INL/EXT-13-29879

Process Knowledge Summary Report for Advanced Test Reactor Complex Contact-Handled Transuranic Waste Drum TRA010029

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The INL is a U.S. Department of Energy National Laboratory
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ABSTRACT

This *Process Knowledge Summary Report* summarizes information collected to satisfy the transportation and waste acceptance requirements for the transfer of one drum containing contact-handled transuranic (TRU) actinide standards generated by the Idaho National Laboratory at the Advanced Test Reactor (ATR) Complex to the Advanced Mixed Waste Treatment Project (AMWTP) for storage and subsequent shipment to the Waste Isolation Pilot Plant for final disposal. The drum (i.e., Integrated Waste Tracking System Bar Code Number TRA010029) is currently stored at the Materials and Fuels Complex. The information collected includes documentation that addresses the requirements for AMWTP and applicable sections of their Resource Conservation and Recovery Act permits for receipt and disposal of this TRU waste generated from ATR.

This *Process Knowledge Summary Report* includes information regarding, but not limited to, the generation process, the physical form, radiological characteristics, and chemical contaminants of the TRU waste, prohibited items, and packaging configuration. This report, along with the referenced supporting documents, will create a defensible and auditable record for this TRU waste originating from ATR.

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TABLES

ACRONYMS

AMWTP	Advanced Mixed Waste Treatment Project
ATR	Advanced Test Reactor
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EDF	engineering design file
ETR	Engineering Test Reactor
HWN	hazardous waste number
INL	Idaho National Laboratory
IWTS	Integrated Waste Tracking System
MFC	Materials and Fuels Complex
MTR	Materials Test Reactor
NWPA	Nuclear Waste Policy Act of 1982
TRA	Test Reactor Area
TRU	transuranic
WDDF	Waste Determination and Disposition Form
WIPP	Waste Isolation Pilot Plant
WGS	Waste Generator Services

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1. INTRODUCTION

This *Process Knowledge Summary Report* summarizes information collected to satisfy the transportation and waste acceptance requirements for the transfer of one drum containing contact-handled transuranic (TRU) actinide standards generated by the Idaho National Laboratory (INL) at the Advanced Test Reactor (ATR) Complex to the Advanced Mixed Waste Treatment Project (AMWTP) for storage and subsequent shipment to the Waste Isolation Pilot Plant (WIPP) for final disposal. These actinide standards were also referred to as actinides, actinide materials, actinide solutions, sources, tracers, and targets in historical documents.[5,7,8,15] The drum is currently stored at the Materials and Fuels Complex (MFC). The information collected includes documentation that addresses the requirements for AMWTP[1] and applicable sections of their Resource Conservation and Recovery Act permits for receipt and disposal of this TRU waste generated from ATR.

This waste container was generated at ATR. The container was shipped to MFC in 2005 to alleviate a nuclear facility category storage problem at ATR and to consolidate Battelle Energy Alliance, LLC contact-handled TRU waste storage. This waste is planned for direct shipment to AMWTP from MFC under existing transportation controls and procedures and does not require return shipment to ATR before shipment to AMWTP.

The ATR TRU absorbed liquids were generated in support of national defense activities and are considered to be a defense-related waste per the Nuclear Waste Policy Act of 1982 (NWPA).

Waste that is spent nuclear fuel or high level waste and waste that does not meet the definition of defense waste per NWPA will not be shipped to AMWTP. Low-level waste and mixed low-level waste will not be included in this TRU absorbed liquid waste shipped to AMWTP. Polychlorinated biphenyls contaminated waste or items will not be shipped to AMWTP.

Only waste that is greater than 100 nCi/gm TRU concentration will be shipped to AMWTP.

AMWTP will be notified in writing when any of the following occur:

- Additional waste is proposed to be shipped to AMWTP
- Changes to the waste material parameters
- New constituents are introduced to the waste
- A change in the hazardous waste numbers (HWNs)
- Changes in the radiological composition from that previously identified.

