ANNUAL TRANSURANIC WASTE INVENTORY REPORT – 2007

DOE/TRU-2008-3379

Revision 1

This document supersedes DOE/TRU-2008-3379, Revision 0

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Carlsbad Field Office

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REVISION HISTORY

Revision 0	Initial Release
Revision 1	This revision is the result of the discovery of a calculation error based on the methodology used by LANL to report radionuclide activity concentration for their waste streams. The site provided their methodology for determination of radionuclide activity concentration, which was based on the concentration within the smallest applicable volume of a container in the waste stream. This resulted in an inordinately high activity concentration for the CH and RH waste streams because the same methodology was applied. Therefore, LANL recalculated activity concentrations for all of their waste streams based on the final form volume of the waste stream, which is incorporated into CID Data Version D.6.06 (LANL-CO 2008).

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1.0 INTRODUCTION

1.1 Background and History

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 transuranic (TRU) waste. The WIPP Land Withdrawal Act (LWA) requires the U. S. Environmental Protection Agency (EPA) to periodically recertify WIPP's compliance with regulations published at Title 40 Code of Federal Regulations Part 191 (40 CFR 191) in accordance with criteria established at 40 CFR Part 194.[1] Under the LWA, five years after the initial receipt of TRU waste at WIPP and every five years thereafter, DOE must submit an application to EPA documenting continued compliance, and EPA must determine (i.e., recertify) that WIPP continues to comply with those regulations within six months of each application submission. DOE submitted the first recertification application, *Compliance Recertification Application 2004* (CRA-2004) (DOE 2004), to EPA in March 2004, and EPA recertified WIPP in March 2006.

The LWA defines TRU waste as "…waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years…"[2] TRU waste is classified as either contact-handled (CH) or remote-handled (RH), depending on the dose rate at the surface of the waste container. CH-TRU waste is packaged TRU waste with an external surface dose rate less than 200 millirem (mrem) per hour [rem: roentgen equivalent man], while RH-TRU waste is packaged TRU waste with an external surface dose rate of 200 mrem or greater per hour, as defined in the LWA. Unless otherwise indicated, for the purpose of this report, all references to TRU waste include TRU waste and mixed TRU waste (waste that contains both radioactive and hazardous components, as defined in the Atomic Energy Act of 1954, 42 USC § 2011 *et seq.* (U.S. Congress 1954), and the Resource Conservation and Recovery Act (RCRA), 42 USC § 66901 *et seq.*

For the preparation of the CRA-2004, a detailed TRU waste inventory update was conducted. The detailed information required for performance assessment (PA) modeling calculations, which are needed for recertification, includes volumes (currently stored, emplaced, and projected), radionuclides in the waste and their activity concentrations, and the densities of the waste material parameters (WMPs) in the waste. The TRU waste inventory changed dramatically between the initial certification of WIPP and the CRA-2004. For that reason, the TRU waste inventory will be updated annually, beginning with the *Annual Transuranic Waste Inventory Report – 2007* (hereafter referred to as "this report"). DOE TRU waste generation has occurred at 27 sites across the country – six large and 21 small quantity sites. Six of these sites have emplaced their waste at WIPP, found other disposition pathways for the waste, or have

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[1] *See* Pub. L. No. 102-579, § 8, 106 Stat. 4777, 4786-4788 (U.S. Congress1992), as amended, Waste Isolation Pilot Plant Land Withdrawal Act Amendments, Pub. L. No. 104-201, § 3187, 110 Stat. 2422, 2852 (U.S. Congress 1996).

[2] The term transuranic waste "…means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes with half-lives greater than twenty years, per gram of waste, except for: (1) High-level radioactive wastes; (2) wastes that the Department [of Energy] has determined, with the concurrence of the Administrator [of the Environmental Protection Agency], do not need the degree of isolation required by this part; or (3) wastes that the [Nuclear Regulatory] Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61" (40 CFR 191.02 (i); EPA 1993).

transferred their waste to other sites for further disposition. The remaining TRU waste is currently retrievably stored at 21 sites, six of which are potential TRU waste sites (see Figure 1 and Section 4.2 for potential waste categories). The inventory data cut-off date for this report was December 31, 2006, with limited changes for selected waste streams through May 2008. From WIPP's opening on March 26, 1999, through December 31, 2006, 5,347 shipments of CH-TRU waste were safely characterized, transported, and disposed in WIPP (Moody 2007a).

For improvement of the data collection process, the inventory team used an internal checklist containing a series of data checks and sources of changes. This checklist was used for TRU waste inventory data screening after receipt of a TRU waste site's data submittal. The inventory team contacted the sites with questions if any of the data checks and sources of changes were questioned. Data checks included:

- Challenged radionuclide inputs if only one fission product was reported or only one radionuclide in secular equilibrium with another was reported
- Distributed radionuclides with specific codes (e.g., Pu-52 and mixed fission products (MFPs))
- Checks to ensure no waste stream was reported greater than 23,000 curies per cubic meter (Ci/m^3)
- Checks to ensure that if cement was reported in a comments field, it was reported as a waste material parameter in kilograms per cubic meter (kg/m^3)
- If prohibited hazardous waste numbers were reported, the TRU waste site was required to identify the type of treatment that would be applied to make the waste shippable to WIPP.

For further improvement, additional data checks will be added for complexing agents (chelating agents) and oxyanions when checking a TRU waste site's data submittal for the *Annual Transuranic Waste Inventory Report—2008.*

The DOE must demonstrate compliance with all applicable regulations for the permanent disposal of TRU defense waste in the WIPP repository. These regulations are the environmental standards for management and disposal of TRU defense waste, as mandated in 40 CFR Parts 191 and 194, and RCRA regulations, where the New Mexico Environment Department has primacy. Compliance demonstration through PA modeling calculations for certification and recertification is based on the estimated inventory of emplaced, stored, and projected waste streams compiled in TRU waste inventory reports. Thus, the best available estimated inventory is needed.

The *WIPP TRU Waste Baseline Inventory Report* (WTWBIR), Revision 0 (DOE 1994) and Revision 1 (DOE 1995a), provided the first set of data to be included in PA modeling calculations. The *Transuranic Waste Baseline Inventory Report* (TWBIR), Revision 2 (DOE 1995b), expanded the original purpose of Revisions 0 and 1 by providing an estimate of the total DOE TRU waste inventory in order to meet LWA requirements, including non-defense, commercial, polychlorinated biphenyl-contaminated, and buried (predominately pre-1970) TRU wastes that were not planned at the time for disposal in WIPP. Since that time, Idaho National Engineering and Environmental Laboratory (INEEL) (now the Idaho National Laboratory [INL]) has begun preparations to ship pre-1970 buried waste to WIPP, as mandated by a federal district court order.[3]

The TWBIR, Revision 3 (DOE 1996a), was based on TWBIR Revision 2 data supplemented by data in several memoranda issued during early calendar year (CY) 1996. These memoranda summarize additional data requested from the DOE TRU waste sites to support PA modeling calculations used in the development of the WIPP *Compliance Certification Application* (CCA) (DOE 1996b). The supplemental information was generated from specific data requests after the publication of Revision 2, and the data were published in appendices in Revision 3. The supplemental data of Revision 3 included estimates for complexing agents, oxyanions, and cement content in solidified waste.

Knowing that waste inventory information is subject to change as a result of characterization activities, improved estimation processes, emplacement of waste in WIPP, and ongoing generation activities, the EPA requested that an update to the CCA inventory be included in the CRA-2004 inventory (Appendix DATA, Attachment F). The *Transuranic Waste Baseline Inventory Report - 2004* (TWBIR-2004) (DOE 2006b) was a revision of Appendix DATA, Attachment F. This update was provided for the Performance Assessment Baseline Calculation (PABC; Leigh et al. 2005a; Leigh et al. 2005b) as requested by EPA to support their completeness review and approval process (Cotsworth 2005).

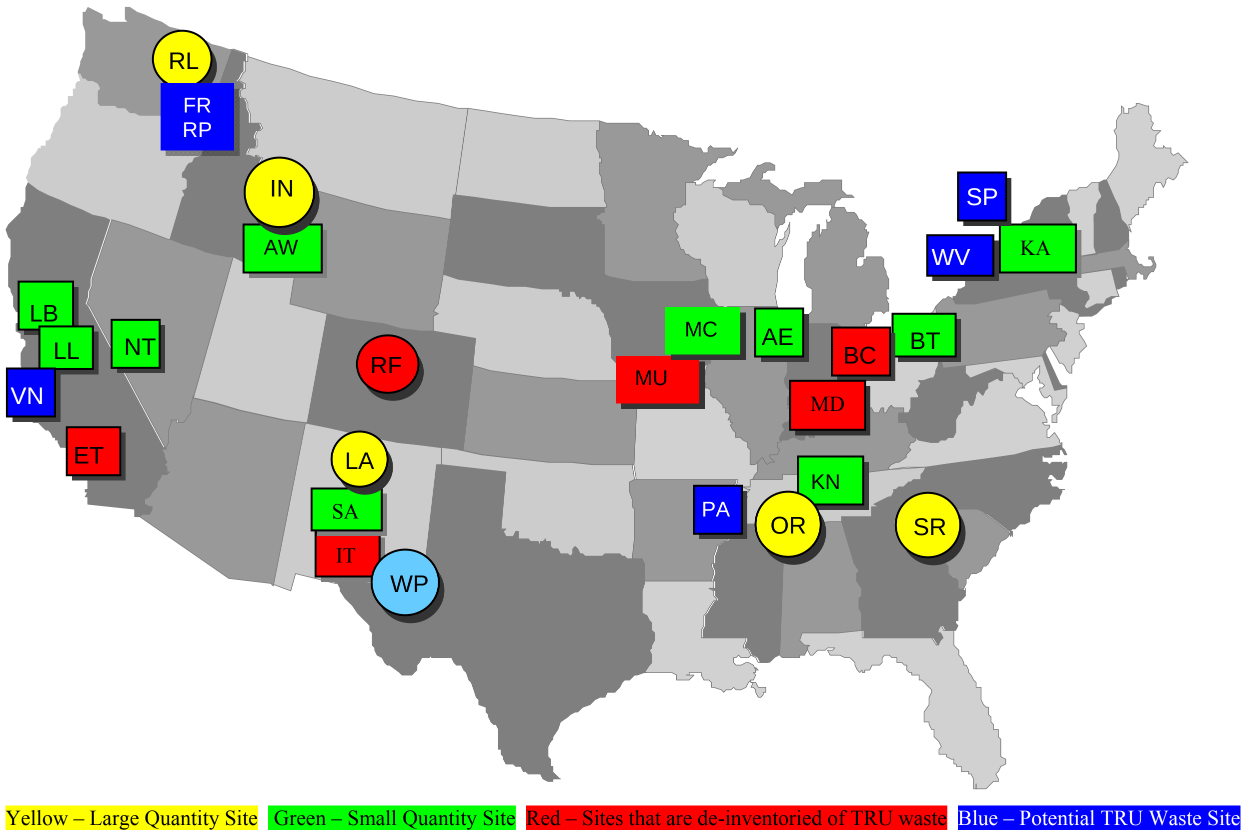
This revision is the result of the discovery of a calculation error based on the methodology used by Los Alamos National Laboratory (LANL) to report radionuclide activity concentration for their waste streams. The site provided their methodology for determination of radionuclide activity concentration which was based on the concentration within the smallest applicable volume of a container in the waste stream. As an example, if Pu-238 was disposed in 1-gallon paint cans, the concentration (in Ci/m^3) was calculated by the summing the activity for Pu-238 and dividing by the volume of the 1-gallon paint cans in which it was found. This resulted in an inordinately high activity concentration for the CH- and RH- waste streams because the same methodology was applied to all LANL waste streams. Therefore, LANL recalculated activity concentrations for all of their waste streams based on the final form volume of the entire waste stream.

This report contains the relevant information needed to perform PA modeling calculations, as well as information that can be used by DOE Carlsbad Field Office (CBFO) management at WIPP for planning purposes. This information is maintained in the *Comprehensive Inventory Database [CID] Version 1.00 Schema Version 1.00, Data Version D.6.06* (hereafter referred to as CID Data Version D.6.06) (LANL-CO 2008). The CID database is qualified by the CBFO *Quality Assurance Program Document* (QAPD) (DOE 2007). This report and the CID will be updated annually to identify changes that may affect the performance of the WIPP repository and will allow better tracking of the TRU waste inventory over time (for a detailed summary of inventory changes reported this year see Appendix D).

[3] Public Serv. Co. v. Kempthorne, 2006 U.S. Dist. LEXIS 34584 (D. Idaho May 25, 2006) (under rules of contract interpretation, the 1995 agreement between the U.S. Department of Energy and the State of Idaho requires the Department to remove transuranic waste in a subsurface disposal area as well as in an above ground storage area at the Department's Idaho facility by 2018).

The methodology used to collect information from the DOE TRU waste sites and enter it into the CID is captured in the following Los Alamos National Laboratory-Carlsbad Operations (LANL-CO) procedures: INV-SP-01, *Data Collection, Data Management and Control for the Comprehensive Inventory* (LANL-CO 2007b), and INV-SP-02, *Entry, Verification and Validation of Inventory Information in the Comprehensive Inventory Database* (LANL-CO 2007c).

This work was performed under the LANL-CO Quality Assurance (QA) Program. The LANL-CO QA Program is fully compliant with the requirements set forth in the CBFO QAPD. The processes used by the LANL-CO TRU Waste Inventory Team to collect, maintain, and report inventory information are graded and implemented to NQA-1 standards under the LANL-CO QA Program. This includes the software QA procedures used to qualify the CID and other software used to analyze TRU waste inventory information. LANL-CO software QA is documented in LCO-QPD-02, *Software Quality Assurance Plan* (LANL-CO 2007d), and LCO-QP19-1, *Software Quality Assurance* (LANL-CO 2007e).



AE	Argonne National Laboratory
AW	Material and Fuels Complex (MFC)
BC	Battelle Columbus Laboratories (BCL)—shipped to RL and SR
BT	Bettis Atomic Power Laboratory (BAPL)
ET	Energy Technology Engineering Center—shipped to RL
FR	Framatome (AREVA) (Potential)
IN	Idaho National Laboratory
IT	Inhalation Toxicology Research Institute (ITRI) (known as Lovelace Respiratory Research Institute) - shipped to SA
KA	Knolls Atomic Power Laboratory
KN	Knolls Atomic Power Laboratory-Nuclear Fuels Services
LA	Los Alamos National Laboratory
LB	Lawrence Berkeley Laboratory (LBL)
LL	Lawrence Livermore National Laboratory (LLNL)
MC	U.S. Army Materiel Command (USAMC)
MD	Mound Plant – shipped to SR
MU	University of Missouri Research Reactor—shipped to AE, then to WIPP
NT	Nevada Test Site (NTS)
OR	Oak Ridge National Laboratory
PA	Paducah Gaseous Diffusion Plant (Potential)
RF	Rocky Flats Environmental Technology Site—shipped to WIPP
RL	Hanford Site (Richland Operations Office)
RP	Hanford Site (Office of River Protection) (Potential)
SA	Sandia National Laboratories
SP	Separations Process Research Unit (Potential)
SR	Savannah River Site (SRS)
VN	General Electric Vallecitos Nuclear Center (Potential)
WV	West Valley Demonstration Project (Potential)
WP	Waste Isolation Pilot Plant

FIGURE 1. U.S. DEPARTMENT OF ENERGY TRU WASTE SITES

1.2 Sources of Transuranic Waste Information

This report includes information taken from the TWBIR, Revisions 2 and 3, the WIPP Waste Information System (WWIS) database, the TWBIR-2004, Acceptable Knowledge (AK), and updated information provided by the DOE TRU waste sites. The TWBIR, Revision 2, and Revision 3 (which used the same data as Revision 2 plus supplemental data needed for CCA PA modeling calculations) provide historical information. The WWIS provides characterization information on the emplaced portion of the TRU waste inventory. The TWBIR-2004 provided TRU waste inventory information for the CRA-2004 and was the "starting point" for the DOE TRU waste sites to update information for this report.

The WIPP has been open and receiving waste since March 1999; therefore, characterization data for the emplaced waste (45,657 m^3) through December 31, 2006, as obtained from the WWIS, are included in this report. In addition to updates from TRU waste sites, information obtained from approved site-specific AK summary reports has been incorporated to provide the most current information on waste streams being characterized and shipped to WIPP. Site visits and onsite interviews facilitated data collection, and site validation of data in the CID ensured accurate representation of data.

Since the issuance of TWBIR-2004, improvements in this report include: use of robust data collection and data management, implementation of LANL-CO QA and records management procedures, connection of site data submittals and records directly to the CID, and maintenance of site inventory records in one location. These improvements, along with ongoing efforts to standardize data development, tracking, and validation, have greatly improved the current inventory and will result in fewer changes for future annual updates.

1.3 Information Used in WIPP Performance Assessment

For PA modeling calculations, the Sandia National Laboratories-Carlsbad Program Group (SNL-CPG) (Dunagan 2007) has requested the following data:

- Waste stream volumes (in m^3).

- Inventory of radionuclides on a waste stream basis for both CH- and RH-TRU waste, as curies and decayed to the years 2033, 2133, 2383, 3033, 7033, and 12033.

    - For waste stream-level inventories, the following are needed: ^{241}Am, ^{243}Am, ^{244}Cm, ^{137}Cs, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{244}Pu, ^{90}Sr, ^{229}Th, ^{230}Th, ^{232}Th, ^{233}U, ^{234}U, ^{235}U, ^{236}U, and ^{238}U

    - For WIPP-scale inventories, the following are needed: ^{227}Ac, ^{241}Am, ^{243}Am, ^{14}C, ^{249}Cf, ^{251}Cf, ^{252}Cf, ^{243}Cm, ^{244}Cm, ^{245}Cm, ^{246}Cm, ^{247}Cm, ^{248}Cm, ^{250}Cm, ^{135}Cs, ^{137}Cs, ^{129}I, ^{59}Ni, ^{63}Ni, ^{237}Np, ^{231}Pa, ^{210}Pb, ^{107}Pd, ^{147}Pm, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{244}Pu, ^{226}Ra, ^{79}Se, ^{147}Sm, ^{151}Sm, ^{121m}Sn, ^{126}Sn, ^{90}Sr, ^{99}Tc, ^{229}Th, ^{230}Th, ^{232}Th, ^{232}U, ^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{238}U, and ^{93}Zr

- Inventory of all non-radioactive WMPs that were previously tracked on a waste stream basis for both CH- and RH-TRU waste. The WMPs include: iron-based metal/alloy, aluminum-based metal/alloy, other metal/alloys, other inorganic materials, vitrified materials, cellulosic, plastic, and rubber (CPR) material, solidified inorganic material, solidified organic material, cements, soils, steel from packaging, plastic/liners from packaging, and lead from RH-TRU waste packaging. All non-radioactive WMPs are reported in average densities (kg/m^3) except for cements, which are also reported as masses (kg).

- Inventory of any other non-radioactive waste materials that are discovered to account for a significant portion (greater than 5 percent by weight or volume) of a waste stream as a result of changes to the inventory.

- Inventory of CPR and other biodegradable materials used to facilitate emplacement of waste and magnesium oxide (MgO) in WIPP, supplied as average densities (kg/m^3) for both CH- and RH-TRU waste.

- Inventory of organic complexing agents and oxyanions (sulfate, nitrate, and phosphate) reported in masses (kg).

- Waste-stream-level inventories of radionuclides and non-radioactive WMPs for emplaced waste.

1.4 Other Uses of Transuranic Waste Inventory Information

In addition to providing TRU waste inventory information for PA modeling calculations, the CID was also developed to be used for other purposes. For planning purposes, CBFO management at WIPP needs TRU waste inventory information for waste that has already been generated and is stored in both “currently stored” and “final form” (compliantly packaged and intended for shipment to WIPP) configurations at the DOE TRU waste sites and for waste that will be generated by the sites (projected waste). Specifically, CBFO management will use TRU waste inventory information to plan waste retrieval, treatment, repackaging, characterization, shipment, and disposal for both stored and projected wastes. Site-specific work plans, which detail approaches for moving TRU waste to WIPP, have been developed and are continually updated using TRU waste inventory information.

Other technical uses for the TRU waste inventory include availability of information for activities such as National Environmental Policy Act (NEPA) analyses and to support the development of new containers or shipping packages.

