (rubber part only), etc;***
- ***Plastic material – Includes generally manmade materials, often derived from petroleum feedstock. Examples are polyethylene, polyvinylchloride, Lucite®, Teflon®, etc;***
- ***Solidified inorganic material – Includes any homogeneous materials consisting of sludge or aqueous-base liquids that are solidified with cement, Envirostone®, or other solidification agents. Examples are wastewater treatment sludge, cemented aqueous liquids, and inorganic particulates, etc. If a TRU waste site has not reported cement used as part of the solidification process in the cement (solidified) waste material parameter, the density of the cement is included in this field;***
- ***Solidified organic material – Includes cemented organic resins, solidified organic liquids, and sludges;***
- ***Cement (solidified) – Includes the cement used in solidifying liquids, particulates, and sludges. If for a solidified final waste form this field is left blank, it means that either cement is not the solidifying agent or that the cement is included in the solidified inorganic material waste material parameter, and***
- ***Soil – Generally consists of naturally occurring soils that have been contaminated with inorganic radioactive waste materials.***

Packaging material parameters are described in further detail in Section DATA-F-3.2.2 and in Annex D. Packaging material parameters were reported from the material parameter descriptions described in the TWBIR Revision 2. These parameters were determined by weights defined as follows:

- ***Steel – The weight of the steel part of the packaging from container information provided by the TRU waste generator/storage sites. Any necessary overpacking is included in the weight;***

- ***Plastic – The weight of any plastic packaging submitted by the TRU waste sites. When weight of a rigid liner is not given, a 90-mil high density polyethylene (HDPE) liner is assumed; and***
- ***Lead – The weight of the lead shielding in a RH-TRU canister is assumed if not provided by the TRU waste generator/storage sites.***

Final waste form refers to the expected physical and chemical form of that waste stream after it is ready for disposal (i.e., once the waste has been processed, treated, or repackaged as necessary). Each final waste form consists of one or more WMCs that are grouped together. The WMCs associated with each of the final waste forms listed below are included in the TWBIR Revision 3 (DOE 1996a, Table 1-2). The purpose of the final waste form is to group waste streams that are expected to have similar physical and chemical properties at the time of disposal. A final waste form was assigned to all reported WIPP waste streams by each of the sites. The final waste forms are:

- ***Solidified inorganic material,***
- ***Salt,***
- ***Solidified organic material,***
- ***Soil,***
- ***Uncategorized metal (metal waste other than lead and/or cadmium) ,***
- ***Lead/cadmium metal,***
- ***Inorganic non-metal,***
- ***Combustible material,***
- ***Graphite,***
- ***Heterogeneous debris,***
- ***Filter material,***
- ***Excluded waste streams (excluded from disposal at WIPP), and***
- ***Unknown (excluded from disposal at WIPP).***

The purpose of the WMCs is to aid in categorizing mixed waste streams into groups based on their different physical and chemical characteristics. The sites assign the WMCs for all of their mixed waste streams and generally assign them for their non-mixed waste streams, as well. The WMC system description and terminology used by the sites and the DOE is detailed in the DOE Waste Treatability Group Guidance. The WMCs are numerous, and are therefore not all listed here. However, the summary category groups (referred to as matrix parameter

categories in the DOE Waste Treatability Group Guidance) are debris (S5000), homogeneous solids (S3000), and soil/gravel (S4000).

There are several WMCs in each of these summary category groups. For example, within the debris (S5000) summary category group, there are inorganic debris (S5100), organic debris (S5300), heterogeneous debris (S5400), and unknown/other debris (S5900). Within the inorganic debris group (S5100), there are metal debris (S5110), inorganic nonmetal debris (S5120), and unknown/other inorganic debris (S5190). Within the metal debris (S5110) group, there are metal debris without lead or cadmium (S5111) and so on. These are detailed in the DOE Waste Treatability Group Guidance document.

DATA-F-3.2.1 Waste Materials

As part of the data call for this 2003 Update Report, the sites were asked to provide information about the materials contained in the waste. For each waste stream they were asked to designate a final waste form and to provide the density of each of the WMPs in the waste stream. The sites were asked to provide minimum, maximum, and average values for the WMPs in each waste stream. In some cases the sites provided all of the information required; in other cases, they did not.

For those waste streams where the site did not provide information regarding WMPs, the WMPs were estimated using the methods described in the Computational Methodology (LANL 2003b) and in the WMP corrections packages as identified in Table DATA-F-2. In summary, when partial information was provided (i.e., the minimum value or maximum value but not the average), it was used to calculate the average WMPs density (which was needed for PA). When no WMPs density information was given for a waste stream, the average density was inferred by identifying an analogous waste stream, and mapping the WMP from that waste stream into the waste stream that lacked WMPs.

For example, when information for a waste stream at a site was missing, the other waste streams from that site were reviewed to identify waste streams with similar final waste forms, WMCs, and waste stream descriptions. If a similar waste stream was identified, the WMPs from that waste stream (source) were attributed to the waste stream that lacked WMPs (destination waste stream). If there were no similar waste streams reported by that site, the other sites were examined to identify an appropriate similar waste regardless of its site of origin. Then the WMPs from the similar waste stream were copied (source to destination waste stream). In both cases, the packaging material parameters were edited using the waste packaging densities discussed in Section DATA-F-3.2.2 as appropriate for the type of container(s) in the destination waste stream.

In some cases, more than one similar waste stream was identified. In these instances, an average of the WMPs from similar streams was calculated and used. It was not necessary to calculate an average set of WMPs based on final waste form, as discussed in the Computational Methodology (LANL 2003b).

Waste streams were sometimes comprised of more than one container type (for example, 55-gallon drums and standard waste boxes (SWBs)). In these instances, when the site provided

only one set of WMPs, those WMPs were used for both container types; except for the packaging material parameters which were corrected for the container type using the waste packaging densities given in Section DATA-F-3.2.2. The TWBID Revision 2.1 contains the WMPs list for every container type in a waste stream. However, the waste profiles in Annexes I and J (non-WIPP and WIPP waste streams, respectively) have a weighted average of the WMPs for all container types used in a waste stream. If the site provided a WMPs list for each container type, those lists were maintained in the TWBID Revision 2.1 and a weighted average of the WMPs for all container types was used in the waste profiles.

In some cases, the sites provided incomplete WMP data from which the needed data could be inferred. Specifically, the WMP average densities were inferred from minimum and maximum WMP data. However, the minimum and maximum values will not be used for CRA PA and therefore were not reported. There are three cases in which WMP data were inferred. If maximum and minimum WMP values were reported, but no average density was reported, the average density was calculated as one half the sum of the maximum and minimum WMPs. If only a minimum WMP was reported, the minimum was assigned as the average density. If only a maximum WMP was reported, the average was calculated as one half the maximum WMP value, and assumed that the minimum was zero.

DATA-F-3.2.1.1 Roll-Up of Final Waste Form Volumes

Table DATA-F-9 presents a roll-up of the final waste form volumes for CH- and RH-TRU waste. Every WIPP waste stream in the TWBID Revision 2.1 (LANL 2003a) has been assigned a final waste form. The total volume for each of the final waste form categories is calculated by summing the actual (not scaled) waste stream volume components (emplaced, stored, and projected) with the same final waste form designation for all waste streams destined for WIPP.

DATA-F-3.2.1.2 Waste Material Parameter average Densities for Each Final Waste Form

Tables DATA-F-10 through DATA-F-29 present the WMP average densities for each final waste form in CH- and RH-TRU waste. Tables DATA-F-10 through DATA-F-20 are for CH-TRU waste. Tables DATA-F-21 through DATA-F-29 are for RH-TRU waste. These tables include the rolled up WMP average densities for each final waste form and the rolled up waste volumes by site that contributed to the total final waste form volume. These volumes are broken out into stored and projected volumes, and the total volume of waste by site for each final waste form. The emplaced volume is given by site, with the WIPP being the only applicable site. The final waste forms that have an emplaced waste CH-TRU waste volume are combustible, filter, heterogeneous, inorganic non-metal, lead/cadmium metal, salt, solidified inorganics, and uncategorized metal. There is no RH-TRU waste emplaced at this time.

For example, Table DATA-F-10 presents the WMP average densities for all CH-TRU waste streams with the combustible final waste form designation. The table shows roll-ups for stored, projected, and emplaced CH-TRU waste with the combustible final waste form designation for each site. This information is derived by summing the component volumes for each CH-TRU waste stream in the combustible category at each site.

Calculation of the WMP average densities in a final waste form requires combining data from the individual waste streams with the same final waste form designation as follows:

$$ {}^{WM}m_i^j = {}^{WM}p_i^j \ x \ v_i^j $$

$$ {}^{WM}M^j = \sum {}^{WM}m_i^j \qquad (6) $$

$$ {}^{WM}P^j = {}^{WM}M^j \ / \ V^j, $$

where

${}^{WM}m_i^j$	***is the mass of the waste material (WM) in waste stream i with a final waste form designation j***
${}^{WM}p_i^j$	***is the average density of the WM in waste stream i with a final form designation j***
v_i^j	***is the volume of waste stream i (stored + projected + emplaced) with a final form designation of j***
${}^{WM}M^j$	***is the total mass of WM in all waste streams with a final form designation of j***
V^j	***is the total volume of all waste streams with a final form designation of j***
${}^{WM}P^j$	***is the average density of the WM in all waste streams the final form designation j.***

Portions of some waste streams have been shipped to the WIPP and emplaced and others have yet to be characterized and shipped. If there was no emplaced waste for a waste stream as of the inventory date, then the emplaced volume in the equation above for that waste stream was zero. If there was no emplaced waste for any of the waste streams within the final waste forms considered, the total emplaced volume for the final waste form was also zero.

There are several notable differences in the WMP average densities for the roll-ups by final waste form when compared to the TWBIR Revision 3 (DOE 1996a). These changes are tabulated and discussed in Appendix DATA, Attachment F, Annex B.2.

DATA-F-3.2.1.3 <u>Waste Isolation Pilot Plant-Scale Waste Material Parameter Densities</u>

Performance assessments conducted in support of the WIPP have been predicated on the assumption that waste materials are distributed homogeneously throughout the repository. As a result, a WIPP-scale average value for waste material densities is needed for PA. The WIPP-scale WMP average densities for CH- and RH-TRU wastes in support of the CRA are presented in Tables DATA-A-30 and DATA-F-31, respectively. These are equivalent to TWBIR Revision 3 (DOE 1996a) Tables 2-2 and 2-3, respectively. Note also that the TWBIR Revision 3 Tables 2-2 and 2-3 are the same as TWBIR Revision 2 (DOE 1995b, Tables 3-2 and 3-3, respectively). Although these tables in TWBIR Revisions 2 and 3 contain the minimum, maximum, and average densities for the WMP, this report contains only the average densities of the waste because only average values are used in PA.

WMPs were combined, or "rolled up," for the whole repository according to the Computational Methodology (LANL 2003b). Specifically, the roll-up of WMP average densities required combining data from all of the WIPP waste streams reported by the sites. A

weighted average value for the WMP based on the individual waste stream volumes in the total inventory was calculated from the WMP average densities provided by the sites as shown below:

$$^{WM}m_i = {}^{WM}p_i \times v_i$$

$$^{WM}M = \sum {}^{WM}m_i \qquad (7)$$

$$^{WM}P = {}^{WM}M / V,$$

where

$^{WM}m_i$	***is the mass of the WM in waste stream i***
$^{WM}p_i$	***is the average density of the WM in waste stream i***
v_i	***is the actual (not-scaled) volume of waste stream i (stored + projected + emplaced)***
^{WM}M	***is the total mass of WM in all waste streams***
V	***is the actual (not-scaled) volume of all waste streams***
^{WM}P	***is the average density of the WM in all waste streams.***

DATA-F-3.2.1.4 Additional Information Received After Transuranic Waste Baseline Inventory Database, Revision 2.1, Version 3.12, Data Version 4.09

After the TWBID, Revision 2.1 was configured for PA calculations, a typographical error was discovered in six of LANL's waste streams. The final form of these waste streams was listed as "solidified organic material" but should have been "solidified inorganic material" to match the waste matrix code. Therefore, the solidified organic material reported in Table DATA-F-9 and the volume identified for LANL in Table DATA-F-19 would decrease by 3,827 m³. The solidified inorganic material reported in Table DATA-F-9 and the volume identified for LANL in Table DATA-F-18 would increase by 3,827 m³. Volumes will also be affected in Tables DATA-F-B-12 and DATA-F-B-13 as well as the analyses for solidified inorganic material and solidified organic material in Appendix DATA, Attachment F, Annex B, Section DATA-F-B-1.4.

Table DATA-F-9. Transuranic Waste Inventory By Final Waste Form For WIPP

Final Waste Forms	Stored Waste	Projected Waste	Emplaced Waste	Total Waste
Contact Handled Waste Volumes (m^3)				
Combustible Material	4.3×10^3	1.9×10^3	6.1×10^2	6.8×10^3
Filter Material	9.9×10^2	5.9×10^2	3.4×10^2	1.9×10^3
Graphite	1.2×10^2	1.3×10^0	0.0×10^0	1.3×10^2
Heterogeneous Debris	4.9×10^4	9.7×10^3	5.7×10^2	5.9×10^4
Inorganic Non-Metal	1.1×10^4	6.8×10^1	9.7×10^2	1.2×10^4
Lead/Cadmium Metal	1.4×10^2	3.2×10^1	8.1×10^1	2.6×10^2
Salt	1.5×10^2	1.9×10^2	1.5×10^3	1.8×10^3
Soil	3.0×10^2	6.0×10^3	0.0×10^0	6.3×10^3
Solidified Inorganic Material [1]	3.5×10^4	7.3×10^2	3.3×10^3	3.9×10^4
Solidified Organic Material [1]	5.2×10^3	3.8×10^2	0.0×10^0	5.5×10^3
Uncategorized Metal	2.4×10^3	5.1×10^3	3.6×10^2	7.9×10^3
Total CH-TRU Waste Volumes	1.1×10^5	2.5×10^4	7.7×10^3	1.4×10^5
Remote-Handled Waste Volumes (m^3)				
Combustible Material	1.8×10^1	8.9×10^{-1}	0.0×10^0	1.9×10^1
Filter Material	8.9×10^0	8.9×10^0	0.0×10^0	1.8×10^1
Heterogeneous Debris	6.1×10^2	3.8×10^3	0.0×10^0	4.4×10^3
Inorganic Non-Metal	4.3×10^1	4.4×10^1	0.0×10^0	8.6×10^1
Lead/Cadmium Metal	1.2×10^1	7.1×10^0	0.0×10^0	1.9×10^1
Soil	0.0×10^0	2.0×10^2	0.0×10^0	2.0×10^2
Solidified Inorganic Material	4.5×10^3	3.3×10^2	0.0×10^0	4.8×10^3
Solidified Organic Material	9.5×10^0	0.0×10^0	0.0×10^0	9.5×10^0
Uncategorized Metal	8.4×10^1	6.1×10^3	0.0×10^0	6.1×10^3
Total RH-TRU Waste Volumes	5.3×10^3	1.0×10^4	0.0×10^0	1.6×10^4
Total TRU Waste Volumes (m^3)	1.1×10^5	3.5×10^4	7.7×10^3	1.6×10^5

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09
[1] See Section DATA-F-3.2.1.4 for additional information.

Table DATA-F-10. WIPP CH-TRU Waste Profiles – Combustible Material

Final Waste Form: ***Combustible Material***

TRU Waste Site Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Argonne National Laboratory – East	9.0×10^{1}	6.6×10^{1}	1.6×10^{2}
Argonne National Laboratory - West	5.4×10^{0}	4.4×10^{0}	9.8×10^{0}
Battelle Columbus Laboratories	5.2×10^{0}	0.0×10^{0}	5.2×10^{0}
Hanford (Richland-RL)	9.8×10^{1}	0.0×10^{0}	9.8×10^{1}
Los Alamos National Laboratory	2.9×10^{3}	1.4×10^{3}	4.3×10^{3}
Rocky Flats Environmental Technology Site	1.2×10^{3}	4.5×10^{2}	1.6×10^{3}
TRU Waste Site Total	4.3×10^{3}	1.9×10^{3}	6.2×10^{3}
Emplaced Waste Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Waste Isolation Pilot Plant	6.1×10^{2}	0.0×10^{0}	6.1×10^{2}
Emplaced Waste Total	6.1×10^{2}	0.0×10^{0}	6.1×10^{2}
Total Waste Volume (m^3)	4.9×10^{3}	1.9×10^{3}	6.8×10^{3}
Waste Material Parameters	**Average Density (kg/m^3)**		
Iron-Base Metal/Alloys	1.5×10^{1}		
Aluminum-Base Metal/Alloys	8.4×10^{-1}		
Other Metal/Alloys	7.9×10^{0}		
Other Inorganic Material	1.0×10^{1}		
Cellulosic Material	2.0×10^{1}		
Rubber Material	1.3×10^{1}		
Plastic Material	4.9×10^{1}		
Solidified Inorganic Material	9.4×10^{-1}		
Cement (Solidified)	4.8×10^{-2}		
Vitrified Material	0.0×10^{0}		
Solidified Organic Material	1.2×10^{1}		
Soil	8.8×10^{-1}		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

1 ***Table DATA-F-11. WIPP Contact-Handled Waste Profiles – Filter Material***

Final Waste Form: Filter Material

TRU Waste Site Volumes (m^3)			
Site	Stored	Projected	Total
Hanford (Richland-RL)	2.2×10^1	0.0×10^0	2.2×10^1
Lawrence Livermore National Laboratory	1.9×10^2	4.5×10^2	6.4×10^2
Los Alamos National Laboratory	3.3×10^2	0.0×10^0	3.3×10^2
Rocky Flats Environmental Technology Site	4.5×10^2	1.4×10^2	5.8×10^2
TRU Waste Site Total	9.9×10^2	5.9×10^2	1.6×10^3
Emplaced Waste volumes (m^3)			
Site	Stored	Projected	Total
Waste Isolation Pilot Plant	3.4×10^2	0.0×10^0	3.4×10^2
Emplaced Waste Total	3.4×10^2	0.0×10^0	3.4×10^2
Total Waste Volume (m^3)	1.3×10^3	5.9×10^2	1.9×10^3
Waste Material Parameters	Average Density (kg/m^3)		
Iron-Base Metal/Alloys	4.5×10^1		
Aluminum-Base Metal/Alloys	1.8×10^1		
Other Metal/Alloys	5.7×10^0		
Other Inorganic Material	1.6×10^1		
Cellulosic Material	4.6×10^1		
Rubber Material	6.2×10^0		
Plastic Material	1.6×10^1		
Solidified Inorganic Material	6.0×10^{-1}		
Cement (Solidified)	0.0×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	3.5×10^{-1}		
Soil	4.8×10^0		

2 ***Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09***

3

Table DATA-F-12. WIPP CH-TRU Waste Profiles – Graphite

Final Waste Form: ***Graphite***

TRU Waste Site Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Rocky Flats Environmental Technology Site	1.2×10^2	1.3×10^0	1.3×10^2
TRU Waste Site Total	1.2×10^2	1.3×10^0	1.3×10^2
Total Waste Volume (m^3)	1.2×10^2	1.3×10^0	1.3×10^2
Waste Material Parameters	**Average Density (kg/m^3)**		
Iron-Base Metal/Alloys	1.9×10^1		
Aluminum-Base Metal/Alloys	0.0×10^0		
Other Metal/Alloys	0.0×10^0		
Other Inorganic Material	1.7×10^2		
Cellulosic Material	8.6×10^1		
Rubber Material	0.0×10^0		
Plastic Material	2.3×10^1		
Solidified Inorganic Material	7.1×10^0		
Cement (Solidified)	0.0×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	0.0×10^0		
Soil	0.0×10^0		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-13. WIPP CH-TRU Waste Profiles – Heterogeneous Debris

Final Waste Form: ***Heterogeneous Debris***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Argonne National Laboratory - West	6.2×10^{-1}	3.4×10^{1}	3.4×10^{1}
Bettis Atomic Power Laboratory	1.9×10^{1}	0.0×10^{0}	1.9×10^{1}
Energy Technology Engineering Center	1.5×10^{0}	0.0×10^{0}	1.5×10^{0}
Hanford (Richland-RL)	1.2×10^{4}	2.1×10^{3}	1.4×10^{4}
Idaho National Engineering & Environmental Laboratory	2.0×10^{4}	2.3×10^{1}	2.0×10^{4}
Knolls Atomic Power Laboratory - Nuclear Fuel Services	5.5×10^{1}	1.7×10^{2}	2.3×10^{2}
Lawrence Livermore National Laboratory	1.3×10^{2}	1.4×10^{3}	1.6×10^{3}
Los Alamos National Laboratory	2.1×10^{3}	1.4×10^{3}	3.5×10^{3}
Nevada Test Site	6.1×10^{2}	4.6×10^{2}	1.1×10^{3}
Oak Ridge National Laboratory	0.0×10^{0}	4.5×10^{2}	4.5×10^{2}
Rocky Flats Environmental Technology Site	1.0×10^{3}	1.2×10^{3}	2.2×10^{3}
Sandia National Laboratories - Albuquerque	2.4×10^{1}	0.0×10^{0}	2.4×10^{1}
Savannah River Site	1.3×10^{4}	2.4×10^{3}	1.5×10^{4}
U.S. Army Material Command	2.5×10^{0}	0.0×10^{0}	2.5×10^{0}
University of Missouri Research Reactor	1.5×10^{0}	0.0×10^{0}	1.5×10^{0}
TRU Waste Site Total	4.9×10^{4}	9.7×10^{3}	5.9×10^{4}
Emplaced Waste Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Waste Isolation Pilot Plant	5.7×10^{2}	0.0×10^{0}	5.7×10^{2}
Emplaced Waste Total	5.7×10^{2}	0.0×10^{0}	5.7×10^{2}
Total Waste Volume (m^3)	4.9×10^{4}	9.7×10^{3}	5.9×10^{4}