This waste stream is approximately 75% homogeneous solids in the form of absorbents and absorbed liquids. Additional related waste generated during the handling and packaging activities were also placed in the drum and comprises approximately 25% of total waste volume within the container.

The waste, contained in a drum identified as Integrated Waste Tracking System (IWTS) bar code number TRA010029, contains TRU radioactive actinide standards produced at ATR and used for nuclear reactor testing and measurements in the ATR Radiochemistry Laboratories (TRA-604) and the ATR Alpha Wing (TRA-661). When the actinide standards were determined by ATR researchers to be of no further value in 1991, they were declared waste and were absorbed and packaged in TRA-604 for eventual disposal.

1.1 Facility Description and Location

1.1.1 Idaho National Laboratory

INL encompasses approximately 890 square miles on the northern edge of the Eastern Snake River Plain in Southeastern Idaho. It is located approximately 45 miles west of Idaho Falls, Idaho, and was formerly named the National Reactor Testing Station. INL was established in 1949 as a site where the U.S. nuclear research entities could safely build, test, and operate various types of nuclear facilities. INL has also served as a storage facility for TRU, low-level, and high-level waste since 1952. Strict security is maintained for all INL facilities in accordance with INL's nuclear and defense missions. At present, INL supports the engineering and operations efforts of the U. S. Department of Energy (DOE) and other federal agencies in nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, and energy technology and conservation programs. A current INL map is included as Figure 1.

1.1.2 Advanced Test Reactor Complex

ATR was established in the early 1950s for studying the effects of radiation on materials, nuclear fuels, and equipment. The ATR Complex was formerly known as the Test Reactor Area (TRA) and the Reactor Technology Complex. ATR is located in the southwestern portion of INL, 4.9 miles northwest of the Central Facilities Area. The closest major population center is the city of Idaho Falls, located about 50 miles east of ATR.

1. Generation Location:

   ATR Complex

   INL

   Scoville, Idaho

   Environmental Protection Agency ID ID4890008952

2. Storage Location:

   MFC

   INL

   Scoville, Idaho

   Environmental Protection Agency ID ID4890008952

3. Facility where the TRU waste was generated:

   Building TRA-604

1.2 Facility Mission

The mission of ATR and associated complex facilities at the time of generation of this waste was to provide testing of the performance capabilities of reactor fuels, materials, and equipment components in environments of high neutron flux to enable scientists to obtain essential data for improved reactor designs and structural materials. The ATR mission remains the same at the present time.