2.0 METHODOLOGY

This report provides information that was collected from the DOE TRU waste sites beginning with a DOE request (Patterson 2006) for the sites to update the data provided for the TWBIR-2004. This report was generated under the LANL-CO QA Program, which was developed to support the DOE CBFO National TRU Program. The LANL-CO TRU waste inventory team completed the following steps in order to generate this report:

1. Collected TRU waste stream information from the DOE TRU waste sites via site visits and additional communication, as needed.

2. Entered the updated information into the CID.

3. Performed necessary analyses of the information to report data that are required for PAs, in accordance with LCO-QP9-1, *Analyses* (LANL-CO 2005).

4. Generated fully qualified data tables and associated fields from the CID.

5. Submitted the above results as official WIPP records acceptable for use in PA modeling calculations, in accordance with LCO-QP17-1, *Record Management* (LANL-CO 2007a).

The following sections describe the three basic process steps leading to the issuance of this report. Section 2.1 discusses collection, compilation, verification, and validation of TRU waste inventory information. Section 2.2 describes preparation of the TRU waste disposal inventory. Section 2.3 describes the analyses that were completed to support this report.

2.1 Collection, Compilation, Verification, and Validation of Inventory Information

For purposes of the second recertification, CRA-2009, the EPA has been concerned with changes in the TRU waste inventory since the CRA-2004. Therefore, each DOE TRU waste site was sent their TRU waste inventory information from the TWBIR-2004, which supported the CRA-2004. The information was entered into a Microsoft™ Excel spreadsheet (template) that contained fields found in the CID. The sites were requested to update any existing information and add information in the new fields.

The TRU waste inventory team visited all of the large quantity sites and several of the small quantity sites to assist them in completing the template. After the templates were completed, the team checked the templates for accuracy and consistency in accordance with INV-SP-01, *Data Collection, Data Management and Control for the Comprehensive Inventory* (LANL-CO 2007b). If discrepancies were found, they were corrected in accordance with INV-SP-02, *Entry, Verification and Validation of Inventory Information in the Comprehensive Inventory Database* (LANL-CO 2007c). The TRU waste inventory information was then uploaded into the CID and verified by an inventory team member who had not been involved in the upload. After this internal, independent verification, validation reports were prepared and sent to the DOE TRU waste site managers. A letter signed by each site manager documented validation of the information in the database. Hard copies of the information and signed letters were then submitted to the LANL-CO Record Center (see Figure 2 for a flow chart of the TRU waste inventory process) in accordance with LCO-QP17-1, *Record Management* (LANL-CO 2007a).

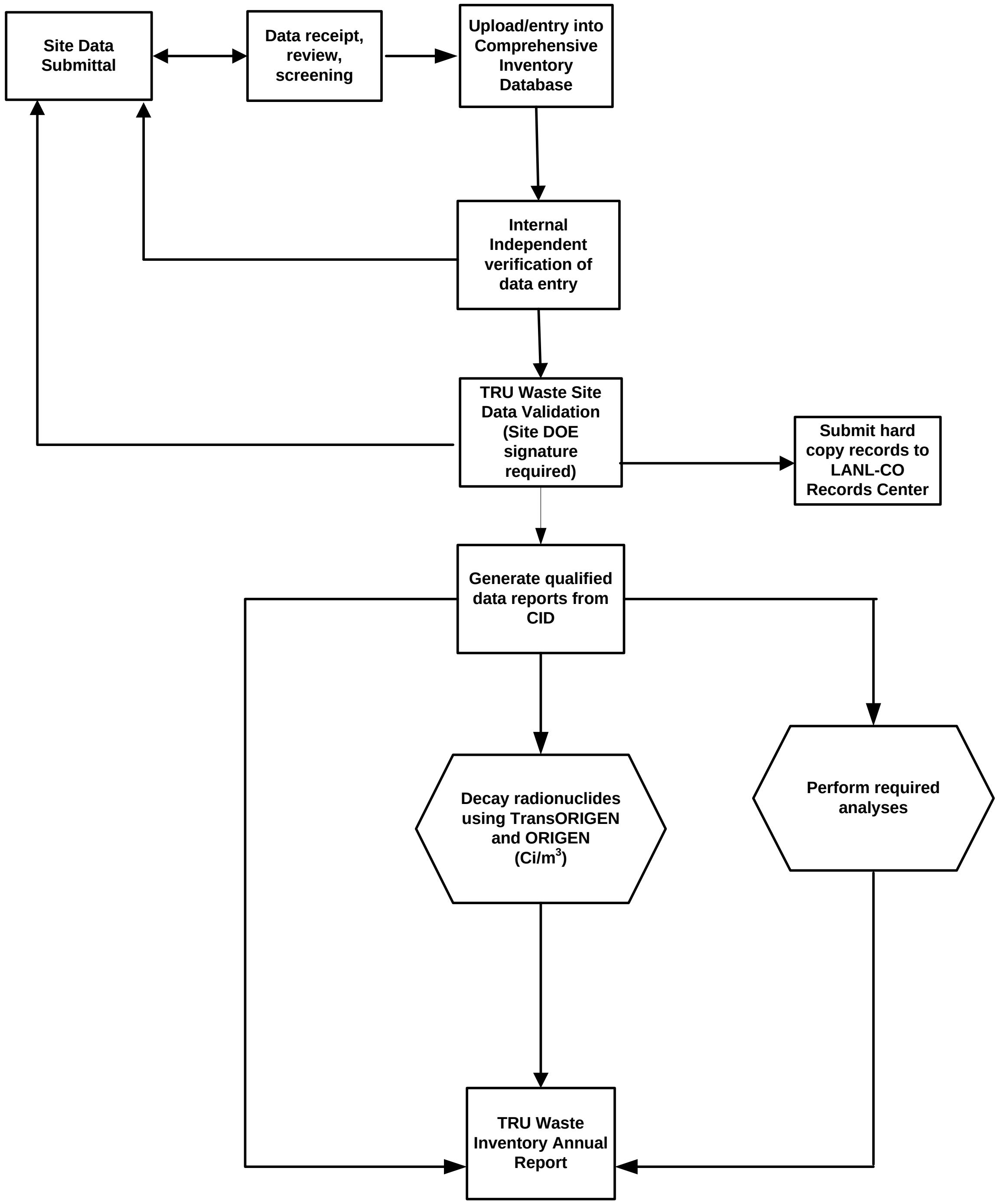


FIGURE 2. TRU WASTE INVENTORY PROCESS FLOWCHART

2.2 Preparation of the Transuranic Waste Disposal Inventory

Data tables included in this report were generated by the CID; the new database developed using Microsoft™ Access Data Project ™ (ADP) technology with a Microsoft SQL [structured query language] Server™ back end. ADP technology allows multiple users to run “front-end” clients while simultaneously accessing a common data store, which is a database running on a Microsoft

SQL Server® 2000 platform. ADP differs from the traditional distributed Microsoft Access database (MDB) solution in that it is a specific file type that stores user objects – such as forms, reports, macros, and Visual Basic for Applications code modules – while all the other objects – tables, stored procedures, user-defined functions, and views – are stored on the database server. This allows for more efficient data storage and utility. An SQL server makes the use of real-time CID data more scalable than it would be in a traditional MDB file.

The CID was used to manage, maintain, and perform calculations on the inventory data, which were then used to generate qualified data reports and tables. The following sections describe how the data were prepared for this report.

2.2.1 Volume and Scaling Calculations

PAs conducted in support of WIPP have been predicated on the assumption that the WIPP repository would 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), as set by the LWA, with a limit of 7079 m^3 (250,000 ft^3) for RH-TRU waste as imposed by the Consultation and Cooperation Agreement (C&C Agreement) (DOE and State of New Mexico 1988); therefore, the difference in the design capacity and the RH-TRU limit sets the CH-TRU disposal limit at 168,485 m^3 (5,950,000 ft^3). The volume of anticipated (stored plus projected) and emplaced TRU waste reported by the DOE TRU waste sites in support of this report is less than the design capacity for WIPP. Therefore, scaling the TRU waste volumes to the design capacity for each in WIPP is necessary for PA (scaling is also applied to the radionuclides, chemical components, and CPR). The *scaled* inventory for PA is referred to as the TRU waste "disposal" volume. Scaling is performed only on projected waste. The roll-up and scaling calculations performed in support of this report were performed in the CID.

The waste stream volumes were derived by summing the waste-stream-level data into a site-level roll-up. For each DOE TRU waste 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 total anticipated volume, V_a (see equation 1):

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

where

V_a is the total anticipated volume
V_s is the total stored volume
V_p is the total projected volume

Since the total reported volume of CH-TRU waste is less than the WIPP disposal limit of 168,485 m^3 (5,950,000 ft^3), the projected volume was scaled so the total volume equaled the CH-TRU waste disposal limit for WIPP. The scaling factor for CH-TRU waste was calculated using equation 2 applied to the WIPP waste streams:

$$SF_{CH} = (\text{CH TRU Disposal Limit in m}^3 - (V_s + V_e))/V_p \qquad (2)$$

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_e is the total emplaced volume for CH-TRU waste over all waste streams and all sites as of December 31, 2006
V_p is the total projected volume over all waste streams and all sites for CH-TRU waste

The disposal inventory for a single CH-TRU waste stream was obtained by multiplying the CH-TRU waste projected volume by the CH-TRU waste scaling factor and adding that value to the stored and emplaced volumes for each waste stream, as shown in equation 3:

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

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
v_e is the emplaced inventory volume for a single CH-TRU waste stream

The scaling factor for RH-TRU waste is calculated in the same manner as the CH-TRU waste scaling factor using RH-TRU waste inventory volumes and the allowed RH-TRU waste capacity.

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

Table 2-1 shows the calculation results for the CH- and RH-TRU waste scaling factors for this report based on the unscaled inventory volumes presented in Tables 3.1 and 3.2, respectively. The total CH-TRU waste disposal inventory, $V_{CH\text{-}Disposal}$, is the sum of the scaled CH-TRU waste stream volumes. The disposal waste stream volumes for the CH- and RH-TRU waste streams included in the estimate of volume for PA are given in Appendix E.

Table 2-1. Volume Scaling Factors

Contact-Handled Waste	
WIPP Capacity for CH Waste	1.68E+05 m^3
Total Stored CH Volume (V_s)	9.99E+04 m^3
Total Projected CH Volume (V_p)	2.96E+03 m^3
Total Emplaced CH Volume (V_e)	4.57E+04 m^3
CH Volume Scaling Factor (SF_{CH})	**7.74E+00**
Remote-Handled Waste	
WIPP Capacity for RH Waste	7.08E+03 m^3
Total Stored RH Volume (V_s)	2.67E+03 m^3
Total Projected RH Volume (V_p)	6.72E+02 m^3
Total Emplaced RH Volume (V_e)	0.00E+00 m^3
RH Volume Scaling Factor (SF_{RH})	**6.56E+00**

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.

These CH and RH scaling factors are larger than the scaling factors reported for TWBIR 2004 (see Appendix D for comparisons) mainly due to the re-categorization (moved from WIPP Bound Waste to Potential TRU Waste; Moody 2007b) of all the waste streams from the Hanford Office of River Protection and the sodium-bearing waste streams from INL.

2.2.2 Waste Material Calculations

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 WIPP repository (i.e., CPR) because they may affect gas generation in the repository (Dunagan 2007). In addition, the DOE needs to know the non-radiological properties of the waste not only for PA purposes, but also to support safe transportation of TRU waste and operation of the WIPP facility.

As part of the data call for this report, the DOE TRU waste sites were asked to update the information about the materials contained in the waste. For each waste stream, they were asked to revisit the final waste forms and to update, if necessary, the density of each of the WMPs for the waste stream.

Waste streams were sometimes comprised of more than one container type (e.g., 55-gallon drums and standard waste boxes [SWBs]). In these instances, when the DOE TRU waste 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 packaging densities given in section 3.2.2. The CID contains the WMP list for every container type in a waste stream. However, the waste profiles in Appendices A and C (WIPP-bound and potential TRU waste, respectively) have a weighted average of the WMPs for all container types used in a waste stream. If the site provided a WMP list for each container type, those lists were maintained in the CID and a weighted average of the WMPs for all container types was used in the waste profiles.

2.2.2.1 Waste Isolation Pilot Plant-Average Waste Material Parameter Densities

PAs conducted in support of WIPP have been predicated on the assumption that waste materials are distributed homogeneously throughout the WIPP repository. As a result, a WIPP average value for waste material densities is needed for PA.

The roll-up of WMP average densities required combining data from all of the WIPP TRU waste streams reported by the DOE TRU waste sites. A weighted average value for the WMP based on the individual waste stream volumes in the total inventory was calculated in the CID from the WMP average densities provided by the sites as shown in equations 4, 5, and 6:

$$^{WM}m_i = {}^{WM}p_i \cdot v_i \tag{4}$$

$$^{WM}M = \sum {}^{WM}m_i \tag{5}$$

$$^{WM}P = {}^{WM}M / V \tag{6}$$

where

- $^{WM}m_i$ is the mass of the waste material (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 WIPP-bound waste streams
- ^{WM}P is the average density of the WM in all (stored + projected + emplaced) WIPP-bound waste streams
- V is the actual (not scaled) volume of all (stored + projected + emplaced) WIPP-bound waste streams

2.2.3 Radionuclide Calculations

The DOE TRU waste sites were asked to update information about the radiological components in the waste they intend to ship to WIPP. For each waste stream, they were asked to update the radionuclide activity concentrations (in Ci/m^3) and to provide the generation or last assay date for each waste stream.

The radionuclide data provided by the DOE TRU waste sites consisted of radionuclide activity concentrations at the date of assay (if the waste stream was assayed) or at the date that the site calculated the activity concentrations. For PA purposes, all radionuclides reported by waste stream must be decayed to a common time frame to facilitate comparison of data (Dunagan 2007). Therefore, all radionuclide data provided in this report in Appendices A, B, and C were decay-corrected to the common base year of CY 2006 (December 31, 2006).

The radionuclide activity concentrations reported by the DOE TRU waste sites were exported from the CID into an external application, Oak Ridge National Laboratory (ORNL) Radiation Safety Information Computational Center *RSICC Computer Code Collection: ORIGEN 2.2, Isotope Generation and Depletion Code Matrix Exponential Method* (ORNL 2002), where the radionuclide decay calculations were performed, and then imported back into the CID. ORIGEN

2.2 uses a matrix exponential method to solve a large system of coupled, linear, first-order ordinary differential equations with constant coefficients. ORIGEN 2.2 has been qualified under the LANL-CO QA Program using LCO-QP19-1, *Software Quality Assurance* (LANL 2007e). A separate analysis describing the use of TransOrigen.xls, a pre- and post-processor Excel workbook application for ORIGEN 2.2, is used to qualify data uploads and unit conversion. This workbook provides a user-friendly interface to process TRU waste stream data from ORIGEN 2.2 by facilitating the creation of input files and post-processing the output files (Van Soest 2008b).

Scaled waste stream volumes were used to calculate waste stream radionuclide activity from the decayed ORIGEN 2.2 radionuclide activity concentrations as shown in equation 7 and are presented in Appendix E for seven decay scenarios:

$$a(RN)_{Disposal} = \alpha(RN) \cdot \mathrm{v}_{Disposal} \tag{7}$$

where

$a(RN)_{Disposal}$	is the activity of the radionuclide RN in the scaled waste stream volume
$\alpha(RN)$	is the decayed radionuclide activity concentration in Ci/m^3 from ORIGEN 2.2 for radionuclide RN
$\mathrm{v}_{Disposal}$	is the scaled waste stream disposal volume (see section 2.2.1) for CH- or RH-TRU waste

The WIPP disposal (see section 3.4 for discussion on WIPP-level roll-up scaling) radionuclide activities were calculated as shown in equations 8 and 9 for both CH- and RH-TRU waste, respectively. In the first step, the activities of each radionuclide in the scaled waste stream volumes ($a(RN)_{Disposal}$) are summed for all TRU waste streams to give the total activity for each radionuclide in CH- and RH-TRU waste in the WIPP repository. In the second step, the total activity for each radionuclide in CH- 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- or RH-TRU waste in the repository.

$$A(RN) = \Sigma\, a(RN)_{Disposal} \tag{8}$$

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

where

$A(RN)$	is the total activity (Ci) for a radionuclide in CH- or RH-TRU waste in the repository (after scaling)
$a(RN)_{Disposal}$	is the activity (Ci) of the radionuclide RN in the scaled waste stream volume
$\hat{A}(RN)$	is the activity concentration for a radionuclide in CH- or RH-TRU waste in the repository (Ci/m^3)
Limit	is 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

2.2.4 Uncertainty Analysis for Proposed Transuranic Waste Inventory

The TRU waste inventory used in PA is divided into three parts: 1) estimates of volumetric data, 2) estimates of non-radiological waste material data, and 3) estimates of radiological data. Each part includes the best estimates each DOE TRU waste site may have for a given set of containers managed as TRU waste. The uncertainty associated with these estimates increases or decreases, based on the sites' knowledge of their waste and amount of characterization information available.

As an example, volumetric information is available on waste that has been emplaced in the WIPP repository (emplaced waste volume), waste stored at the sites (stored waste volume), and waste expected to be generated by the sites in the future (projected waste volumes). The most accurate estimate of emplaced waste volume is reported in the WWIS. Since each drum is accounted for during emplacement, there is no error associated with the container count in the WWIS. However, depending on how the information is reported, there may be rounding errors as large as 1.1 percent associated with the volumes for ten-drum overpacks (TDOPs). The same uncertainty is assumed to be applicable for the stored waste at the DOE TRU waste sites, as each site maintains an accurate count of containers in storage. The largest uncertainty is that associated with the projected waste. This uncertainty can be as high as 100 percent, depending on processes and programs that may or may not be supported at the DOE TRU waste sites in the future. This projected waste volume will decrease as programs are defined and implemented and waste is generated. As programs reach maturity and more waste is emplaced, the uncertainty associated with projected volumes will diminish. With the wide variance of program maturity throughout the DOE complex and the uncertainty in future funding of these programs, the projected volumes will be difficult to quantify.

The uncertainty for WMPs for emplaced waste is not reported in the WWIS and therefore is not accounted for in the emplaced TRU waste inventory. However, an evaluation of CPR uncertainty was performed in 2006 (Kirchner 2006) supporting reduction in the mass of MgO required in the WIPP repository. This evaluation indicated that the uncertainty of the CPR materials in a room filled with 11,000 drums would be less than 0.3 percent. This same uncertainty could be applied to other WMPs.

The uncertainty of radionuclide measurements for emplaced waste is reported for all data collected during non-destructive assay characterization and is available in the WWIS. All radionuclide data reported for emplaced containers include the uncertainty in the final reported value.

Since volume is a contributing factor to WMP densities and radionuclide activity concentrations, the error in waste volumes should be considered in determining these estimates. However, the projected volume cannot be quantified for all of the waste streams in the repository. Therefore, the uncertainties for WMP and radionuclide estimates were determined from an analysis comparing emplaced waste volumes to those estimated in the inventory used to support the PABC (Crawford 2006). The uncertainties for WMP and radionuclide estimates for anticipated waste (stored + projected) have been reported to be less than 5 percent, based on a comparison of estimated and emplaced information for Rocky Flats Environmental Technology Site (RFETS). As waste streams are characterized and eventually emplaced, the uncertainty is expected to drop from 5 percent to less than 0.3 percent as determined for WMPs (Kirchner 2006). Uncertainties in TRU waste inventory parameters will decrease as more waste is characterized and emplaced, and projected waste streams are actualized.

2.3 Analyses Supporting the Annual Transuranic Waste Inventory Report - 2007

In addition to collecting and processing information from the DOE TRU waste sites and securing the site information in a qualified database for future use, analyses were performed on the information to support this report. For example, information on emplaced waste was obtained from the WWIS and migrated into standardized CID Import Template (CIT) files; materials used to emplace waste (CPR, etc.) were calculated for a full repository (i.e., scaled); and the estimated chemical masses of organic ligands, oxyanions, and solidified cements in the disposal volume for WIPP were calculated.

These analyses were performed and documented in accordance with LCO-QP9-1, *Analyses* (LANL-CO 2005). Some analyses were identified in INV-AP-01, Revision 2, *Analysis Plan for Transuranic Inventory* (LANL-CO 2006). Other analyses were performed as needed to support the inventory process as required by INV-SP-01, *Data Collection, Data Management and Control for the Comprehensive Inventory* (LANL-CO 2007b).