Waste Material Parameters	***Average Density (kg/m^3)***
Iron-Base Metal/Alloys	2.4×10^{2}
Aluminum-Base Metal/Alloys	3.3×10^{1}
Other Metal/Alloys	5.7×10^{1}
Other Inorganic Material	5.6×10^{1}
Cellulosic Material	1.2×10^{2}
Rubber Material	3.2×10^{1}
Plastic Material	9.0×10^{1}
Solidified Inorganic Material	3.6×10^{0}
Cement (Solidified)	0.0×10^{0}
Vitrified Material	0.0×10^{0}
Solidified Organic Material	1.8×10^{0}
Soil	4.2×10^{0}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-14. WIPP CH-TRU Waste Profiles – Inorganic Non-Metal

Final Waste Form: ***Inorganic Non-Metal***

TRU Waste Site Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Hanford (Richland-RL)	1.1×10^1	3.0×10^1	4.2×10^1
Idaho National Engineering & Environmental Laboratory	1.1×10^4	0.0×10^0	1.1×10^4
Paducah Gaseous Diffusion Plant	5.7×10^0	5.7×10^0	1.1×10^1
Rocky Flats Environmental Technology Site	6.5×10^2	3.2×10^1	6.8×10^2
TRU Waste Site Total	1.1×10^4	6.8×10^1	1.1×10^4
Emplaced Waste Volumes (m^3)			
Site	**Stored (m^3)**	**Projected (m^3)**	**Total (m^3)**
Waste Isolation Pilot Plant	9.7×10^2	0.0×10^0	9.7×10^2
Emplaced Waste Total	9.7×10^2	0.0×10^0	9.7×10^2
Total Waste Volume (m^3)	1.2×10^4	6.8×10^1	1.2×10^4

Waste Material Parameters	Average Density (kg/m^3)
Iron-Base Metal/Alloys	4.2×10^0
Aluminum-Base Metal/Alloys	1.2×10^{-2}
Other Metal/Alloys	5.0×10^0
Other Inorganic Material	5.5×10^1
Cellulosic Material	1.9×10^1
Rubber Material	1.1×10^{-1}
Plastic Material	2.7×10^0
Solidified Inorganic Material	9.0×10^{-1}
Cement (Solidified)	0.0×10^0
Vitrified Material	7.1×10^1
Solidified Organic Material	2.7×10^{-5}
Soil	1.8×10^{-3}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-15. WIPP CH-TRU Waste Profiles – Lead/Cadmium Metal

Final Waste Form: ***Lead/Cadmium Metal***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Hanford (Richland-RL)	1.7×10^1	1.4×10^1	3.1×10^1
Los Alamos National Laboratory	3.7×10^0	0.0×10^0	3.7×10^0
Rocky Flats Environmental Technology Site	1.2×10^2	1.8×10^1	1.4×10^2
TRU Waste Site Total	1.4×10^2	3.2×10^1	1.8×10^2
Emplaced Waste Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Waste Isolation Pilot Plant	8.1×10^1	0.0×10^0	8.1×10^1
Emplaced Waste Total	8.1×10^1	0.0×10^0	8.1×10^1
Total Waste Volume (m^3)	2.2×10^2	3.2×10^1	2.6×10^2

Waste Material Parameters	***Average Density (kg/m^3)***
Iron-Base Metal/Alloys	9.2×10^2
Aluminum-Base Metal/Alloys	1.8×10^1
Other Metal/Alloys	1.5×10^2
Other Inorganic Material	1.8×10^1
Cellulosic Material	5.0×10^0
Rubber Material	3.3×10^0
Plastic Material	9.3×10^0
Solidified Inorganic Material	8.2×10^{-1}
Cement (Solidified)	0.0×10^0
Vitrified Material	0.0×10^0
Solidified Organic Material	1.1×10^{-2}
Soil	1.6×10^{-1}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

1 ***Table DATA-F-16. WIPP CH-TRU Waste Profiles – Salt***

Final Waste Form: Salt

TRU Waste Site Volumes (m3)			
Site	***Stored***	***Projected***	***Total***
Lawrence Livermore National Laboratory	1.2×10^{0}	1.5×10^{1}	1.6×10^{1}
Los Alamos National Laboratory	1.3×10^{2}	1.7×10^{2}	3.0×10^{2}
Rocky Flats Environmental Technology Site	2.5×10^{1}	0.0×10^{0}	2.5×10^{1}
TRU Waste Site Total	1.5×10^{2}	1.9×10^{2}	3.4×10^{2}
Emplaced Waste Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Waste Isolation Pilot Plant	1.5×10^{3}	0.0×10^{0}	1.5×10^{3}
Emplaced Waste Total	1.5×10^{3}	0.0×10^{0}	1.5×10^{3}
Total Waste Volume (m^3)	1.6×10^{3}	1.9×10^{2}	1.8×10^{3}

Waste Material Parameters	***Average Density (kg/m^3)***
Iron-Base Metal/Alloys	9.3×10^{0}
Aluminum-Base Metal/Alloys	5.7×10^{-2}
Other Metal/Alloys	3.1×10^{0}
Other Inorganic Material	2.1×10^{2}
Cellulosic Material	1.4×10^{2}
Rubber Material	4.1×10^{-2}
Plastic Material	8.9×10^{-1}
Solidified Inorganic Material	1.3×10^{1}
Cement (Solidified)	0.0×10^{0}
Vitrified Material	0.0×10^{0}
Solidified Organic Material	1.2×10^{1}
Soil	1.5×10^{0}

2 ***Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09***

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Table DATA-F-17. WIPP CH-TRU Waste Profiles – Soil

Final Waste Form: ***Soil***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Hanford (Richland-RL)	1.1×10^2	5.9×10^3	6.0×10^3
Idaho National Engineering & Environmental Laboratory	0.0×10^0	9.7×10^1	9.7×10^1
Los Alamos National Laboratory	1.9×10^2	0.0×10^0	1.9×10^2
TRU Waste Site Total	3.0×10^2	6.0×10^3	6.3×10^3
Total Waste Volume (m^3)	3.0×10^2	6.0×10^3	6.3×10^3
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	2.4×10^{-2}		
Aluminum-Base Metal/Alloys	9.1×10^{-3}		
Other Metal/Alloys	6.4×10^{-2}		
Other Inorganic Material	9.1×10^{-1}		
Cellulosic Material	1.5×10^{-1}		
Rubber Material	2.7×10^{-2}		
Plastic Material	1.4×10^{-1}		
Solidified Inorganic Material	1.8×10^0		
Cement (Solidified)	1.8×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	5.0×10^0		
Soil	3.2×10^2		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-18. WIPP CH-TRU Waste Profiles – Solidified Inorganic Material[1]

Final Waste Form: Solidified Inorganic Material

TRU Waste Site Volumes (m^3)			
Site	Stored	Projected	Total
Argonne National Laboratory - East	2.4×10^{1}	1.3×10^{1}	3.7×10^{1}
Hanford (Richland-RL)	1.9×10^{2}	3.0×10^{1}	2.2×10^{2}
Hanford (River Protection-RP)	3.9×10^{3}	0.0×10^{0}	3.9×10^{3}
Idaho National Engineering & Environmental Laboratory	2.9×10^{4}	0.0×10^{0}	2.9×10^{4}
Lawrence Livermore National Laboratory	1.4×10^{1}	1.8×10^{2}	1.9×10^{2}
Los Alamos National Laboratory	6.5×10^{2}	2.4×10^{2}	8.9×10^{2}
Nevada Test Site	5.7×10^{0}	0.0×10^{0}	5.7×10^{0}
Rocky Flats Environmental Technology Site	8.1×10^{2}	2.7×10^{2}	1.1×10^{3}
Savannah River Site	2.4×10^{1}	0.0×10^{0}	2.4×10^{1}
TRU Waste Site Total	3.5×10^{4}	7.3×10^{2}	3.6×10^{4}
Emplaced Waste Volumes (m^3)			
Site	Stored	Projected	Total
Waste Isolation Pilot Plant	3.3×10^{3}	0.0×10^{0}	3.3×10^{3}
Emplaced Waste Total	3.3×10^{3}	0.0×10^{0}	3.3×10^{3}
Total Waste Volume (m^3)	3.8×10^{4}	7.3×10^{2}	3.9×10^{4}

Waste Material Parameters	Average Density (kg/m^3)
Iron-Base Metal/Alloys	9.5×10^{-1}
Aluminum-Base Metal/Alloys	2.9×10^{-2}
Other Metal/Alloys	1.4×10^{0}
Other Inorganic Material	3.3×10^{1}
Cellulosic Material	7.6×10^{0}
Rubber Material	1.3×10^{-2}
Plastic Material	3.8×10^{0}
Solidified Inorganic Material	2.5×10^{2}
Cement (Solidified)	9.8×10^{1}
Vitrified Material	4.6×10^{-2}
Solidified Organic Material	2.7×10^{0}
Soil	4.2×10^{0}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09
[1]See Section DATA-F-3.2.1.4 for additional information.

Table DATA-F-19. WIPP CH-TRU Waste Profiles – Solidified Organic Material[1]

Final Waste Form: Solidified Organic Material

TRU Waste Site Volumes (m^3)			
Site	Stored	Projected	Total
Energy Technology Engineering Center	8.4×10^{-1}	0.0×10^{0}	8.4×10^{-1}
Hanford (Richland-RL)	2.3×10^{0}	3.4×10^{2}	3.4×10^{2}
Idaho National Engineering & Environmental Laboratory	1.1×10^{3}	0.0×10^{0}	1.1×10^{3}
Lawrence Livermore National Laboratory	8.1×10^{0}	4.8×10^{0}	1.3×10^{1}
Los Alamos National Laboratory	3.9×10^{3}	2.7×10^{1}	3.9×10^{3}
Rocky Flats Environmental Technology Site	1.4×10^{2}	4.4×10^{0}	1.4×10^{2}
TRU Waste Site Total	5.2×10^{3}	3.8×10^{2}	5.5×10^{3}
Total Waste Volume (m^3)	5.2×10^{3}	3.8×10^{2}	5.5×10^{3}
Waste Material Parameters	Average Density (kg/m^3)		
Iron-Base Metal/Alloys	3.9×10^{-1}		
Aluminum-Base Metal/Alloys	1.9×10^{-1}		
Other Metal/Alloys	2.8×10^{-1}		
Other Inorganic Material	2.7×10^{1}		
Cellulosic Material	3.7×10^{-1}		
Rubber Material	2.5×10^{-1}		
Plastic Material	7.1×10^{0}		
Solidified Inorganic Material	1.4×10^{2}		
Cement (Solidified)	3.8×10^{1}		
Vitrified Material	0.0×10^{0}		
Solidified Organic Material	3.3×10^{2}		
Soil	3.6×10^{1}		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09
[1]See Section DATA-F-3.2.1.4 for additional information.

1 Table DATA-F-20. WIPP CH-TRU Waste Profiles – Uncategorized Metal

Final Waste Form: Uncategorized Metal

TRU Waste Site Volumes (m^3)			
Site	Stored	Projected	Total
Hanford (Richland-RL)	1.1×10^2	4.4×10^3	4.5×10^3
Idaho National Engineering & Environmental Laboratory	9.4×10^0	0.0×10^0	9.4×10^0
Los Alamos National Laboratory	1.5×10^3	3.2×10^1	1.5×10^3
Rocky Flats Environmental Technology Site	7.9×10^2	6.7×10^2	1.5×10^3
TRU Waste Site Total	2.4×10^3	5.1×10^3	7.5×10^3
Emplaced Waste Volume (m^3)			
Site	Stored	Projected	Total
Waste Isolation Pilot Plant	3.6×10^2	0.0×10^0	3.6×10^2
Emplaced Waste Total	3.6×10^2	0.0×10^0	3.6×10^2
Total Waste Volume (m^3)	2.8×10^3	5.1×10^3	7.9×10^3

Waste Material Parameters	Average Density (kg/m^3)
Iron-Base Metal/Alloys	8.8×10^1
Aluminum-Base Metal/Alloys	5.3×10^0
Other Metal/Alloys	8.5×10^1
Other Inorganic Material	1.2×10^0
Cellulosic Material	2.3×10^0
Rubber Material	1.5×10^0
Plastic Material	7.5×10^0
Solidified Inorganic Material	7.7×10^0
Cement (Solidified)	0.0×10^0
Vitrified Material	0.0×10^0
Solidified Organic Material	6.7×10^{-1}
Soil	6.1×10^{-2}

2 Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

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Table DATA-F-21. WIPP RH-TRU Waste Profiles – Combustible Material

Final Waste Form: ***Combustible Material***

TRU Waste Site Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Battelle Columbus Laboratories	1.7×10^{1}	8.9×10^{-1}	1.8×10^{1}
Hanford (Richland-RL)	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
TRU Waste Site Total	1.8×10^{1}	8.9×10^{-1}	1.9×10^{1}
Total Waste Volume (m^3)	1.8×10^{1}	8.9×10^{-1}	1.9×10^{1}
Waste Material Parameters	**Average Density (kg/m^3)**		
Iron-Base Metal/Alloys	8.7×10^{0}		
Aluminum-Base Metal/Alloys	7.6×10^{0}		
Other Metal/Alloys	6.3×10^{0}		
Other Inorganic Material	9.2×10^{0}		
Cellulosic Material	3.9×10^{1}		
Rubber Material	2.3×10^{1}		
Plastic Material	9.2×10^{1}		
Solidified Inorganic Material	0.0×10^{0}		
Cement (Solidified)	1.7×10^{1}		
Vitrified Material	0.0×10^{0}		
Solidified Organic Material	1.5×1^{0}		
Soil	1.4×10^{0}		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-22. WIPP RH-TRU Waste Profiles – Filter Material

Final Waste Form: ***Filter Material***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Argonne National Laboratory - West	1.8×10^{0}	8.9×10^{0}	1.1×10^{1}
Battelle Columbus Laboratories	5.3×10^{0}	0.0×10^{0}	5.3×10^{0}
Hanford (Richland-RL)	1.8×10^{0}	0.0×10^{0}	1.8×10^{0}
TRU Waste Site Total	8.9×10^{0}	8.9×10^{0}	1.8×10^{1}
Total Waste Volume (m^3)	8.9×10^{0}	8.9×10^{0}	1.8×10^{1}
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	3.3×10^{1}		
Aluminum-Base Metal/Alloys	1.7×10^{1}		
Other Metal/Alloys	4.3×10^{1}		
Other Inorganic Material	1.1×10^{2}		
Cellulosic Material	7.3×10^{1}		
Rubber Material	1.9×10^{1}		
Plastic Material	6.3×10^{0}		
Solidified Inorganic Material	0.0×10^{0}		
Cement (Solidified)	7.7×10^{0}		
Vitrified Material	0.0×10^{0}		
Solidified Organic Material	1.2×10^{1}		
Soil	0.0×10^{0}		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-23. WIPP RH-TRU Waste Profiles – Heterogeneous Debris

Final Waste Form: ***Heterogeneous Debris***

TRU Waste Site Volumes (m^3)			
Site	*Stored*	*Projected*	*Total*
Argonne National Laboratory - East	1.5×10^{1}	1.0×10^{2}	1.2×10^{2}
Argonne National Laboratory - West	6.2×10^{0}	3.6×10^{1}	4.3×10^{1}
Bettis Atomic Power Laboratory	2.0×10^{0}	0.0×10^{0}	2.0×10^{0}
Energy Technology Engineering Center	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
Hanford (Richland-RL)	2.6×10^{2}	3.2×10^{3}	3.5×10^{3}
Idaho National Engineering & Environmental Laboratory	2.0×10^{2}	0.0×10^{0}	2.0×10^{2}
Knolls Atomic Power Laboratory - Schenectady	0.0×10^{0}	1.4×10^{2}	1.4×10^{2}
Los Alamos National Laboratory	1.2×10^{2}	0.0×10^{0}	1.2×10^{2}
Oak Ridge National Laboratory	0.0×10^{0}	2.7×10^{2}	2.7×10^{2}
Sandia National Laboratories - Albuquerque	4.6×10^{0}	0.0×10^{0}	4.6×10^{0}
Savannah River Site	0.0×10^{0}	2.3×10^{1}	2.3×10^{1}
TRU Waste Site Total	6.1×10^{2}	3.8×10^{3}	4.4×10^{3}
Total Waste Volume (m^3)	6.1×10^{2}	3.8×10^{3}	4.4×10^{3}

Waste Material Parameters	*Average Density (kg/m^3)*
Iron-Base Metal/Alloys	1.2×10^{2}
Aluminum-Base Metal/Alloys	8.0×10^{0}
Other Metal/Alloys	3.5×10^{1}
Other Inorganic Material	4.7×10^{1}
Cellulosic Material	1.6×10^{1}
Rubber Material	1.1×10^{1}
Plastic Material	1.6×10^{1}
Solidified Inorganic Material	3.6×10^{1}
Cement (Solidified)	0.0×10^{0}
Vitrified Material	0.0×10^{0}
Solidified Organic Material	1.4×10^{1}
Soil	3.5×10^{1}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-24. WIPP RH-TRU Waste Profiles – Inorganic Non-Metal

Final Waste Form: ***Inorganic Non-Metal***

TRU Waste Site Volumes (m^3)			
Site	**Stored**	**Projected**	**Total**
Battelle Columbus Laboratories	1.4×10^1	8.9×10^{-1}	1.5×10^1
Hanford (Richland-RL)	2.8×10^1	4.3×10^1	7.1×10^1
TRU Waste Site Total	4.3×10^1	4.4×10^1	8.6×10^1
Total Waste Volume (m^3)	4.3×10^1	4.4×10^1	8.6×10^1
Waste Material Parameters	**Average Density (kg/m^3)**		
Iron-Base Metal/Alloys	1.6×10^2		
Aluminum-Base Metal/Alloys	2.1×10^1		
Other Metal/Alloys	4.8×10^1		
Other Inorganic Material	9.9×10^2		
Cellulosic Material	3.9×10^0		
Rubber Material	1.8×10^0		
Plastic Material	2.4×10^1		
Solidified Inorganic Material	1.5×10^1		
Cement (Solidified)	3.1×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	2.8×10^{-1}		
Soil	7.1×10^0		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

1 ***Table DATA-F-25. WIPP RH-TRU Waste Profiles – Lead/Cadmium Metal***

Final Waste Form: ***Lead/Cadmium Metal***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Hanford (Richland-RL)	1.2×10^1	7.1×10^0	1.9×10^1
TRU Waste Site Total	1.2×10^1	7.1×10^0	1.9×10^1
Total Waste Volume (m^3)	1.2×10^1	7.1×10^0	1.9×10^1
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	5.4×10^3		
Aluminum-Base Metal/Alloys	0.0×10^0		
Other Metal/Alloys	7.4×10^1		
Other Inorganic Material	0.0×10^0		
Cellulosic Material	0.0×10^0		
Rubber Material	0.0×10^0		
Plastic Material	0.0×10^0		
Solidified Inorganic Material	0.0×10^0		
Cement (Solidified)	0.0×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	0.0×10^0		
Soil	0.0×10^0		

2 ***Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09***

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Table DATA-F-26. WIPP RH-TRU Waste Profiles – Soil

Final Waste Form: ***Soil***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Oak Ridge National Laboratory	0.0×10^0	2.0×10^2	2.0×10^2
TRU Waste Site Total	0.0×10^0	2.0×10^2	2.0×10^2
Total Waste Volume (m^3)	0.0×10^0	2.0×10^2	2.0×10^2
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	0.0×10^0		
Aluminum-Base Metal/Alloys	0.0×10^0		
Other Metal/Alloys	0.0×10^0		
Other Inorganic Material	0.0×10^0		
Cellulosic Material	0.0×10^0		
Rubber Material	0.0×10^0		
Plastic Material	0.0×10^0		
Solidified Inorganic Material	0.0×10^0		
Cement (Solidified)	0.0×10^0		
Vitrified Material	0.0×10^0		
Solidified Organic Material	0.0×10^0		
Soil	1.3×10^3		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

1 ***Table DATA-F-27. WIPP RH-TRU Waste Profiles – Solidified Inorganic Material***

Final Waste Form: Solidified Inorganic Material

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Argonne National Laboratory - West	1.6×10^{1}	2.3×10^{1}	3.9×10^{1}
Battelle Columbus Laboratories	1.8×10^{0}	0.0×10^{0}	1.8×10^{0}
Hanford (Richland-RL)	1.5×10^{1}	1.2×10^{2}	1.3×10^{2}
Hanford (River Protection-RP)	4.5×10^{3}	0.0×10^{0}	4.5×10^{3}
Idaho National Engineering & Environmental Laboratory	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
Oak Ridge National Laboratory	0.0×10^{0}	1.9×10^{2}	1.9×10^{2}
TRU Waste Site Total	4.5×10^{3}	3.3×10^{2}	4.8×10^{3}
Total Waste Volume (m^3)	4.5×10^{3}	3.3×10^{2}	4.8×10^{3}
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	6.8×10^{0}		
Aluminum-Base Metal/Alloys	0.0×10^{0}		
Other Metal/Alloys	3.4×10^{-2}		
Other Inorganic Material	6.9×10^{-1}		
Cellulosic Material	3.5×10^{-3}		
Rubber Material	0.0×10^{0}		
Plastic Material	1.6×10^{-2}		
Solidified Inorganic Material	9.2×10^{1}		
Cement (Solidified)	2.4×10^{0}		
Vitrified Material	1.8×10^{-1}		
Solidified Organic Material	3.1×10^{-2}		
Soil	4.1×10^{-3}		

2 ***Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09***

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Table DATA-F-28. WIPP RH-TRU Waste Profiles – Solidified Organic Material