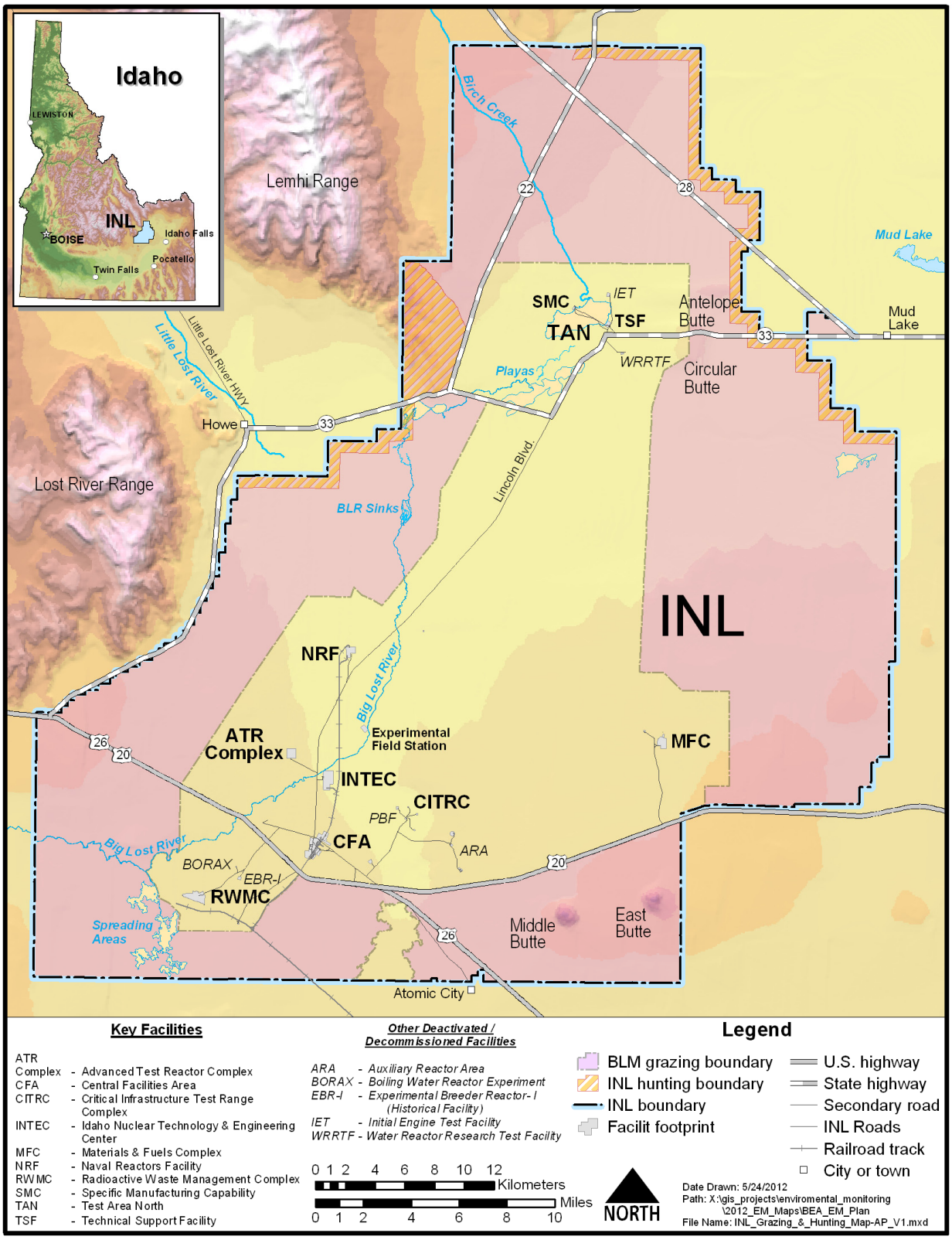

Figure 1. Map of the Idaho National Laboratory.

Reactor facilities included the Materials Test Reactor (MTR), Engineering Test Reactor (ETR), and ATR. The MTR operated from 1952 to 1970 and was the first reactor to be built solely for testing materials to be used in other reactors. The choice of core structural materials and fuel elements of every reactor designed in this country since 1952 was influenced by the information obtained from tests in MTR. In the 1950s, the usefulness of MTR was demonstrated and a demand rose for more testing facilities with higher neutron fluxes and space for larger samples. The ETR and ATR were constructed to meet this demand. The ETR was operational in 1957 with a power level of 175 megawatt (MW) compared to MTR's 40 MW capability. ETR's mission was materials research primarily for the Naval Reactors Program. The ATR was operational in 1967 and is one of the world's largest and most advanced test reactors. The ATR is designed to provide high neutron fluxes in a multiplicity of high-pressure water loops of small diameter in support of the Naval Reactors Program. In addition to Naval Reactors materials testing, ATR has supported missions of isotope production in support of DOE Office of Nuclear Energy, Science, and Technology to serve a national need for a reliable source of isotope products and services for medicine, industry, and research.

The Radiochemistry Laboratory (TRA-604) and Alpha Wing (TRA-661) provided analytical services for research and development (R&D) activities at MTR, ETR and ATR. This drum contains actinide standards that were used in naval reactors development and defense research and development at ATR.[6] Operations at both of these facilities ceased in 2008 and the buildings were decommissioned and demolished in 2010.