2.3.1 Analysis of WIPP Waste Information System/Emplaced Data

In order to account for TRU waste emplaced in the WIPP repository at the time of the inventory cut-off date, a documented request was made of the WWIS database administrators to supply data for the waste emplaced as of December 31, 2006. In order to effectively import the WWIS data into the CID, the WWIS data submittal was first migrated into standardized CIT files. This migration to the CIT files required that the original WWIS data submittal undergo various transformations, including but not limited to calculations, aggregations, and data mapping. An analysis was performed (Van Soest 2007) to document these activities in order to properly format the WWIS data for insertion into the CIT files. The results of this analysis are presented in sections 3.1 through 3.4.

2.3.2 Analysis of Emplacement Materials Based on a Full Repository

This analysis was conducted to update CPR materials that are used to facilitate the emplacement of waste at WIPP. This inventory of emplacement materials was calculated and is a best estimate based on current knowledge of the number and type of containers and the emplacement schemes expected to be used by the DOE TRU waste sites and WIPP Waste Handling Operations (WHO) (Crawford 2007). This analysis provides the expected disposal CPR and includes emplacement materials used for waste emplaced and anticipated to be emplaced in the WIPP repository (see section 3.2.3). The results of this analysis take into account packaging configurations used by WHO and include emplacement materials that apply to 7-packs of 55-gallon drums, 4-packs of 85-gallon drums, 3-packs of 100-gallon drums, SWBs, TDOPs, RH canisters, standard large box 2s (SLB2s; 5 ft x 5 ft x 8 ft), and MgO supersacks (woven plastic bags). To calculate the disposal mass of CPR materials introduced incidental to the waste emplacement process, the following process was used:

- The number and type of each waste container was calculated for emplaced, stored, and projected waste.

- The projected waste volume value was scaled to a full repository value using the CH- and RH-TRU waste scaling factors, determined in section 2.2.1, and added to the un-scaled stored and emplaced volumes.
- Using a list of emplacement assumptions and the results of calculations for numbers of containers by type, the numbers of waste emplacement units were calculated.
- Quantities of CPR materials for emplacement units were calculated from the assumptions and the known mass of CPR materials for the configuration of each waste emplacement unit.
- Waste emplacement units were then mathematically constructed into waste stacks using the emplacement assumptions for each container type. This allowed for the calculation of the number of supersacks to be emplaced on each stack and their CPR contribution.
- The contribution of CPR for each emplacement unit, stack, and supersack was summed and reported as an emplacement material total for the repository.

These calculations were performed using data from the CID on the TRU waste inventory as of December 31, 2006. The results of this analysis are presented in section 3.2.3.

2.3.3 Analysis for Chemical Components

In response to a request from SNL-CPG (Dunagan 2007), this report provides information about the chemical components of the waste similar to that supplied in support of the CCA PA by the TWBIR, Revision 3, and in support of the CRA-2004 PA by the TWBIR-2004. This includes a calculation of the disposal mass of organic ligands (complexing agents), the disposal mass of oxyanions (nitrate, sulfate, and phosphate), and the disposal mass of solidified cements expected in the disposal volume for WIPP. The DOE TRU waste sites reported the complexing agents and oxyanions in weight percent and the cements as a density (in kg/m^3). PA requires mass units (kg) (Dunagan 2007) for complexing agents, oxyanions, and cements; therefore, an analysis was performed to convert these data (which are in the CID) into kg. The analysis (Van Soest 2008a) compared the CID data with previously published totals from the TWBIR-2004. With the understanding that some of this waste may have been emplaced at WIPP since this report, it is recognized that the 2006 data reported by the sites may reflect lesser amounts of chemical components. In order to conservatively report the mass of the chemical components, the following cases were developed and their respective methodology documented:

Determine whether chemical components in waste streams reported in the TWBIR-2004 are also returned in the 2006 query, recognizing and accounting for waste stream identifications (IDs) that may have been combined or divided. If so, then:

Case 1	If all or a portion of those waste streams have been shipped to and emplaced at WIPP, the greater of the TWBIR 2004 or 2006 totals will be reported, unless a specific lesser value is otherwise documented to be more accurate.
Case 2	If no waste stream has been shipped to and emplaced at WIPP, the 2006 total will be reported.

Determine whether chemical components were reported in the 2006 query and were not previously reported in the TWBIR-2004.

Case 3	Chemical components that are newly reported in 2006 will be reported.

Determine whether chemical components were reported in the TWBIR-2004 and are not returned in the 2006 query.

Case 4	If the waste streams are still identified in the 2006 inventory as WIPP-bound, have been rolled into a new waste stream ID that is WIPP-bound, or have been entirely emplaced at WIPP, the chemical component values will be carried forward and reported.
Case 5	If the waste streams have been changed to potential or removed from the inventory for other reasons, the values will not be carried forward and reported.

The results of this analysis are presented in sections 3.3.1, 3.3.2, and 3.3.3 for cements, complexing agents, and oxyanions, respectively.

3.0 TRANSURANIC WASTE INVENTORY ESTIMATES

This section presents the TRU waste inventory that was collected for this report. The data were collected and stored in the CID and were validated by the DOE TRU waste sites, as discussed in section 2.1.

This presentation of the TRU waste inventory consists of summaries of the inventory information collected from the DOE TRU waste sites and information calculated from the data submitted by the sites. Section 3.1 presents TRU waste volume information provided by the sites for CH- and RH-TRU waste and the volume of emplaced waste in the WIPP repository. Data for emplaced waste were obtained from the WWIS. Section 3.2 presents the non-radiological TRU waste inventory as reported by the sites and the WWIS. This includes roll-ups of the waste materials (section 3.2.1), packaging materials (section 3.2.2), and emplacement materials used in the repository (section 3.2.3). Section 3.3 provides information about the chemical components of the waste, and section 3.4 presents the TRU waste radionuclide inventory reported by the sites and the WWIS.

The TRU waste inventory, as collected from the DOE TRU waste sites, is presented by waste stream in Appendices A, B, and C. Appendix A presents individual waste stream profiles (WSPs) for all TRU waste streams planned for emplacement in the WIPP repository. Appendix B presents individual WSPs for all TRU waste streams that were emplaced in WIPP as of December 31, 2006. Appendix C presents individual WSPs for non-WIPP/potential-WIPP TRU waste streams, as discussed in section 4.

Appendix D presents comparisons among the CCA, CRA-2004, and this report for volume, WMPs, scaling factors, and radionuclide data. Appendix E presents the PA waste-stream-level decayed radionuclides for seven time periods, with volumes and activities scaled. Appendix F presents the crosswalk of waste streams among the TWBIR, Revision 2, the TWBIR-2004, and this report.

3.1 Transuranic Waste Volume Inventory Estimates

This section presents the TRU waste inventory volume estimates that were collected for this report. The volume estimates are stored in the CID, which contains data that have been fully qualified for use under the LANL-CO QA Program, as discussed in sections 1.1 and 2.1.

The TRU waste volume estimates were derived from the container type and count provided by the DOE TRU waste sites. The sites provided both stored and projected container types and count for both current form and final form containers. The volume for the final form was calculated using established container volumes for WIPP-approved containers so that there is consistency in the final form volume from site to site. Section 3.1.1 presents TRU waste inventory volume information for emplaced waste reported by site. Section 3.1.2 presents stored, projected, and anticipated TRU waste volumes by site. Section 3.1.3 provides the total disposal volume roll-up by site.

3.1.1 Emplaced Volumes by Site

Data on waste emplaced in the WIPP repository were obtained from the WWIS and uploaded to the CID after conversion using the analysis discussed in section 2.3.1. The information was provided by container type and count. The volume for the emplaced waste was calculated using the same container volumes as used for the final form containers from the DOE TRU waste sites so that there was consistency with all WIPP-approved containers. The last column of Table 3-1 shows the total emplaced CH-TRU waste volume by DOE TRU waste site, and the last column of Table 3-2 shows the total emplaced RH-TRU waste volume by DOE TRU waste site.

3.1.2 Stored, Projected, and Anticipated Volumes by Site

TRU waste volume information requested from the DOE TRU waste sites falls into two categories: stored waste (i.e., 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). The total waste stream volume information collected from the sites included stored and projected components as applicable for each TRU waste stream. The sites also reported both current form and final form waste volumes for their waste streams. The final form volume accounts for the payload container (the volume the waste container occupies in the WIPP repository). Since PA only considers the waste volume that will be disposed in the WIPP repository, only final form volumes were used in the calculation of actual (reported by the site) and scaled (used in PA) TRU waste volumes, as discussed in section 3.1.3.

Table 3-1 shows the total CH-TRU unscaled waste stored, projected, and anticipated (stored plus projected), using final form payload volumes anticipated to be shipped to WIPP and broken out by DOE TRU waste site. Table 3-2 shows the total RH-TRU unscaled waste stored, projected, and anticipated, using final form payload volumes anticipated to be shipped to WIPP and broken out by site.

Table 3-1. WIPP CH-TRU Unscaled Waste Inventory Volumes By Site

Storage/Generator Site	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)	Emplaced Volumes (m^3)
Argonne National Laboratory – East	8.3E+00	7.9E+01	8.8E+01	1.2E+02
Argonne National Laboratory – West (MFC)	7.5E+00	3.0E+01	3.7E+01	0.0E+00
Bettis Atomic Power Laboratory	1.9E+01	0.0E+00	1.9E+01	0.0E+00
Hanford (Richland) Site	1.4E+04	0.0E+00	1.4E+04	2.6E+03
Idaho National Laboratory	5.9E+04	0.0E+00	5.9E+04	1.6E+04
Knolls Atomic Power Laboratory - Nuclear Fuel Services	2.1E+00	1.2E+02	1.3E+02	0.0E+00
Lawrence Berkeley Laboratory	2.1E-01	2.1E-01	4.2E-01	0.0E+00
Lawrence Livermore National Laboratory	2.9E+02	9.1E+01	3.8E+02	1.4E+02
Los Alamos National Laboratory	1.5E+04	1.1E+03	1.6E+04	1.5E+03
Nevada Test Site	3.0E+02	3.7E+02	6.7E+02	4.0E+02
Oak Ridge National Laboratory	6.8E+02	3.4E+02	1.0E+03	0.0E+00
Rocky Flats Environmental Technology Site	0.0E+00	0.0E+00	0.0E+00	1.5E+04
Sandia National Laboratories - Albuquerque	2.5E+01	4.4E+00	2.9E+01	0.0E+00
Savannah River Site	1.0E+04	8.4E+02	1.1E+04	9.6E+03
U.S. Army Materiel Command	2.1E-01	0.0E+00	2.1E-01	0.0E+00
Grand Total	**1.0E+05**	**3.0E+03**	**1.0E+05**	**4.6E+04**

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.
This table contains data for WIPP-bound waste streams reported by site only; it does not include data for potential waste streams.

Table 3-2. WIPP RH-TRU Unscaled Waste Inventory Volumes By Site

Storage/Generator Site	Stored Volumes (m^3)	Projected Volumes (m^3)	Anticipated Volumes (m^3)	Emplaced Volumes (m^3)
Argonne National Laboratory - East	1.1E+01	3.2E+01	4.3E+01	0.0E+00
Argonne National Laboratory – West (MFC)	6.2E+00	3.5E+01	4.1E+01	0.0E+00
Bettis Atomic Power Laboratory	3.6E+00	0.0E+00	3.6E+00	0.0E+00
Hanford (Richland) Site	1.2E+03	1.3E+02	1.3E+03	0.0E+00
Idaho National Laboratory	3.7E+02	0.0E+00	3.7E+02	0.0E+00
Knolls Atomic Power Laboratory – Schenectady	3.0E+01	8.0E+01	1.1E+02	0.0E+00
Los Alamos National Laboratory	9.8E+01	0.0E+00	9.8E+01	0.0E+00
Oak Ridge National Laboratory	9.3E+02	3.6E+02	1.3E+03	0.0E+00
Sandia National Laboratories - Albuquerque	2.0E+01	0.0E+00	2.0E+01	0.0E+00
Savannah River Site	4.2E+01	3.6E+01	7.8E+01	0.0E+00
Grand Total	**2.7E+03**	**6.7E+02**	**3.3E+03**	**0.0E+00**

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.
This table contains data for WIPP-bound waste streams reported by site only; it does not include data for potential waste streams.

3.1.3 Total Disposal Volume by Site

PAs conducted in support of WIPP have been predicated on the assumption that the WIPP repository would be filled to its design capacity at the time of closure. The design capacity for WIPP is 6,200,000 ft^3 (175,564 m^3), as set by the LWA, with a limit of 250,000 ft^3 (7,079 m^3) for RH-TRU waste as imposed by the C&C Agreement; therefore, the difference in the design capacity and the RH-TRU limit sets the CH-TRU disposal limit at 5,950,000 ft^3 (168,485 m^3). The volume of anticipated (stored plus projected) and emplaced (CH- and RH-TRU) waste reported by the DOE TRU waste sites in support of this report is less than the design capacity for WIPP. Therefore, CH- and RH-TRU waste volumes were scaled to the design capacity of WIPP for PA. The *scaled* inventory for PA is referred to as the TRU waste "disposal" volume. Scaling is performed only on the projected waste.

The TRU waste disposal volume for a CH- or RH-TRU waste stream was obtained by multiplying the projected volume by the appropriate scaling factor and adding that value to the stored and emplaced volumes for each waste stream. Section 2.2.1 discusses the CH and RH scaling factors and associated calculations. Table 3-3 shows the total WIPP waste disposal volume by site for both CH- and RH-TRU waste.

Table 3-3. WIPP CH and RH-TRU Disposal Volume By Site

Storage/Generator Site	CH (m^3)[1]	RH (m^3)[1]
Argonne National Laboratory - East	7.5E+02	2.2E+02
Argonne National Laboratory – West (MFC)	2.4E+02	2.3E+02
Bettis Atomic Power Laboratory	1.9E+01	3.6E+00
Hanford (Richland) Site	1.6E+04	2.0E+03
Idaho National Laboratory	7.6E+04	3.7E+02
Knolls Atomic Power Laboratory - Nuclear Fuel Services	9.7E+02	0.0E+00
Knolls Atomic Power Laboratory - Schenectady	0.0E+00	5.6E+02
Lawrence Berkeley Laboratory	1.8E+00	0.0E+00
Lawrence Livermore National Laboratory	1.1E+03	0.0E+00
Los Alamos National Laboratory	2.5E+04	9.8E+01
Nevada Test Site	3.5E+03	0.0E+00
Oak Ridge National Laboratory	3.3E+03	3.3E+03
Rocky Flats Environmental Technology Site	1.5E+04	0.0E+00
Sandia National Laboratories - Albuquerque	5.9E+01	2.0E+01
Savannah River Site	2.7E+04	2.8E+02
U.S. Army Materiel Command	2.1E-01	0.00E+00
Grand Total	**1.7E+05**	**7.1E+03**

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.
[1] Volume estimates based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

3.2 Waste, Packaging, and Emplacement Material Densities

This section presents the non-radiological TRU waste inventory that was collected for this report. Section 3.2.1 presents the inventory of waste materials; section 3.2.2 presents the inventory of packaging materials; and section 3.2.3 presents the inventory of emplacement materials used for disposal of waste in the WIPP repository.

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 some waste materials that go into the repository (i.e., CPR materials) because they may affect gas generation in the repository (Dunagan 2007). 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 WIPP facility.

3.2.1 Waste Materials

As part of the data call for this report, the DOE TRU waste sites were asked to provide the average density (kg/m^3) of each of the WMPs in each waste stream.

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

- Iron-based metal/alloys – Includes iron and steel alloys in the waste, but does not include the waste container materials. Also includes an iron-based metallic phase associated with any vitrification process, if applicable.

- Aluminum-based metal/alloys – Aluminum or aluminum-base alloys in the waste materials.

- Other metal/alloys – All other metal/alloys (e.g., copper, zirconium, tantalum) found in the waste materials, including the lead portion of leaded rubber gloves/aprons.

- Other inorganic material – Inorganic non-metal waste materials such as concrete, glass, firebrick, ceramics, graphite, sand, and inorganic sorbents.

- Vitrified material – 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 WMP.)

- Cellulosic material – Materials generally derived from high-polymer plant carbohydrates such as paper, cardboard, Kimwipes®, wood, cellophane, and cloth.

- Rubber material – Natural or manmade elastic latex materials such as Hypalon®, neoprene, surgeons' gloves, and leaded-rubber gloves (rubber part only).

- Plastic material – Generally manmade, often derived from petroleum feedstock. Examples are polyethylene, polyvinylchloride, Lucite® and Teflon®.

- Solidified inorganic material – Any homogeneous materials consisting of sludge or aqueous-base liquids that are solidified with Envirostone® or other solidification agents. Examples are wastewater treatment sludge and inorganic particulates.

- Solidified organic material – Organic resins, solidified organic liquids, and sludges.

- Cements (solidified) – Used in solidifying liquids, particulates, and sludges.

- Soil – Generally consists of naturally occurring soils that have been contaminated with radioactive waste materials at a high enough level to be considered TRU waste.

PAs conducted in support of WIPP have been predicated on the assumption that waste materials are distributed homogeneously throughout the repository. As a result, a WIPP average estimated value for waste material densities is provided in section 2.2.2. The estimated WIPP WMP average densities for CH- and RH-TRU waste are presented in Tables 3-4 and 3-5, respectively.

3.2.2 Packaging Materials

Packaging materials (such as steel, plastic, cellulose, and lead) are the materials used to construct the containers that hold TRU waste. PA assumes that packaging materials are distributed homogeneously throughout the WIPP repository. As a result, a WIPP average value for packaging material densities is provided for PA. The WIPP packaging material average densities for CH- and RH-TRU waste are presented in Tables 3-4 and 3-5, respectively.

Packaging material densities have historically been reported by the DOE TRU waste sites. With the development of the CID, the packaging material densities for the WIPP-approved payload containers are fixed values in the CID. The sites report the final form container type, and the CID populates the packaging material densities with consistent values associated with the container type. An analysis was performed (McInroy 2006) to calculate the packaging material densities to be used in the CID. The purpose of this analysis was to document calculations that provided the packaging material densities for steel, plastic, cellulose, and lead, which may be used in the containers that package CH- and RH-TRU waste for shipment to WIPP.

Table 3-4. WIPP CH-TRU Waste Material Parameter Inventory

Waste Material	Average Density (kg/m^3)
Iron-based Metals/Alloys	1.8E+02
Aluminum-based Metals/Alloys	1.5E+01
Other Metal/Alloys	1.1E+01
Other Inorganic Materials	3.4E+01
Cellulosics	7.3E+01
Rubber	6.6E+00
Plastics	8.2E+01
Cements	6.8E+01
Solidified Inorganic Material	1.1E+02
Solidified Organic Material	4.6E+01
Soils/gravel	9.1E+00
Vitrified	0.0E+00
Package Material	
Packaging Material, Steel	1.8E+02
Packaging Material, Plastic	1.9E+01
Packaging Material, Cellulosics	4.7E+00
Packaging Material, Lead	0.0E+00

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.

Table 3-5. WIPP RH-TRU Waste Material Parameter Inventory

Waste Material	Average Density (kg/m^3)
Iron-based Metals/Alloys	1.9E+02
Aluminum-based Metals/Alloys	1.0E+01
Other Metal/Alloys	4.5E+01
Other Inorganic Materials	2.3E+01
Cellulosics	1.4E+01
Rubber	4.7E+00
Plastics	1.8E+01
Cements	1.2E+01
Solidified Inorganic Material	5.9E+02
Solidified Organic Material	7.1E-01
Soils/gravel	7.7E+01
Vitrified	7.2E-02
Package Material	
Packaging Material, Steel	6.1E+02
Packaging Material, Plastic	1.1E+01
Packaging Material, Cellulosics	0.0E+00
Packaging Material, Lead	5.4E+00

Data Source: CID Data Version D.6.06, LANL-CO 2008.
NOTE: Actual numerical values have been rounded for presentation purposes.

3.2.3 Emplacement Materials

The WIPP WHO uses several emplacement materials to facilitate the disposal of TRU waste containers and MgO in the WIPP repository. The amount of MgO emplaced on top of the containers is based on a safety factor and is subject to change based on the amount of CPR in the repository. The CPR, however, has been estimated for each payload configuration expected to be emplaced in the repository (Crawford 2007). Plastic and cellulosic materials are used to emplace CH-TRU waste, but no rubber materials are used. It is assumed in this report that RH-TRU waste will be emplaced in boreholes in the walls of the disposal rooms. Currently, no CPR material is used for RH-TRU waste emplacement.