Final Waste Form: ***Solidified Organic Material***

TRU Waste Site Volumes (m^3)			
Site	Stored	Projected	Total
Battelle Columbus Laboratories	5.3×10^0	0.0×10^0	5.3×10^0
Energy Technology Engineering Center	4.1×10^0	0.0×10^0	4.1×10^0
TRU Waste Site Total	9.5×10^0	0.0×10^0	9.5×10^0
Total Waste Volume (m^3)	9.5×10^0	0.0×10^0	9.5×10^0
Waste Material Parameters	Average Density (kg/m^3)		
Iron-Base Metal/Alloys	4.9×10^1		
Aluminum-Base Metal/Alloys	0.0×10^0		
Other Metal/Alloys	0.0×10^0		
Other Inorganic Material	1.2×10^1		
Cellulosic Material	2.0×10^1		
Rubber Material	4.2×10^0		
Plastic Material	2.0×10^1		
Solidified Inorganic Material	0.0×10^0		
Cement (Solidified)	1.4×10^2		
Vitrified Material	0.0×10^0		
Solidified Organic Material	1.7×10^2		
Soil	0.0×10^0		

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

1 ***Table DATA-F-29. WIPP RH-TRU Waste Profiles – Uncategorized Metal***

Final Waste Form: ***Uncategorized Metal***

TRU Waste Site Volumes (m^3)			
Site	***Stored***	***Projected***	***Total***
Battelle Columbus Laboratories	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
Hanford (Richland-RL)	6.1×10^{1}	6.1×10^{3}	6.1×10^{3}
Idaho National Engineering & Environmental Laboratory	2.2×10^{1}	0.0×10^{0}	2.2×10^{1}
TRU Waste Site Total	8.4×10^{1}	6.1×10^{3}	6.1×10^{3}
Total Waste Volume (m^3)	8.4×10^{1}	6.1×10^{3}	6.1×10^{3}
Waste Material Parameters	***Average Density (kg/m^3)***		
Iron-Base Metal/Alloys	1.8×10^{2}		
Aluminum-Base Metal/Alloys	4.5×10^{-1}		
Other Metal/Alloys	5.6×10^{1}		
Other Inorganic Material	4.0×10^{1}		
Cellulosic Material	7.5×10^{-2}		
Rubber Material	5.2×10^{-2}		
Plastic Material	7.8×10^{-2}		
Solidified Inorganic Material	3.1×10^{-3}		
Cement (Solidified)	0.0×10^{0}		
Vitrified Material	0.0×10^{0}		
Solidified Organic Material	0.0×10^{0}		
Soil	6.2×10^{-2}		

2
3

Table DATA-F-30. WIPP CH-TRU Waste Material Parameter Disposal Inventory

Waste Material Parameters	Average Density (kg/m^3)
Iron-Base Metal/Alloys	1.1×10^{2}
Aluminum-Base Metal/Alloys	1.4×10^{1}
Other Metal/Alloys	3.0×10^{1}
Other Inorganic Material	4.2×10^{1}
Cellulosic Material	5.8×10^{1}
Rubber Material	1.4×10^{1}
Plastic Material	4.2×10^{1}
Solidified Inorganic Material	7.7×10^{1}
Cement (Solidified)	2.9×10^{1}
Vitrified Material	6.2×10^{0}
Solidified Organic Material	1.6×10^{1}
Soil	1.9×10^{1}
Container Materials	
Steel	1.7×10^{2}
Plastic	1.6×10^{1}
Lead	1.4×10^{-2}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

Table DATA-F-31. WIPP RH-TRU Waste Material Parameter Disposal Inventory

Waste Material Parameters	Average Density (kg/m^3)
Iron-Base Metal/Alloys	1.1×10^{2}
Aluminum-Base Metal/Alloys	2.5×10^{0}
Other Metal/Alloys	3.2×10^{1}
Other Inorganic Material	3.5×10^{1}
Cellulosic Material	4.5×10^{0}
Rubber Material	3.1×10^{0}
Plastic Material	4.9×10^{0}
Solidified Inorganic Material	3.9×10^{1}
Cement (Solidified)	8.7×10^{-1}
Vitrified Material	5.7×10^{-2}
Solidified Organic Material	4.0×10^{0}
Soil	2.6×10^{1}
Container Materials	
Steel	4.8×10^{2}
Plastic	1.4×10^{0}
Lead	4.4×10^{2}

Source: TWBID Revision 2.1, Version 3.12, Data Version 4.09

DATA-F-3.2.2 Packaging Materials

The PA assumption that materials are distributed homogeneously throughout the repository also applies to packaging materials. As a result, a WIPP-scale average value for packaging material densities is needed for PA. The WIPP-scale packaging (container) material average densities for CH- and RH-TRU wastes in support of the CRA are presented in Tables DATA-F-30 and DATA-F-31, respectively. These are equivalent to the TWBIR Revision 3 (DOE 1996a), Tables 2-2 and 2-3, respectively. Note also that the TWBIR Revision 3 Tables 2-2 and 2-3 are the same as TWBIR Revision 2 (DOE 1995b), Tables 3-2 and 3-3, respectively.

Analysis of the packaging material data submitted by the sites identified inconsistencies in reporting among the sites. Therefore, adjustments were made at the waste stream level to achieve consistency among the waste streams. In particular, a consistent set of densities for packaging materials for different types of containers was used unless otherwise noted by the site. Table 1-3 of the TWBIR Revision 2 identified the packaging materials and packaging material densities for the waste containers that were being used at that time. These values were used in this 2003 Update Report as well. Since the time of the TWBIR Revision 2, the sites have begun using ten-drum overpacks (TDOPs) for packaging waste. The calculated packaging material densities for TDOPs are presented in Appendix DATA, Attachment F, Annex D, Packaging Materials.

In addition, sites are also reporting that they use 85 and 100-gallon drums. This is possible because Section 2.1 in the pending update to the TRAMPAC document (DOE 2002b) has been revised to add the 85-gallon drum as an authorized payload container for shipment in the TRUPACT II (the 85-gallon drum is currently authorized for shipment in the Half PACT), and to add the 100-gallon drum as an authorized payload container in the Half PACT (the 100-gallon drum is currently authorized for shipment in the TRUPACT II). This section of the TRAMPAC document has also been revised to specify a range of sizes (75 to 88 gallons) for a container identified as an "85-gallon drum."

Table DATA-F-32 is a summary of the assumed waste packaging material densities for some common final form container types reported by the sites. The packaging material densities in Table DATA-F-32 for 55-, 85-, and 100-gallon drums, SWBs, RH-TRU canisters, and TDOPs are calculated as shown in Appendix DATA, Attachment F, Annex D.

DATA-F-3.2.3 Chemical Components in Solidified Transuranic Waste

As part of the data call for this 2003 Update Report, the sites were asked to provide information about the chemical components of the waste. The sites were asked about complexing agents (acetate, citrate, oxylate, EDTA), oxyanions (nitrate, sulfate, and phosphate), cement, and pyrochemical salts.

Table DATA-F-32. Assumed Packaging Material Densities[1]

Container Configuration	*Steel (kg/m^3)*	*Plastic (kg/m^3)*	*Lead (kg/m^3)*	*Volume (m^3)[2]*
55-gallon drum	*131*	*37*	*0*	*0.208*
SWB (direct load)	*154*	*1.2*	*0*	*1.89*
SWB (overpack 4 55-gal. drums)	*211*	*16*	*0*	*1.89*
RH-TRU Waste Canister (direct load)	*434*	*0*	*464*	*0.89*
RH-TRU Waste Canister (overpack 3 55-gal. drums)	*526*	*26*	*464*	*0.89*
85-gallon drum	*114*	*0*	*0*	*0.322*
100-gallon drum	*114*	*81*	*0*	*0.379*
Ten-Drum Overpacks	*218*	*16*	*0*	*4.79*

[1] This table was used when sites did not report container volumes.
[2] Container volumes differ from WWIS container volumes.

This section presents the summary of the chemical components that are present in the solidified TRU waste inventory in support of the CRA. Specifically, complexing agents, oxyanions, and cement are calculated as the sum of the constituents found in anticipated waste scheduled for delivery to WIPP and any waste that has already been placed in the repository. The information provided is based on input from the TWBIR Revision 3 (DOE 1996a) and updates received from Rocky Flats Environmental Technology Site (RFETS), Los Alamos National Laboratory (LANL), Idaho National Engineering and Environmental Laboratory (INEEL), Hanford-Richland Operations (Hanford RL) and Hanford-Office of River Protection (Hanford RP). The methods used to estimate the masses of cement, complexing agents, and oxyanions are discussed in Leigh and Lott (2003), Crawford and Leigh (2003), and Leigh and Sparks-Roybal (2003), respectively. A brief discussion of pyrochemical salts is presented in Appendix DATA, Attachment F, Annex A.

DATA-F-3.2.3.1 Cement Content in Solidified Transuranic Waste

The PA for the CRA requires an estimate of the mass of cement in waste expected for disposal in the repository. An estimate of the cement mass for the CCA was given in Appendix B-7 of the TWBIR Revision 3 (DOE 1996a). While the waste stream volumes reported by the generator sites in the 2003 Update Report have changed when compared to the TWBIR Revision 3 volumes, the waste streams identified by the sites at the time of the TWBIR Revision 3 as containing cement have not changed. On the whole, the TRU waste generator sites did not report any new information about cement in this 2003 Update Report. As a result, the mass of cement in the repository was calculated for the PA in support of the CRA as the sum of the mass of cement reported in the TWBIR Revision 3 adjusting for the new waste stream volumes from this update.

The total estimated mass of cement in the scaled solidified waste streams for this 2003 Update Report is 1.20×10^7 kg (2.65×10^7 lb). This estimate of cement mass in the WIPP repository is larger than the estimate made for the CCA (8.54×10^6 kg [1.88×10^7 lb]). The increase in

cement mass is primarily because of larger volumes projected for existing waste streams. The calculations for cement masses are given in Leigh and Lott (2003).

DATA-F-3.2.3.2 Complexing Agents in Solidified Transuranic Waste

The DOE tracks the mass of complexing agents going into the repository because of their impact on solubility of actinides in the waste. In the latest request by DOE for data from the sites, none of the sites updated or modified their estimates of complexing agents in the waste streams that had been reported previously in the TWBIR Revision 3 (DOE 1996a). When applicable, the sites did report the expected masses of complexing agents in waste streams added to their inventory since publication of the TWBIR Revision 3. As a result, the mass of complexing agents in the repository was calculated for the PA in support of the CRA as the sum of the mass of complexing agents reported in the TWBIR Revision 3 plus the mass of complexing agents reported by the sites for their new waste streams.

The TWBIR Revision 3 contained information on complexing agents that was used in the PA in support of the CCA. TWBIR Revision 3 presented two estimates for complexing agents in the WIPP repository; one assuming reduction of complexing agents due to thermal treatment and one without the thermal treatment assumption. Since publication of the TWBIR Revision 3, the DOE's strategy for wastes at the INEEL has changed, and incineration operations for INEEL TRU waste did not occur as planned. Therefore, the data reported in Appendix B-4 of the TWBIR Revision 3 without the thermal treatment assumption is used in the current calculation of mass of complexing agents.

Only two sites reported complexing agents in new waste streams; RFETS and Hanford RP. For their new waste streams, RFETS reported that ethylenediaminetetraacetic acid (EDTA) might be present at trace levels (< 1 wt%) in their waste. Hanford RP identified sodium acetate and sodium oxalate in their new waste streams. The total mass of acetic acid, sodium acetate, citric acid, sodium citrate, oxalic acid, sodium oxalate, and sodium EDTA estimated for the WIPP repository are reported in Table DATA-F-33.

Table DATA-F-33. Mass of Potential Complexing Agents in the WIPP Repository

Compound	RFETS (kg)	LANL(kg)	Hanford RP (kg)	Total (kg)
Acetic Acid	132	10	---	142
Sodium Acetate	1,110	---	7,400	8,510
Citric Acid	90	1,100.5	---	1,190.5
Sodium Citrate	400	---	---	400
Oxalic Acid	90	13,706	---	13,796
Sodium Oxalate	---	---	33,940	33,940
EDTA	25.6	---	---	25.6

Source: Crawford and Leigh (2003)

Only a slight increase in EDTA was reported with this updated information over that reported in 1996 (DOE 1996a). The increase comes from one waste stream at RFETS that reported trace amounts of EDTA present in the waste and is reported as the upper limit of expected

concentration. Waste from Hanford RP waste tanks is included in Table DATA-F-33 as well, and represents a significant increase in sodium acetate and sodium oxalate that had not been reported for the TRU inventory in 1996 (DOE 1996a).

DATA-F-3.2.3.3 Mass of Oxyanions in Solidified Transuranic Waste

The PA for the CRA requires an estimate of the mass of nitrate, sulfate, and phosphate in waste expected for disposal in the repository. An estimate of the oxyanion masses for the CCA was given in Appendix B-6 of the TWBIR Revision 3 (DOE 1996a). The TRU waste sites did not report any new information about oxyanions for this 2003 Update Report with the exception of new waste streams reported by Hanford RP and LANL and revised values for a waste stream at RFETS. Therefore, the mass of nitrate, sulfate, and phosphate in the repository was calculated for the PA in support of the CRA as the sum of the mass of nitrate, sulfate, and phosphate in the TWBIR Revision 3 adjusting for the new waste stream volumes from this update plus the mass of nitrate, sulfate, and phosphate reported by the sites for their new waste streams. Table DATA-F-34 presents the mass of nitrate, sulfate, and phosphate in the WIPP repository for the CRA. The calculations for oxyanion masses are given in Leigh and Sparks-Roybal (2003).

The estimate of nitrate mass in the WIPP repository (2.51×10^6 kg [5.53×10^6 lb]) is larger than the estimate made for the CCA which was 1.62×10^6 kg (3.57×10^6 lb). The increase in nitrate mass is due primarily to larger volumes projected for existing waste streams and the added waste streams from Hanford RP. The estimate of sulfate mass in the WIPP repository (4.21×10^5 kg [9.28×10^5 lb]) is less than the estimate made for the CCA which was 6.33×10^5 kg (1.39×10^6 lb).

The estimate of phosphate mass in the WIPP repository (1.05×10^5 kg [2.31×105 lb]) is significant when compared to the CCA. There was no phosphate of reportable quantity given by the generator sites in the TWBIR Revision 3. The primary source of phosphate in the current estimate is the tank waste from Hanford RP which is now a waste stream to be disposed at WIPP.

Table DATA-F-34. Mass of Oxyanions and Cement In the WIPP Disposal Inventory

Chemical Component	Mass Contained in the Disposal Inventory (kg)
Nitrate	2.51×10^6
Sulfate	4.21×10^5
Phosphate	1.05×10^5
Cement	1.20×10^7

Sources: Leigh and Lott (2003); Leigh and Sparks-Roybal (2003)

DATA-F-3.2.3.4 Pyrochemical Salts in Waste Isolation Pilot Plant Transuranic Waste

Five waste streams at LANL, one waste stream at Lawrence Livermore National Laboratory (LLNL), and seven waste streams at RFETS have been identified as containing pyrochemical salts. Direct oxide reduction (DOR) salts have been identified in two waste streams at LANL

(LA-TA-55-39 and LA-TA-55-53), the LLNL waste stream (LL-T004) and in two RFETS waste streams (RF-TT454X and RF-TT433X). The pyrochemical salt waste streams are given in Appendix DATA, Attachment F, Annex A.

DATA-F-3.3 Transuranic Waste Radionuclide Inventory

As part of the data call for this 2003 Update Report, the sites were asked to provide information about the radiological components in the waste they intend to ship to WIPP. For each waste stream they were asked to specify the radionuclide activity concentrations (in Ci/m^3), to provide the generation or last assay date for each waste stream. In some cases, the sites provided all of the information required; in other cases, they did not.

For those waste streams where the site did not provide adequate information regarding the radiological components of the waste, radionuclide activities were estimated using the methods described in the Computational Methodology (LANL 2003b) and in the radionuclide correction package as identified in Table DATA-F-2. Radionuclide data for comparable waste streams at the same site were mapped into waste streams with missing data. For 73 waste streams without data, this mapping was accomplished by first matching to the site, the handling (RH or CH), and the WMC. Then, if there were no matches, the waste description was used to find a comparable waste stream. In this way, a waste stream requiring radionuclide data was matched to a waste stream that was generated by the same or very similar process. Seven waste streams without data were matched to waste streams with WMCs that were identical through the first two digits. Three waste streams without data were soil waste at Hanford and were matched to another Hanford soil waste stream. Two waste streams, from LANL, were found to have no similar waste stream in the present inventory but were reported in the TWBIR Revision 2 (DOE 1995b) inventory. Data from the TWBIR Revision 2 were used to fill out the radionuclide data for these two waste streams.

All of the radionuclide data were decayed to a common base year of CY 2001 (December 31, 2001) using Oak Ridge National Laboratory Isotope Generation and Depletion Code, Version 2.2 (hereafter referred to as ORIGEN 2.2) (Croff 1983; Croff 1980). ORIGEN 2.2 is a computer code that calculates the buildup and decay of radionuclides. ORIGEN 2.2 was qualified according to SNL procedure, NP 19-1, Software Requirements (SNL 2002a) for the decay calculations that were done for the TRU waste radionuclide inventory. ORIGEN 2.2 uses a matrix exponential method to solve a large system of coupled, linear, first-order ordinary differential equations with constant coefficients.

The ORIGEN 2.2 half-life data are contained within libraries that remain unchanged since their use (via ORIGEN 2.1; ORNL 2002) for the TWBIR Revision 3 (DOE 1996a) in 1996. The results obtained for data in 1996 using ORIGEN 2.1 and those that would be obtained using the current version of ORIGEN 2.2 for 1996 data would be identical. Therefore, the only differences expected between the data obtained in 1996 using ORIGEN 2.1 and those reported for the 2003 Update Report using ORIGEN 2.2 are those related to time.

Updated waste stream volumes were used to calculate waste stream radionuclide activity from the decayed ORIGEN 2.2 radionuclide activity concentrations as shown in the following equation:

$$a(RN)_{Disposal} = \alpha(RN) \cdot v_{Disposal}, \qquad (8)$$

where

$a(RN)_{Disposal}$	*is the activity of the radionuclide RN in the scaled waste stream volume,*
$\alpha(RN)$	*is the decayed radionuclide activity in Ci/m³ from ORIGEN 2.2 for radionuclide RN, and*
$v_{Disposal}$	*is the waste stream disposal volume for CH-TRU or RH-TRU waste.*

More information on how $v_{Disposal}$ was calculated can be found in Section DATA-F-3.1.

The WIPP-scale radionuclide activities were calculated as shown in the following equations for both CH- and RH-TRU wastes. In the first step, the activities of each radionuclide in the scaled waste stream volumes ($a(RN)_{Disposal}$) are summed for all waste streams to give the total activity for each radionuclide in CH-TRU and RH-TRU waste in the repository. In the second step, the total activity for each radionuclide in CH-TRU and RH-TRU waste in the repository is divided by the volume limit (168,485 m^3 [5,950,000 ft^3]for CH-TRU waste and 7,079 m^3 [250,000 ft^3] for RH-TRU waste) to give the activity concentration for a radionuclide in CH-TRU or RH-TRU waste in the repository.

$$A(RN) = \Sigma\, a(RN)_{Disposal}$$

$$\hat{A}(RN) = A(RN)/Limit, \qquad (9)$$

where

$A(RN)$	*is the total activity (Ci) for a radionuclide in CH-TRU or RH-TRU waste in the repository (after scaling)*
$\hat{A}(RN)$	*is the activity concentration for a radionuclide in CH-TRU or RH-TRU waste in the repository (Ci/m³)*
$a(RN)_{Disposal}$	*is the activity (Ci) of the radionuclide RN in the scaled waste stream volume,*
Limit	*is 168,485 m³ (5,950,000 ft³) for CH-waste and 7,079 m³ (250,000 ft³) for RH-TRU waste.*

DATA-F-3.3.1 Site-Level Roll-up of Radionuclide Activities

Tables DATA-F-35 and DATA-F-36 provide the site-specific radionuclide inventory estimates in total curies decayed through 2001 for CH-TRU and RH-TRU waste, respectively. The data shown in Tables DATA-F-35 and DATA-F-36 are the radionuclide inventories as the sum of the actual stored and projected volumes (not scaled) reported by the site.

DATA-F-3.3.2 Waste-Stream-Level Radionuclide Activities

The radionuclide activities in the scaled waste stream volumes for the CH-TRU waste streams included in the estimate of volume for PA are given in Appendix DATA, Attachment F, Annex E, Table DATA-F-E-1. The radionuclide activities in the scaled waste stream volumes for the

RH-TRU waste streams included in the estimate of volume for PA are given in Appendix DATA, Attachment F, Annex E, Table DATA-F-E-2.

DATA-F-3.3.3 Waste Isolation Pilot Plant-Level Roll-up of Radionuclide Activities

Table DATA-F-37 presents the WIPP-level roll-up of radionuclide activities for the disposal inventory (scaled for a full WIPP repository) in Ci/m^3 and total Ci decayed through 2001 for both CH-TRU and RH-TRU waste. Table DATA-F-37 corresponds to Table 3-1, TWBIR Revision 3 (DOE 1996a). The waste-stream-level radionuclide activities provide the decayed (through December 31, 2001) radionuclide inventory by waste stream for all the waste streams included in Appendix DATA, Attachment F, Annex J.

A comparison of TWBIR Revision 3, Table 3-1 data to the data reported in Table DATA-F-37 can be found in Appendix DATA, Attachment F, Annex B Table DATA-F-B-27 for CH-TRU waste and Table DATA-F-B-28 for RH-TRU waste. A review of the results for CH-TRU waste indicates that although there is a substantial change in some radionuclides from 1995 to 2001, with the exception of ^{239}Pu and ^{240}Pu the activities for the dominant five radionuclides (^{241}Am, ^{238}Pu,-^{239}Pu, ^{240}Pu, and ^{241}Pu) have decreased. The overall activity for all radionuclides has decreased by 17 percent. The results for RH-TRU waste show substantial variations in individual radionuclide activity. An overall increase in activity of 30 percent was observed with this update. Five radionuclides made up 99.0 percent of the CH-TRU waste curies in the TWBIR Revision 3 and the same five make up 97.2 percent of the total CH-TRU waste curies in this report. The five most abundant RH-TRU waste isotopes in the TWBIR Revision 3 (^{137m}Ba, ^{137}Cs, ^{241}Pu, ^{90}Sr, and ^{90}Y) are still the most abundant in the 2003 Update Report. These five radionuclides made up 96.1 percent of the RH-TRU waste curies in the TWBIR Revision 3 and make up 97.6 percent of the total RH-TRU waste curies in the 2003 Update Report.