2. PROCESS KNOWLEDGE INFORMATION

Waste characterization and container information are documented by completing INL IWTS material and container profiles. Process knowledge data, analytical results, and container inventory are used to profile the waste stream and are recorded in IWTS in accordance with LWP-8300, "Transuranic Waste Handling."[2,4,5,7,8,9,13,14,15,16,17,18,19] The history of waste management of this container is presented in Section 4.4.

This drum was characterized using process knowledge provided by ATR research personnel who were the responsible custodians of the actinide standards. Radiological characterization is provided in Section 6.1. Composition and non-radiological characterization data are provided in Section 6.2 through Section 7.

The contents of this waste container were inventoried and documented during waste packaging in 1991.[15] Formal controls and documentation methods (e.g., IWTS profiles,[9, 13,14,16] forms, including INL Form 435.83, "Idaho National Laboratory Contact-Handled Transuranic Waste Disposition,"[10] Form 435.39, "Waste Determination and Disposition Form,"[20,21,22] TEM-10200-1, "Engineering Calculation and Analysis Report," [11] and LWP-15026)[12] are used to assure proper characterization, waste categorization, tracking, and management of TRU waste generated at ATR facilities.

Radiological characterization was documented in 2001 in engineering design file (EDF) number CFA-2001-013[17], based on known radiological activities of the actinide standards. Revision 1 was created for this EDF to correct the contact dose rate on the 85-gallon overpack.[18] The radiological characterization was updated in 2013 on ECAR-2329 to adjust the original EDF isotopic activities for decay.[19]

3. DEFENSE AND LAND WITHDRAWAL ACT INFORMATION

3.1 Defense Information

The WIPP Waste Acceptance Criteria requires generator sites to use acceptable knowledge to determine if the TRU waste streams to be disposed of at WIPP meet the definition of TRU "defense" waste. Based on DOE guidance, TRU waste is eligible for disposal at WIPP if it has been generated in whole or part by one of the *atomic energy defense activities* listed in Section 10101(3) of NWPA. The

term "*atomic energy defense activities*" means "any activity of the Secretary performed in whole or in part in carrying out any of the following functions:

(A) naval reactors development;

(B) weapons activities including defense inertial confinement fusion;

(C) verification and control technology;

(D) defense nuclear materials production;

(E) defense nuclear waste and materials by-products management;

(F) defense nuclear materials security and safeguards and security investigations; and

(G) defense research and development."

The waste in this container was generated from naval reactors development and defense research and development activities.

Various actinide standards were prepared during the 1950 to 1960 timeframe at ATR. These standards were developed for defense programs to provide data for naval reactor development and for determining weapon yields. They were also used to perform measurements and studies of nuclear structure and neutron cross sections in support of the production of fissile weapons-grade material and in the diagnosis of weapon materials production and weapon yields.

The specific research conducted during the 1950 and 1960 ETR/MTR era involved several programs, including the following:[6]

- ANP (Aircraft Nuclear Propulsion program – Air Force)
- GEH-ETR 3x3 & GEH-ETR-6x9 Experiments (General Electric Company Hanford)
- AGN-302 Experiment (Army)
- Naval Reactor Test Program.

These actinide standards were retained for their intrinsic value for possible follow-on studies and measurements since the actinides were difficult to obtain due to the shut-down of production reactors and calutrons at other DOE facilities. In 1991 ATR research personnel determined that adequate data existed for these actinides in national nuclear databases and retention of the standards was no longer deemed necessary. The actinide standards were packaged in a 55-gallon steel drum in 1991 as waste for eventual disposal.[5,15]

Based on a review of these generating processes, the ATR contact-handled TRU actinide standards have been determined to be defense-related and eligible for disposal at the WIPP facility.