The materials used to emplace CH-TRU waste are:

- Polyethylene slip-sheets for 7-packs of 55-gallon drums and/or pipe overpack components (POCs), 4-packs of 85-gallon drums, 3-packs of 100-gallon drums, and MgO supersacks (plastics)
- Fiberboard slip-sheets (cellulosic material) for SWBs and TDOPs
- Woven polypropylene supersacks (plastic material) containing MgO
- Cardboard stabilizers (cellulosic material) for supersacks
- Stretch wrap (plastic material) for 7-packs, 4-packs, and 3-packs

For CH-TRU waste, the total disposal mass of the emplacement materials was calculated based on information provided by the DOE TRU waste sites and the WWIS as of December 31, 2006. The relevant information is provided in Table 3-6.

Table 3-6. Total Disposal CPR by Supersacks and Emplacement Units[1]

CPR Component	From Supersacks (kg)	From Waste Emplacement Units (kg)	Total CPR Component (kg)
Cellulose	1.17E+05	1.19E+05	2.36E+05
Plastic	3.85E+05	1.03E+06	1.42E+06
Rubber	0	0	0

NOTE: Actual numerical values have been rounded for presentation purposes.
[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

3.3 Chemical Components in Transuranic Waste

As part of the data call for this report, the DOE TRU waste sites were asked to provide information about the chemical components of their waste streams. The sites were asked about cements, complexing agents (acetate, citrate, oxylate, and ethylenediaminetetraacetic acid [EDTA]), and oxyanions (nitrate, sulfate, and phosphate). The disposal masses presented in Tables 3-8, 3-10, and 3-12 are used by SNL-CPG in PA modeling calculations.

Specifically, cements, complexing agents, and oxyanions are calculated as the sum of the constituents found in anticipated waste scheduled for delivery to WIPP and any waste that has been emplaced where these components were reported in the TWBIR-2004. The methods used to estimate the disposal masses of cements, complexing agents, and oxyanions are discussed in section 2.3.3.

3.3.1 Cement Content in Solidified Transuranic Waste

The DOE TRU waste sites have not reported cement densities consistently over time; therefore, for the inventory data call for this report, the sites were instructed to report their cements as WMPs. Table 3-7 shows TRU waste streams containing new amounts of cement that have changed since the last inventory report, and Table 3-8 shows the roll-up of the total solidified disposal mass of cements by site.

Table 3-7. Waste Streams Reporting New Disposal Mass of Cement[1]

Waste Stream Identifier	Cements (kg)	Waste Stream Identifier	Cements (kg)
AW-N026.82	1.12E+03	RL105-03	5.31E+04
IN-ID-SDA-Debris	5.49E+02	RL200-01	2.75E+00
IN-ID-SDA-Sludge	8.03E+03	RL209E-01	3.15E+03
IN-ID-SDA-Soil	2.77E+02	RL231Z-01	1.17E+05
IN-W216.877	9.39E+03	RL300-01	4.99E+03
IN-W228.886	1.98E+03	RL308-01	1.66E+02
KN-B234TRU	2.20E+06	RL324-01	1.67E+01
LA-TA-55-35	1.83E+03	RL325-01	6.74E+04
LA-TA-55-36	9.05E+04	RLBW-01	1.04E+04
LA-TA-55-37	5.16E+03	RLGEV-01	8.14E+03
LA-TA-55-40	1.61E+03	RLPFP-01	7.10E+01
LL-W019	3.24E+03	RLPRC-01	7.80E+02
NT-W001	8.74E+03	SR-W027-999-AGNS-HOM	1.34E+04
NT-W021	1.44E+02		

[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

Table 3-8. Disposal Mass of Cements[1]

ANL-E (kg)	ANL-W (MFC) (kg)	INL (kg)	KAPL-NFS (kg)	LANL (kg)	LLNL (kg)
8.67E+03	2.05E+04	7.03E+06	2.20E+06	4.29E+06	2.28E+05

NTS (kg)	ORNL (kg)	Hanford (kg)	RFETS (kg)	SRS (kg)	Total (kg)
8.89E+03	6.60E+04	2.66E+05	3.58E+05	1.58E+04	**1.45E+07**

NOTE: Sites not reporting cements are not listed in the table.
[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

3.3.2 Complexing Agents (Organic Ligands) in Transuranic Waste

The DOE tracks the mass of complexing agents destined for disposal in the WIPP repository because of their potential impact on solubility of actinides in the waste. In the latest inventory request, the DOE TRU waste sites were asked to update their estimates of complexing agents in the waste streams. When applicable, the sites reported the estimates of complexing agents in waste streams as a weight percent. As a result of this request, INL reported a larger quantity of EDTA (in weight percent) than the EDTA reported in CRA-2004. The quantity of EDTA in INL's waste streams was subsequently verified and checked against existing AK, resulting in a total slightly more than previously reported.

Also, as a result of the request for additional complexing agent information, Hanford RL identified 16 waste streams containing complexing agents that were not identified in TWBIR-2004. Further investigation by the site revealed that those complexing agents may have been disposed in low-level waste (LLW). An analysis performed by Hanford RL (Evans et al. 2008) indicated the concentration of EDTA found in three waste streams (RL-222S-01, RL-300-01, and

RL-325-01) had lower concentrations than first reported in their Solid Waste Inventory Tracking System (SWITS).

Additional information on EDTA and chelating agents will be collected in the next TRU waste inventory update and, at that time, mass quantities of EDTA will be further refined and quantified and ultimately reported in the *Annual Transuranic Inventory Report – 2008.*

Table 3-9 shows TRU waste streams containing new disposal masses of complexing agents (Van Soest 2008a) that have changed since the last inventory report. Table 3-10 shows the roll-up of the total disposal mass of complexing agents by site.

Table 3-9. Waste Streams Reporting New Disposal Masses of Complexing Agents[1]

Waste Stream ID	Acetic Acid (kg)	Sodium Acetate (kg)	Citric Acid (kg)	Sodium Citrate (kg)	Oxalic Acid (kg)	Sodium Oxalate (kg)	Sodium EDTA[2] (kg)
BN004-S	--	--	--	--	--	--	5.36E+01
ID-RF-S5300-A-S	--	--	--	--	--	--	8.33E-01
IN-BN004	--	--	--	--	--	--	2.24E+02
IN-ID-RF-S5300-A	--	--	--	--	--	--	2.69E+01
INW169.001-S	--	--	--	--	--	--	1.09E+00
RF001.01-S	--	--	--	--	--	--	3.25E-01
RF101.01-S	--	--	--	--	--	--	4.30E+00
RF101.29-S	--	--	--	--	--	--	3.10E-01
RF101.30-S	--	--	--	--	--	--	1.79E+00
RF101.31-S	--	--	--	--	--	--	1.57E+00
RL200-01	--	--	2.75E+00	--	3.79E+00	--	--
RL216Z-02	--	--	--	--	6.22E+00	--	--
RL222S-01	--	7.17E+00	--	--	7.17E+00	--	3.00E-01[2]
RL233S-01	5.45E-02	--	1.17E+00	--	5.45E-02	--	--
RL300-01	--	5.28E+01	--	2.13E+01	2.57E+01	1.23E+01	3.00E-01[2]
RL308-01	--	2.38E-02	1.17E-02	9.65E-02	1.17E-02	1.08E-01	1.08E-01
RL324-01	--	1.79E-01	8.96E-02	7.40E-01	8.96E-02	--	8.29E-01
RL325-01	3.39E+01	4.03E+02	2.01E+02	1.66E+03	2.01E+02	6.38E+02	3.00E-01[2]
RLBAT-01	1.47E+00	--	5.15E-01	--	--	--	--
RLBW-01	3.05E+00	1.18E+01	1.84E+00	--	--	--	--
RLESG-01	--	--	5.11E+00	--	4.96E+00	--	--
RLGEV-01	--	--	8.64E+00	--	--	--	--
RLPFP-01	1.37E+04	2.84E+04	1.00E+01	--	5.42E+01	7.79E+00	7.79E+00
RLPFP-05	5.39E-02	1.11E-01	--	--	2.23E-04	--	--
RLSWO-01	3.30E-01	--	8.67E+00	--	1.37E-03	--	--
RLWAR-01	--	--	4.02E+03	--	1.39E+04	--	--

[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

[2] An analyses (Evans et al. 2008) at Hanford RL found EDTA in these waste streams to be less than 1 kilogram.

Table 3-10. Disposal Mass of Complexing Agents[1]

Compound	INL (kg)	LANL (kg)	Hanford-RL (kg)	RFETS (kg)	Total (kg)
Acetic Acid	2.90E+02	1.10E+01	1.38E+04	5.29E+00	**1.41E+04**
Citric Acid	2.01E+02	1.22E+03	4.26E+03	3.63E+00	**5.68E+03**
Oxalic Acid	2.01E+02	1.51E+04	1.42E+04	3.63E+00	**2.95E+04**
Sodium Acetate	2.46E+03	--	2.89E+04	4.46E+01	**3.14E+04**
Sodium Citrate	8.59E+02	--	1.68E+03	1.66E+01	**2.56E+03**
Sodium EDTA	3.07E+02	--	1.02E+02	1.18E+01	**4.23E+02**
Sodium Oxalate	--	--	6.58E+02	--	**6.58E+02**

NOTE: Sites not reporting complexing agents are not listed in the table.
[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

3.3.3 Oxyanions in Transuranic Waste

An estimate of the masses of nitrate, sulfate, and phosphate in waste expected for disposal in the WIPP repository must be reported (Dunagan 2007). An analysis (Van Soest 2008a) was completed to determine the oxyanions by waste stream. The analysis was done to convert the weight percentages reported by the DOE TRU waste sites into disposal masses, as discussed in section 2.3.3.

Table 3-11 shows TRU waste streams in which new disposal amounts of oxyanions have changed since the last inventory report, and Table 3-12 shows the roll-up of the total disposal mass of oxyanions by waste site.

Table 3-11. Waste Streams Reporting New Disposal Masses of Oxyanions[1]

Waste Stream Identifier	Nitrate (kg)	Sulfate (kg)	Phosphate (kg)
IN-BN004	0.00E+00	5.14E+03	5.14E+03
IN-W228.884	3.38E+02	3.38E+02	0.00E+00
IN-W228.885	3.38E+01	3.38E+01	0.00E+00
IN-W228.886	5.01E+01	5.01E+01	0.00E+00
OR-W215	4.37E+05	6.24E+03	3.12E+00
RL200-01	2.65E+02	0.00E+00	2.56E+02
RL201-01	0.00E+00	2.62E+00	0.00E+00
RL202S-01	5.69E-01	0.00E+00	0.00E+00
RL209E-01	1.81E+02	4.33E+02	5.45E+01
RL216Z-02	5.74E+02	2.56E+01	6.37E+02
RL222S-01	1.08E+02	1.51E+01	1.61E+02
RL231Z-01	1.69E+02	2.19E+04	1.23E+04
RL231Z-03	5.90E-01	6.20E+00	2.77E+02
RL233S-01	2.55E+02	5.54E-01	1.98E+00
RL300-01	1.32E+03	0.00E+00	3.14E+02
RL308-01	5.39E-01	2.08E+02	1.18E-01
RL324-01	4.12E+00	3.26E+00	8.69E-01
RL325-01	1.61E+04	1.22E+04	4.59E+03
RL325-03	1.27E+01	0.00E+00	0.00E+00
RLBAT-01	0.00E+00	2.14E+00	2.43E+00

Waste Stream Identifier	Nitrate (kg)	Sulfate (kg)	Phosphate (kg)
RLBW-01	4.32E+00	1.17E+03	2.45E+00
RLESG-01	4.96E+00	1.16E+04	3.14E+02
RLEXX-01	3.29E-01	0.00E+00	1.09E-01
RLGEV-01	7.84E+00	8.85E+02	7.84E+00
RLPFP-01	5.18E+05	2.22E+04	5.11E+05
RLPFP-03	8.08E+01	0.00E+00	5.19E+00
RLPFP-04	3.83E-02	0.00E+00	3.27E-01
RLPFP-05	3.12E+00	4.48E-01	2.09E+00
RLPURX-01	3.89E+01	0.00E+00	0.00E+00
RLSWO-01	1.40E+01	2.73E+00	1.70E+02
RLWAR-01	1.20E+04	2.06E+03	0.00E+00

[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

Table 3-12. Disposal Masses of Oxyanions[1]

Compound	INL (kg)	LANL (kg)	LLNL (kg)	ORNL (kg)	Hanford-RL (kg)	RFETS (kg)	Total (kg)
Nitrate	8.52E+05	8.51E+05	0.00E+00	4.37E+05	5.50E+05	9.31E+03	**2.70E+06**
Sulfate	1.64E+04	4.45E+05	1.00E+03	6.24E+03	7.28E+04	5.52E+04	**5.96E+05**
Phosphate	5.14E+03	0.00E+00	0.00E+00	3.12E+00	5.30E+05	8.50E+01	**5.35E+05**

NOTE: Sites not reporting oxyanions are not listed in the table.
[1] Mass estimates are based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

3.4 Transuranic Waste Radionuclide Inventory

This section presents the TRU waste radionuclide activity concentration inventory collected for this report. The roll-ups for the TRU waste radionuclide concentrations, summations of radionuclide activities, and disposal activities are generated from the CID (LANL 2008).

3.4.1 Unscaled Radionuclide Activities by Site

Tables 3-13 and 3-14 provide the comprehensive unscaled WIPP-bound DOE TRU waste site radionuclide inventory estimates in total curies for CH- and RH-TRU waste, respectively. The radionuclides are decayed from the waste stream assay year through the end of CY 2006. These tables were generated using the sum of the site TRU waste activity concentrations (Ci/m^3) converted to activities (Ci) based on the site's anticipated (sum of the projected and stored) waste volume.

3.4.2 Disposal Volumes and Activities for Selected Radionuclides by Waste Streams

The PA disposal volumes (m^3) and disposal waste-stream-level radionuclide activities (Ci) for the CH- and RH-TRU waste streams are given in tables in Appendix E. The tables provide the site-specific radionuclide inventory estimates decayed from the waste stream assay year through the end of the 2006, 2033, 2133, 2383, 3033, 7033, and 12033 calendar years (Table E-1 through Table E-14, respectively).

3.4.3 WIPP Disposal Radionuclides

The waste profiles in Appendices A (WIPP-bound waste), B (WIPP emplaced waste), and C (WIPP potential waste) include unscaled radionuclide concentrations for each waste stream. These radionuclide concentrations (Ci/m^3) have been decayed from the waste stream assay year through the end of CY 2006.

Table 3-15 presents the WIPP disposal roll-up of radionuclide concentrations in Ci/m^3 and the total disposal activity (Ci) decayed through the end of CY 2006 for both CH- and RH-TRU waste.

Table 3-15 corresponds to Table 3-1 of the TWBIR, Revision 3, and Table 3.2 of the TWBIR–2004. A comparison of the radionuclides with the highest activity concentrations in this report to those reported in the TWBIR, Revision 3, and the TWBIR-2004 (CH-and RH-TRU waste), are presented in Appendix D.

The 2006 overall unscaled CH activity has increased by 7.88E+05 curies (18.3%; difference of CRA total activity and 2006 total activity divided by the CRA total activity) from the total activity reported in the PABC inventory. This increase is the result of better inventory reporting by the sites and data checks performed during data collection. Five radionuclides (Am-241, Pu-238, Pu-239, Pu-240, and Pu-241) made up 99 percent of the unscaled CH-TRU waste activity in the CCA. The same five radionuclides made up 97 percent of the unscaled CH-TRU waste activity in the CRA-2004, while five radionuclides (Am-241, Eu-155, Pu-238, Pu-239, and Pu-241) make up 96 percent of the total unscaled CH-TRU waste activity in this report (see Appendix D for further discussion on radionuclide changes).

The 2006 overall unscaled RH activity has increased by 5.54E+05 curies (32.9%) from the total activity reported in the PABC inventory. The RH-TRU inventory has higher activity report for 2006 for the same reasons CH-TRU radionuclide activity is higher. The five most abundant unscaled RH-TRU waste radionuclides (Ba-137m, Cs-137, Pu-241, Sr-90, and Y-90) have remained the same through the three reporting periods (the CCA, the CRA-2004, and this report). These five radionuclides made up 96 percent of the total unscaled RH-TRU waste activity in the CCA, 98 percent of the total unscaled RH-TRU waste activity in the CRA-2004, and 98 percent of the total unscaled RH-TRU waste activity in this report.

Table 3-13. Unscaled CH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1]