DATA-F-3.4 Non-Waste Isolation Pilot Plant and Future Potential Waste

This section identifies waste streams not included in the WIPP inventory used for PA. The waste permitted to come to WIPP is restricted by radionuclide activity limits, volume, and waste generated only from defense activities. Non-WIPP waste streams in Appendix DATA, Attachment F, Annex I are summarized in Section DATA-F-3.4.1.

Other restrictions to the waste result from how the waste has been managed at the TRU waste sites. There are some materials that have not been declared TRU waste by the DOE TRU waste sites at this time that may become TRU waste in the future. Some waste has been identified in the TRU inventory but the option for processing has not been determined at this time. These possible future waste streams may ultimately become eligible for shipment to WIPP and are discussed in Section DATA-F-3.4.2.

Table DATA-F-35. CH-TRU Waste Curies on a Site-by-Site Basis [1]

Radionuclide	AE	AW	MC	BC	BT	ET	IN	KN	LA	LL	MU	NT	OR	PA	RF	RL	RP	SA	SR	WP	Total Of Curies
^{225}Ac	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5 x 10^{-12}	2.7 x 10^{-3}	2.2 x 10^{-1}	1.4 x 10^{-9}	5.4 x 10^{-9}	---	---	1.1 x 10^{-6}	1.9 x 10^{-9}	9.8 x 10^{-5}	1.3 x 10^{0}
^{227}Ac	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.1×10^{-6}	---	1.3×10^{-3}	---	3.6 x 10^{-16}	2.0 x 10^{-4}	2.4 x 10^{-1}	6.0 x 10^{-14}	3.9 x 10^{-6}	---	---	8.3 x 10^{-4}	2.4 x 10^{-7}	3.7 x 10^{-4}	2.4 x 10^{-1}
^{228}Ac	4.9×10^{-5}	---	---	---	---	3.8×10^{-18}	4.8×10^{0}	---	9.4×10^{-7}	---	---	1.9 x 10^{-15}	1.1 x 10^{-3}	---	5.4 x 10^{-13}	---	---	3.7 x 10^{-3}	9.1 x 10^{-13}	8.8 x 10^{-7}	4.8 x 10^{0}
^{109m}Ag	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.3 x 10^{-4}	---	---	1.3 x 10^{-4}
^{110}Ag	---	---	---	---	---	---	---	---	---	---	---	---	2.1 x 10^{-11}	---	---	---	---	---	---	---	2.1 x 10^{-11}
^{110m}Ag	---	---	---	---	---	---	---	---	---	---	---	---	1.6 x 10^{-9}	---	---	---	---	---	---	---	1.6 x 10^{-9}
^{241}Am	6.1×10^{1}	1.0×10^{-1}	1.6×10^{-1}	6.5×10^{0}	8.4×10^{-3}	2.3×10^{-1}	1.6×10^{5}	7.8×10^{1}	6.8×10^{3}	2.5×10^{3}	2.2 x 10^{0}	3.7 x 10^{2}	2.5 x 10^{3}	---	2.6 x 10^{4}	3.3 x 10^{4}	5.2 x 10^{2}	9.0 x 10^{0}	8.7 x 10^{3}	1.2 x 10^{5}	3.6 x 10^{5}
^{242}Am	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.7 x 10^{-2}	---	---	4.7 x 10^{-2}
^{242m}Am	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4.8 x 10^{-2}	---	---	4.8 x 10^{-2}
^{243}Am	---	---	---	---	4.0×10^{-5}	---	6.4×10^{-3}	---	3.8×10^{-3}	---	---	1.2 x 10^{0}	9.4 x 10^{0}	---	---	---	---	1.4 x 10^{-2}	---	4.8 x 10^{-3}	1.1 x 10^{1}
^{245}Am	---	---	---	---	---	---	---	---	2.0×10^{-13}	---	---	---	6.2 x 10^{-11}	---	---	---	---	---	---	---	6.2 x 10^{-11}
^{217}At	1.6×10^{4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5 x 10^{-12}	2.7 x 10^{-3}	2.2 x 10^{-1}	1.4 x 10^{-9}	5.4 x 10^{-9}	---	---	1.1 x 10^{-6}	1.9 x 10^{-9}	9.9 x 10^{-5}	1.3 x 10^{0}
^{137m}Ba	3.4×10^{0}	2.8×10^{-1}	---	---	2.0×10^{1}	1.5×10^{-2}	---	---	1.1×10^{-2}	---	---	2.6 x 10^{-2}	3.4 x 10^{3}	---	1.5 x 10^{-2}	3.4 x 10^{2}	1.3 x 10^{3}	7.3 x 10^{1}	---	3.6 x 10^{-4}	5.2 x 10^{3}
^{210}Bi	6.2×10^{-10}	1.7×10^{-14}	---	---	---	9.3×10^{-12}	2.7×10^{-8}	---	1.0×10^{-6}	---	---	9.8 x 10^{-2}	1.2 x 10^{0}	5.5 x 10^{-5}	2.6 x 10^{-8}	---	---	1.1 x 10^{-2}	5.2 x 10^{-6}	2.4 x 10^{-7}	1.3 x 10^{0}
^{211}Bi	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.0×10^{-6}	---	1.3×10^{-3}	---	3.6 x 10^{-16}	2.0 x 10^{-4}	2.4 x 10^{-1}	6.0 x 10^{-14}	3.8 x 10^{-6}	---	---	8.2 x 10^{-4}	2.4 x 10^{-7}	3.7 x 10^{-4}	2.4 x 10^{-1}
^{212}Bi	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.2×10^{0}	---	1.7×10^{-6}	---	---	1.6 x 10^{-2}	5.0 x 10^{-1}	---	3.1 x 10^{-13}	---	---	8.5 x 10^{-3}	8.7 x 10^{-13}	4.4 x 10^{-7}	5.1 x 10^{0}
^{213}Bi	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5 x 10^{-12}	2.7 x 10^{-3}	2.2 x 10^{-1}	1.4 x 10^{-9}	5.4 x 10^{-9}	---	---	1.1 x 10^{-6}	1.9 x 10^{-9}	9.8 x 10^{-5}	1.3 x 10^{0}
^{214}Bi	4.3×10^{-9}	1.8×10^{-12}	---	---	---	7.6×10^{-11}	2.9×10^{-7}	---	2.3×10^{-6}	---	2.7 x 10^{-20}	2.5 x 10^{-1}	2.8 x 10^{0}	3.1 x 10^{-4}	2.3 x 10^{-7}	---	---	5.0 x 10^{-2}	2.8 x 10^{-5}	7.8 x 10^{-6}	3.1 x 10^{0}
^{249}Bk	---	---	---	---	---	---	---	---	1.4×10^{-8}	---	---	---	4.3 x 10^{-6}	---	---	---	---	---	---	---	4.3 x 10^{-6}
^{250}Bk	---	---	---	---	---	---	---	---	---	---	---	---	1.7 x 10^{-12}	---	---	---	---	---	---	---	1.7 x 10^{-12}
^{14}C	---	---	---	---	5.3×10^{-4}	---	---	---	---	---	---	2.5 x 10^{-4}	2.1 x 10^{-4}	---	---	1.1 x 10^{0}	9.9 x 10^{-2}	---	---	---	1.2 x 10^{0}
^{109}Cd	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.3 x 10^{-4}	---	---	1.3 x 10^{-4}
^{144}Ce	---	---	---	---	---	---	---	---	---	---	---	---	1.2 x 10^{-7}	---	---	---	---	3.6 x 10^{-4}	---	---	3.6 x 10^{-4}
^{249}Cf	---	---	---	---	7.6×10^{-13}	---	---	---	1.2×10^{-4}	---	---	1.1 x 10^{-2}	3.1 x 10^{-2}	---	---	---	---	---	---	---	4.2 x 10^{-2}
^{250}Cf	---	---	---	---	---	---	---	---	---	---	---	1.4 x 10^{-1}	1.9 x 10^{-2}	---	---	---	---	---	---	---	1.6 x 10^{-1}
^{251}Cf	---	---	---	---	3.6×10^{-14}	---	---	---	---	---	---	---	1.7 x 10^{-4}	---	---	---	---	---	---	---	1.7 x 10^{-4}
^{252}Cf	---	---	---	---	---	---	3.0×10^{-3}	---	---	---	---	8.3 x 10^{-2}	5.7 x 10^{-2}	---	---	---	---	---	---	---	1.4 x 10^{-1}
^{242}Cm	---	---	---	---	---	---	---	---	---	---	---	---	4.3 x 10^{-10}	---	---	---	---	3.9 x 10^{-2}	---	---	3.9 x 10^{-2}
^{243}Cm	---	---	---	---	4.5×10^{-5}	---	---	---	---	---	---	4.6 x 10^{-4}	---	---	---	---	---	4.0 x 10^{-1}	---	---	4.0 x 10^{-1}
^{244}Cm	---	---	---	---	2.5×10^{-3}	---	---	---	3.3×10^{3}	2.6×10^{3}	---	2.3 x 10^{0}	1.7 x 10^{3}	---	---	---	---	4.8 x 10^{0}	---	---	7.6 x 10^{3}
^{245}Cm	---	---	---	---	2.7×10^{-7}	---	---	---	2.5×10^{-7}	---	---	1.5 x 10^{-5}	4.0 x 10^{-3}	---	---	---	---	---	---	---	4.0 x 10^{-3}

Table DATA-F-35. CH-TRU Waste Curies on a Site-by-Site Basis [1] — Continued

Radionuclide	AE	AW	MC	BC	BT	ET	IN	KN	LA	LL	MU	NT	OR	PA	RF	RL	RP	SA	SR	WP	Total Of Curies
^{246}Cm	---	---	---	---	4.6×10^{-8}	---	---	---	---	---	---	5.2×10^{-4}	7.4×10^{-1}	---	---	---	---	---	---	---	7.4×10^{-1}
^{247}Cm	---	---	---	---	1.1×10^{-13}	---	---	---	---	---	---	---	1.3×10^{-10}	---	---	---	---	---	---	---	1.3×10^{-10}
^{248}Cm	---	---	---	---	1.9×10^{-13}	---	6.8×10^{-7}	---	---	---	---	4.1×10^{-5}	4.3×10^{-2}	---	---	---	---	---	---	---	4.3×10^{-2}
^{250}Cm	---	---	---	---	---	---	---	---	---	---	---	---	3.2×10^{-11}	---	---	---	---	---	---	---	3.2×10^{-11}
^{60}Co	---	---	---	---	9.3×10^{-1}	---	---	---	8.1×10^{-8}	---	---	---	3.5×10^{-3}	---	---	---	---	4.8×10^{-2}	---	1.5×10^{-7}	9.8×10^{-1}
^{134}Cs	---	---	---	---	---	---	---	---	2.2×10^{-10}	---	---	---	8.1×10^{-4}	---	---	---	---	1.9×10^{-2}	---	---	2.0×10^{-2}
^{137}Cs	3.6×10^{0}	3.0×10^{-1}	---	---	2.1×10^{1}	1.6×10^{-2}	---	---	1.1×10^{-2}	---	---	2.8×10^{-2}	3.7×10^{3}	---	1.6×10^{-2}	3.5×10^{2}	1.4×10^{3}	7.8×10^{1}	---	3.9×10^{-4}	5.5×10^{3}
^{152}Eu	---	---	---	---	9.3×10^{-1}	---	---	---	6.8×10^{-8}	---	---	9.2×10^{-1}	4.1×10^{-2}	---	---	---	---	---	---	---	1.9×10^{0}
^{154}Eu	---	---	---	---	9.3×10^{-1}	---	---	---	3.0×10^{-7}	---	---	3.4×10^{-1}	1.2×10^{-1}	---	---	---	---	1.3×10^{-1}	---	---	1.5×10^{0}
^{155}Eu	---	---	---	---	---	---	---	---	2.7×10^{-5}	---	---	---	3.1×10^{-2}	---	---	---	---	1.8×10^{-3}	---	---	3.3×10^{-2}
^{221}Fr	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5×10^{-12}	2.7×10^{-3}	2.2×10^{-1}	1.4×10^{-9}	5.4×10^{-9}	---	---	1.1×10^{-6}	1.9×10^{-9}	9.8×10^{-5}	1.3×10^{0}
^{223}Fr	2.9×10^{-9}	3.3×10^{-13}	4.4×10^{-17}	---	---	7.3×10^{-16}	5.6×10^{-8}	---	1.7×10^{-5}	---	4.9×10^{-18}	2.8×10^{-6}	3.3×10^{-3}	8.2×10^{-16}	5.3×10^{-8}	---	---	1.1×10^{-5}	3.3×10^{-9}	5.1×10^{-6}	3.3×10^{-3}
^{152}Gd	---	---	---	---	---	---	---	---	4.1×10^{-21}	---	---	3.9×10^{-14}	1.9×10^{-15}	---	---	---	---	---	---	---	4.1×10^{-14}
^{3}H	---	---	---	---	---	---	---	---	2.1×10^{2}	---	---	5.2×10^{-2}	---	---	---	3.4×10^{0}	---	1.8×10^{-2}	---	---	2.2×10^{2}
^{129}I	---	---	---	---	7.0×10^{-6}	---	---	---	---	---	---	---	---	---	---	---	5.0×10^{-4}	---	---	---	5.1×10^{-4}
^{85}Kr	---	---	---	---	---	---	---	---	---	---	---	1.4×10^{-1}	---	---	---	---	---	3.2×10^{-1}	---	---	4.6×10^{-1}
^{22}Na	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3.9×10^{-7}	3.9×10^{-7}
^{59}Ni	---	---	---	---	7.6×10^{-2}	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	7.6×10^{-2}
^{63}Ni	---	---	---	---	3.7×10^{0}	---	---	---	---	---	---	---	1.2×10^{-4}	---	---	---	---	---	---	---	3.7×10^{0}
^{237}Np	6.9×10^{-1}	3.3×10^{-8}	4.0×10^{-7}	---	5.6×10^{-5}	9.9×10^{-7}	8.8×10^{-1}	---	4.0×10^{-2}	---	4.7×10^{-4}	6.5×10^{-3}	8.0×10^{-1}	4.1×10^{-2}	2.5×10^{-1}	---	3.2×10^{-3}	1.4×10^{-1}	4.8×10^{-2}	5.4×10^{-1}	3.4×10^{0}
^{238}Np	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2.4×10^{-4}	---	---	2.4×10^{-4}
^{239}Np	---	---	---	---	---	---	6.3×10^{-3}	---	3.7×10^{-3}	---	---	1.2×10^{0}	9.2×10^{0}	---	---	---	---	1.4×10^{-2}	---	4.8×10^{-3}	1.0×10^{1}
^{240m}Np	---	---	---	---	---	---	5.1×10^{-14}	---	1.8×10^{-7}	---	---	1.0×10^{-6}	5.7×10^{-9}	---	---	---	---	---	---	---	1.2×10^{-6}
^{231}Pa	9.9×10^{-7}	1.6×10^{-9}	4.0×10^{-14}	---	---	4.1×10^{-13}	2.2×10^{-5}	---	2.9×10^{-6}	---	8.8×10^{-15}	5.1×10^{-4}	5.7×10^{-1}	4.8×10^{-13}	2.3×10^{-5}	---	---	5.6×10^{-3}	1.0×10^{-6}	5.0×10^{-4}	5.8×10^{-1}
^{233}Pa	6.9×10^{-1}	3.3×10^{-8}	4.0×10^{-7}	---	---	9.8×10^{-7}	8.7×10^{-1}	---	4.0×10^{-2}	---	4.7×10^{-4}	6.4×10^{-3}	7.9×10^{-1}	4.1×10^{-2}	2.5×10^{-1}	---	---	1.4×10^{-1}	4.8×10^{-2}	5.3×10^{-1}	3.4×10^{0}
^{234}Pa	6.7×10^{-5}	3.5×10^{-10}	---	---	---	5.4×10^{-18}	3.0×10^{-5}	---	2.7×10^{-4}	---	3.1×10^{-10}	2.0×10^{-7}	8.7×10^{-5}	---	2.3×10^{-4}	---	---	1.2×10^{-5}	---	8.4×10^{-3}	9.1×10^{-3}
^{234m}Pa	5.2×10^{-2}	2.7×10^{-7}	---	---	---	4.1×10^{-15}	2.3×10^{-2}	---	2.0×10^{-1}	---	2.4×10^{-7}	1.5×10^{-4}	6.7×10^{-2}	---	1.8×10^{-1}	---	---	8.9×10^{-3}	---	6.5×10^{0}	7.0×10^{0}

Table DATA-F-35. CH-TRU Waste Curies on a Site-by-Site Basis [1] — Continued

Radionuclide	AE	AW	MC	BC	BT	ET	IN	KN	LA	LL	MU	NT	OR	PA	RF	RL	RP	SA	SR	WP	Total Of Curies
^{209}Pb	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5×10^{-12}	2.7×10^{-3}	2.2×10^{-1}	1.4×10^{-9}	5.4×10^{-9}	---	---	1.1×10^{-6}	1.9×10^{-9}	9.8×10^{-5}	1.3×10^{0}
^{210}Pb	6.3×10^{-10}	1.7×10^{-14}	---	---	---	9.4×10^{-12}	2.7×10^{-8}	---	1.0×10^{-6}	---	---	9.9×10^{-2}	1.2×10^{0}	5.5×10^{-5}	2.6×10^{-8}	---	---	1.1×10^{-2}	5.3×10^{-6}	2.4×10^{-7}	1.3×10^{0}
^{211}Pb	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.0×10^{-6}	---	1.3×10^{-3}	---	3.6×10^{-16}	2.0×10^{-4}	2.4×10^{-1}	6.0×10^{-14}	3.8×10^{-6}	---	---	8.2×10^{-4}	2.4×10^{-7}	3.7×10^{-4}	2.4×10^{-1}
^{212}Pb	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.1×10^{0}	---	1.7×10^{-6}	---	---	1.6×10^{-2}	4.9×10^{-1}	---	3.1×10^{-13}	---	---	8.5×10^{-3}	8.7×10^{-13}	4.4×10^{-7}	5.1×10^{0}
^{214}Pb	4.3×10^{-9}	1.8×10^{-12}	---	---	---	7.7×10^{-11}	2.9×10^{-7}	---	2.3×10^{-6}	---	2.7×10^{-20}	2.5×10^{-1}	2.8×10^{0}	3.1×10^{-4}	2.3×10^{-7}	---	---	5.0×10^{-2}	2.8×10^{-5}	7.8×10^{-6}	3.1×10^{0}
^{147}Pm	---	---	---	---	9.3×10^{-1}	---	---	---	---	---	---	---	9.5×10^{-2}	---	---	---	---	6.9×10^{-1}	---	---	1.7×10^{0}
^{210}Po	6.3×10^{-10}	5.5×10^{-15}	---	---	---	9.4×10^{-12}	2.7×10^{-8}	---	1.0×10^{-6}	---	---	9.9×10^{-2}	1.2×10^{0}	5.5×10^{-5}	2.6×10^{-8}	---	---	1.1×10^{-2}	5.3×10^{-6}	1.3×10^{-7}	1.3×10^{0}
^{211}Po	6.4×10^{-10}	7.4×10^{-14}	9.7×10^{-18}	---	---	1.6×10^{-16}	1.2×10^{-8}	---	3.8×10^{-6}	---	1.1×10^{-18}	6.1×10^{-7}	7.2×10^{-4}	1.8×10^{-16}	1.2×10^{-8}	---	---	2.5×10^{-6}	7.2×10^{-10}	1.1×10^{-6}	7.3×10^{-4}
^{212}Po	2.7×10^{-1}	---	---	---	---	1.5×10^{-18}	2.6×10^{0}	---	1.1×10^{-6}	---	---	1.0×10^{-2}	3.2×10^{-1}	---	2.0×10^{-13}	---	---	5.4×10^{-3}	5.6×10^{-13}	2.8×10^{-7}	3.2×10^{0}
^{213}Po	1.6×10^{-4}	9.8×10^{-10}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5×10^{-12}	2.7×10^{-3}	2.2×10^{-1}	1.4×10^{-9}	5.3×10^{-9}	---	---	1.1×10^{-6}	1.8×10^{-9}	9.6×10^{-5}	1.3×10^{0}
^{214}Po	4.3×10^{-9}	1.8×10^{-12}	---	---	---	7.7×10^{-11}	2.9×10^{-7}	---	2.3×10^{-6}	---	2.7×10^{-20}	2.5×10^{-1}	2.8×10^{0}	3.1×10^{-4}	2.3×10^{-7}	---	---	5.0×10^{-2}	2.8×10^{-5}	7.8×10^{-6}	3.1×10^{0}
^{215}Po	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.0×10^{-6}	---	1.3×10^{-3}	---	3.6×10^{-16}	2.0×10^{-4}	2.4×10^{-1}	6.0×10^{-14}	3.8×10^{-6}	---	---	8.2×10^{-4}	2.4×10^{-7}	3.7×10^{-4}	2.4×10^{-1}
^{216}Po	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.1×10^{0}	---	1.7×10^{-6}	---	---	1.6×10^{-2}	4.9×10^{-1}	---	3.1×10^{-13}	---	---	8.5×10^{-3}	8.7×10^{-13}	4.4×10^{-7}	5.1×10^{0}
^{218}Po	4.2×10^{-9}	1.7×10^{-12}	---	---	---	7.5×10^{-11}	2.8×10^{-7}	---	2.3×10^{-6}	---	2.7×10^{-20}	2.5×10^{-1}	2.8×10^{0}	3.0×10^{-4}	2.3×10^{-7}	---	---	4.9×10^{-2}	2.7×10^{-5}	7.7×10^{-6}	3.1×10^{0}
^{144}Pr	---	---	---	---	---	---	---	---	---	---	---	---	1.1×10^{-7}	---	---	---	---	3.5×10^{-4}	---	---	3.5×10^{-4}
^{236}Pu	2.1×10^{-7}	---	---	---	---	---	4.4×10^{-4}	---	---	---	---	---	---	---	---	---	---	---	---	---	4.4×10^{-4}
^{238}Pu	1.4×10^{1}	1.5×10^{2}	---	1.8×10^{3}	9.3×10^{-1}	1.2×10^{-2}	6.9×10^{4}	1.3×10^{1}	9.9×10^{4}	5.5×10^{2}	---	1.6×10^{2}	5.3×10^{3}	---	2.7×10^{3}	1.1×10^{5}	2.2×10^{1}	1.7×10^{0}	1.0×10^{6}	5.4×10^{3}	1.3×10^{6}
^{239}Pu	1.9×10^{2}	1.2×10^{2}	6.1×10^{-2}	2.9×10^{1}	7.3×10^{-4}	2.1×10^{-1}	5.7×10^{4}	1.6×10^{2}	1.1×10^{4}	3.1×10^{3}	5.3×10^{-2}	2.9×10^{3}	1.3×10^{3}	2.7×10^{-1}	7.4×10^{4}	7.2×10^{4}	3.2×10^{3}	4.6×10^{0}	2.0×10^{5}	1.4×10^{5}	5.6×10^{5}
^{240}Pu	1.0×10^{2}	7.0×10^{-1}	---	7.5×10^{0}	1.5×10^{-3}	8.1×10^{-2}	7.6×10^{3}	5.3×10^{1}	3.7×10^{3}	1.4×10^{3}	---	6.3×10^{1}	1.3×10^{3}	---	1.7×10^{4}	1.9×10^{4}	2.7×10^{2}	5.0×10^{-1}	4.9×10^{3}	3.1×10^{4}	8.6×10^{4}
^{241}Pu	2.6×10^{2}	6.2×10^{-1}	1.9×10^{-1}	3.6×10^{2}	1.6×10^{-1}	8.9×10^{-1}	5.1×10^{4}	2.8×10^{2}	3.1×10^{4}	4.3×10^{4}	---	1.4×10^{3}	4.3×10^{4}	---	1.8×10^{5}	1.1×10^{6}	5.4×10^{2}	6.7×10^{0}	9.7×10^{4}	3.4×10^{5}	1.9×10^{6}
^{242}Pu	6.9×10^{-2}	8.8×10^{-6}	---	1.2×10^{-3}	1.2×10^{-5}	2.0×10^{-6}	1.2×10^{1}	4.1×10^{-4}	8.2×10^{-1}	---	---	8.9×10^{-2}	3.8×10^{-1}	---	1.7×10^{0}	4.0×10^{0}	7.7×10^{-3}	7.7×10^{-8}	---	3.0×10^{0}	2.2×10^{1}
^{243}Pu	---	---	---	---	--	---	---	---	---	---	---	---	1.3×10^{-10}	---	---	---	---	---	---	---	1.3×10^{-10}
^{244}Pu	---	---	---	---	6.6×10^{-13}	---	5.0×10^{-14}	---	1.8×10^{-7}	---	---	1.0×10^{-6}	5.7×10^{-9}	---	---	---	---	---	---	---	1.2×10^{-6}
^{223}Ra	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.1×10^{-6}	---	1.3×10^{-3}	---	3.6×10^{-16}	2.0×10^{-4}	2.4×10^{-1}	6.0×10^{-14}	3.9×10^{-6}	---	---	8.3×10^{-4}	2.4×10^{-7}	3.7×10^{-4}	2.4×10^{-1}
^{224}Ra	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.1×10	---	1.7×10^{-6}	---	---	1.6×10^{-2}	4.9×10^{-1}	---	3.1×10^{-13}	---	---	8.5×10^{-3}	8.7×10^{-13}	4.4×10^{-7}	5.1×10^{0}
^{225}Ra	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5×10^{-12}	2.7×10^{-3}	2.2×10^{-1}	1.4×10^{-9}	5.4×10^{-9}	---	---	1.1×10^{-6}	1.9×10^{-9}	9.9×10^{-5}	1.3×10^{0}
^{226}Ra	4.3×10^{-9}	1.8×10^{-12}	---	---	---	7.7×10^{-11}	2.9×10^{-7}	---	2.3×10^{-6}	---	2.8×10^{-20}	2.5×10^{-1}	2.9×10^{0}	3.1×10^{-4}	2.3×10^{-7}	---	---	5.1×10^{-2}	2.8×10^{-5}	7.9×10^{-6}	3.2×10^{0}