3.2 Land Withdrawal Act Information

The WIPP Land Withdrawal Act prohibits disposal of spent nuclear fuel and high-level waste, as defined by NWPA, at the WIPP facility. According to NWPA, spent nuclear fuel is "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing." High-level waste is defined by NWPA as "the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation."

This waste stream consists of discarded actinide standards used as reference materials in testing and measurements in support of reactor research at ATR. These standards do not contain constituents related

to spent nuclear fuel and were not used for or generated from reprocessing of spent fuel.[5,7,8,15] This waste does not meet the definition of spent nuclear fuel or high-level waste.

4. WASTE GENERATION AND HISTORICAL MANAGEMENT

Eighteen ATR actinide standards were produced during the 1950 to 1960 time period for a variety of defense-related activities to identify and measure important actinide characteristics (see Section 3). These standards were stored in the MTR (building TRA-604) basement, lab 104A "source vault" during that time period when not being used. When needed for research-related projects or experiments, individual standards were transferred to the specified TRA-661 Alpha Wing laboratories and then moved back to the source vault for storage when the project was completed.

These actinide standards were retained due to their intrinsic value up until 1991 for possible follow-on studies and measurements because the actinides were difficult to obtain at that time. In 1991, they were determined to be of no further use because adequate data existed in national nuclear databases and were declared waste.[5,7,8] After being declared waste in 1991, the 18 actinide standards were packaged as waste in the MTR basement. These standards were contained in dilute nitric acid solutions in glass containers (e.g., ampoules, vials, bottles). Of the 18 standards, nine of the glass containers were found to be dry (free of liquids) according to notes taken during packaging.[15] The nine dry glass containers were individually bagged. The liquid contents of the remaining glass containers were poured onto Floor-Dry absorbent (diatomaceous earth) in individual small (less than 4-L) polyethylene bags and potassium phosphate powder was poured on top of the absorbed liquid in the bags for neutralization and the empty glass containers were also added to the bags. All 18 of the bags were sealed and were placed in layers of additional Floor-Dry in a 55-gallon drum equipped with a vented 90-mil poly liner to maintain separation and stability. No other chemical solvents were used in the process and the waste does not contain any Resource Conservation and Recovery Act metals. All liquids were poured into Floor-Dry absorbent and no free liquid remained according to historical documents.[15] Approximately 25% of the waste volume includes additional materials that were generated during packaging, including the empty glass containers, a pen, hand tools, and plastic gloves that were also bagged and placed in the 55-gallon drum.[5,8,15]

4.1 Areas and Period of Generation

The 18 ATR actinide standards were produced during the 1950 to 1960 time period for a variety of defense-related activities to identify and measure important actinide characteristics (see Section 3). These standards were stored in the MTR (building TRA-604) basement lab 104A "source vault" during that time period when not being used. When needed for research related projects or experiments, individual standards were transferred to the specified TRA-661 Alpha Wing laboratories and then moved back to the source vault for storage when the project was completed

After being declared waste in 1991, the 18 actinide standards were packaged as waste in the MTR basement. These standards were packaged in a 55-gallon drum in 1991 that was overpacked into a Department of Transportation (DOT) 7A Type A 85-gallon drum in 2005. The 85-gallon drum was assigned IWTS bar code number TRA010029 and was managed as waste in the MTR Lab-104A source vault until it was shipped to MFC in 2005, where it is currently stored. Use of these actinide standards has been discontinued and no additional waste of this type is anticipated to be generated at ATR.