Nuclide	ANL-E	ANL-W (MFC)	Army	BAPL	Hanford-RL	INL	KAPL-NFS	LANL	LBL	LLNL	NTS	ORNL	RFETS	SNL-A	SRS	Total
Ac-225	1.00E-02	6.37E-09	5.85E-12	1.82E-13	4.37E-04	6.97E-01	3.19E-06	1.26E-01	5.65E-07	6.02E-11	1.60E-03	1.52E-01	5.82E-05	2.00E-06	5.43E-03	**9.92E-01**
Ac-227	1.45E-07	1.21E-09	8.99E-15	1.37E-10	3.50E-06	9.08E-04	1.48E-10	1.49E-01	3.73E-09	1.41E-03	1.07E-04	8.74E-02	4.71E-07	1.40E-03	2.71E-03	**2.43E-01**
Ac-228	2.32E-05	6.38E-18	--	2.98E-14	1.67E-04	2.64E-01	5.51E-06	2.27E-03	8.29E-10	3.18E-17	2.70E-15	7.99E-04	1.20E-09	4.40E-03	6.99E-04	**2.73E-01**
Ag-109m	1.46E-02	--	--	--	--	--	--	5.95E-04	--	--	--	3.42E-11	1.17E-08	1.42E-05	--	**1.52E-02**
Ag-110	1.71E-05	--	--	--	--	--	--	--	--	--	--	1.24E-12	--	--	--	**1.71E-05**
Ag-110m	1.30E-03	--	--	--	--	--	--	--	--	--	--	2.52E-02	--	--	--	**2.65E-02**
Am-241	1.04E+02	8.22E-02	--	9.44E-03	1.95E+04	1.75E+05	4.46E+01	6.82E+04	1.65E-02	5.31E+03	3.63E+02	3.00E+03	1.16E+05	9.19E+00	5.30E+03	**3.93E+05**
Am-242	--	--	--	--	--	--	--	--	--	1.06E-02	--	--	--	4.61E-02	4.34E-01	**4.91E-01**
Am-242m	--	--	--	--	--	--	--	--	--	1.62E+00	--	--	--	4.69E-02	4.41E-01	**2.11E+00**
Am-243	1.89E+00	--	--	4.02E-05	6.05E-03	4.31E+01	--	1.95E+00	1.87E-04	8.51E-02	5.86E-01	2.80E+00	1.08E-02	1.38E-02	1.57E+01	**6.61E+01**
Am-245	--	--	--	--	--	--	--	3.07E-14	4.15E-14	--	--	1.55E-11	--	--	--	**1.55E-11**
At-217	1.00E-02	6.37E-09	5.85E-12	1.82E-13	4.38E-04	6.97E-01	3.19E-06	1.26E-01	5.65E-07	6.03E-11	1.60E-03	1.52E-01	5.83E-05	2.00E-06	5.44E-03	**9.92E-01**
Ba-133	--	--	--	--	1.23E-06	--	--	1.11E-05	--	--	--	3.63E-07	1.07E-02	--	7.58E-06	**1.07E-02**
Ba-137m	3.05E+00	3.90E+00	--	1.85E+01	6.66E+03	8.12E+00	--	4.58E+00	--	1.97E-05	1.10E-02	3.48E+00	1.05E-02	6.64E+01	3.56E+02	**7.12E+03**
Bi-210	1.97E-04	1.42E-11	--	2.50E-12	1.41E-07	1.96E-05	7.64E-13	5.82E-01	1.68E-17	3.00E-12	5.11E-02	3.97E-01	7.17E-06	1.84E-02	1.18E-05	**1.05E+00**
Bi-211	1.43E-07	1.20E-09	8.87E-15	1.35E-10	3.46E-06	8.74E-04	1.46E-10	1.48E-01	3.69E-09	6.46E-10	1.05E-04	8.63E-02	4.65E-07	1.38E-03	2.69E-03	**2.39E-01**
Bi-212	1.75E-01	2.82E-18	--	1.01E-05	6.28E-04	7.91E-02	9.50E-05	3.79E-01	4.76E-10	3.73E-03	6.83E-03	1.00E+01	1.28E-09	5.53E-03	1.30E-02	**1.07E+01**
Bi-213	1.00E-02	6.36E-09	5.84E-12	1.82E-13	4.37E-04	6.96E-01	3.18E-06	1.25E-01	5.64E-07	6.02E-11	1.60E-03	1.51E-01	5.81E-05	2.00E-06	5.42E-03	**9.90E-01**
Bi-214	2.05E-03	2.01E-10	--	6.24E-11	7.78E-07	6.52E-05	1.93E-11	8.86E-01	4.46E-16	1.49E-10	1.10E-01	8.25E-01	7.96E-05	5.89E-02	5.82E-05	**1.88E+00**
Bk-249	--	--	--	--	--	--	--	2.12E-09	2.87E-09	1.94E-01	--	1.07E-06	--	--	--	**1.94E-01**
Bk-250	--	--	--	--	--	--	--	--	--	--	--	7.38E-12	--	--	--	**7.38E-12**
C-14	--	--	--	5.38E-04	1.66E+00	--	--	--	--	--	1.12E-04	2.54E-04	1.12E-05	--	--	**1.66E+00**
Cd-109	1.48E-02	--	--	--	--	--	--	6.03E-04	--	1.20E+00	--	3.47E-11	1.18E-08	1.44E-05	--	**1.22E+00**
Ce-139	--	--	--	--	--	--	--	--	--	--	--	3.75E-22	--	--	--	**3.75E-22**
Ce-141	--	--	--	--	--	--	--	--	--	--	--	7.09E-01	--	--	--	**7.09E-01**
Ce-144	--	--	--	--	--	--	--	7.58E-07	--	--	--	2.29E-01	--	1.01E-05	1.96E+01	**1.99E+01**
Cf-249	1.68E-01	--	--	7.71E-13	1.97E-05	--	--	9.00E-03	2.02E-03	2.16E+02	5.07E-03	5.35E-01	--	--	5.94E-03	**2.17E+02**
Cf-250	--	--	--	--	--	--	--	1.72E-05	--	8.89E-05	5.03E-02	4.49E-02	--	--	5.73E-02	**1.53E-01**
Cf-251	--	--	--	3.64E-14	--	--	--	1.56E-03	--	3.82E-04	--	3.96E-04	--	--	1.13E-02	**1.36E-02**
Cf-252	1.71E-04	--	--	--	--	1.07E-03	--	--	--	3.04E-01	1.28E-02	8.85E-01	1.91E-04	--	2.20E+01	**2.32E+01**
Cl-36	--	--	--	--	--	--	--	2.00E-03	--	--	--	--	3.52E-08	--	--	**2.00E-03**
Cm-242	--	--	--	--	--	--	--	2.35E-14	--	--	--	2.47E-01	--	3.87E-02	5.06E-01	**7.91E-01**
Cm-243	5.39E-01	--	--	4.12E-05	2.39E-04	6.26E-05	--	7.53E-01	3.21E-05	3.37E-02	7.74E-03	4.31E-02	--	4.24E-01	1.74E-01	**1.97E+00**
Cm-244	1.21E-01	--	--	2.21E-03	--	7.85E+00	--	7.20E+01	--	2.68E+02	3.05E+01	1.14E+03	1.39E-07	4.83E+00	1.49E+03	**3.02E+03**
Cm-245	4.13E-05	--	--	2.76E-07	3.22E-09	--	--	6.98E-04	8.30E-07	1.13E-02	1.07E-03	6.84E-03	--	--	1.59E-01	**1.79E-01**

Table 3-13. Unscaled CH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	Army	BAPL	Hanford-RL	INL	KAPL-NFS	LANL	LBL	LLNL	NTS	ORNL	RFETS	SNL-A	SRS	Total
Cm-246	--	--	--	4.70E-08	--	--	--	5.95E-02	4.99E-06	--	2.61E-04	1.38E+00	--	--	2.31E-01	**1.67E+00**
Cm-247	--	--	--	1.08E-13	--	--	--	1.01E-07	--	7.11E-07	--	6.96E-08	--	--	3.91E-02	**3.91E-02**
Cm-248	1.54E-09	--	--	1.95E-13	--	6.91E-07	--	--	1.96E-06	3.56E-03	1.84E-05	4.32E-02	8.59E-09	--	9.04E-05	**4.69E-02**
Cm-250	--	--	--	--	--	--	--	--	--	--	--	6.98E-11	--	--	--	**6.98E-11**
Co-60	2.41E-01	--	--	5.58E-01	3.77E-06	--	--	2.70E-02	--	3.85E-04	--	1.59E-02	5.25E-05	2.82E-02	1.41E-04	**8.71E-01**
Cs-134	3.23E-03	--	--	--	--	--	--	8.78E-09	--	--	--	1.29E-01	--	4.90E-03	7.59E+02	**7.59E+02**
Cs-137	3.26E+00	4.17E+00	--	1.98E+01	7.14E+03	8.68E+00	--	5.06E+00	--	1.12E+00	1.18E-02	5.40E+00	1.12E-02	7.10E+01	3.81E+02	**7.64E+03**
Es-254	--	--	--	--	--	--	--	--	--	--	--	3.56E-12	--	--	--	**3.56E-12**
Eu-150	--	--	--	--	--	--	--	--	--	--	--	2.26E-03	--	--	--	**2.26E-03**
Eu-152	3.53E-01	--	--	7.71E-01	1.42E-05	--	--	1.83E-05	7.74E-09	2.06E-01	3.30E-01	4.86E-01	6.70E-05	--	2.15E-04	**2.15E+00**
Eu-154	3.92E-03	--	--	6.85E-01	4.00E-05	--	--	3.64E-05	--	7.42E+04	1.09E-01	3.61E-01	4.92E-07	9.37E-02	1.09E+02	**7.43E+04**
Eu-155	--	--	--	--	--	--	--	2.16E-03	--	9.59E-05	--	1.98E-01	4.85E-08	1.03E-03	9.55E+05	**9.55E+05**
Fe-55	--	--	--	--	--	--	--	4.43E-07	--	--	--	--	1.24E-04	--	--	**1.25E-04**
Fr-221	1.00E-02	6.37E-09	5.85E-12	1.82E-13	4.37E-04	6.96E-01	3.19E-06	1.26E-01	5.64E-07	6.02E-11	1.60E-03	1.52E-01	5.82E-05	2.00E-06	5.43E-03	**9.91E-01**
Fr-223	1.98E-09	1.65E-11	1.23E-16	1.86E-12	4.78E-08	1.21E-05	2.02E-12	2.04E-03	5.10E-11	8.92E-12	1.46E-06	1.19E-03	6.42E-09	1.91E-05	3.70E-05	**3.30E-03**
Gd-152	1.99E-15	--	--	5.95E-15	1.02E-19	--	--	6.69E-19	7.66E-23	5.75E-19	1.99E-14	2.86E-14	3.77E-19	--	3.87E-19	**5.65E-14**
H-3	--	--	--	--	1.51E+00	--	--	1.70E+03	--	1.37E-06	1.82E-02	1.41E-03	7.52E+00	1.42E-02	3.72E+02	**2.08E+03**
Ho-166m	--	--	--	--	--	--	--	--	--	--	--	5.01E-05	--	--	--	**5.01E-05**
I-129	--	--	--	7.07E-06	--	--	--	1.20E-06	--	--	--	--	--	--	--	**8.27E-06**
K-40	3.93E-03	--	--	--	4.42E-04	3.12E-06	--	--	--	--	--	--	--	--	--	**4.38E-03**
Kr-85	--	--	--	--	--	--	--	--	--	--	4.92E-02	--	2.21E-05	2.44E-01	2.23E+02	**2.23E+02**
Mn-54	2.63E-03	--	--	--	--	--	--	--	--	--	--	5.76E-14	1.61E-11	--	--	**2.63E-03**
Na-22	3.41E-02	--	--	--	8.89E-05	--	--	1.44E-01	--	4.56E-05	--	5.24E-09	3.85E-04	--	2.52E-02	**2.03E-01**
Nb-93m	--	--	--	2.01E-04	--	--	--	--	--	--	--	--	--	--	--	**2.01E-04**
Nb-94	--	--	--	--	3.80E-06	--	--	--	--	--	--	--	--	--	1.21E-07	**3.92E-06**
Nb-95	--	--	--	--	--	--	--	1.17E-07	--	--	--	--	--	--	--	**1.17E-07**
Ni-59	--	--	--	7.77E-02	--	--	--	--	--	--	--	--	--	--	--	**7.77E-02**
Ni-63	--	--	--	3.67E+00	--	--	--	--	--	--	--	1.30E-04	1.21E-01	--	--	**3.79E+00**
Np-237	4.31E-01	2.16E-07	3.95E-05	5.73E-05	4.60E-01	3.17E+00	5.75E-05	8.43E-01	6.66E-05	7.97E-02	2.32E-02	5.17E-01	1.13E+00	1.41E-01	1.41E+01	**2.09E+01**
Np-238	--	--	--	--	--	--	--	--	--	--	--	--	--	2.32E-04	2.18E-03	**2.41E-03**
Np-239	1.86E+00	--	--	3.97E-05	5.97E-03	4.26E+01	--	1.92E+00	1.85E-04	1.56E-02	5.79E-01	2.80E+00	1.06E-02	1.36E-02	1.55E+01	**6.52E+01**
Np-240m	2.03E-17	--	--	6.79E-13	--	7.18E-14	--	2.99E-04	7.58E-14	--	4.52E-07	5.82E-06	1.82E-16	--	5.21E-13	**3.05E-04**
Pa-231	6.42E-07	9.94E-09	3.84E-14	2.24E-09	1.47E-05	2.46E-03	2.42E-09	1.53E-02	2.54E-08	1.12E-02	2.66E-04	1.79E-01	6.83E-06	5.63E-03	5.44E-04	**2.14E-01**
Pa-233	4.27E-01	2.14E-07	3.92E-05	5.68E-05	4.50E-01	3.09E+00	5.70E-05	8.32E-01	6.60E-05	7.32E-02	2.30E-02	5.12E-01	1.12E+00	1.39E-01	1.39E+01	**2.06E+01**
Pa-234	8.97E-05	2.69E-10	--	1.57E-10	1.45E-03	6.73E-02	2.91E-06	1.86E-03	2.52E-06	4.55E-06	8.16E-05	7.98E-05	1.82E-03	1.16E-05	3.27E-04	**7.31E-02**

Table 3-13. Unscaled CH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	Army	BAPL	Hanford-RL	INL	KAPL-NFS	LANL	LBL	LLNL	NTS	ORNL	RFETS	SNL-A	SRS	Total
Pa-234m	6.90E-02	2.07E-07	--	1.21E-07	1.11E+00	5.18E+01	2.24E-03	1.43E+00	1.93E-03	3.50E-03	6.27E-02	6.14E-02	1.40E+00	8.90E-03	2.52E-01	**5.62E+01**
Pb-209	1.00E-02	6.37E-09	5.85E-12	1.82E-13	4.37E-04	6.96E-01	3.19E-06	1.26E-01	5.65E-07	6.02E-11	1.60E-03	1.52E-01	5.82E-05	2.00E-06	5.43E-03	**9.91E-01**
Pb-210	1.99E-04	1.43E-11	--	2.53E-12	1.42E-07	1.98E-05	7.73E-13	5.89E-01	1.70E-17	3.04E-12	5.17E-02	4.02E-01	7.26E-06	1.86E-02	1.19E-05	**1.06E+00**
Pb-211	1.43E-07	1.20E-09	8.89E-15	1.35E-10	3.46E-06	8.75E-04	1.46E-10	1.48E-01	3.69E-09	6.46E-10	1.05E-04	8.64E-02	4.65E-07	1.39E-03	2.69E-03	**2.40E-01**
Pb-212	1.74E-01	2.82E-18	--	1.01E-05	6.26E-04	7.88E-02	9.47E-05	3.78E-01	4.75E-10	6.08E-18	6.80E-03	1.00E+01	1.28E-09	5.52E-03	1.30E-02	**1.07E+01**
Pb-214	2.05E-03	2.02E-10	--	6.25E-11	7.79E-07	6.53E-05	1.93E-11	8.88E-01	4.47E-16	1.50E-10	1.10E-01	8.27E-01	7.98E-05	5.89E-02	5.83E-05	**1.89E+00**
Pm-147	--	--	--	3.29E-01	--	--	--	1.53E-04	--	--	--	1.00E-02	5.34E-05	2.38E-01	5.41E+02	**5.42E+02**
Po-210	1.66E-04	1.43E-11	--	2.53E-12	1.42E-07	1.98E-05	7.73E-13	5.88E-01	1.70E-17	1.53E-12	5.16E-02	4.02E-01	5.96E-06	1.86E-02	1.18E-05	**1.06E+00**
Po-211	4.36E-10	3.65E-12	2.71E-17	4.11E-13	1.06E-08	2.67E-06	4.45E-13	4.51E-04	1.13E-11	1.97E-12	3.22E-07	2.63E-04	1.42E-09	4.23E-06	8.20E-06	**7.30E-04**
Po-212	1.11E-01	1.80E-18	--	6.44E-06	4.00E-04	5.04E-02	6.05E-05	2.41E-01	3.03E-10	3.88E-18	4.35E-03	6.39E+00	8.16E-10	3.53E-03	8.31E-03	**6.81E+00**
Po-213	9.81E-03	6.23E-09	5.72E-12	1.78E-13	4.28E-04	6.81E-01	3.12E-06	1.23E-01	5.52E-07	5.89E-11	1.56E-03	1.48E-01	5.69E-05	1.96E-06	5.31E-03	**9.70E-01**
Po-214	2.05E-03	2.02E-10	--	6.24E-11	7.79E-07	6.53E-05	1.93E-11	8.87E-01	4.47E-16	1.50E-10	1.10E-01	8.26E-01	7.97E-05	5.89E-02	5.83E-05	**1.88E+00**
Po-215	1.43E-07	1.20E-09	8.88E-15	1.35E-10	3.46E-06	8.75E-04	1.46E-10	1.48E-01	3.69E-09	6.46E-10	1.06E-04	8.64E-02	4.65E-07	1.39E-03	2.69E-03	**2.40E-01**
Po-216	1.74E-01	2.81E-18	--	1.01E-05	6.26E-04	7.88E-02	9.47E-05	3.77E-01	4.74E-10	6.07E-18	6.80E-03	1.00E+01	1.28E-09	5.51E-03	1.30E-02	**1.07E+01**
Po-218	2.02E-03	1.98E-10	--	6.14E-11	7.66E-07	6.42E-05	1.90E-11	8.72E-01	4.39E-16	1.47E-10	1.08E-01	8.12E-01	7.84E-05	5.79E-02	5.73E-05	**1.85E+00**
Pr-144	--	--	--	--	--	--	--	7.43E-07	--	--	--	9.22E-09	--	9.89E-06	1.92E+01	**1.92E+01**
Pu-236	4.05E-08	--	--	--	--	5.66E-05	--	2.38E-11	--	8.89E-04	--	7.69E-13	--	--	--	**9.45E-04**
Pu-238	7.49E+01	1.10E+02	--	9.16E-01	1.18E+05	7.90E+04	7.24E+00	1.93E+05	4.40E-05	1.31E+03	1.34E+02	2.76E+03	1.06E+04	1.87E+00	1.07E+06	**1.48E+06**
Pu-239	2.13E+02	8.85E+01	5.05E-03	7.37E-04	5.83E+04	8.38E+04	8.90E+01	8.80E+04	7.90E-04	8.23E+02	1.83E+03	1.12E+03	2.23E+05	7.98E+00	1.80E+04	**4.75E+05**
Pu-240	1.27E+02	5.32E-01	--	1.51E-03	1.65E+04	2.02E+04	3.00E+01	1.36E+04	1.95E-04	2.33E+02	1.78E+02	1.22E+03	5.60E+04	1.16E+00	4.39E+03	**1.12E+05**
Pu-241	1.94E+02	3.32E-01	--	1.33E-01	2.82E+05	1.24E+05	1.29E+02	3.58E+05	7.86E-05	3.05E+03	2.39E+03	4.04E+04	6.12E+05	1.11E+01	1.55E+05	**1.58E+06**
Pu-242	5.81E-02	6.71E-06	--	1.17E-05	3.92E+00	1.62E+00	2.32E-04	2.17E+01	1.71E-05	6.05E-02	5.37E-02	6.13E-01	6.08E+00	7.60E-05	4.88E+00	**3.89E+01**
Pu-243	--	--	--	1.06E-13	--	--	--	9.98E-08	--	--	--	6.88E-08	--	--	3.86E-02	**3.86E-02**
Pu-244	2.01E-17	--	--	6.73E-13	--	7.11E-14	--	2.96E-04	7.51E-14	--	4.47E-07	5.76E-06	1.81E-16	--	5.16E-13	**3.03E-04**
Ra-223	1.45E-07	1.21E-09	8.98E-15	1.36E-10	3.50E-06	8.85E-04	1.48E-10	1.50E-01	3.73E-09	6.53E-10	1.07E-04	8.73E-02	4.71E-07	1.40E-03	2.72E-03	**2.42E-01**
Ra-224	1.74E-01	2.81E-18	--	1.01E-05	6.25E-04	7.87E-02	9.45E-05	3.77E-01	4.74E-10	6.07E-18	6.79E-03	9.99E+00	1.27E-09	5.51E-03	1.30E-02	**1.06E+01**
Ra-225	1.00E-02	6.37E-09	5.85E-12	1.82E-13	4.38E-04	6.97E-01	3.19E-06	1.26E-01	5.65E-07	6.03E-11	1.60E-03	1.52E-01	5.82E-05	2.00E-06	5.43E-03	**9.92E-01**
Ra-226	2.08E-03	2.04E-10	--	6.32E-11	7.88E-07	6.69E-05	1.95E-11	8.97E-01	4.52E-16	1.51E-10	1.11E-01	8.36E-01	8.07E-05	5.96E-02	5.90E-05	**1.91E+00**
Ra-228	2.73E-05	7.53E-18	--	3.52E-14	1.98E-04	3.12E-01	6.51E-06	2.68E-03	9.79E-10	3.75E-17	3.19E-15	9.43E-04	1.42E-09	5.20E-03	8.25E-04	**3.22E-01**
Rh-106	--	--	--	--	--	--	--	7.51E-10	--	--	--	2.57E-06	--	6.87E-06	8.57E+01	**8.57E+01**
Rn-219	1.43E-07	1.20E-09	8.87E-15	1.35E-10	3.46E-06	8.74E-04	1.46E-10	1.48E-01	3.69E-09	6.46E-10	1.05E-04	8.63E-02	4.65E-07	1.38E-03	2.69E-03	**2.39E-01**
Rn-220	1.74E-01	2.81E-18	--	1.01E-05	6.26E-04	7.88E-02	9.47E-05	3.77E-01	4.74E-10	6.07E-18	6.80E-03	1.00E+01	1.28E-09	5.51E-03	1.30E-02	**1.07E+01**
Rn-222	2.06E-03	2.02E-10	--	6.25E-11	7.80E-07	6.53E-05	1.93E-11	8.88E-01	4.47E-16	1.50E-10	1.10E-01	8.27E-01	7.98E-05	5.90E-02	5.84E-05	**1.89E+00**
Ru-103	--	--	--	--	--	--	--	--	--	--	--	3.34E-01	--	--	--	**3.34E-01**
Ru-106	--	--	--	--	--	--	--	7.58E-10	--	--	--	1.51E+00	--	6.95E-06	8.66E+01	**8.81E+01**