Table DATA-F-35. CH-TRU Waste Curies on a Site-by-Site Basis [1] — Continued

Radionuclide	AE	AW	MC	BC	BT	ET	IN	KN	LA	LL	MU	NT	OR	PA	RF	RL	RP	SA	SR	WP	Total Of Curies
^{228}Ra	5.8×10^{-5}	---	---	---	---	4.4×10^{-18}	5.7×10^{0}	---	1.1×10^{-6}	---	---	2.2×10^{-15}	1.3×10^{-3}	---	6.4×10^{-13}	---	---	4.3×10^{-3}	1.1×10^{-12}	1.0×10^{-6}	5.7×10^{0}
^{106}Rh	---	---	---	---	---	---	---	---	8.5×10^{-11}	---	---	---	2.4×10^{-5}	---	---	---	---	1.1×10^{-4}	---	---	1.3×10^{-4}
^{219}Rn	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.0×10^{-6}	---	1.3×10^{-3}	---	3.6×10^{-16}	2.0×10^{-4}	2.4×10^{-1}	6.0×10^{-14}	3.8×10^{-6}	---	---	8.2×10^{-4}	2.4×10^{-7}	3.7×10^{-4}	2.4×10^{-1}
^{220}Rn	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.1×10^{0}	---	1.7×10^{-6}	---	---	1.6×10^{-2}	4.9×10^{-1}	---	3.1×10^{-13}	---	---	8.5×10^{-3}	8.7×10^{-13}	4.4×10^{-7}	5.1×10^{0}
^{222}Rn	4.3×10^{-9}	1.8×10^{-12}	---	---	---	7.7×10^{-11}	2.9×10^{-7}	---	2.3×10^{-6}	---	2.7×10^{-20}	2.5×10^{-1}	2.8×10^{0}	3.1×10^{-4}	2.3×10^{-7}	---	---	5.0×10^{-2}	2.8×10^{-5}	7.8×10^{-6}	3.1×10^{0}
^{106}Ru	---	---	---	---	---	---	---	---	8.6×10^{-11}	---	---	---	2.4×10^{-5}	---	---	---	---	1.1×10^{-4}	---	---	1.3×10^{-4}
^{125}Sb	---	---	---	---	---	---	---	---	2.9×10^{-6}	---	---	---	2.4×10^{-3}	---	---	---	---	---	---	---	2.4×10^{-3}
^{79}Se	---	---	---	---	1.3×10^{-4}	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.3×10^{-4}
^{147}Sm	---	---	---	---	---	---	---	---	---	---	---	---	2.0×10^{-10}	---	---	---	---	4.6×10^{-11}	---	---	2.5×10^{-10}
^{151}Sm	---	---	---	---	1.0×10^{-1}	---	---	---	---	---	---	---	---	---	---	---	5.6×10^{1}	2.7×10^{-1}	---	---	5.7×10^{1}
^{90}Sr	2.6×10^{0}	1.5×10^{0}	---	---	2.1×10^{1}	1.2×10^{-2}	---	---	---	---	---	9.5×10^{-5}	2.2×10^{3}	---	---	1.4×10^{2}	5.3×10^{4}	7.4×10^{1}	---	---	5.5×10^{4}
^{99}Tc	5.8×10^{0}	---	---	---	4.7×10^{-3}	---	---	2.5×10^{-2}	---	---	---	---	3.1×10^{1}	2.9×10^{0}	---	4.1×10^{-3}	8.9×10^{1}	1.6×10^{-3}	---	---	1.3×10^{2}
^{123}Te	---	---	---	---	---	---	---	---	---	---	---	---	3.2×10^{-5}	---	---	---	---	---	---	---	3.2×10^{-5}
^{123m}Te	---	---	---	---	---	---	---	---	---	---	---	---	2.4×10^{-19}	---	---	---	---	---	---	---	2.4×10^{-19}
^{125m}Te	---	---	---	---	---	---	---	---	7.1×10^{-7}	---	---	---	5.8×10^{-4}	---	---	---	---	---	---	---	5.8×10^{-4}
^{227}Th	2.1×10^{-7}	2.4×10^{-11}	3.1×10^{-15}	---	---	5.2×10^{-14}	4.0×10^{-6}	---	1.2×10^{-3}	---	3.5×10^{-16}	2.0×10^{-4}	2.3×10^{-1}	5.9×10^{-14}	3.8×10^{-6}	---	---	8.1×10^{-4}	2.3×10^{-7}	3.6×10^{-4}	2.4×10^{-1}
^{228}Th	4.2×10^{-1}	---	---	---	---	2.3×10^{-18}	4.2×10^{0}	1.7×10^{-4}	1.7×10^{-6}	---	---	1.6×10^{-2}	5.0×10^{-1}	---	3.2×10^{-13}	---	---	8.5×10^{-3}	8.8×10^{-13}	4.4×10^{-7}	5.1×10^{0}
^{229}Th	1.6×10^{-4}	1.0×10^{-9}	1.7×10^{-15}	---	---	1.2×10^{-14}	1.1×10^{0}	---	1.4×10^{-3}	---	1.5×10^{-12}	2.7×10^{-3}	2.3×10^{-1}	1.4×10^{-9}	5.4×10^{-9}	---	---	1.1×10^{-6}	1.9×10^{-9}	9.9×10^{-5}	1.3×10^{0}
^{230}Th	1.3×10^{-6}	8.9×10^{-9}	---	---	---	2.8×10^{-8}	1.6×10^{-4}	---	5.6×10^{-5}	---	4.8×10^{-17}	1.2×10^{-6}	3.2×10^{-3}	5.6×10^{-2}	9.1×10^{-5}	---	---	8.5×10^{-6}	7.0×10^{-3}	4.9×10^{-5}	6.6×10^{-2}
^{231}Th	2.9×10^{-3}	7.3×10^{-5}	4.7×10^{-10}	---	---	2.8×10^{-9}	8.1×10^{-2}	---	5.8×10^{-3}	---	2.1×10^{-10}	1.5×10^{-4}	1.0×10^{-2}	3.5×10^{-9}	9.0×10^{-2}	---	---	1.2×10^{-2}	3.9×10^{-3}	1.2×10^{-1}	3.3×10^{-1}
^{232}Th	6.2×10^{-5}	5.1×10^{-19}	---	---	5.6×10^{-14}	1.1×10^{-17}	6.6×10^{0}	2.9×10^{-5}	1.1×10^{-6}	---	---	4.9×10^{-15}	1.3×10^{-3}	---	1.8×10^{-12}	4.4×10^{-2}	---	3.9×10^{-3}	1.8×10^{-12}	2.6×10^{-6}	6.6×10^{0}
^{234}Th	5.2×10^{-2}	2.7×10^{-7}	---	---	---	4.1×10^{-15}	2.3×10^{-2}	---	2.1×10^{-1}	---	2.4×10^{-7}	1.5×10^{-4}	6.7×10^{-2}	---	1.8×10^{-1}	---	---	8.9×10^{-3}	---	6.5×10^{0}	7.0×10^{0}
^{207}Tl	2.1×10^{-7}	2.4×10^{-11}	3.2×10^{-15}	---	---	5.3×10^{-14}	4.0×10^{-6}	---	1.3×10^{-3}	---	3.5×10^{-16}	2.0×10^{-4}	2.3×10^{-1}	5.9×10^{-14}	3.8×10^{-6}	---	---	8.1×10^{-4}	2.3×10^{-7}	3.7×10^{-4}	2.4×10^{-1}
^{208}Tl	1.5×10^{-1}	---	---	---	---	8.2×10^{-19}	1.5×10^{0}	---	6.1×10^{-7}	---	---	5.7×10^{-3}	1.8×10^{-1}	---	1.1×10^{-13}	---	---	3.1×10^{-3}	3.1×10^{-13}	1.6×10^{-7}	1.8×10^{0}
^{209}Tl	3.5×10^{-6}	2.2×10^{-11}	3.8×10^{-17}	---	---	2.7×10^{-16}	2.4×10^{-2}	---	3.1×10^{-5}	---	3.3×10^{-14}	6.0×10^{-5}	4.9×10^{-3}	3.1×10^{-11}	1.2×10^{-10}	---	---	2.4×10^{-8}	4.1×10^{-11}	2.2×10^{-6}	2.9×10^{-2}
^{232}U	4.1×10^{-1}	---	---	---	1.3×10^{-5}	---	3.6×10^{-4}	1.7×10^{-4}	7.3×10^{-7}	---	---	1.6×10^{-2}	4.9×10^{-1}	---	---	---	---	---	---	---	9.1×10^{-1}
^{233}U	1.1×10^{-1}	1.1×10^{-5}	6.9×10^{-12}	---	---	2.9×10^{-11}	8.8×10^{2}	1.5×10^{-2}	5.7×10^{-1}	---	8.0×10^{-9}	1.8×10^{0}	1.4×10^{2}	2.3×10^{-6}	1.0×10^{-5}	5.3×10^{1}	1.1×10^{-5}	2.4×10^{-3}	2.3×10^{-6}	2.7×10^{-1}	1.1×10^{3}

Table DATA-F-35. CH-TRU Waste Curies on a Site-by-Site Basis [1] — Continued

Radionuclide	AE	AW	MC	BC	BT	ET	IN	KN	LA	LL	MU	NT	OR	PA	RF	RL	RP	SA	SR	WP	Total Of Curies
^{234}U	9.1×10^{-3}	1.2×10^{-3}	---	---	2.0×10^{-3}	2.4×10^{-4}	2.6×10^{0}	1.1×10^{-3}	7.6×10^{-1}	---	$2.7 x 10^{-12}$	$1.2 x 10^{-2}$	$2.1 x 10^{1}$	---	$8.9 x 10^{-1}$	$3.3 x 10^{1}$	$1.3 x 10^{1}$	$1.9 x 10^{-1}$	$6.3 x 10^{1}$	$1.3 x 10^{0}$	$1.3 x 10^{2}$
^{235}U	2.9×10^{-3}	7.4×10^{-5}	4.8×10^{-10}	---	2.6×10^{-5}	2.8×10^{-9}	8.2×10^{-2}	5.1×10^{-5}	5.8×10^{-3}	---	$2.1 x 10^{-10}$	$1.5 x 10^{-4}$	$1.0 x 10^{-2}$	$3.5 x 10^{-9}$	$9.1 x 10^{-2}$	$3.9 x 10^{-1}$	$5.8 x 10^{-1}$	$1.2 x 10^{-2}$	$4.0 x 10^{-3}$	$1.2 x 10^{-1}$	$1.3 x 10^{0}$
^{236}U	6.7×10^{-5}	2.1×10^{-8}	---	---	3.0×10^{-4}	3.3×10^{-8}	2.9×10^{-3}	---	2.6×10^{-3}	---	---	$1.2 x 10^{-5}$	$8.1 x 10^{-4}$	---	$6.0 x 10^{-3}$	$1.6 x 10^{-5}$	$1.0 x 10^{-1}$	$7.4 x 10^{-8}$	$3.0 x 10^{-3}$	$4.5 x 10^{-3}$	$1.3 x 10^{-1}$
^{237}U	6.3×10^{-3}	1.5×10^{-5}	4.6×10^{-6}	---	---	2.2×10^{-5}	1.3×10^{0}	---	7.5×10^{-1}	---	---	$6.0 x 10^{-3}$	$1.1 x 10^{0}$	---	$4.3 x 10^{0}$	---	---	$1.6 x 10^{-4}$	$2.4 x 10^{0}$	$8.5 x 10^{0}$	$1.8 x 10^{1}$
^{238}U	5.2×10^{-2}	2.7×10^{-7}	---	---	1.2×10^{-7}	4.2×10^{-15}	2.3×10^{-2}	4.0×10^{-3}	2.1×10^{-1}	---	$2.4 x 10^{-7}$	$1.6 x 10^{-4}$	$6.8 x 10^{-2}$	---	$1.8 x 10^{-1}$	$4.0 x 10^{0}$	$1.3 x 10^{1}$	$9.0 x 10^{-3}$	---	$6.5 x 10^{0}$	$2.4 x 10^{1}$
^{240}U	---	---	---	---	---	---	5.0×10^{-14}	---	1.8×10^{-7}	---	---	$1.0 x 10^{-6}$	$5.6 x 10^{-9}$	---	---	---	---	---	---	---	$1.2 x 10^{-6}$
^{90}Y	2.6×10^{0}	1.5×10^{0}	---	---	2.1×10^{1}	1.1×10^{-2}	---	---	---	---	---	$9.4 x 10^{-5}$	$2.2 x 10^{3}$	---	---	$1.4 x 10^{2}$	$5.3 x 10^{4}$	$7.3 x 10^{1}$	---	---	$5.5 x 10^{4}$
^{65}Zn	---	---	---	---	---	---	---	---	---	---	---	---	$1.1 x 10^{-10}$	---	---	---	---	---	---	---	$1.1 x 10^{-10}$
^{93}Zr	---	---	---	---	1.1×10^{-3}	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$1.1 x 10^{-3}$
Total:	6.5×10^{2}	2.7×10^{2}	4.0×10^{-1}	2.2×10^{3}	9.3×10^{1}	1.5×10	3.5×10^{5}	5.8×10^{2}	1.6×10^{5}	5.3×10^{4}	$2.22 x 10^{0}$	$4.86 x 10^{3}$	$6.68 x 10^{4}$	$3.36 x 10^{0}$	$2.96 x 10^{5}$	$1.33 x 10^{6}$	$1.13 x 10^{5}$	$3.27 x 10^{2}$	$1.33 x 10^{6}$	$6.38 x 10^{5}$	$4.34 x 10^{6}$

[1] Decayed through December 31, 2001

Table DATA-F-36. RH-TRU Waste Curies on a Site-by-Site Basis [1]

Radionuclide	AE	AW	BC	BT	ET	IN	KA	LA	OR	RL	RP	SA	SR	Total Of Curies
^{225}Ac	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	6.1 X 10^{-15}	2.1 X 10^{-1}	---	---	4.6 X 10^{-12}	---	2.1 X 10^{-1}
^{227}Ac	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.9×10^{-8}	2.4 X 10^{-8}	2.3 X 10^{-5}	---	---	4.4 X 10^{-9}	---	2.3 X 10^{-5}
^{228}Ac	1.1×10^{-15}	1.2×10^{-14}	---	---	9.2×10^{-18}	2.4×10^{-16}	3.5×10^{-11}	1.0 X 10^{-16}	8.3 X 10^{-1}	---	---	1.2 X 10^{-18}	---	8.3 X 10^{-1}
^{110}Ag	---	---	---	---	---	---	---	---	1.1 X 10^{-10}	---	---	---	---	1.1 X 10^{-10}
^{110m}Ag	---	---	---	---	---	---	---	---	8.5 X 10^{-9}	---	---	---	---	8.5 X 10^{-9}
^{241}Am	1.0×10^{1}	1.2×10^{1}	8.6×10^{1}	2.5×10^{0}	6.5×10^{-1}	3.0×10^{1}	3.0×10^{-2}	2.5 X 10^{-2}	3.2 X 10^{2}	4.5 X 10^{3}	1.1 X 10^{4}	2.1 X 10^{1}	---	1.6 X 10^{4}
^{242}Am	---	5.0×10^{-3}	---	---	---	---	---	---	---	---	---	---	---	5.0 X 10^{-3}
^{242m}Am	---	5.0×10^{-3}	2.0×10^{-1}	---	---	---	---	---	---	---	---	---	---	2.1 X 10^{-1}
^{243}Am	3.2×10^{-5}	5.4×10^{-4}	6.7×10^{-1}	1.2×10^{-2}	---	---	5.3×10^{-5}	---	3.3 X 10^{-1}	---	---	---	4.1 X 10^{-2}	1.0 X 10^{0}
^{217}At	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	6.1 X 10^{-15}	2.1 X 10^{-1}	---	---	4.6 X 10^{-12}	---	2.1 X 10^{-1}
^{137m}Ba	4.3×10^{1}	1.6×10^{3}	---	6.2×10^{3}	9.2×10^{0}	1.9×10^{2}	7.2×10^{1}	1.5 X 10^{1}	1.5 X 10^{4}	2.6 X 10^{5}	1.2 X 10^{5}	4.6 X 10^{2}	5.8 X 10^{1}	4.0 X 10^{5}
^{210}Bi	7.0×10^{-11}	4.3×10^{-11}	---	---	9.8×10^{-16}	9.2×10^{-11}	2.5×10^{-9}	9.1 X 10^{-12}	1.2 X 10^{-6}	---	---	1.8 X 10^{-11}	2.1 X 10^{-13}	1.2 X 10^{-6}
^{211}Bi	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.8×10^{-8}	2.4 X 10^{-8}	2.2 X 10^{-5}	---	---	4.3 X 10^{-9}	---	2.3 X 10^{-5}
^{212}Bi	1.1×10^{-15}	5.6×10^{-15}	---	---	5.4×10^{-18}	9.8×10^{-17}	1.0×10^{-5}	1.0 X 10^{-16}	1.6 X 10^{1}	---	---	3.2 X 10^{-19}	---	1.6 X 10^{1}
^{213}Bi	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	6.1 X 10^{-15}	2.1 X 10^{-1}	---	---	4.6 X 10^{-12}	---	2.1 X 10^{-1}
^{214}Bi	3.8×10^{-10}	7.2×10^{-10}	---	---	1.7×10^{-14}	1.8×10^{-9}	9.5×10^{-9}	3.6 X 10^{-11}	7.9 X 10^{-6}	---	---	3.5 X 10^{-10}	3.5 X 10^{-12}	7.9 X 10^{-6}
^{14}C	---	---	---	1.6×10^{-1}	---	---	1.9×10^{-3}	---	4.8 X 10^{-4}	4.9 X 10^{0}	1.0 X 10^{0}	---	---	6.1 X 10^{0}
^{113m}Cd	5.9×10^{-1}	---	---	---	---	---	---	---	---	---	---	---	---	5.9 X 10^{-1}
^{141}Ce	---	4.3×10^{-19}	---	---	---	---	---	---	---	---	---	---	---	4.3 X 10^{-19}
^{144}Ce	2.0×10^{-9}	7.3×10^{0}	---	---	---	---	---	---	6.2 X 10^{-7}	---	---	---	---	7.3 X 10^{0}
^{249}Cf	---	---	---	2.3×10^{-10}	---	---	4.0×10^{-12}	---	4.9 X 10^{-3}	---	---	---	---	4.9 X 10^{-3}
^{250}Cf	---	---	---	---	---	---	---	---	8.7 X 10^{-2}	---	---	---	---	8.7 X 10^{-2}
^{251}Cf	---	---	---	1.1×10^{-11}	---	---	5.0×10^{-14}	---	9.3 X 10^{-4}	---	---	---	---	9.3 X 10^{-4}
^{252}Cf	---	---	---	---	---	---	1.9×10^{-15}	---	1.0 X 10^{-1}	---	---	---	---	1.0 X 10^{-1}
^{242}Cm	1.5×10^{-21}	4.2×10^{-3}	---	---	---	---	---	---	8.9 X 10^{-12}	---	---	---	---	4.2 X 10^{-3}
^{243}Cm	---	1.4×10^{-4}	4.6×10^{-1}	1.3×10^{-2}	---	---	1.5×10^{-5}	---	3.1 X 10^{-7}	---	---	3.8 X 10^{-2}	---	5.1 X 10^{-1}