Table 3-13. Unscaled CH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	Army	BAPL	Hanford-RL	INL	KAPL-NFS	LANL	LBL	LLNL	NTS	ORNL	RFETS	SNL-A	SRS	Total
Sb-125	5.73E-06	--	--	--	--	--	--	1.53E-04	--	2.12E-06	--	8.95E-02	1.32E-08	--	5.69E-03	**9.54E-02**
Sb-126	--	--	--	1.36E-05	--	--	--	--	--	--	--	--	--	--	--	**1.36E-05**
Sb-126m	--	--	--	9.72E-05	--	--	--	--	--	--	--	--	--	--	--	**9.72E-05**
Sc-46	--	--	--	--	--	--	--	2.34E-25	--	--	--	--	--	--	--	**2.34E-25**
Se-75	--	--	--	--	--	--	--	--	--	--	--	--	1.06E-09	--	--	**1.06E-09**
Se-79	--	--	--	1.34E-04	--	--	--	--	--	--	--	--	--	--	--	**1.34E-04**
Sm-147	--	--	--	1.51E-11	--	--	--	2.12E-12	--	--	--	6.31E-11	1.58E-15	5.71E-11	4.35E-09	**4.49E-09**
Sm-151	--	--	--	1.01E-01	--	--	--	7.64E-04	--	--	--	1.17E-01	--	2.65E-01	2.97E+00	**3.45E+00**
Sn-126	--	--	--	9.73E-05	--	--	--	--	--	--	--	--	--	--	--	**9.73E-05**
Sr-90	2.92E+00	2.07E+01	--	1.98E+01	1.20E+03	7.18E-03	--	2.08E+00	--	3.02E+00	4.25E-04	3.04E+01	3.34E-02	6.69E+01	3.80E+02	**1.72E+03**
Tc-99	2.53E+00	--	--	4.76E-03	4.50E-04	--	1.41E-02	--	--	6.04E-05	--	9.35E+00	6.02E-08	1.59E-03	--	**1.19E+01**
Te-123	--	--	--	--	--	--	--	--	--	--	--	2.17E-18	--	--	--	**2.17E-18**
Te-123m	--	--	--	--	--	--	--	--	--	--	--	2.02E-22	--	--	--	**2.02E-22**
Te-125m	1.39E-06	--	--	--	--	--	--	3.70E-05	--	--	--	2.80E-04	3.19E-09	--	5.32E+00	**5.32E+00**
Th-227	1.41E-07	1.18E-09	8.75E-15	1.33E-10	3.41E-06	8.61E-04	1.44E-10	1.46E-01	3.63E-09	6.36E-10	1.04E-04	8.51E-02	4.58E-07	1.36E-03	2.65E-03	**2.36E-01**
Th-228	1.76E-01	2.85E-18	--	1.02E-05	6.33E-04	7.97E-02	9.57E-05	3.82E-01	4.80E-10	2.88E-04	6.88E-03	1.01E+01	1.29E-09	5.57E-03	1.31E-02	**1.08E+01**
Th-229	1.00E-02	6.38E-09	5.86E-12	1.82E-13	4.38E-04	6.98E-01	3.19E-06	1.26E-01	5.66E-07	2.90E-04	1.60E-03	1.52E-01	5.83E-05	2.00E-06	5.44E-03	**9.94E-01**
Th-230	2.96E-06	1.45E-07	--	7.29E-08	1.86E-04	8.11E-03	2.30E-08	1.06E-01	6.26E-13	6.77E-05	7.13E-06	6.35E-03	8.24E-05	1.52E-05	9.80E-03	**1.30E-01**
Th-231	2.85E-03	5.63E-05	1.33E-10	2.61E-05	7.48E-02	5.34E+00	2.85E-05	7.90E-02	7.81E-09	4.91E-04	9.89E-01	5.00E-03	8.27E-02	1.21E-02	3.66E-02	**6.62E+00**
Th-232	2.69E-05	2.71E-17	--	1.17E-13	4.33E-03	1.43E+00	1.65E-05	2.48E-03	2.08E-09	1.17E-06	6.64E-15	9.12E-04	4.56E-09	4.65E-03	4.07E-03	**1.45E+00**
Th-234	6.91E-02	2.07E-07	--	1.21E-07	1.11E+00	5.19E+01	2.24E-03	1.44E+00	1.94E-03	3.50E-03	6.28E-02	6.15E-02	1.40E+00	8.91E-03	2.52E-01	**5.63E+01**
Tl-204	--	--	--	--	--	--	--	--	--	--	--	1.53E-06	1.29E-06	--	--	**2.82E-06**
Tl-207	1.42E-07	1.19E-09	8.84E-15	1.34E-10	3.44E-06	8.70E-04	1.45E-10	1.47E-01	3.67E-09	6.43E-10	1.05E-04	8.59E-02	4.63E-07	1.38E-03	2.67E-03	**2.38E-01**
Tl-208	6.27E-02	1.01E-18	--	3.63E-06	2.25E-04	2.84E-02	3.41E-05	1.36E-01	1.71E-10	1.95E-03	2.45E-03	3.60E+00	4.60E-10	1.99E-03	4.68E-03	**3.84E+00**
Tl-209	2.20E-04	1.40E-10	1.29E-13	4.00E-15	9.62E-06	1.53E-02	7.01E-08	2.76E-03	1.24E-08	1.32E-12	3.51E-05	3.34E-03	1.28E-06	4.39E-08	1.19E-04	**2.18E-02**
U-232	1.71E-01	--	--	1.31E-05	8.53E-04	1.61E-04	9.09E-05	3.69E-01	--	4.75E-03	6.68E-03	9.82E+00	--	--	2.60E-02	**1.04E+01**
U-233	9.09E-02	8.19E-06	4.63E-09	9.72E-10	5.63E+00	4.94E+02	8.52E-03	4.26E+01	1.21E-03	1.44E+00	1.29E+00	7.72E+01	1.07E-01	2.38E-03	2.35E+00	**6.25E+02**
U-234	8.83E-02	3.26E-03	--	2.03E-03	1.12E+01	3.27E+01	6.82E-04	1.83E+01	2.78E-08	3.11E-02	1.16E-01	2.02E+01	2.20E+00	1.88E-01	7.23E+01	**1.57E+02**
U-235	2.89E-03	5.70E-05	1.35E-10	2.65E-05	9.27E-01	6.41E+00	2.89E-05	8.00E-02	7.91E-09	1.28E-03	1.00E+00	5.07E-03	8.37E-02	1.23E-02	3.72E-02	**8.56E+00**
U-236	4.26E-05	1.31E-07	--	3.02E-04	1.98E-03	9.36E-01	3.55E-06	8.74E-03	2.90E-11	9.97E-06	2.20E-05	1.78E-01	9.73E-03	1.34E-07	9.02E-02	**1.23E+00**
U-237	4.77E-03	8.15E-06	--	3.26E-06	4.11E+00	2.88E+00	3.18E-03	8.78E+00	1.93E-09	5.30E-02	5.88E-02	9.93E-01	1.50E+01	1.36E-04	3.80E+00	**3.57E+01**
U-238	6.98E-02	2.09E-07	--	1.22E-07	1.66E+00	5.24E+01	2.26E-03	1.45E+00	1.95E-03	6.91E-03	6.34E-02	6.20E-02	1.42E+00	9.00E-03	2.54E-01	**5.74E+01**
U-240	1.99E-17	--	--	6.66E-13	--	7.04E-14	--	2.93E-04	7.43E-14	--	4.43E-07	5.70E-06	1.79E-16	--	5.11E-13	**2.99E-04**
Y-90	2.88E+00	2.04E+01	--	1.95E+01	1.18E+03	6.06E-03	--	1.92E+00	--	3.02E+00	4.20E-04	1.78E+01	3.30E-02	6.61E+01	3.76E+02	**1.68E+03**

Table 3-13. Unscaled CH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	Army	BAPL	Hanford-RL	INL	KAPL-NFS	LANL	LBL	LLNL	NTS	ORNL	RFETS	SNL-A	SRS	Total
Zn-65	4.99E-04	--	--	--	--	--	--	3.85E-08	--	--	--	4.99E-13	--	--	--	**4.99E-04**
Zr-93	--	--	--	1.14E-03	--	--	--	--	--	--	--	--	--	--	--	**1.14E-03**
Zr-95	--	--	--	--	--	--	--	--	--	--	--	1.81E-01	--	--	--	**1.81E-01**
Total	**7.36E+02**	**2.48E+02**	**5.13E-03**	**8.49E+01**	**5.11E+05**	**4.83E+05**	**3.00E+02**	**7.23E+05**	**2.72E-02**	**8.54E+04**	**4.94E+03**	**5.00E+04**	**1.02E+06**	**3.09E+02**	**2.21E+06**	**5.09E+06**

[1] Data Source: CID Data Version D.6.06, LANL-CO 2008.

Table 3-14. Unscaled RH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1]

Nuclide	ANL-E	ANL-W (MFC)	BAPL	Hanford	INL	KAPL-S	LANL	ORNL	SNL-A	SRS	Total
Ac-225	1.91E-07	1.46E-04	3.10E-02	2.98E-09	2.33E-06	1.29E-09	3.37E-13	5.67E+00	6.37E-11	1.36E-09	**5.70E+00**
Ac-227	1.33E-08	8.01E-08	1.11E-01	1.28E-05	1.70E-08	6.39E-08	1.75E-06	4.25E+01	5.83E-08	9.59E-10	**4.26E+01**
Ac-228	5.37E-16	1.11E-15	2.56E-03	2.31E-05	1.12E-14	4.28E-11	7.79E-15	3.04E+00	2.66E-17	8.85E-14	**3.04E+00**
Ag-110	--	--	--	--	--	--	--	2.89E-13	--	--	**2.89E-13**
Ag-110m	--	--	--	--	--	--	--	2.20E-11	--	--	**2.20E-11**
Am-241	3.64E+00	8.50E+00	4.15E+00	1.71E+04	2.06E+03	3.72E-02	2.18E+00	1.32E+03	9.07E+01	7.46E+01	**2.07E+04**
Am-242	--	1.61E-03	6.76E-03	7.16E-04	--	--	--	--	--	1.80E-01	**1.89E-01**
Am-242m	--	1.64E-03	6.88E-03	7.28E-04	--	--	--	--	--	1.83E-01	**1.93E-01**
Am-243	1.13E-05	1.72E-04	2.60E-02	1.24E-01	--	6.14E-05	--	5.42E-02	--	1.41E+00	**1.61E+00**
At-217	1.91E-07	1.46E-04	3.10E-02	2.98E-09	2.34E-06	1.29E-09	3.37E-13	5.67E+00	6.37E-11	1.37E-09	**5.71E+00**
Ba-133	--	--	4.64E-07	--	--	--	--	--	--	--	**4.64E-07**
Ba-137m	1.39E+01	8.58E+03	1.15E+04	1.75E+05	1.46E+03	7.66E+01	1.49E+03	6.25E+04	1.78E+03	1.76E+03	**2.64E+05**
Bi-210	4.20E-11	9.01E-11	9.06E-06	6.01E-09	1.04E-09	4.02E-09	5.69E-10	5.01E-06	4.26E-10	4.53E-11	**1.41E-05**
Bi-211	1.31E-08	7.90E-08	1.09E-01	1.26E-05	1.68E-08	6.32E-08	1.72E-06	4.21E+01	5.76E-08	9.47E-10	**4.22E+01**
Bi-212	5.40E-16	3.45E-16	5.25E+00	5.54E-06	7.54E-15	3.24E-05	7.82E-15	1.19E+01	1.29E-17	3.75E-04	**1.72E+01**
Bi-213	1.90E-07	1.45E-04	3.10E-02	2.97E-09	2.33E-06	1.29E-09	3.37E-13	5.66E+00	6.36E-11	1.36E-09	**5.69E+00**
Bi-214	2.07E-10	7.65E-10	1.54E-05	3.45E-08	1.25E-08	1.39E-08	2.49E-09	3.63E-05	4.90E-09	5.78E-10	**5.18E-05**
C-14	--	--	3.32E-06	1.14E-07	--	2.16E-03	--	2.16E+00	--	--	**2.17E+00**
Cd-113m	1.75E-01	--	--	2.68E-02	--	--	--	--	--	--	**2.02E-01**
Ce-144	2.04E-11	3.25E+01	--	5.62E+02	--	--	--	1.52E-06	--	--	**5.94E+02**
Cf-249	--	--	--	--	--	4.61E-12	--	8.03E-03	--	--	**8.03E-03**
Cf-250	--	--	--	--	--	--	--	2.05E-01	--	--	**2.05E-01**
Cf-251	--	--	--	--	--	5.85E-14	--	1.37E-04	--	--	**1.37E-04**
Cf-252	--	--	--	--	--	7.59E-16	--	7.22E-02	--	--	**7.22E-02**
Cm-242	1.11E-24	1.36E-03	5.72E-03	1.21E-01	1.32E-11	--	--	2.67E-15	--	1.50E-01	**2.78E-01**
Cm-243	--	4.67E-05	1.16E-02	1.27E+00	--	1.59E-05	--	9.25E+01	1.46E-01	3.42E-01	**9.42E+01**
Cm-244	5.72E-02	1.59E-03	5.69E-01	4.83E+00	1.25E-02	1.51E-03	--	4.14E+03	1.53E+00	7.61E+01	**4.22E+03**
Cm-245	--	--	8.86E-07	--	--	5.68E-07	--	1.41E-05	--	1.71E-02	**1.71E-02**
Cm-246	--	--	--	--	--	7.39E-08	--	5.88E-01	--	1.28E-02	**6.01E-01**
Cm-247	--	--	--	--	--	1.74E-13	--	1.29E-10	--	2.56E-08	**2.57E-08**
Cm-248	--	--	--	--	--	3.45E-13	--	1.71E-03	--	5.87E-07	**1.71E-03**
Co-60	4.74E-02	6.11E+00	--	6.25E+01	5.81E-02	--	2.92E-01	1.83E+02	8.39E-02	2.68E+02	**5.20E+02**
Cs-134	8.22E-06	1.52E+02	9.29E-01	1.01E+00	5.73E-05	--	--	7.56E-01	1.81E+01	9.67E-05	**1.72E+02**

Table 3-14. Unscaled RH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	BAPL	Hanford	INL	KAPL-S	LANL	ORNL	SNL-A	SRS	Total
Cs-135	--	--	9.01E-03	7.18E-04	--	4.69E-04	--	--	--	--	**1.02E-02**
Cs-137	1.48E+01	9.15E+03	1.22E+04	6.43E+05	1.55E+03	8.19E+01	1.59E+03	6.68E+04	1.91E+03	1.88E+03	**7.39E+05**
Eu-152	5.05E-05	--	4.23E-02	9.22E-03	3.31E-03	--	--	1.10E+04	--	9.35E-03	**1.10E+04**
Eu-154	2.13E-03	1.02E+02	1.27E+02	1.51E+00	1.09E-01	--	--	2.21E+03	3.98E+00	2.96E-01	**2.45E+03**
Eu-155	2.10E-03	2.47E+02	2.66E-01	4.95E-01	1.64E-02	--	1.28E+00	1.64E+02	--	--	**4.13E+02**
Fe-55	1.87E-02	--	--	5.26E-02	--	--	--	--	--	--	**7.13E-02**
Fr-221	1.91E-07	1.45E-04	3.10E-02	2.97E-09	2.33E-06	1.29E-09	3.37E-13	5.66E+00	6.36E-11	1.36E-09	**5.70E+00**
Fr-223	1.81E-10	1.09E-09	1.51E-03	1.74E-07	2.33E-10	8.71E-10	2.38E-08	5.80E-01	7.96E-10	1.31E-11	**5.82E-01**
Gd-152	6.64E-18	--	7.54E-17	1.65E-17	9.52E-17	--	--	7.22E-10	--	5.27E-17	**7.22E-10**
H-3	--	2.61E-04	2.20E+01	2.74E-01	2.29E-05	--	--	--	--	--	**2.23E+01**
Ho-166m	--	--	2.04E-07	--	--	--	--	--	--	--	**2.04E-07**
I-129	--	--	5.77E-03	2.42E-03	--	4.28E-05	--	5.43E-07	--	--	**8.23E-03**
Kr-81	--	--	1.80E-07	--	--	--	--	--	--	--	**1.80E-07**
Kr-85	1.13E-01	--	2.17E+02	--	--	--	--	--	--	--	**2.17E+02**
Mn-54	3.49E-11	4.07E-03	--	--	1.37E-07	--	--	--	--	--	**4.07E-03**
Mo-93	--	--	--	2.81E-03	--	--	--	--	--	--	**2.81E-03**
Na-22	--	2.96E-02	--	--	--	--	--	--	--	--	**2.96E-02**
Nb-93m	3.49E-04	--	6.11E-01	1.83E-04	--	6.45E-04	--	--	--	--	**6.13E-01**
Nb-94	--	--	1.89E-05	--	--	--	--	--	--	--	**1.89E-05**
Ni-59	--	--	--	1.84E-02	--	2.03E-04	--	3.91E-01	--	--	**4.09E-01**
Ni-63	--	--	--	1.60E-02	--	2.14E-02	--	4.35E+01	--	--	**4.35E+01**
Np-237	5.98E-04	6.61E-04	3.60E-02	7.77E-01	1.18E-02	9.93E-04	1.17E-05	8.07E-02	3.99E-03	1.62E-02	**9.28E-01**
Np-238	--	8.11E-06	3.40E-05	3.60E-06	--	--	--	--	--	9.06E-04	**9.51E-04**
Np-239	1.12E-05	1.70E-04	2.56E-02	1.77E-04	--	6.07E-05	--	5.35E-02	--	1.39E+00	**1.47E+00**
Np-240m	--	--	--	--	--	2.02E-12	--	2.75E-10	--	1.32E-13	**2.77E-10**
Pa-231	3.64E-08	5.04E-07	1.74E-01	3.86E-04	5.95E-08	1.20E-07	5.30E-06	3.20E-03	4.47E-07	2.06E-08	**1.78E-01**
Pa-233	5.92E-04	6.55E-04	3.56E-02	9.10E-02	1.17E-02	9.84E-04	1.15E-05	8.00E-02	3.95E-03	1.61E-02	**2.41E-01**
Pa-234	2.80E-08	3.31E-07	7.92E-08	3.94E-05	5.84E-10	4.74E-10	5.26E-08	6.81E-02	1.01E-06	8.08E-06	**6.81E-02**
Pa-234m	2.16E-05	2.55E-04	6.09E-05	3.03E-02	4.49E-07	3.65E-07	4.04E-05	5.24E+01	7.75E-04	6.22E-03	**5.24E+01**
Pb-209	1.91E-07	1.45E-04	3.10E-02	2.97E-09	2.33E-06	1.29E-09	3.37E-13	5.67E+00	6.37E-11	1.36E-09	**5.70E+00**
Pb-210	4.25E-11	9.12E-11	9.17E-06	6.08E-09	1.05E-09	4.07E-09	5.75E-10	5.07E-06	4.31E-10	4.58E-11	**1.42E-05**
Pb-211	1.31E-08	7.92E-08	1.10E-01	1.26E-05	1.69E-08	6.32E-08	1.73E-06	4.21E+01	5.76E-08	9.48E-10	**4.22E+01**
Pb-212	5.38E-16	3.44E-16	5.23E+00	5.52E-06	7.52E-15	3.23E-05	7.80E-15	1.19E+01	1.29E-17	3.73E-04	**1.71E+01**
Pb-214	2.07E-10	7.66E-10	1.55E-05	3.45E-08	1.26E-08	1.40E-08	2.49E-09	3.64E-05	4.91E-09	5.79E-10	**5.19E-05**