Table DATA-F-36. RH-TRU Waste Curies on a Site-by-Site Basis [1]— Continued

Radionuclide	AE	AW	BC	BT	ET	IN	KA	LA	OR	RL	RP	SA	SR	Total Of Curies
^{244}Cm	1.9×10^{-1}	4.4×10^{-3}	6.8×10^{1}	7.6×10^{-1}	---	---	1.5×10^{-3}	---	$1.2 X 10^{3}$	---	---	$4.2 X 10^{-1}$	---	$1.3 X 10^{3}$
^{245}Cm	---	---	1.1×10^{-2}	8.1×10^{-5}	---	---	4.9×10^{-7}	---	$6.9 X 10^{-6}$	---	---	---	---	$1.1 X 10^{-2}$
^{246}Cm	---	---	1.6×10^{-4}	1.4×10^{-5}	---	---	6.3×10^{-8}	---	$3.9 X 10^{0}$	---	---	---	---	$3.9 X 10^{0}$
^{247}Cm	---	---	---	3.2×10^{-11}	---	---	1.5×10^{-13}	---	$7.1 X 10^{-10}$	---	---	---	$5.5 X 10^{1}$	$5.5 X 10^{1}$
^{248}Cm	---	---	---	5.8×10^{-11}	---	---	3.0×10^{-13}	---	$1.1 X 10^{-2}$	---	---	---	---	$1.1 X 10^{-2}$
^{60}Co	2.2×10^{-1}	1.7×10^{1}	5.0×10^{2}	2.8×10^{2}	---	---	---	---	$1.7 X 10^{2}$	$8.8 X 10^{2}$	---	$3.3 X 10^{-2}$	---	$1.8 X 10^{3}$
^{134}Cs	8.8×10^{-5}	2.5×10^{1}	2.7×10^{-4}	---	---	---	---	---	$4.5 X 10^{-3}$	---	---	$1.6 X 10^{1}$	---	$4.2 X 10^{1}$
^{135}Cs	---	---	---	---	---	---	4.0×10^{-4}	---	---	---	---	---	---	$4.0 X 10^{-4}$
^{137}Cs	4.5×10^{1}	1.7×10^{3}	2.3×10^{3}	6.4×10^{3}	9.8×10^{0}	2.0×10^{2}	7.7×10^{1}	$1.6 X 10^{1}$	$1.6 X 10^{4}$	$2.8 X 10^{5}$	$1.2 X 10^{5}$	$4.9 X 10^{2}$	$6.2 X 10^{1}$	$4.3 X 10^{5}$
^{152}Eu	1.7×10^{-4}	---	1.4×10^{-2}	2.8×10^{2}	---	---	---	---	$2.4 X 10^{3}$	---	---	---	---	$2.7 X 10^{3}$
^{154}Eu	8.2×10^{-3}	3.6×10^{0}	3.8×10^{-1}	2.8×10^{2}	---	---	---	---	$8.2 X 10^{2}$	---	---	$1.3 X 10^{0}$	---	$1.1 X 10^{3}$
^{155}Eu	1.0×10^{-2}	2.2×10^{1}	---	---	---	---	---	$7.9 X 10^{-3}$	$8.2 X 10^{1}$	---	---	---	---	$1.0 X 10^{2}$
^{55}Fe	1.5×10^{-1}	---	---	---	---	---	---	---	---	---	---	---	---	$1.5 X 10^{-1}$
^{221}Fr	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	$6.1 X 10^{-15}$	$2.1 X 10^{-1}$	---	---	$4.6 X 10^{-12}$	---	$2.1 X 10^{-1}$
^{223}Fr	4.0×10^{-10}	4.5×10^{-10}	---	---	2.4×10^{-10}	2.9×10^{-10}	6.6×10^{-10}	$3.3 X 10^{-10}$	$3.1 X 10^{-7}$	---	---	$6.0 X 10^{-11}$	---	$3.1 X 10^{-7}$
^{152}Gd	1.7×10^{-17}	---	---	---	---	---	---	---	$1.1 X 10^{-10}$	---	---	---	---	$1.1 X 10^{-10}$
^{3}H	---	6.8×10^{-4}	---	---	---	---	---	---	$2.6 X 10^{-1}$	$6.4 X 10^{0}$	---	---	---	$6.7 X 10^{0}$
^{129}I	---	---	---	2.1×10^{-3}	---	---	3.7×10^{-5}	---	---	$1.9 X 10^{-3}$	$8.0 X 10^{-2}$	---	---	$8.4 X 10^{-2}$
^{85}Kr	4.1×10^{-1}	---	---	---	---	---	---	---	---	---	---	---	---	$4.1 X 10^{-1}$
^{54}Mn	2.5×10^{-9}	2.1×10^{0}	---	---	---	---	---	---	---	---	---	---	---	$2.1 X 10^{0}$
^{22}Na	---	3.3×10^{-1}	---	---	---	---	---	---	---	---	---	---	---	$3.3 X 10^{-1}$
^{93m}Nb	9.2×10^{-4}	---	---	---	---	---	1.2×10^{-4}	---	---	---	---	---	---	$1.0 X 10^{-3}$
^{95}Nb	---	2.4×10^{-13}	---	---	---	---	---	---	---	---	---	---	---	$2.4 X 10^{-13}$
^{95m}Nb	---	8.1×10^{-16}	---	---	---	---	---	---	---	---	---	---	---	$8.1 X 10^{-16}$
^{59}Ni	---	---	---	2.3×10^{1}	---	---	1.7×10^{-4}	---	---	---	---	---	---	$2.3 X 10^{1}$
^{63}Ni	---	---	---	1.1×10^{3}	---	---	1.9×10^{-2}	---	---	---	---	---	---	$1.1 X 10^{3}$
^{237}Np	1.7×10^{-3}	1.9×10^{-3}	1.2×10^{-2}	1.7×10^{-2}	2.6×10^{-6}	6.8×10^{-5}	8.5×10^{-4}	$1.6 X 10^{-7}$	$1.8 X 10^{-3}$	$2.6 X 10^{-6}$	$6.4 X 10^{-1}$	$9.0 X 10^{-4}$	---	$6.7 X 10^{-1}$
^{238}Np	---	2.5×10^{-5}	---	---	---	---	---	---	---	---	---	---	---	$2.5 X 10^{-5}$
^{239}Np	3.1×10^{-5}	5.3×10^{-4}	---	---	---	---	5.2×10^{-5}	---	$3.2 X 10^{-1}$	---	---	---	$4.1 X 10^{-2}$	$3.7 X 10^{-1}$

Table DATA-F-36. RH-TRU Waste Curies on a Site-by-Site Basis [1]— Continued

Radionuclide	AE	AW	BC	BT	ET	IN	KA	LA	OR	RL	RP	SA	SR	Total Of Curies
^{240m}Np	---	---	---	---	---	---	1.7×10^{-12}	---	$6.5 X 10^{-3}$	---	---	---	---	$6.5 X 10^{-3}$
^{231}Pa	8.9×10^{-8}	3.7×10^{-7}	---	---	1.5×10^{-7}	2.0×10^{-7}	9.7×10^{-8}	$6.6 X 10^{-8}$	$9.9 X 10^{-5}$	---	---	$5.8 X 10^{-8}$	$5.3 X 10^{-19}$	$1.0 X 10^{-4}$
^{233}Pa	1.6×10^{-3}	1.9×10^{-3}	---	---	2.6×10^{-6}	6.7×10^{-5}	8.4×10^{-4}	$1.6 X 10^{-7}$	$1.8 X 10^{-3}$	---	---	$9.0 X 10^{-4}$	---	$7.1 X 10^{-3}$
^{234}Pa	7.8×10^{-8}	5.9×10^{-7}	---	---	2.9×10^{-6}	1.4×10^{-15}	4.1×10^{-10}	$5.7 X 10^{-10}$	$1.6 X 10^{-2}$	---	---	$2.4 X 10^{-7}$	---	$1.6 X 10^{-2}$
^{234m}Pa	6.0×10^{-5}	4.6×10^{-4}	---	---	2.2×10^{-3}	1.1×10^{-12}	3.1×10^{-7}	$4.3 X 10^{-7}$	$1.3 X 10^{1}$	---	---	$1.8 X 10^{-4}$	---	$1.3 X 10^{1}$
^{209}Pb	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	$6.1 X 10^{-15}$	$2.1 X 10^{-1}$	---	---	$4.6 X 10^{-12}$	---	$2.1 X 10^{-1}$
^{210}Pb	7.0×10^{-11}	4.3×10^{-11}	---	---	9.9×10^{-16}	9.3×10^{-11}	2.5×10^{-9}	$9.2 X 10^{-12}$	$1.2 X 10^{-6}$	---	---	$1.8 X 10^{-11}$	$2.1 X 10^{-13}$	$1.2 X 10^{-6}$
^{211}Pb	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.8×10^{-8}	$2.4 X 10^{-8}$	$2.2 X 10^{-5}$	---	---	$4.3 X 10^{-9}$	---	$2.3 X 10^{-5}$
^{212}Pb	1.1×10^{-15}	5.6×10^{-15}	---	---	5.4×10^{-18}	9.8×10^{-17}	1.0×10^{-5}	$1.0 X 10^{-16}$	$1.6 X 10^{1}$	---	---	$3.2 X 10^{-19}$	---	$1.6 X 10^{1}$
^{214}Pb	3.9×10^{-10}	7.2×10^{-10}	---	---	1.7×10^{-14}	1.8×10^{-9}	9.5×10^{-9}	$3.6 X 10^{-11}$	$7.9 X 10^{-6}$	---	---	$3.5 X 10^{-10}$	$3.5 X 10^{-12}$	$7.9 X 10^{-6}$
^{107}Pd	---	---	---	---	---	---	1.7×10^{-5}	---	---	---	---	---	---	$1.7 X 10^{-5}$
^{147}Pm	3.0×10^{-2}	3.7×10^{2}	---	2.8×10^{2}	---	---	5.9×10^{-2}	---	---	---	---	$7.0 X 10^{0}$	$2.2 X 10^{0}$	$6.6 X 10^{2}$
^{210}Po	7.0×10^{-11}	4.3×10^{-11}	---	---	9.9×10^{-16}	9.3×10^{-11}	2.0×10^{-9}	$9.2 X 10^{-12}$	$1.2 X 10^{-6}$	---	---	$1.8 X 10^{-11}$	$2.1 X 10^{-13}$	$1.2 X 10^{-6}$
^{211}Po	8.8×10^{-11}	1.0×10^{-10}	---	---	5.4×10^{-11}	6.3×10^{-11}	1.5×10^{-10}	$7.2 X 10^{-11}$	$6.8 X 10^{-8}$	---	---	$1.3 X 10^{-11}$	---	$6.9 X 10^{-8}$
^{212}Po	6.8×10^{-16}	3.5×10^{-15}	---	---	3.5×10^{-18}	6.3×10^{-17}	6.6×10^{-6}	$6.6 X 10^{-17}$	$1.0 X 10^{1}$	---	---	$2.1 X 10^{-19}$	---	$1.0 X 10^{1}$
^{213}Po	4.5×10^{-7}	1.1×10^{-4}	---	---	3.1×10^{-14}	2.2×10^{-13}	9.4×10^{-10}	$6.0 X 10^{-15}$	$2.1 X 10^{-1}$	---	---	$4.5 X 10^{-12}$	---	$2.1 X 10^{-1}$
^{214}Po	3.9×10^{-10}	7.2×10^{-10}	---	---	1.7×10^{-14}	1.8×10^{-9}	9.5×10^{-9}	$3.6 X 10^{-11}$	$7.9 X 10^{-6}$	---	---	$3.5 X 10^{-10}$	$3.5 X 10^{-12}$	$7.9 X 10^{-6}$
^{215}Po	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.8×10^{-8}	$2.4 X 10^{-8}$	$2.2 X 10^{-5}$	---	---	$4.3 X 10^{-9}$	---	$2.3 X 10^{-5}$
^{216}Po	1.1×10^{-15}	5.5×10^{-15}	---	---	5.4×10^{-18}	9.8×10^{-17}	1.0×10^{-5}	$1.0 X 10^{-16}$	$1.6 X 10^{1}$	---	---	$3.2 X 10^{-19}$	---	$1.6 X 10^{1}$
^{218}Po	3.8×10^{-10}	7.1×10^{-10}	---	---	1.6×10^{-14}	1.7×10^{-9}	9.3×10^{-9}	$3.5 X 10^{-11}$	$7.8 X 10^{-6}$	---	---	$3.5 X 10^{-10}$	$3.5 X 10^{-12}$	$7.8 X 10^{-6}$
^{144}Pr	2.0×10^{-9}	7.1×10^{0}	---	---	---	---	---	---	$6.1 X 10^{-7}$	---	---	---	---	$7.1 X 10^{0}$
^{238}Pu	9.2×10^{0}	1.2×10^{0}	7.8×10^{1}	2.8×10^{2}	1.5×10^{-2}	2.7×10^{3}	2.8×10^{0}	$1.3 X 10^{-2}$	$2.5 X 10^{2}$	$1.1 X 10^{3}$	$1.0 X 10^{1}$	$4.2 X 10^{0}$	$3.6 X 10^{0}$	$4.5 X 10^{3}$
^{239}Pu	1.8×10^{1}	4.2×10^{1}	1.0×10^{1}	2.2×10^{-1}	1.1×10^{0}	3.5×10^{1}	7.6×10^{-3}	$2.5 X 10^{0}$	$1.4 X 10^{2}$	$2.3 X 10^{3}$	$4.2 X 10^{3}$	$2.8 X 10^{0}$	$4.8 X 10^{-6}$	$6.8 X 10^{3}$
^{240}Pu	3.8×10^{0}	2.3×10^{1}	1.6×10^{1}	4.5×10^{-1}	2.7×10^{-1}	3.3×10^{1}	1.9×10^{-3}	$2.7 X 10^{-2}$	$3.4 X 10^{1}$	$1.3 X 10^{3}$	$1.0 X 10^{3}$	$4.3 X 10^{-1}$	---	$2.4 X 10^{3}$
^{241}Pu	3.0×10^{1}	7.2×10^{2}	1.3×10^{3}	4.8×10^{1}	2.2×10^{0}	6.6×10^{1}	2.7×10^{-1}	$2.2 X 10^{-1}$	$1.5 X 10^{2}$	$1.4 X 10^{5}$	$1.8 X 10^{4}$	$2.5 X 10^{-2}$	---	$1.6 X 10^{5}$
^{242}Pu	---	5.5×10^{-4}	4.8×10^{-2}	3.5×10^{-3}	---	1.0×10^{-3}	7.2×10^{-6}	$1.6 X 10^{-5}$	$7.1 X 10^{-2}$	$4.4 X 10^{-1}$	$2.2 X 10^{-1}$	---	---	$7.8 X 10^{-1}$
^{243}Pu	---	---	---	---	---	---	1.5×10^{-13}	---	$7.0 X 10^{-10}$	---	---	---	$5.4 X 10^{1}$	$5.4 X 10^{1}$
^{244}Pu	---	---	---	2.0×10^{-10}	---	---	1.7×10^{-12}	---	$6.4 X 10^{-3}$	---	---	---	---	$6.4 X 10^{-3}$
^{223}Ra	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.9×10^{-8}	$2.4 X 10^{-8}$	$2.3 X 10^{-5}$	---	---	$4.4 X 10^{-9}$	---	$2.3 X 10^{-5}$

Table DATA-F-36. RH-TRU Waste Curies on a Site-by-Site Basis [1]— Continued

Radionuclide	AE	AW	BC	BT	ET	IN	KA	LA	OR	RL	RP	SA	SR	Total Of Curies
^{224}Ra	1.1×10^{-15}	5.5×10^{-15}	---	---	5.4×10^{-18}	9.8×10^{-17}	1.0×10^{-5}	$1.0 X 10^{-16}$	$1.6 X 10^{1}$	---	---	$3.2 X 10^{-19}$	---	$1.6 X 10^{1}$
^{225}Ra	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	$6.1 X 10^{-15}$	$2.1 X 10^{-1}$	---	---	$4.6 X 10^{-12}$	---	$2.1 X 10^{-1}$
^{226}Ra	3.9×10^{-10}	7.3×10^{-10}	---	---	1.7×10^{-14}	1.8×10^{-9}	9.6×10^{-9}	$3.6 X 10^{-11}$	$8.0 X 10^{-6}$	---	---	$3.6 X 10^{-10}$	$3.6 X 10^{-12}$	$8.0 X 10^{-6}$
^{228}Ra	1.3×10^{-15}	1.4×10^{-14}	---	---	1.1×10^{-17}	2.8×10^{-16}	4.1×10^{-11}	$1.2 X 10^{-16}$	$9.8 X 10^{-1}$	---	---	$1.4 X 10^{-18}$	---	$9.8 X 10^{-1}$
^{106}Rh	3.6×10^{-7}	---	---	---	---	---	---	$1.3 X 10^{-10}$	$2.2 X 10^{-3}$	$3.9 X 10^{-1}$	---	---	---	$4.0 X 10^{-1}$
^{219}Rn	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.8×10^{-8}	$2.4 X 10^{-8}$	$2.2 X 10^{-5}$	---	---	$4.3 X 10^{-9}$	---	$2.3 X 10^{-5}$
^{220}Rn	1.1×10^{-15}	5.6×10^{-15}	---	---	5.4×10^{-18}	9.8×10^{-17}	1.0×10^{-5}	$1.0 X 10^{-16}$	$1.6 X 10^{1}$	---	---	$3.2 X 10^{-19}$	---	$1.6 X 10^{1}$
^{222}Rn	3.9×10^{-10}	7.2×10^{-10}	---	---	1.7×10^{-14}	1.8×10^{-9}	9.5×10^{-9}	$3.6 X 10^{-11}$	$7.9 X 10^{-6}$	---	---	$3.5 X 10^{-10}$	$3.5 X 10^{-12}$	$7.9 X 10^{-6}$
^{106}Ru	3.6×10^{-7}	---	---	---	---	---	---	$1.3 X 10^{-10}$	$2.3 X 10^{-3}$	$3.9 X 10^{-1}$	---	---	---	$4.0 X 10^{-1}$
^{125}Sb	3.7×10^{-3}	5.0×10^{0}	2.8×10^{-3}	---	---	---	---	$5.5 X 10^{-4}$	$1.3 X 10^{-2}$	---	---	---	---	$5.0 X 10^{0}$
^{126}Sb	1.2×10^{-4}	---	---	---	---	---	4.7×10^{-5}	---	---	---	---	---	---	$1.7 X 10^{-4}$
^{126m}Sb	8.7×10^{-4}	---	---	---	---	---	3.4×10^{-4}	---	---	---	---	---	---	$1.2 X 10^{-3}$
^{79}Se	---	---	---	4.0×10^{-2}	---	---	1.0×10^{-4}	---	---	$2.8 X 10^{-2}$	---	---	---	$6.7 X 10^{-2}$
^{147}Sm	9.3×10^{-10}	3.5×10^{-8}	---	---	---	---	4.4×10^{-13}	---	---	---	---	$4.7 X 10^{-10}$	$4.0 X 10^{-10}$	$3.7 X 10^{-8}$
^{151}Sm	2.0×10^{0}	3.5×10^{1}	---	3.1×10^{1}	---	---	1.2×10^{0}	---	---	$3.5 X 10^{2}$	$2.4 X 10^{2}$	---	---	$6.6 X 10^{2}$
^{121m}Sn	---	---	---	---	---	---	3.0×10^{-3}	---	---	---	---	---	---	$3.0 X 10^{-3}$
^{126}Sn	8.7×10^{-4}	---	---	---	---	---	3.4×10^{-4}	---	---	---	---	---	---	$1.2 X 10^{-3}$
^{90}Sr	2.6×10^{1}	1.3×10^{3}	1.5×10^{3}	6.4×10^{3}	9.5×10^{0}	---	7.3×10^{1}	---	$5.6 X 10^{4}$	$1.9 X 10^{5}$	$7.5 X 10^{4}$	$4.9 X 10^{2}$	$5.8 X 10^{1}$	$3.3 X 10^{5}$
^{99}Tc	1.1×10^{-2}	---	4.4×10^{-1}	1.4×10^{0}	---	---	2.1×10^{-2}	---	$6.5 X 10^{-9}$	$6.6 X 10^{-3}$	$1.6 X 10^{2}$	---	---	$1.6 X 10^{2}$
^{125m}Te	8.9×10^{-4}	1.2×10^{0}	---	---	---	---	---	$1.3 X 10^{-4}$	$3.1 X 10^{-3}$	---	---	---	---	$1.2 X 10^{0}$
^{227}Th	2.8×10^{-8}	3.2×10^{-8}	---	---	1.7×10^{-8}	2.0×10^{-8}	4.7×10^{-8}	$2.3 X 10^{-8}$	$2.2 X 10^{-5}$	---	---	$4.3 X 10^{-9}$	---	$2.2 X 10^{-5}$
^{228}Th	1.1×10^{-15}	5.6×10^{-15}	---	---	5.5×10^{-18}	9.9×10^{-17}	1.0×10^{-5}	$1.0 X 10^{-16}$	$1.6 X 10^{1}$	---	---	$3.2 X 10^{-19}$	---	$1.6 X 10^{1}$
^{229}Th	4.6×10^{-7}	1.2×10^{-4}	---	---	3.2×10^{-14}	2.2×10^{-13}	9.6×10^{-10}	$6.1 X 10^{-15}$	$2.1 X 10^{-1}$	---	---	$4.6 X 10^{-12}$	---	$2.1 X 10^{-1}$
^{230}Th	9.8×10^{-8}	5.6×10^{-7}	---	---	1.4×10^{-11}	1.8×10^{-6}	1.4×10^{-6}	$5.5 X 10^{-9}$	$2.2 X 10^{-3}$	---	---	$3.3 X 10^{-7}$	$3.1 X 10^{-9}$	$2.2 X 10^{-3}$
^{231}Th	1.5×10^{-4}	2.9×10^{-3}	---	---	8.9×10^{-4}	1.3×10^{-3}	7.1×10^{-5}	$9.9 X 10^{-5}$	$2.7 X 10^{-1}$	---	---	$5.4 X 10^{-4}$	$1.2 X 10^{-14}$	$2.8 X 10^{-1}$
^{232}Th	2.0×10^{-15}	4.7×10^{-14}	---	1.7×10^{-11}	2.9×10^{-17}	1.2×10^{-15}	4.1×10^{-11}	$1.5 X 10^{-16}$	$1.0 X 10^{0}$	$4.3 X 10^{-2}$	---	$7.8 X 10^{-18}$	---	$1.1 X 10^{0}$
^{234}Th	6.0×10^{-5}	4.6×10^{-4}	---	---	2.2×10^{-3}	1.1×10^{-12}	3.1×10^{-7}	$4.4 X 10^{-7}$	$1.3 X 10^{1}$	---	---	$1.8 X 10^{-4}$	---	$1.3 X 10^{1}$
^{207}Tl	2.9×10^{-8}	3.3×10^{-8}	---	---	1.8×10^{-8}	2.1×10^{-8}	4.8×10^{-8}	$2.4 X 10^{-8}$	$2.2 X 10^{-5}$	---	---	$4.3 X 10^{-9}$	---	$2.2 X 10^{-5}$
^{208}Tl	3.8×10^{-16}	2.0×10^{-15}	2.3×10^{-3}	---	2.0×10^{-18}	3.5×10^{-17}	3.7×10^{-6}	$3.7 X 10^{-17}$	$5.6 X 10^{0}$	---	---	$1.2 X 10^{-19}$	---	$5.6 X 10^{0}$