Table 3-14. Unscaled RH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	BAPL	Hanford	INL	KAPL-S	LANL	ORNL	SNL-A	SRS	Total
Pd-107	--	--	2.76E-04	4.65E-05	--	1.96E-05	--	--	--	--	**3.42E-04**
Pm-146	--	--	4.27E-07	--	--	--	--	--	--	--	**4.27E-07**
Pm-147	3.77E-03	2.63E+02	1.30E+01	1.06E+01	--	2.40E-02	1.35E-01	3.22E-02	1.04E+01	--	**2.97E+02**
Po-210	4.25E-11	9.07E-11	8.98E-06	6.08E-09	1.05E-09	4.07E-09	5.75E-10	5.07E-06	4.31E-10	4.12E-11	**1.41E-05**
Po-211	4.00E-11	2.41E-10	3.34E-04	3.85E-08	5.14E-11	1.93E-10	5.26E-09	1.28E-01	1.76E-10	2.89E-12	**1.29E-01**
Po-212	3.44E-16	2.20E-16	3.34E+00	3.53E-06	4.81E-15	2.06E-05	4.98E-15	7.60E+00	8.22E-18	2.39E-04	**1.09E+01**
Po-213	1.87E-07	1.42E-04	3.03E-02	2.91E-09	2.28E-06	1.26E-09	3.30E-13	5.55E+00	6.23E-11	1.33E-09	**5.58E+00**
Po-214	2.07E-10	7.66E-10	1.55E-05	3.45E-08	1.26E-08	1.40E-08	2.49E-09	3.63E-05	4.91E-09	5.79E-10	**5.19E-05**
Po-215	1.31E-08	7.92E-08	1.10E-01	1.26E-05	1.69E-08	6.33E-08	1.73E-06	4.21E+01	5.77E-08	9.48E-10	**4.23E+01**
Po-216	5.38E-16	3.43E-16	5.23E+00	5.52E-06	7.51E-15	3.23E-05	7.79E-15	1.19E+01	1.29E-17	3.73E-04	**1.71E+01**
Po-218	2.04E-10	7.53E-10	1.52E-05	3.39E-08	1.23E-08	1.37E-08	2.45E-09	3.57E-05	4.83E-09	5.69E-10	**5.10E-05**
Pr-144	2.00E-11	3.18E+01	--	5.50E+02	--	--	--	1.48E-06	--	--	**5.82E+02**
Pu-236	--	--	1.06E-07	--	--	--	--	--	--	--	**1.06E-07**
Pu-238	3.18E+00	3.90E-01	2.88E+02	1.44E+03	4.66E+03	3.20E+00	1.28E+00	1.26E+03	1.75E+01	6.61E+01	**7.73E+03**
Pu-239	6.27E+00	6.81E+00	5.02E-01	1.09E+03	6.24E+02	8.82E-03	2.45E+02	8.74E+02	1.21E+01	1.18E+01	**2.87E+03**
Pu-240	1.37E+00	8.18E+00	5.63E-01	3.62E+02	2.21E+02	2.21E-03	2.53E+00	9.56E+01	1.82E+00	1.43E+01	**7.07E+02**
Pu-241	8.79E+00	2.93E+02	3.73E+01	2.14E+05	2.29E+03	2.58E-01	2.51E+01	1.16E+03	8.76E-02	8.93E+02	**2.19E+05**
Pu-242	--	1.76E-04	3.99E-03	2.23E-01	3.20E-02	8.42E-06	1.52E-03	3.92E-01	--	3.83E-02	**6.91E-01**
Pu-243	--	--	--	--	--	1.72E-13	--	1.28E-10	--	2.53E-08	**2.54E-08**
Pu-244	--	--	--	--	--	2.00E-12	--	2.72E-10	--	1.31E-13	**2.74E-10**
Ra-223	1.33E-08	8.00E-08	1.11E-01	1.28E-05	1.70E-08	6.39E-08	1.74E-06	4.26E+01	5.83E-08	9.59E-10	**4.27E+01**
Ra-224	5.37E-16	3.43E-16	5.22E+00	5.51E-06	7.50E-15	3.22E-05	7.78E-15	1.19E+01	1.28E-17	3.73E-04	**1.71E+01**
Ra-225	1.91E-07	1.46E-04	3.10E-02	2.98E-09	2.33E-06	1.29E-09	3.37E-13	5.67E+00	6.37E-11	1.36E-09	**5.70E+00**
Ra-226	2.09E-10	7.75E-10	1.56E-05	3.49E-08	1.27E-08	1.41E-08	2.52E-09	3.68E-05	4.97E-09	5.86E-10	**5.25E-05**
Ra-228	6.34E-16	1.31E-15	3.02E-03	2.72E-05	1.32E-14	5.05E-11	9.19E-15	3.59E+00	3.14E-17	1.04E-13	**3.59E+00**
Rb-87	--	--	9.68E-07	--	--	--	--	--	--	--	**9.68E-07**
Rh-106	8.15E-09	--	1.51E-05	6.81E+02	--	--	1.87E-07	2.05E-04	--	--	**6.81E+02**
Rn-219	1.31E-08	7.91E-08	1.09E-01	1.26E-05	1.68E-08	6.32E-08	1.72E-06	4.21E+01	5.76E-08	9.47E-10	**4.22E+01**
Rn-220	5.38E-16	3.44E-16	5.23E+00	5.52E-06	7.51E-15	3.23E-05	7.79E-15	1.19E+01	1.29E-17	3.73E-04	**1.71E+01**
Rn-222	2.07E-10	7.67E-10	1.55E-05	3.46E-08	1.26E-08	1.40E-08	2.49E-09	3.64E-05	4.91E-09	5.80E-10	**5.19E-05**
Ru-106	8.23E-09	--	1.52E-05	6.88E+02	--	--	1.89E-07	2.08E-04	--	--	**6.88E+02**
Sb-125	4.84E-04	4.92E-01	5.38E-01	1.37E+00	--	--	1.40E-01	7.02E-04	--	1.31E-03	**2.54E+00**
Sb-126	4.35E-05	--	4.61E-03	8.97E-05	--	5.48E-05	--	--	--	--	**4.80E-03**
Sb-126m	3.11E-04	--	3.29E-02	6.40E-04	--	3.91E-04	--	--	--	--	**3.43E-02**

Table 3-14. Unscaled RH Radionuclides (Ci) on a Site Basis Decayed Through 2006[1] Continued

Nuclide	ANL-E	ANL-W (MFC)	BAPL	Hanford	INL	KAPL-S	LANL	ORNL	SNL-A	SRS	Total
Se-79	--	--	9.19E-02	4.26E-04	--	1.20E-04	--	--	--	--	**9.24E-02**
Sm-146	--	--	1.14E-15	--	--	--	--	--	--	--	**1.14E-15**
Sm-147	3.33E-10	7.80E-09	9.67E-11	7.84E-11	--	1.61E-12	4.15E-09	2.02E-10	2.48E-09	--	**1.51E-08**
Sm-151	6.93E-01	1.15E+01	5.12E+01	3.59E+02	--	1.31E+00	--	--	--	--	**4.24E+02**
Sn-121m	--	--	4.42E-02	9.26E-05	--	3.31E-03	--	--	--	--	**4.76E-02**
Sn-126	3.11E-04	--	3.30E-02	6.41E-04	--	3.92E-04	--	--	--	--	**3.43E-02**
Sr-90	8.35E+00	1.10E+04	1.21E+04	4.35E+05	1.15E+03	7.78E+01	1.43E+03	1.78E+05	1.90E+03	1.20E+03	**6.42E+05**
Tc-99	3.81E-03	--	3.02E+00	1.57E+01	--	2.46E-02	--	1.35E+02	--	3.73E-01	**1.54E+02**
Te-125m	1.17E-04	1.19E-01	1.28E-01	3.26E-01	--	--	3.41E-02	1.70E-04	--	3.17E-04	**6.08E-01**
Th-227	1.29E-08	7.79E-08	1.08E-01	1.24E-05	1.66E-08	6.23E-08	1.70E-06	4.15E+01	5.68E-08	9.34E-10	**4.16E+01**
Th-228	5.44E-16	3.47E-16	5.29E+00	5.58E-06	7.60E-15	3.27E-05	7.88E-15	1.20E+01	1.30E-17	3.78E-04	**1.73E+01**
Th-229	1.91E-07	1.46E-04	3.11E-02	2.98E-09	2.34E-06	1.29E-09	3.38E-13	5.68E+00	6.38E-11	1.37E-09	**5.71E+00**
Th-230	4.60E-08	3.18E-07	1.28E-03	9.47E-06	7.76E-06	1.82E-06	4.36E-07	1.31E-02	2.55E-06	6.56E-07	**1.44E-02**
Th-231	5.50E-05	2.81E-03	8.76E-03	5.73E-03	1.31E-04	8.30E-05	9.19E-03	1.32E+00	2.32E-03	3.20E-04	**1.34E+00**
Th-232	9.67E-16	7.72E-15	3.02E-03	2.38E-04	2.85E-14	4.83E-11	1.22E-14	3.52E+00	1.08E-16	6.37E-13	**3.53E+00**
Th-234	2.16E-05	2.55E-04	6.10E-05	3.04E-02	4.50E-07	3.65E-07	4.05E-05	5.24E+01	7.76E-04	6.22E-03	**5.25E+01**
Tl-207	1.30E-08	7.87E-08	1.09E-01	1.26E-05	1.68E-08	6.29E-08	1.72E-06	4.19E+01	5.73E-08	9.43E-10	**4.20E+01**
Tl-208	1.94E-16	1.24E-16	1.88E+00	1.99E-06	2.71E-15	1.16E-05	2.81E-15	4.28E+00	4.63E-18	1.34E-04	**6.16E+00**
Tl-209	4.19E-09	3.20E-06	6.82E-04	6.54E-11	5.13E-08	2.83E-11	7.41E-15	1.25E-01	1.40E-12	3.00E-11	**1.25E-01**
U-232	--	--	1.71E+01	5.77E-06	--	3.83E-05	--	1.03E+01	--	5.62E-04	**2.74E+01**
U-233	6.59E-05	1.20E-01	1.10E+01	5.11E+00	2.56E-01	4.70E-07	5.03E-10	4.24E+02	1.51E-07	2.01E-06	**4.40E+02**
U-234	3.17E-04	4.32E-03	1.54E+00	3.46E+00	6.12E-01	5.65E-03	1.85E-03	2.70E+01	3.18E-02	2.31E-02	**3.26E+01**
U-235	5.57E-05	4.12E-03	8.86E-03	1.49E-01	1.64E-02	8.40E-05	9.30E-03	1.33E+00	2.35E-03	3.24E-04	**1.52E+00**
U-236	1.26E-06	5.15E-05	1.01E-01	5.77E-02	6.94E-05	7.97E-04	1.01E-05	5.25E-02	4.86E-07	4.29E-03	**2.16E-01**
U-237	2.16E-04	7.19E-03	9.17E-04	5.24E+00	2.87E-02	6.35E-06	6.16E-04	2.84E-02	2.15E-06	2.19E-02	**5.33E+00**
U-238	2.18E-05	2.57E-04	6.16E-05	3.22E+00	2.73E-03	3.69E-07	4.09E-05	5.29E+01	7.84E-04	6.29E-03	**5.62E+01**
U-240	--	--	--	--	--	1.98E-12	--	2.69E-10	--	1.29E-13	**2.71E-10**
Y-90	8.26E+00	1.09E+04	1.20E+04	1.12E+05	1.15E+03	7.69E+01	1.41E+03	1.76E+05	1.87E+03	1.19E+03	**3.17E+05**
Y-91	--	6.58E-07	--	--	--	--	--	--	--	--	**6.58E-07**
Zn-65	--	--	--	--	1.09E-07	--	--	--	--	--	**1.09E-07**
Zr-93	4.61E-04	--	7.65E-01	3.86E-03	--	3.01E-03	--	--	--	--	**7.73E-01**
Total	**6.97E+01**	**4.08E+04**	**4.86E+04**	**1.60E+06**	**1.52E+04**	**3.18E+02**	**6.21E+03**	**5.08E+05**	**7.62E+03**	**7.44E+03**	**2.24E+06**

[1] Data Source: CID Data Version D.6.06, LANL-CO 2008.

Table 3-15. Disposal Radionuclide Inventory Decayed Through 2006[1]

Radionuclide	CH-TRU Waste (Ci/m^3)	RH-TRU Waste (Ci/m^3)	CH-TRU Waste (Total Ci)	RH-TRU Waste (Total Ci)
Ac-225	7.69E-06	3.84E-03	1.30E+00	2.72E+01
Ac-227	2.07E-06	1.23E-02	3.49E-01	8.73E+01
Ac-228	1.63E-06	8.92E-04	2.74E-01	6.32E+00
Ag-109m	9.03E-08	--	1.52E-02	--
Ag-110	1.01E-10	8.84E-17	1.71E-05	6.26E-13
Ag-110m	1.16E-06	6.72E-15	1.96E-01	4.75E-11
Am-241	2.76E+00	3.94E+00	4.64E+05	2.79E+04
Am-242	5.80E-06	3.90E-05	9.78E-01	2.76E-01
Am-242m	4.72E-05	3.96E-05	7.95E+00	2.81E-01
Am-243	5.50E-04	8.94E-04	9.27E+01	6.33E+00
Am-245	3.24E-16	--	5.46E-11	--
At-217	7.69E-06	3.85E-03	1.30E+00	2.72E+01
Ba-133	6.33E-08	6.55E-11	1.07E-02	4.64E-07
Ba-137m	4.50E-02	5.26E+01	7.58E+03	3.72E+05
Bi-210	8.95E-06	3.11E-09	1.51E+00	2.20E-05
Bi-211	2.01E-06	1.22E-02	3.39E-01	8.64E+01
Bi-212	1.39E-04	8.23E-03	2.34E+01	5.83E+01
Bi-213	7.68E-06	3.84E-03	1.29E+00	2.72E+01
Bi-214	1.68E-05	1.90E-08	2.84E+00	1.34E-04
Bk-249	4.98E-06	--	8.39E-01	--
Bk-250	1.72E-16	--	2.90E-11	--
C-14	9.86E-06	6.31E-04	1.66E+00	4.47E+00
Cd-109	1.56E-05	--	2.63E+00	--
Cd-113m	--	1.32E-04	--	9.33E-01
Ce-139	9.06E-27	--	1.53E-21	--
Ce-141	3.26E-05	--	5.49E+00	--
Ce-144	2.72E-04	1.07E-01	4.59E+01	7.60E+02
Cf-249	2.81E-03	2.45E-06	4.73E+02	1.74E-02
Cf-250	2.62E-06	5.96E-05	4.41E-01	4.22E-01
Cf-251	1.79E-07	4.19E-08	3.01E-02	2.97E-04
Cf-252	3.42E-04	2.18E-05	5.77E+01	1.55E-01
Cl-36	1.19E-08	--	2.00E-03	--
Cm-242	1.64E-05	4.95E-05	2.76E+00	3.51E-01

Table 3-15. Disposal Radionuclide Inventory Decayed Through 2006[1] Continued

Radionuclide	CH-TRU Waste (Ci/m^3)	RH-TRU Waste (Ci/m^3)	CH-TRU Waste (Total Ci)	RH-TRU Waste (Total Ci)
Cm-243	1.31E-05	2.71E-02	2.21E+00	1.92E+02
Cm-244	4.53E-02	1.23E+00	7.63E+03	8.70E+03
Cm-245	2.54E-06	7.69E-06	4.28E-01	5.44E-02
Cm-246	4.44E-05	1.89E-04	7.48E+00	1.34E+00
Cm-247	5.48E-07	1.99E-11	9.24E-02	1.41E-07
Cm-248	1.05E-06	5.23E-07	1.78E-01	3.70E-03
Cm-250	1.58E-15	--	2.66E-10	--
Co-60	5.75E-06	1.53E-01	9.69E-01	1.09E+03
Cs-134	1.00E-02	1.32E-01	1.69E+03	9.33E+02
Cs-135	--	1.71E-06	--	1.21E-02
Cs-137	4.84E-02	4.79E+02	8.15E+03	3.39E+06
Es-254	8.59E-17	--	1.45E-11	--
Eu-150	2.87E-08	--	4.84E-03	--
Eu-152	2.28E-05	3.20E+00	3.84E+00	2.27E+04
Eu-154	1.91E+00	7.49E-01	3.21E+05	5.30E+03
Eu-155	1.29E+01	2.62E-01	2.17E+06	1.85E+03
Fe-55	7.41E-10	2.11E-05	1.25E-04	1.49E-01
Fr-221	7.68E-06	3.84E-03	1.29E+00	2.72E+01
Fr-223	2.78E-08	1.68E-04	4.68E-03	1.19E+00
Gd-152	5.98E-19	2.09E-13	1.01E-13	1.48E-09
H-3	1.50E-02	3.14E-03	2.53E+03	2.23E+01
Ho-166m	1.21E-09	2.88E-11	2.04E-04	2.04E-07
I-129	4.91E-11	3.08E-06	8.27E-06	2.18E-02
K-40	2.60E-08	--	4.38E-03	--
Kr-81	--	2.55E-11	--	1.80E-07
Kr-85	2.93E-03	3.07E-02	4.94E+02	2.18E+02
Mn-54	1.56E-08	3.51E-06	2.63E-03	2.48E-02
Mo-93	--	3.97E-07	--	2.81E-03
Na-22	1.21E-06	2.55E-05	2.03E-01	1.81E-01
Nb-93m	1.19E-09	8.71E-05	2.01E-04	6.17E-01
Nb-94	2.33E-11	2.67E-09	3.92E-06	1.89E-05
Nb-95	6.94E-13	--	1.17E-07	--
Ni-59	4.61E-07	1.16E-04	7.77E-02	8.20E-01

Table 3-15. Disposal Radionuclide Inventory Decayed Through 2006[1] Continued

Radionuclide	CH-TRU Waste (Ci/m^3)	RH-TRU Waste (Ci/m^3)	CH-TRU Waste (Total Ci)	RH-TRU Waste (Total Ci)
Ni-63	2.25E-05	1.26E-02	3.79E+00	8.92E+01
Np-237	2.02E-04	6.89E-04	3.41E+01	4.88E+00
Np-238	2.78E-08	1.96E-07	4.68E-03	1.39E-03
Np-239	5.43E-04	7.69E-04	9.15E+01	5.44E+00
Np-240m	1.91E-09	8.54E-14	3.21E-04	6.04E-10
Pa-231	2.72E-06	2.57E-05	4.59E-01	1.82E-01
Pa-233	2.00E-04	5.41E-05	3.37E+01	3.83E-01
Pa-234	4.39E-07	1.98E-05	7.39E-02	1.40E-01
Pa-234m	3.37E-04	1.52E-02	5.68E+01	1.08E+02
Pb-209	7.69E-06	3.84E-03	1.30E+00	2.72E+01
Pb-210	9.06E-06	3.14E-09	1.53E+00	2.23E-05
Pb-211	2.02E-06	1.22E-02	3.40E-01	8.65E+01
Pb-212	1.38E-04	8.20E-03	2.33E+01	5.81E+01
Pb-214	1.69E-05	1.90E-08	2.84E+00	1.35E-04
Pd-107	--	5.95E-08	--	4.21E-04
Pm-146	--	6.03E-11	--	4.27E-07
Pm-147	7.14E-03	2.36E-01	1.20E+03	1.67E+03
Po-210	9.05E-06	3.12E-09	1.52E+00	2.21E-05
Po-211	6.15E-09	3.72E-05	1.04E-03	2.64E-01
Po-212	8.84E-05	5.24E-03	1.49E+01	3.71E+01
Po-213	7.52E-06	3.76E-03	1.27E+00	2.66E+01
Po-214	1.69E-05	1.90E-08	2.84E+00	1.35E-04
Po-215	2.02E-06	1.22E-02	3.40E-01	8.65E+01
Po-216	1.38E-04	8.20E-03	2.33E+01	5.80E+01
Po-218	1.66E-05	1.87E-08	2.79E+00	1.32E-04
Pr-144	2.56E-04	1.05E-01	4.32E+01	7.45E+02
Pu-236	2.32E-08	1.50E-11	3.90E-03	1.06E-07
Pu-238	1.26E+01	1.32E+00	2.12E+06	9.36E+03
Pu-239	3.19E+00	1.10E+00	5.38E+05	7.80E+03
Pu-240	7.79E-01	2.16E-01	1.31E+05	1.53E+03
Pu-241	1.13E+01	3.23E+01	1.90E+06	2.29E+05
Pu-242	3.38E-04	1.63E-04	5.69E+01	1.16E+00
Pu-243	5.42E-07	1.97E-11	9.13E-02	1.39E-07

Table 3-15. Disposal Radionuclide Inventory Decayed Through 2006[1] Continued

Radionuclide	CH-TRU Waste (Ci/m^3)	RH-TRU Waste (Ci/m^3)	CH-TRU Waste (Total Ci)	RH-TRU Waste (Total Ci)
Pu-244	1.89E-09	8.46E-14	3.19E-04	5.99E-10
Ra-223	2.04E-06	1.24E-02	3.43E-01	8.74E+01
Ra-224	1.38E-04	8.19E-03	2.33E+01	5.80E+01
Ra-225	7.69E-06	3.85E-03	1.30E+00	2.72E+01
Ra-226	1.71E-05	1.92E-08	2.87E+00	1.36E-04
Ra-228	1.92E-06	1.05E-03	3.24E-01	7.46E+00
Rb-87	--	1.37E-10	--	9.68E-07
Rh-106	1.14E-03	9.62E-02	1.92E+02	6.81E+02
Rn-219	2.01E-06	1.22E-02	3.39E-01	8.64E+01
Rn-220	1.38E-04	8.20E-03	2.33E+01	5.80E+01
Rn-222	1.69E-05	1.90E-08	2.84E+00	1.35E-04
Ru-103	1.53E-05	--	2.59E+00	--
Ru-106	1.22E-03	9.72E-02	2.06E+02	6.88E+02
Sb-125	4.12E-06	7.14E-04	6.95E-01	5.05E+00
Sb-126	8.08E-11	7.35E-07	1.36E-05	5.20E-03
Sb-126m	5.77E-10	5.25E-06	9.72E-05	3.71E-02
Sc-46	1.39E-30	--	2.34E-25	--
Se-75	6.30E-15	--	1.06E-09	--
Se-79	7.97E-10	1.31E-05	1.34E-04	9.29E-02
Sm-146	--	1.61E-19	--	1.14E-15
Sm-147	5.72E-14	8.13E-12	9.64E-09	5.76E-08
Sm-151	4.26E-05	6.96E-02	7.18E+00	4.93E+02
Sn-121m	--	8.61E-06	--	6.10E-02
Sn-126	5.78E-10	5.25E-06	9.73E-05	3.72E-02
Sr-90	1.39E-02	3.78E+02	2.34E+03	2.67E+06
Tc-99	2.33E-04	5.42E-02	3.93E+01	3.83E+02
Te-123	5.25E-23	--	8.84E-18	--
Te-123m	4.88E-27	--	8.22E-22	--
Te-125m	7.16E-05	1.72E-04	1.21E+01	1.22E+00
Th-227	1.99E-06	1.20E-02	3.35E-01	8.52E+01
Th-228	1.40E-04	8.29E-03	2.36E+01	5.87E+01
Th-229	7.71E-06	3.85E-03	1.30E+00	2.73E+01
Th-230	8.61E-07	7.64E-06	1.45E-01	5.41E-02

Table 3-15. Disposal Radionuclide Inventory Decayed Through 2006[1] Continued

Radionuclide	CH-TRU Waste (Ci/m^3)	RH-TRU Waste (Ci/m^3)	CH-TRU Waste (Total Ci)	RH-TRU Waste (Total Ci)
Th-231	3.98E-05	3.90E-04	6.70E+00	2.76E+00
Th-232	8.62E-06	1.06E-03	1.45E+00	7.48E+00
Th-234	3.38E-04	1.52E-02	5.69E+01	1.08E+02
Tl-204	4.46E-11	--	7.51E-06	--
Tl-207	2.01E-06	1.21E-02	3.38E-01	8.60E+01
Tl-208	4.98E-05	2.95E-03	8.39E+00	2.09E+01
Tl-209	1.69E-07	8.45E-05	2.85E-02	5.98E-01
U-232	1.35E-04	1.01E-02	2.28E+01	7.12E+01
U-233	4.62E-03	1.32E-01	7.79E+02	9.34E+02
U-234	1.37E-03	1.14E-02	2.31E+02	8.08E+01
U-235	5.13E-05	5.30E-04	8.65E+00	3.75E+00
U-236	1.10E-05	8.35E-05	1.86E+00	5.91E-01
U-237	2.59E-04	7.62E-04	4.36E+01	5.40E+00
U-238	3.45E-04	1.83E-02	5.80E+01	1.30E+02
U-240	1.87E-09	8.37E-14	3.15E-04	5.92E-10
Y-90	1.32E-02	7.84E+01	2.22E+03	5.55E+05
Y-91	--	5.79E-10	--	4.10E-06
Zn-65	2.96E-09	1.54E-11	4.99E-04	1.09E-07
Zr-93	6.79E-09	1.11E-04	1.14E-03	7.87E-01
Zr-95	8.30E-06	--	1.40E+00	--
Grand Total	**4.56E+01**	**1.03E+03**	**7.68E+06**	**7.32E+06**

Data Source: CID Data Version D.6.06, LANL 2008.

[1] Concentration and total curies estimates based on 168,485 m^3 of CH waste and 7,079 m^3 of RH waste.

4.0 NON-WIPP/POTENTIAL WIPP TRANSURANIC WASTE

This section identifies TRU waste streams currently not included in the WIPP-bound TRU waste inventory. The TRU waste permitted to come to WIPP is restricted by radionuclide activity limits, volume, classification, and purpose of generation (i.e., TRU waste generated only from defense activities). These restrictions are discussed in section 4.1. Other restrictions result from how the waste has been managed at the DOE TRU waste sites. Some materials that have not been declared TRU waste by the sites at this time may become TRU waste in the future. These potential future waste streams may ultimately become eligible for shipment to WIPP and are discussed in section 4.2. Waste profiles and waste streams for potential TRU waste are presented in Appendix C.

4.1 Non-WIPP Transuranic Waste

As listed below, the DOE has several categories of TRU waste that are currently not acceptable for disposal in WIPP:

- Non-defense TRU waste — The DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980 authorized the construction of WIPP to demonstrate the safe disposal of radioactive waste resulting from U. S. defense activities.[4] Under the LWA, Congress restricted WIPP to the disposal of TRU radioactive waste from atomic energy defense activities.[5] Accordingly, WIPP may not accept non-TRU radioactive waste, and more specifically, non-defense (i.e., commercial) TRU radioactive waste for disposal.

- RH-TRU waste exceeding 23,000 Ci/m^3 (23 Ci/l) — This limit is mandated by the LWA.

- RH-TRU waste with dose rates greater than 1000 rem/hr — This limit is mandated by the LWA, which also requires that only 5 percent of the RH-TRU waste emplaced at WIPP may exceed 100 rem per hour (R/hr).

- TRU waste streams with D001 (Ignitable), D002 (Corrosive), and D003 (Reactive) RCRA hazardous waste numbers — This restriction is from the WIPP Hazardous Waste Permit (NMED 1999).

- Waste determined to be low-level waste, mixed low-level waste, high-level waste, or spent nuclear fuel — This restriction is mandated by the LWA.

- Total curies of RH-TRU waste shall not exceed 5.1 million curies — This limit is mandated by the LWA.

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[4] Pub. L. No. 96-164, § 213, 93 Stat. 1259, 1265 (1979).

[5] Pub. L. No. 102-579, §§ 2, 7, 106 Stat. 4777, 4779, 4785, 4786 (1992), as amended, Waste Isolation Pilot Plant Land Withdrawal Act Amendments, Pub. L. No. 104-201, §§ 3182, 3186, 110 Stat. 2422, 2851, 2852 (1996)

4.2 Potential WIPP Transuranic Waste

Categories of waste that eventually may become acceptable for disposal at WIPP include the following:

- Unknown — Potential TRU waste may come from TRU waste streams currently declared "unknown" (see Tables 4-1 and 4-2). These TRU wastes have not been characterized adequately to determine the final TRU waste form and/or other significant parameters. If these TRU wastes are characterized and meet the WIPP Waste Acceptance Criteria (WAC) (DOE 2006a), they will be included in the WIPP TRU waste inventory in the future.

- Pre-1970 buried TRU waste — Several DOE TRU waste sites (LANL, SRS, Hanford, INL, ORNL, and West Valley Demonstration Project) have TRU waste that was buried prior to 1970. INL is currently preparing pre-1970 buried TRU waste for shipment to WIPP as mandated by a federal district court order.[6] Two waste streams at Hanford Richland Operations (RL618-01 and RL618-07) have been added to potential waste in this report. SRS and ORNL have RCRA caps on pre-1970 buried TRU waste, and this waste will not be excavated or retrieved per the Government Accounting Office (GAO 2007).

- Defense determination pending — Some TRU waste streams require a formal defense determination.

- Newly-identified TRU waste —Newly-identified TRU waste not identified in the last collection period.

- Beryllium block TRU waste stream at INL — This waste stream includes beryllium blocks and outer shim control cylinders from the Advanced Test Reactor and may be considered in the future. The radionuclide concentrations are too high to be considered in this update.

- Any TRU waste contaminated with constituents other than those listed in Table II.C.4 of the WIPP Hazardous Waste Permit — This waste requires a permit modification or removal of hazardous waste numbers before shipment.

- All waste streams from the Hanford Office of River Protection (Hanford-RP) (tank wastes managed as high-level waste [HLW]), two sodium-bearing waste streams at INL, and sludge from Hanford RL K-Basin knock-out pots — Categorization as potential TRU waste based on CBFO correspondence (Moody 2007b).

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[6] Public Serv. Co. v. Kempthorne, 2006 U.S. Dist. LEXIS 34584 (D. Idaho May 25, 2006) (under rules of contract interpretation, the 1995 agreement between the U.S. Department of Energy and the State of Idaho requires the Department to remove transuranic waste in a subsurface disposal area as well as in an above ground storage area at the Department's Idaho facility by 2018).

Table 4-1. Potential CH-TRU Waste Streams

Waste Stream ID	Waste Stream Name	Final Form Stored Payload (m^3)	Final Form Projected Payload (m^3)	Final Form Anticipated Payload (m^3)
BT-T006	Neutron Sources	5.09E+01	0.00E+00	5.09E+01
FR-MOX-MT02	Framatome MOX [mixed oxide] Fuel Plant D&D TRU Heterogeneous Mixed Debris Waste	4.16E-01	0.00E+00	4.16E-01
FR-MOX-T01	Framatome MOX Fuel Plant D&D TRU Heterogeneous Debris Waste	5.62E+00	0.00E+00	5.62E+00
IN-W146.699	TRU HEAVY METAL SLUDGE	2.29E+00	0.00E+00	2.29E+00
IN-W159.1072	EVAPORATOR AND DISSOLVER SLUDGE: Direct Ship	1.89E+00	0.00E+00	1.89E+00
IN-W325.1076	PARTS: Cert-repack	4.16E-01	0.00E+00	4.16E-01
IN-W325.679	PARTS: Direct Ship	5.88E+00	0.00E+00	5.88E+00
IN-W341.671	ANL-W (MFC) HFEF ANALYTICAL CHEMISTRY AND META: Cert-repack	2.08E-01	0.00E+00	2.08E-01
IN-W341.954	ANL-W (MFC) HFEF ANALYTICAL CHEMISTRY AND META: Direct Ship	1.89E+00	0.00E+00	1.89E+00
IN-W350.650	WASTE MATERIAL :Direct Ship	2.08E-01	0.00E+00	2.08E-01
IN-W350.923	WASTE MATERIAL: Cert-repack	2.08E-01	0.00E+00	2.08E-01
IN-W353.859	SOLIDIFIED SOLUTIONS: Direct Ship	1.89E+00	0.00E+00	1.89E+00
IN-W359.853	Neutron Sources	8.32E-01	0.00E+00	8.32E-01
IN-W360.852	MISCELLANEOUS SOURCES:RH Direct Ship	2.08E-01	0.00E+00	2.08E-01
IN-W360.912	MISCELLANEOUS SOURCES: Cert-repack	2.08E-01	0.00E+00	2.08E-01
LA-LA238HOR	Pu-238 Homogeneous, Hazardous	8.32E-01	7.90E+00	8.74E+00
LA-TA-03-17	HEPA Filters	2.18E+01	0.00E+00	2.18E+01
LA-TA-55-52	Oil on vermiculite, corrosive waste not for disposal at WIPP (mixed).	6.24E-01	0.00E+00	6.24E-01
LB-T002	LBL - Waste	4.16E-01	0.00E+00	4.16E-01
LL-T001	R&D Glovebox Waste (Form 1)	0.00E+00	2.69E+02	2.69E+02
LL-T003	Combined metal scrap & incidental combust (Form 3)	0.00E+00	4.76E+02	4.76E+02
MC-W002	USAMC TRU Waste	2.08E-01	0.00E+00	2.08E-01
PA-A015[1]	Transuranic – Solid	2.77E+00	0.00E+00	2.77E+00
PA-W014[1]	Transuranic Waste Liquid/Solids	3.48E+00	0.00E+00	3.48E+00
RL618-01	618 - 10&11 Burial Grounds TRU Mixed Debris	9.13E+03	0.00E+00	9.13E+03
RLRFET-01	Rocky Flats TRU Mixed Debris	2.45E+02	0.00E+00	2.45E+02
RP-TFC001	Bismuth Phosphate Process TRU Solids	4.39E+02	0.00E+00	4.39E+02
RP-W754	224 Waste	3.23E+02	0.00E+00	3.23E+02
RP-W755	Bismuth Phosphate Process TRU Solids	7.94E+02	0.00E+00	7.94E+02
SP-T001	(blank)	4.99E+01	0.00E+00	4.99E+01
SR-T001-773A-CLAS	CH-TRU - waste from 773A	1.25E+02	0.00E+00	1.25E+02
SR-T001-WSB-1	UNKNOWN	0.00E+00	4.91E+03	4.91E+03
SR-T001-WSB-3	UNKNOWN	0.00E+00	1.44E+02	1.44E+02

Waste Stream ID	Waste Stream Name	Final Form Stored Payload (m^3)	Final Form Projected Payload (m^3)	Final Form Anticipated Payload (m^3)
SR-W026-MFFF-1	UNKNOWN	0.00E+00	3.50E+03	3.50E+03
SR-W026-PDCF-1	UNKNOWN	0.00E+00	2.15E+03	2.15E+03
SR-W026-WSB-2	UNKNOWN	0.00E+00	6.26E+02	6.26E+02
SR-W027-221H-HET-B	Heterogeneous debris from 221H	1.48E+01	0.00E+00	1.48E+01
SR-W027-HBL-Box-B	CH mixed TRU from 221H	1.02E+02	0.00E+00	1.02E+02
SR-W027-SRSG-SOIL	CH mixed TRU Soil / Gravel (S4000)	3.33E+00	0.00E+00	3.33E+00
VN-CHT001	Heterogeneous debris	2.02E+01	0.00E+00	2.02E+01
WV-M005	TRU Filters	1.20E+02	0.00E+00	1.20E+02
WV-M007	TRU General Waste	1.08E+01	0.00E+00	1.08E+01
WV-M008	TRU Concrete	2.08E-01	0.00E+00	2.08E-01
WV-M010	TRU Spent Absorbents	8.32E-01	0.00E+00	8.32E-01
WV-M013	Sweeping Compound	1.87E+00	0.00E+00	1.87E+00
WV-M015	Chemical Process Cell General Waste	1.31E+01	0.00E+00	1.31E+01
WV-T001	Fissile Material - Solids	3.12E+01	0.00E+00	3.12E+01
WV-T004	Fissile Material - Other	6.24E-01	0.00E+00	6.24E-01
WV-T006	TRU General Waste	1.04E+01	1.02E+01	2.06E+01
WV-T009	TRU General Laboratory Waste	9.98E+00	2.12E+01	3.12E+01
WV-T011	TRU Glove Boxes	3.39E+01	0.00E+00	3.39E+01
WV-T014	Chemical Process Cell Vessels	2.70E+02	0.00E+00	2.70E+02
WV-T016	Chemical Process Cell Miscellaneous Equipment	1.47E+02	0.00E+00	1.47E+02
WV-T017	Spent Filter Media	2.29E+00	0.00E+00	2.29E+00
WV-T018b	Head End Cell Debris	1.52E+02	2.75E+01	1.79E+02
WV-T019	FRS Pool Filters	0.00E+00	1.87E+00	1.87E+00
WV-T020	PPC/XC2 PPE and DAW	0.00E+00	2.27E+02	2.27E+02
WV-W024	TRU Lead	1.79E+01	0.00E+00	1.79E+01
WV-Z001	West Valley Buried TRU Waste	1.35E+03	0.00E+00	1.35E+03
	Grand Total	**1.35E+04**	**1.24E+04**	**2.59E+04**

Data Source: CID Data Version D.6.06, LANL2008.

Table 4-2. Potential RH-TRU Waste Streams

Waste Stream ID	Waste Stream Name	Final Form Stored Payload (m^3)	Final Form Projected Payload (m^3)	Final Form Anticipated Payload (m^3)
AW-IN-TRA-BE-01	TRA Beryllium Blocks	1.51E+01	1.07E+01	2.58E+01
AW-W018	SODIUM - TRU	4.45E+00	0.00E+00	4.45E+00
AW-W019	SODIUM POTASSIUM - NaK - TRU	8.90E-01	0.00E+00	8.90E-01
AW-W029	RSWF TRANSURANIC WASTE	1.25E+01	0.00E+00	1.25E+01
AW-W048	FCF Indirect RH-MTRU [mixed TRU] Waste	1.78E+00	4.45E+00	6.23E+00
IN-ID-RTC-S5000	RH-TRU Debris waste from Reactor Technology Complex at THE INL	0.00E+00	1.49E+02	1.49E+02
IN-SBW-01A	SBW Treatment – Steam Reforming – Carbonate Waste Form	5.34E+02	0.00E+00	5.34E+02
IN-SBW-01B	SBW Treatment – Steam Reforming – Debris	0.00E+00	8.90E+01	8.90E+01
RL105-09A	105KE knock out pots - TRU RH mixed solidified inorganics	8.90E-01	0.00E+00	8.90E-01
RL618-07	618 - 10&11 Burial Grounds TRU RH Non-mixed Debris	1.31E+02	0.00E+00	1.31E+02
RLCH2-08	Tank Farms TRU RH Mixed Debris	2.94E+02	0.00E+00	2.94E+02
RP-TFC002	Bismuth Phosphate Process TRU Solids mixed with Fission Product Waste	1.92E+03	0.00E+00	1.92E+03
RP-TFC003	Bismuth Phosphate Process TRU Solids mixed with Fission Product Waste	2.58E+02	0.00E+00	2.58E+02
RP-W013	PFP TRU Solids	4.10E+02	0.00E+00	4.10E+02
RP-W016	PUREX TRU Cladding Removal Solids	1.28E+03	0.00E+00	1.28E+03
VN-RHT001	Heterogeneous debris	1.25E+01	0.00E+00	1.25E+01
WV-T018a	Head End Cell Debris	2.85E+01	0.00E+00	2.85E+01
WV-T021	Remote-handled waste facility (RHWF) Process	0.00E+00	1.16E+02	1.16E+02
	Grand Total	**4.90E+03**	**3.68E+02**	**5.27E+03**

Data Source: CID Data Version D.6.06, LANL 2008.

[1] Paducah would not report a final form container in the inventory and the information had to be added in the table manually.

5.0 SUMMARY

This report is an update of the TWBIR-2004, which documented the total estimated inventory of TRU waste as defined by the DOE TRU waste sites in support of the PABC for the CRA-2004. The TWBIR-2004 cut-off date for data collection was September 30, 2002. Like the TWBIR-2004, this report focuses on changes resulting from characterization, improved estimations, continued generation, and WIPP emplacement. The cut-off date for data collection for this report was December 31, 2006.

This report contains the information required for PA modeling calculations, as well as additional information helpful for TRU waste management and strategic decisions. Beginning with this report, site inventory information will be updated annually to track changes in the TRU waste inventory.

The information in this report was collected from and validated by the DOE TRU waste sites and entered into the newly-qualified CID database. The CID includes estimates for: 1) disposal waste volumes (stored, projected, and emplaced); 2) radionuclides (unscaled, disposal, and decayed); 3) waste material parameters average densities; 4) disposal complexing agents; 5) disposal oxyanions; 6) solidified disposal cements; 7) disposal packaging materials; and 8) the disposal materials used to emplace TRU waste in the WIPP repository.

This report includes WIPP-bound waste, emplaced waste, potential TRU waste, inventory comparisons, radiological data (with radionuclides decayed to seven time periods for use in PA), and a historic crosswalk of TRU waste streams in Appendices A, B, C, D, E, and F, respectively.

On October 18, 2007, LANL-CO received a letter from the CBFO manager instructing the inventory team that "all waste streams from the Hanford Office of River Protection (tank wastes managed as HLW) and the two sodium-bearing waste streams from the Idaho National Laboratory (INL) shall be categorized as potential WIPP waste. In addition, the sludge from the Hanford Richland Operations (RL) K-Basin knock-out pots shall also be included in a separate waste stream and placed in the potential WIPP waste category" (Moody 2007b).

This revision is the result of the discovery of a calculation error based on the methodology used by LANL to report radionuclide activity concentration for their waste streams. This report provides the revised waste stream radionuclide concentrations based on the application of radionuclide activity over the entire waste stream volume. The inventory team made these changes in the CID and ensured that site validation of the changes was completed.

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