Table DATA-F-36. RH-TRU Waste Curies on a Site-by-Site Basis [1]— Continued

Radionuclide	AE	AW	BC	BT	ET	IN	KA	LA	OR	RL	RP	SA	SR	Total Of Curies
^{209}Tl	1.0×10^{-8}	2.6×10^{-6}	---	---	7.1×10^{-16}	4.9×10^{-15}	2.1×10^{-11}	$1.3 X 10^{-16}$	$4.7 X 10^{-3}$	---	---	$1.0 X 10^{-13}$	---	$4.7 X 10^{-3}$
^{232}U	---	---	7.3×10^{-4}	4.0×10^{-3}	---	---	3.4×10^{-5}	---	$1.5 X 10^{1}$	---	---	---	---	$1.5 X 10^{1}$
^{233}U	1.8×10^{-4}	2.1×10^{-1}	1.3×10^{-6}	---	7.6×10^{-11}	1.0×10^{-9}	3.9×10^{-7}	$7.9 X 10^{-12}$	$1.3 X 10^{2}$	$8.5 X 10^{0}$	$2.3 X 10^{0}$	$1.9 X 10^{-8}$	---	$1.5 X 10^{2}$
^{234}U	7.8×10^{-4}	1.0×10^{-2}	2.8×10^{-2}	6.0×10^{-1}	4.0×10^{-7}	5.5×10^{-2}	4.8×10^{-3}	$2.0 X 10^{-5}$	$1.4 X 10^{1}$	$9.2 X 10^{0}$	$1.5 X 10^{1}$	$7.4 X 10^{-3}$	$8.4 X 10^{-5}$	$3.9 X 10^{1}$
^{235}U	1.6×10^{-4}	2.9×10^{-3}	4.1×10^{-4}	7.8×10^{-3}	9.0×10^{-4}	1.4×10^{-3}	7.2×10^{-5}	$1.0 X 10^{-4}$	$2.8 X 10^{-1}$	$5.3 X 10^{-1}$	$5.6 X 10^{-1}$	$5.5 X 10^{-4}$	$1.3 X 10^{-14}$	$1.4 X 10^{0}$
^{236}U	3.1×10^{-6}	1.6×10^{-4}	5.4×10^{-3}	8.9×10^{-2}	9.4×10^{-8}	6.8×10^{-6}	6.8×10^{-4}	$1.1 X 10^{-7}$	$4.9 X 10^{-2}$	$8.3 X 10^{-1}$	$1.2 X 10^{0}$	$6.3 X 10^{-8}$	---	$2.2 X 10^{0}$
^{237}U	7.3×10^{-4}	1.8×10^{-2}	---	---	5.4×10^{-5}	1.6×10^{-3}	6.6×10^{-6}	$5.5 X 10^{-6}$	$3.7 X 10^{-3}$	---	---	$6.1 X 10^{-7}$	---	$2.4 X 10^{-2}$
^{238}U	6.1×10^{-5}	4.6×10^{-4}	8.0×10^{-3}	3.6×10^{-5}	2.2×10^{-3}	1.1×10^{-12}	3.2×10^{-7}	$4.4 X 10^{-7}$	$1.3 X 10^{1}$	$4.5 X 10^{0}$	$1.3 X 10^{2}$	$1.8 X 10^{-4}$	---	$1.4 X 10^{2}$
^{240}U	---	---	---	---	---	---	1.7×10^{-12}	---	$6.4 X 10^{-3}$	---	---	---	---	$6.4 X 10^{-3}$
^{90}Y	2.5×10^{1}	1.3×10^{3}	---	6.4×10^{3}	9.4×10^{0}	---	7.2×10^{1}	---	$5.5 X 10^{4}$	$1.8 X 10^{5}$	$7.5 X 10^{4}$	$4.8 X 10^{2}$	$5.7 X 10^{1}$	$3.2 X 10^{5}$
^{91}Y	---	4.7×10^{-12}	---	---	---	---	---	---	---	---	---	---	---	$4.7 X 10^{-12}$
^{93}Zr	1.3×10^{-3}	---	---	3.4×10^{-1}	---	---	2.6×10^{-3}	---	---	---	---	---	---	$3.4 X 10^{-1}$
^{95}Zr	---	1.1×10^{-13}	---	---	---	---	---	---	---	---	---	---	---	$1.1 X 10^{-13}$
Total:	2.1×10^{2}	7.2×10^{3}	5.8×10^{3}	2.8×10^{4}	4.2×10^{1}	3.3×10^{3}	3.0×10^{2}	$3.3 X 10^{1}$	$1.5 X 10^{5}$	$1.1 X 10^{6}$	$4.3 X 10^{5}$	$2.0 X 10^{3}$	$3.5 X 10^{2}$	$1.7 X 10^{6}$

[1] *Decayed through December 31, 2001*

Table DATA-F-37. WIPP Disposal Radionuclide Inventory for the CRA[1, 2]

Radionuclide	CH Concentration (Ci/m^3)	RH Concentration (Ci/m^3)	CH-TRU Curies	RH-TRU Curies
^{225}Ac	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{227}Ac	3.0×10^{-6}	5.7×10^{-10}	5.1×10^{-1}	4.0×10^{-6}
^{228}Ac	2.8×10^{-5}	2.0×10^{-5}	4.8×10^{0}	1.4×10^{-1}
^{109m}Ag	7.5×10^{-10}	NR	1.3×10^{-4}	NR
^{110}Ag	2.6×10^{-16}	2.7×10^{-15}	4.4×10^{-11}	1.9×10^{-11}
^{110m}Ag	2.0×10^{-14}	2.1×10^{-13}	3.3×10^{-9}	1.5×10^{-9}
^{241}Am	2.4×10^{0}	1.9×10^{0}	4.0×10^{5}	1.4×10^{4}
^{242}Am	2.8×10^{-7}	1.2×10^{-7}	4.7×10^{-2}	8.5×10^{-4}
^{242m}Am	2.8×10^{-7}	2.8×10^{-5}	4.8×10^{-2}	2.0×10^{-1}
^{243}Am	1.3×10^{-4}	1.0×10^{-4}	2.1×10^{1}	7.2×10^{-1}
^{245}Am	7.8×10^{-16}	NR	1.3×10^{-10}	NR
^{217}At	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{137m}Ba	5.4×10^{-2}	4.7×10^{1}	9.1×10^{3}	3.4×10^{5}
^{210}Bi	1.5×10^{-5}	3.0×10^{-11}	2.6×10^{0}	2.1×10^{-7}
^{211}Bi	3.0×10^{-6}	5.6×10^{-10}	5.0×10^{-1}	4.0×10^{-6}
^{212}Bi	3.5×10^{-5}	3.8×10^{-4}	5.8×10^{0}	2.7×10^{0}
^{213}Bi	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{214}Bi	3.7×10^{-5}	1.9×10^{-10}	6.3×10^{0}	1.4×10^{-6}
^{249}Bk	5.4×10^{-11}	NR	9.1×10^{-6}	NR
^{250}Bk	2.2×10^{-17}	NR	3.7×10^{-12}	NR
^{14}C	7.2×10^{-6}	2.9×10^{-4}	1.2×10^{0}	2.1×10^{0}
^{109}Cd	7.6×10^{-10}	NR	1.3×10^{-4}	NR
^{113m}Cd	NR	2.3×10^{-5}	NR	1.6×10^{-1}
^{141}Ce	NR	5.3×10^{-23}	NR	3.8×10^{-19}
^{144}Ce	2.1×10^{-9}	2.6×10^{-4}	3.6×10^{-4}	1.8×10^{0}
^{249}Cf	4.5×10^{-7}	1.2×10^{-7}	7.6×10^{-2}	8.4×10^{-4}
^{250}Cf	1.1×10^{-6}	2.1×10^{-6}	1.8×10^{-1}	1.5×10^{-2}
^{251}Cf	2.2×10^{-9}	2.3×10^{-8}	3.6×10^{-4}	1.6×10^{-4}
^{252}Cf	1.2×10^{-6}	2.5×10^{-6}	2.1×10^{-1}	1.8×10^{-2}
^{242}Cm	2.3×10^{-7}	1.0×10^{-7}	3.9×10^{-2}	7.2×10^{-4}
^{243}Cm	2.4×10^{-6}	6.9×10^{-5}	4.0×10^{-1}	4.9×10^{-1}
^{244}Cm	6.9×10^{-2}	3.8×10^{-2}	1.2×10^{4}	2.7×10^{2}
^{245}Cm	5.0×10^{-8}	1.5×10^{-6}	8.4×10^{-3}	1.1×10^{-2}
^{246}Cm	9.2×10^{-6}	9.5×10^{-5}	1.6×10^{0}	6.7×10^{-1}
^{247}Cm	1.7×10^{-15}	1.3×10^{-3}	2.8×10^{-10}	9.4×10^{0}
^{248}Cm	5.4×10^{-7}	2.6×10^{-7}	9.1×10^{-2}	1.8×10^{-3}

Table DATA-F-37. WIPP Disposal Radionuclide Inventory for the CRA[1, 2]— Continued

Radionuclide	CH Concentration (Ci/m^3)	RH Concentration (Ci/m^3)	CH-TRU Curies	RH-TRU Curies
^{250}Cm	3.9×10^{-16}	NR	6.6×10^{-11}	NR
^{60}Co	5.9×10^{-6}	2.4×10^{-1}	9.9×10^{-1}	1.7×10^{3}
^{134}Cs	1.2×10^{-7}	4.8×10^{-3}	2.1×10^{-2}	3.4×10^{1}
^{135}Cs	NR	9.8×10^{-9}	NR	6.9×10^{-5}
^{137}Cs	5.7×10^{-2}	5.2×10^{1}	9.7×10^{3}	3.7×10^{5}
^{152}Eu	1.2×10^{-5}	9.8×10^{-2}	2.0×10^{0}	7.0×10^{2}
^{154}Eu	9.8×10^{-6}	6.0×10^{-2}	1.7×10^{0}	4.2×10^{2}
^{155}Eu	4.0×10^{-7}	2.6×10^{-3}	6.7×10^{-2}	1.9×10^{1}
^{55}Fe	NR	5.9×10^{-6}	NR	4.2×10^{-2}
^{221}Fr	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{223}Fr	4.1×10^{-8}	7.7×10^{-12}	6.9×10^{-3}	5.5×10^{-8}
^{152}Gd	2.6×10^{-19}	2.8×10^{-15}	4.4×10^{-14}	2.0×10^{-11}
^{3}H	1.3×10^{-3}	1.6×10^{-4}	2.2×10^{2}	1.2×10^{0}
^{129}I	3.0×10^{-9}	1.2×10^{-5}	5.1×10^{-4}	8.2×10^{-2}
^{85}Kr	2.7×10^{-6}	1.6×10^{-5}	4.6×10^{-1}	1.1×10^{-1}
^{54}Mn	NR	2.6×10^{-4}	NR	1.8×10^{0}
^{22}Na	2.3×10^{-12}	4.2×10^{-5}	3.9×10^{-7}	3.0×10^{-1}
^{93m}Nb	NR	3.9×10^{-8}	NR	2.8×10^{-4}
^{95}Nb	NR	1.1×10^{-17}	NR	7.5×10^{-14}
^{95m}Nb	NR	3.6×10^{-20}	NR	2.5×10^{-16}
^{59}Ni	4.5×10^{-7}	3.3×10^{-3}	7.6×10^{-2}	2.3×10^{1}
^{63}Ni	2.2×10^{-5}	1.6×10^{-1}	3.7×10^{0}	1.1×10^{3}
^{237}Np	2.8×10^{-5}	9.4×10^{-5}	4.8×10^{0}	6.7×10^{-1}
^{238}Np	1.4×10^{-9}	6.1×10^{-10}	2.4×10^{-4}	4.3×10^{-6}
^{239}Np	1.2×10^{-4}	8.9×10^{-6}	2.1×10^{1}	6.3×10^{-2}
^{240m}Np	7.8×10^{-12}	1.6×10^{-7}	1.3×10^{-6}	1.1×10^{-3}
^{231}Pa	7.2×10^{-6}	2.5×10^{-9}	1.2×10^{0}	1.8×10^{-5}
^{233}Pa	2.8×10^{-5}	3.3×10^{-7}	4.8×10^{0}	2.3×10^{-3}
^{234}Pa	5.5×10^{-8}	4.0×10^{-7}	9.3×10^{-3}	2.8×10^{-3}
^{234m}Pa	4.2×10^{-5}	3.1×10^{-4}	7.1×10^{0}	2.2×10^{0}
^{209}Pb	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{210}Pb	1.6×10^{-5}	3.0×10^{-11}	2.6×10^{0}	2.1×10^{-7}
^{211}Pb	3.0×10^{-6}	5.6×10^{-10}	5.0×10^{-1}	4.0×10^{-6}
^{212}Pb	3.5×10^{-5}	3.8×10^{-4}	5.8×10^{0}	2.7×10^{0}
^{214}Pb	3.7×10^{-5}	1.9×10^{-10}	6.3×10^{0}	1.4×10^{-6}
^{107}Pd	NR	4.1×10^{-10}	NR	2.9×10^{-6}
^{147}Pm	1.1×10^{-5}	5.0×10^{-2}	1.8×10^{0}	3.5×10^{2}
^{210}Po	1.6×10^{-5}	3.0×10^{-11}	2.6×10^{0}	2.1×10^{-7}
^{211}Po	9.1×10^{-9}	1.7×10^{-12}	1.5×10^{-3}	1.2×10^{-8}

Table DATA-F-37. WIPP Disposal Radionuclide Inventory for the CRA[1, 2]— Continued

Radionuclide	CH Concentration (Ci/m^3)	RH Concentration (Ci/m^3)	CH-TRU Curies	RH-TRU Curies
^{212}Po	2.2×10^{-5}	2.4×10^{-4}	3.7×10^{0}	1.7×10^{0}
^{213}Po	9.0×10^{-6}	5.1×10^{-6}	1.5×10^{0}	3.6×10^{-2}
^{214}Po	3.7×10^{-5}	1.9×10^{-10}	6.3×10^{0}	1.4×10^{-6}
^{215}Po	3.0×10^{-6}	5.6×10^{-10}	5.0×10^{-1}	4.0×10^{-6}
^{216}Po	3.5×10^{-5}	3.8×10^{-4}	5.8×10^{0}	2.7×10^{0}
^{218}Po	3.7×10^{-5}	1.9×10^{-10}	6.2×10^{0}	1.3×10^{-6}
^{144}Pr	2.1×10^{-9}	2.5×10^{-4}	3.5×10^{-4}	1.8×10^{0}
^{236}Pu	2.6×10^{-9}	NR	4.4×10^{-4}	NR
^{238}Pu	9.6×10^{0}	5.1×10^{-1}	1.6×10^{6}	3.6×10^{3}
^{239}Pu	3.9×10^{0}	7.6×10^{-1}	6.6×10^{5}	5.4×10^{3}
^{240}Pu	6.4×10^{-1}	2.4×10^{-1}	1.1×10^{5}	1.7×10^{3}
^{241}Pu	1.4×10^{1}	1.6×10^{1}	2.4×10^{6}	1.1×10^{5}
^{242}Pu	1.6×10^{-4}	6.7×10^{-5}	2.7×10^{1}	4.7×10^{-1}
^{243}Pu	1.6×10^{-15}	1.3×10^{-3}	2.7×10^{-10}	9.3×10^{0}
^{244}Pu	7.7×10^{-12}	1.6×10^{-7}	1.3×10^{-6}	1.1×10^{-3}
^{223}Ra	3.0×10^{-6}	5.6×10^{-10}	5.1×10^{-1}	4.0×10^{-6}
^{224}Ra	3.5×10^{-5}	3.8×10^{-4}	5.8×10^{0}	2.7×10^{0}
^{225}Ra	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{226}Ra	3.8×10^{-5}	2.0×10^{-10}	6.4×10^{0}	1.4×10^{-6}
^{228}Ra	3.4×10^{-5}	2.4×10^{-5}	5.7×10^{0}	1.7×10^{-1}
^{106}Rh	9.4×10^{-10}	9.6×10^{-6}	1.6×10^{-4}	6.8×10^{-2}
^{219}Rn	3.0×10^{-6}	5.6×10^{-10}	5.0×10^{-1}	4.0×10^{-6}
^{220}Rn	3.5×10^{-5}	3.8×10^{-4}	5.8×10^{0}	2.7×10^{0}
^{222}Rn	3.7×10^{-5}	1.9×10^{-10}	6.3×10^{0}	1.4×10^{-6}
^{106}Ru	9.5×10^{-10}	9.6×10^{-6}	1.6×10^{-4}	6.8×10^{-2}
^{125}Sb	3.0×10^{-8}	6.2×10^{-4}	5.0×10^{-3}	4.4×10^{0}
^{126}Sb	NR	5.9×10^{-9}	NR	4.2×10^{-5}
^{126m}Sb	NR	4.2×10^{-8}	NR	3.0×10^{-4}
^{79}Se	7.8×10^{-10}	6.3×10^{-6}	1.3×10^{-4}	4.5×10^{-2}
^{147}Sm	2.8×10^{-15}	9.7×10^{-13}	4.8×10^{-10}	6.9×10^{-9}
^{151}Sm	3.4×10^{-4}	8.2×10^{-2}	5.7×10^{1}	5.8×10^{2}
^{121m}Sn	NR	7.3×10^{-8}	NR	5.2×10^{-4}
^{126}Sn	NR	4.2×10^{-8}	NR	3.0×10^{-4}
^{90}Sr	3.4×10^{-1}	3.5×10^{1}	5.8×10^{4}	2.5×10^{5}
^{99}Tc	9.9×10^{-4}	2.3×10^{-2}	1.7×10^{2}	1.6×10^{2}
^{123}Te	4.0×10^{-10}	NR	6.8×10^{-5}	NR
^{123m}Te	3.0×10^{-24}	NR	5.0×10^{-19}	NR
^{125m}Te	7.2×10^{-9}	1.5×10^{-4}	1.2×10^{-3}	1.1×10^{0}
^{227}Th	2.9×10^{-6}	5.5×10^{-10}	4.9×10^{-1}	3.9×10^{-6}

Table DATA-F-37. WIPP Disposal Radionuclide Inventory for the CRA[1, 2]— Continued

Radionuclide	CH Concentration (Ci/m^3)	RH Concentration (Ci/m^3)	CH-TRU Curies	RH-TRU Curies
^{228}Th	3.5×10^{-5}	3.9×10^{-4}	5.9×10^{0}	2.7×10^{0}
^{229}Th	9.2×10^{-6}	5.2×10^{-6}	1.6×10^{0}	3.7×10^{-2}
^{230}Th	6.0×10^{-7}	5.3×10^{-8}	1.0×10^{-1}	3.8×10^{-4}
^{231}Th	2.1×10^{-6}	7.4×10^{-6}	3.5×10^{-1}	5.2×10^{-2}
^{232}Th	3.9×10^{-5}	3.1×10^{-5}	6.6×10^{0}	2.2×10^{-1}
^{234}Th	4.2×10^{-5}	3.1×10^{-4}	7.1×10^{0}	2.2×10^{0}
^{207}Tl	3.0×10^{-6}	5.6×10^{-10}	5.0×10^{-1}	3.9×10^{-6}
^{208}Tl	1.2×10^{-5}	1.4×10^{-4}	2.1×10^{0}	9.7×10^{-1}
^{209}Tl	2.0×10^{-7}	1.1×10^{-7}	3.4×10^{-2}	8.1×10^{-4}
^{232}U	9.8×10^{-6}	3.6×10^{-4}	1.6×10^{0}	2.5×10^{0}
^{233}U	7.3×10^{-3}	4.8×10^{-3}	1.2×10^{3}	3.4×10^{1}
^{234}U	1.0×10^{-3}	3.1×10^{-3}	1.7×10^{2}	2.2×10^{1}
^{235}U	7.8×10^{-6}	1.3×10^{-4}	1.3×10^{0}	9.4×10^{-1}
^{236}U	7.7×10^{-7}	2.0×10^{-4}	1.3×10^{-1}	1.4×10^{0}
^{237}U	1.3×10^{-4}	2.5×10^{-6}	2.2×10^{1}	1.8×10^{-2}
^{238}U	1.5×10^{-4}	1.8×10^{-2}	2.4×10^{1}	1.3×10^{2}
^{240}U	7.6×10^{-12}	1.5×10^{-7}	1.3×10^{-6}	1.1×10^{-3}
^{90}Y	3.4×10^{-1}	3.4×10^{1}	5.7×10^{4}	2.4×10^{5}
^{91}Y	NR	1.2×10^{-16}	NR	8.1×10^{-13}
^{65}Zn	1.4×10^{-15}	NR	2.3×10^{-10}	NR
^{93}Zr	6.7×10^{-9}	4.8×10^{-5}	1.1×10^{-3}	3.4×10^{-1}
^{95}Zr	NR	4.8×10^{-18}	NR	3.4×10^{-14}
Total:	3.2×10^{1}	1.9×10^{2}	5.3×10^{6}	1.3×10^{6}

NR=Not Reported

[1] *Decayed through 2001*

[2] *Total curies estimated by assuming 168,485 m^3 for CH-TRU Waste and 7,079 m^3 for RH-TRU Waste*

DATA-F-3.4.1 Non-Defense TRU Waste-Waste Isolation Pilot Plant Future Potential Waste

The DOE has several categories of waste that are currently not acceptable for disposal in WIPP. These are summarized below:

- *Non-Defense Waste—The National Security Programs (Public Law 96-164, 1980, National Security and Military Applications of Nuclear Energy Authorization Act of 1980, 93 Stat. 1259), which authorized the construction of the WIPP, states that the WIPP is to be a defense waste repository. Therefore, those wastes that are identified as non-defense are not currently allowed to be disposed in the WIPP. Waste streams from sites for which a defense determination has not been made are identified in Table DATA-F-38 and in Table DATA-F-39.*

Table DATA-F-38. Non-Defense TRU Waste (Final Waste Form)

Waste Stream ID	Waste Stream Name	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)
Non-defense TRU Waste				
FM-MOX-MT0	Framatome MOX Fuel Plant D&D Mixed TRU Waste	4.2×10^{-1}	0.0×10^{0}	4.2×10^{-1}
FM-MOX-T01	Framatome MOX Fuel Plant D&D TRU Waste	6.9×10^{0}	0.0×10^{0}	6.9×10^{0}
LA-OS-00-02	Isotopic sources waiting determination of eligibility for WIPP disposal	0.0×10^{0}	1.6×10^{2}	1.6×10^{2}
LA-TA-00-06	Containers waiting assignment to waste streams	4.5×10^{1}	0.0×10^{0}	4.5×10^{1}
LB-T001	LBL -Waste	6.2×10^{-1}	1.0×10^{0}	1.7×10^{0}
RL-W684	327 TRU RH heterogeneous S5420 Non-mixed	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
VN-CHT001		0.0×10^{0}	2.0×10^{1}	2.0×10^{1}
VN-RHT001		0.0×10^{0}	1.2×10^{1}	1.2×10^{1}
	Totals	5.3×10^{1}	1.9×10^{2}	2.4×10^{2}

Table DATA-F-39. Possible Future Waste for WIPP

Waste Stream ID	Waste Stream Name	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)
BL-001	Reactor Fuel Test Specimens	4.5×10^{1}	0.0×10^{0}	4.5×10^{1}
LA-TA-00-01	Containers waiting assignment to waste streams	7.7×10^{1}	0.0×10^{0}	7.7×10^{1}
LA-TA-00-02	Containers waiting assignment to waste streams	1.1×10^{2}	0.0×10^{0}	1.1×10^{2}
LA-TA-00-03	Containers waiting assignment to waste streams	7.7×10^{0}	0.0×10^{0}	7.7×10^{0}
LA-TA-00-04	Containers waiting assignment to waste streams	2.1×10^{2}	0.0×10^{0}	2.1×10^{2}
LA-TA-00-05	Containers waiting assignment to waste streams	4.2×10^{2}	0.0×10^{0}	4.2×10^{2}
LA-TA-00-06	Containers waiting assignment to waste streams	4.5×10^{1}	0.0×10^{0}	4.5×10^{1}
LA-TA-00-07	Containers waiting assignment to waste streams	1.8×10^{1}	0.0×10^{0}	1.8×10^{1}
PA-B015	Transuranic and Technetium Wastes - Liquid	2.5×10^{0}	0.0×10^{0}	2.5×10^{0}
PA-W014	Transuranic Waste Liquid	4.2×10^{-1}	0.0×10^{0}	4.2×10^{-1}
RF-MT0503		1.7×10^{0}	0.0×10^{0}	1.7×10^{0}
RF-MT0505		2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RF-MT0529		2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RF-MT0533		3.1×10^{0}	0.0×10^{0}	3.1×10^{0}
RF-MT0535		6.3×10^{-1}	0.0×10^{0}	6.3×10^{-1}
RF-TT0533		8.3×10^{-1}	0.0×10^{0}	8.3×10^{-1}
RL-W284	201C Unknown form CH RCRA MTRU w/ met	4.2×10^{-1}	0.0×10^{0}	4.2×10^{-1}
RL-W332	2345Z Unknown form CH St MTRU	1.9×10^{0}	0.0×10^{0}	1.9×10^{0}

Table DATA-F-39. Possible Future Waste for WIPP — Continued

Waste Stream ID	Waste Stream Name	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)
RL-W357	KAPL Unknown form CH/r TRU	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W366	202A Unknown form CH TRU	1.5×10^{0}	8.3×10^{-1}	2.3×10^{0}
RL-W382	2345Z Unknown form CH TRU	1.9×10^{1}	6.1×10^{1}	8.0×10^{1}
RL-W391	308 Combustible unknown form CH TRU	4.2×10^{-1}	0.0×10^{0}	4.2×10^{-1}
RL-W471	202A MTRU CH unknown forms S9000 Mixed RCRA w/ org, met, Hg	1.9×10^{0}	0.0×10^{0}	1.9×10^{0}
RL-W472	202A MTRU CH unknown forms S9000 Mixed RCRA w/ met	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W556	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ org, met, Hg	4.2×10^{-1}	0.0×10^{0}	4.2×10^{-1}
RL-W557	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ org, ign	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W558	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ org	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W559	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ met, ign	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W560	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ met	4.0×10^{0}	0.0×10^{0}	4.0×10^{0}
RL-W561	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ met, Hg, cor	2.1×10^{-1}	$0.0\ x\ 10^{0}$	2.1×10^{-1}
RL-W562	2345Z MTRU CH unknown forms S9000 Mixed RCRA w/ met, Hg	1.0×10^{0}	0.0×10^{0}	1.0×10^{0}
RL-W577	2345Z TRU RH unknown forms S9000 Non-mixed	2.7×10^{0}	0.0×10^{0}	2.7×10^{0}
RL-W578	2345Z TRU RH unknown forms U9999 Non-mixed	5.3×10^{0}	0.0×10^{0}	5.3×10^{0}
RL-W609	324 MTRU CH unknown forms S9000 Mixed RCRA w/org, met, Hg	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W650	325 TRU CH unknown forms S9000 Non-mixed	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
RL-W651	325 MTRU CH unknown forms S9000 Mixed RCRA w/org, met	1.0×10^{0}	0.0×10^{0}	1.0×10^{0}
RL-W652	325 MTRU CH unknown forms S9000 Mixed RCRA w/org	3.8×10^{0}	0.0×10^{0}	3.8×10^{0}
RL-W667	325 TRU RH unknown forms S9000 Non-mixed	8.9×10^{-1}	0.0×10^{0}	8.9×10^{-1}
RL-W722	MCGEE TRU CH unknown forms S9000 Non-mixed	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
SR-T001-WSB-3	Unknown	0.0×10^{0}	1.4×10^{2}	1.4×10^{2}
VN-CHT001		0.0×10^{0}	2.0×10^{1}	2.0×10^{1}
VN-RHT001		0.0×10^{0}	1.2×10^{1}	1.2×10^{1}

Table DATA-F-39. Possible Future Waste for WIPP — Continued

Waste Stream ID	Waste Stream Name	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)
WV-M007	TRU General Waste	1.1×10^{1}	0.0×10^{0}	1.1×10^{1}
WV-T004	Fissile Material - Other	6.2×10^{-1}	0.0×10^{0}	6.2×10^{-1}
WV-T020	PPC/XC2 PPE and DAW	0.0×10^{0}	2.3×10^{2}	2.3×10^{2}
	Totals	1.2×10^{3}	6.7×10^{2}	1.9×10^{3}
WV-M005	TRU Filters	6.0×10^{1}	4.6×10^{1}	1.1×10^{2}
WV-M008	TRU Concrete	2.1×10^{-1}	0.0×10^{0}	2.1×10^{-1}
WV-M010	TRU Spent Absorbents	8.3×10^{-1}	0.0×10^{0}	8.3×10^{-1}
WV-M013	Sweeping Compound	1.9×10^{0}	0.0×10^{0}	1.9×10^{0}
WV-M015	Chemical Process Cell General Waste	6.0×10^{0}	0.0×10^{0}	6.0×10^{0}
WV-T001	Fissile Material -Solids	3.7×10^{1}	0.0×10^{0}	3.7×10^{1}
WV-T006	TRU General Waste	1.0×10^{1}	1.0×10^{1}	2.1×10^{1}
WV-T009	TRU General Laboratory Waste	1.0×10^{1}	2.1×10^{1}	3.1×10^{1}
WV-T011	TRU Glove Boxes	1.0×10^{1}	0.0×10^{0}	1.0×10^{1}
WV-T014	Chemical Process Cell Vessels	1.1×10^{1}	0.0×10^{0}	1.1×10^{1}
WV-T016	Chemical Process Cell Miscellaneous Equipment	8.5×10^{0}	0.0×10^{0}	8.5×10^{0}
WV-T017	Spent Filter Media	2.5×10^{0}	0.0×10^{0}	2.5×10^{0}
WV-T018	Head End Cell Debris	5.4×10^{1}	2.6×10^{1}	8.0×10^{1}
WV-T019	FRS Pool Filters	0.0×10^{0}	2.1×10^{1}	2.1×10^{1}
WV-T021	RHWF Process	0.0×10^{0}	8.1×10^{1}	8.1×10^{1}
WV-W024	TRU Lead	1.9×10^{1}	0.0×10^{0}	1.9×10^{1}
	Totals	1.2×10^{3}	6.7×10^{2}	1.9×10^{3}

- ***Pre-1970 buried TRU Waste—Several sites (i.e., LANL, SRS, SNL, Hanford Site, INEEL, Oak Ridge National Laboratory, and West Valley Demonstration Project) have TRU wastes that were buried prior to 1970. The final disposition of the buried pre-1970 TRU waste at DOE sites is still undecided.***

- ***Classified Waste—Some classified TRU waste is now acceptable to be disposed of at WIPP. TRU-contaminated classified materials are materials used in weapons production. These materials are classified for security and national defense purposes due to their physical shape or form. TRU-contaminated classified materials include graphite shapes, metal shapes, tooling, and plastic shapes. The same characterization and associated QA activities, as currently required under the WIPP program, will be implemented for the characterization of classified materials in waste. The primary change associated with the proposed acceptance at WIPP of classified materials in waste is the security qualifications of the responsible parties implementing the waste***

characterization requirements and the associated QA requirements. Due to national security requirements, responsible parties for waste characterization and related QA activities will possess a DOE "Q" clearance. Site and CBFO personnel will accomplish waste characterization and related QA activities in accordance with currently approved requirements.

- ***Polychlorinated Biphenyls (PCBs) —The U.S. Environmental Protection Agency, Region 6, Dallas, Texas office approved the disposal of non-liquid polychlorinated biphenyl-contaminated TRU waste (PCB/TRU waste) and PCB/TRU waste mixed with hazardous waste (PCB/TRU mixed waste) at the WIPP in May 2003. However, at the time the inventory data was prepared for the PA, this approval had not been received, therefore PCB-contaminated TRU waste > 50ppm was not included in this updated inventory data.***

- ***RH-TRU waste that exceeds 23,000 Curies/m3 (650 Curies/ft3)—This limit is from the LWA (Pub. L. No. 102-579, 110 Stat. 2422 (1992), as amended by 104-201 (1996)).***

- ***Waste streams that have unknown waste matrices —There are waste streams at the TRU waste sites that have not been characterized and therefore the determination cannot be made regarding the make up of the waste stream. These wastes are assigned unknown WMCs or final forms and have no known WMPs or radionuclide content.***

DATA-F-3.4.2 Other Possible Future Waste Isolation Pilot Plant Waste

There are several other categories of material that eventually may become waste acceptable at WIPP. These include the following wastes.

- ***One category of potential future waste may come from waste streams that have been currently declared "unknown." These waste streams are summarized in Table DATA-F-39. These wastes have not been characterized adequately to determine the final waste form and/or other significant parameters. If these wastes are characterized, and if they meet the WAC (DOE 2002a), they will be included in the WIPP inventory in the future.***

- ***Babcock and Wilcox in Lynchburg, Virginia, currently has approximately 45 m^3 (1,590 ft^3) of TRU waste that requires a defense determination, in on-site storage silos of which a portion may be possible future TRU waste. Virtually all of the material was generated from the Light Water Reactor Extended Burn-up Program. That program was responsible for sending test elements of reactor fuel to various hot cells, including the one at Lynchburg. The waste consists mostly of cellulosic material, rubber material, and lead-lined gloves.***

- ***Another potential TRU waste site is the Brookhaven National Laboratory (BNL). BNL has identified an existing legacy 17,500-lb concrete vault stored at the Hazardous Waste Management Facility as TRU waste based on recalculation of ^{239}Pu curie content. The vault holds five plutonium foils (TRU waste) and other non-TRU waste constituents including Brookhaven Linear Isotope Production (BLIP) waste and*** *cesium and cobalt sources embedded in concrete. The vault must now be managed as TRU waste.*

- *There are four waste streams at the SRS that were not listed in Table DATA-F-39. These waste streams will account for nearly 9.6×10^3 m^3 (3.3×10^5 ft^3) of possible future TRU waste for WIPP. These waste streams will come from proposed facilities at SRS. Those waste streams are SR-T001-WSB-1, SR-T001-WSB-2, SR-W026-PDCF-1, and SR-W026-MFFF-1.*

- *Sodium-Bearing Waste (SBW) at INEEL requires a declaration that it is waste incidental to reprocessing (WIR). Several treatment options are being considered with the final treatment option to be selected in the near future. For this update, the SBW is included in the Non-WIPP TRU waste and has been entered using the bounding case for RH-TRU waste. That is, the case in which RH-TRU waste is generated from the calcine process.*

- *Beryllium Block Waste from the INEEL is a waste stream that includes beryllium blocks and outer shim control cylinders from the Advanced Test Reactor. The radionuclide concentrations are too great to be considered in this update but may considered in the future.*

DATA-F-3.5 Emplacement Materials

The inventory of CPR materials used by WIPP Waste Handling Operations (WHO) to facilitate waste emplacement was estimated to support the CRA-2004 PA. Other materials that were not accounted for by the sites in their waste/ packaging material parameter data submissions were also estimated. Finally, the mass of magnesium oxide (MgO) used as backfill was estimated for the full repository. The results of these estimations were summarized in a letter to SNL (Crawford 2003a).

The estimates for CPR materials, other emplacement materials, and MgO are based on the number and type of waste containers emplaced in the WIPP as of the inventory date, September 30, 2002.

The TRUPACT-II Authorized Methods for Payload Control (TRAMPAC), Revision 19c (NMED 2002) allows certain container types to be transported in the Transuranic Package Transporter-II (TRUPACT-II). These are 55-gallon drums, 100-gallon drums, SWB, and ten-drum overpacks (TDOP).

The WIPP was designed to receive both CH- and RH-TRU waste. CH-TRU waste that has been emplaced in the WIPP since the repository opened is in seven-packs of 55-gallon drums and/or pipe overpack components (POCs), SWBs, and TDOPs. RH-TRU waste has not been shipped to the WIPP to date.

WIPP WHO uses several materials to facilitate the emplacement of TRU waste, and MgO is used as barrier. Plastic and cellulosic materials are used to emplace CH-TRU waste. The MgO is placed on top of the containers and comes in a woven plastic bag called a "supersack."

RH-TRU waste will be emplaced in boreholes in the salt and then a shield plug, which consists of concrete (cement), steel, and plastic, will be installed to seal the canister into the borehole and provide shielding. There are no rubber materials used for waste emplacement.

The materials used to emplace CH-TRU waste are:

- ***Polyethylene (PE) slip-sheets for the seven-packs of 55-gallon drums and/or POCs and the MgO supersacks (plastics);***
- ***Fiberboard slip-sheet for the SWB and TDOP (cellulosic material);***
- ***Woven polypropylene supersacks containing MgO (plastic material/MgO);***
- ***Cardboard stabilizers for the supersacks (cellulosic material); and***
- ***Stretch wrap for the seven-packs (plastic material).***

The materials that will be used to emplace RH-TRU waste are:

- ***Shield plug (cement components);***
- ***Shield plug (steel components); and***
- ***Shield plug (plastic components).***

Data on the MgO and other emplacement materials were obtained from WIPP WHO drawings and procedures, from WWIS personnel, from the WIPP CH-TRU Waste Safety Analysis Report, and from the internet. These sources are referenced in a letter to SNL (Crawford 2003a).

For CH-TRU waste, the total mass of each of the emplacement materials (plastic, cellulosic, and MgO) as of the inventory date was calculated. These total masses were then divided by the total volume of the emplaced waste (as of the inventory date September 30, 2002) to obtain the density of these materials in the WIPP as of the inventory date. These densities were then scaled to a full repository based on the volume limit for CH-TRU waste of 168,485 m^3 (5,950,000 ft^3).

The total masses of the emplacement materials (cement, steel, and plastic) that will be used for RH-TRU waste emplaced in the WIPP in the future were calculated. This was done by first determining the total number of RH-TRU waste shield plugs that will be used in the repository. The total mass of each shield plug component for the repository was then calculated by determining the mass of each component for each shield plug and multiplying that mass by the number of plugs to be used.

The estimates for CPR and MgO, as well as for the steel and cement used in the RH-TRU waste shield plug, are provided in Table DATA-F-40.

Table DATA-F-40. Estimates of Materials Used to Facilitate Emplacement of Waste in the WIPP

Material Parameter	Mass used for CH Waste (kg) [1]	Density used for CH Waste (kg/m^3) [1]	CH Mass-Scaled to CH Limit[2] (kg)	RH Mass-for the WIPP (kg)	Total (CH+RH) WIPP Mass (kg)
Cellulosic Material (fibreboard slip-sheets)	2.03×10^3	2.63×10^{-1}	4.44×10^4	N/A	4.44×10^4
Cellulosic Material (cardboard stabilizers)	7.02×10^3	9.09×10^{-1}	1.53×10^5	N/A	1.53×10^5
Total Cellulosic Material	9.06×10^3	1.17×10^0	1.98×10^5	N/A	1.98×10^5
Plastic (slip-sheets)	1.02×10^5	1.33×10^1	2.23×10^6	N/A	2.23×10^6
Plastic (poly bag)	6.24×10^3	8.08×10^{-1}	1.36×10^5	N/A	1.36×10^5
Plastic (shrink wrap)	3.56×10^3	4.62×10^{-1}	7.78×10^4	N/A	7.78×10^4
Plastic (RH shield plug)				1.73×10^5	1.73×10^5
Total Plastic Material	1.12×10^5	1.45×10^1	2.45×10^6	1.73×10^5	2.62×10^6
Rubber Material	N/A	N/A	N/A	N/A	N/A
Cement (RH-TRU Waste shield plug)	N/A	N/A	N/A	6.33×10^6	6.33×10^6
Steel (RH-TRU Waste shield plug)	N/A	N/A	N/A	7.95×10^4	7.95×10^4
Magnesium Oxide	3.20×10^6	4.14×10^2	6.98×10^7	N/A	6.98×10^7

[1] These are the masses and densities of the materials that were used to facilitate emplacement of waste in the WIPP as of September 30, 2002. There was no RH-TRU waste emplaced as of that date.

[2] The CH-TRU waste limit is 1.68×10^5 m^3.

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