4.2 Waste Volume

The net volume of the waste is approximately 50-gallons, including the Floor-Dry packaging material.[15] Approximately 25% of the waste volume includes material that was generated during the packaging of this waste, including the empty glass containers, a pen, hand tools, polyethylene bags, and plastic gloves.[5,8,15]

4.3 Types of Waste Generated

This waste consists of bags containing neutralized and absorbed dilute nitric acid solutions that contained actinide standards that were placed in layers of additional Floor-Dry as packaging material. The bagged standards and Floor-Dry constitutes approximately 75% of the waste volume. The remaining waste volume includes the empty glass containers and items used during packaging, including a pen, a screwdriver, aviation snips, and plastic gloves.[5,8,15] All liquids have been neutralized and absorbed in Floor-Dry (diatomaceous earth) in small (less than 4-L) polyethylene bags. There is no free or containerized liquid present in this drum.[15] The activities that generated the waste are presented in Sections 4 and 4.1.

4.4 Waste Management and Profile History

4.4.1 Advanced Test Reactor Waste Management

The 55-gallon drum was identified as drum No. 90A0938 when it was packaged in 1991 [15] and was managed by ATR facility waste management personnel. Characterization was based on process knowledge provided by the generator and was documented on a Waste Profile Sheet for Transuranic and Transuranic Mixed Waste Streams[7] and a Summary of TRU Drum 90A0938.[15] The drum was stored in the MTR Lab-104A source vault under the custody and control of ATR laboratory and radiological controls organizations.[5]

4.4.2 Waste Generator Services Waste Management

In 1996, the Waste Generator Services (WGS) organization assumed waste management and waste disposition responsibilities for INL facilities. The WGS Program instituted the use of the Waste Determination and Disposition Form (WDDF) and the IWTS database system to document waste stream characterization and to track waste containers. Under the WGS Program, initial characterization data are recorded on a WDDF from generator process knowledge and analytical data if available. The WDDF is reviewed and approved by WGS personnel and the waste stream is assigned an IWTS material profile number. The material profile is typically created to include a wide range of characterization parameters to allow for composition and radiological variations in specific container content generated under the waste stream. Each container of waste is assigned an IWTS container profile number under the parent material profile. The container profile documents the actual container content. Each waste container is labeled with an IWTS bar code label that has the corresponding container profile number.

Under the WGS Program, WDDF forms and IWTS material profiles may be updated by revising the existing documents or by creating new ones. IWTS container profiles are updated as needed until the containers are finalized and approved for shipment to offsite facilities.

4.4.2.1 IWTS Material Profile 2913Q. Based on the waste profile sheet, container inventory information produced at the time of packaging in 1991 and process knowledge statements provided by the generator, management of ATR drum No. 90A0938 was transferred to WGS by the ATR custodians in 2001.[5,7,8,15] WGS created a WDDF (unnumbered)[20] and a corresponding material profile No. 2913Q[14]

The 55-gallon drum was overpacked into an 85-gallon drum in order to transport the waste as DOT compliant. The 85-gallon drum was assigned IWTS container profile number TRA010029 in 2001 under material profile 2913Q.[16] The drum remained stored in the ATR Lab 104A source vault.

4.4.2.2 IWTS Material Profile 4246N. To conform to the most up-to-date WGS procedural changes and to update pertinent information, WGS created a new WDDF, number TRA-04-013, and a new material profile No. 4246N in 2005 to replace the original documents.[13,21] This new material profile also anticipated the potential of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) TRU waste.

In 2005, WDDF number TRA-05-009 was created to replace the previous WDDF to provide updated container information in preparation for shipment to MFC.[22]

The 55-gallon drum was removed from the original overpack drum and was placed in a new filtered DOT 7A Type A 85-gallon drum in 2005 because the 2001 85-gallon overpack drum did not have required quality assurance information available. The new 85-gallon drum retained IWTS container profile number TRA010029 and the container profile was updated. A corresponding bar code label was applied to the new overpack drum. The new 85-gallon drum was then shipped to MFC in 2005, where it is currently stored.

4.4.2.3 IWTS Material Profile 5649N. Material profile No. 5649N was created in 2008 for other TRU actinide standard waste generated in 2005 at the MTR labs. Because it was determined that CERCLA waste should be profiled separately and that drum TRA010029 waste was substantially similar to the 2005 actinide standards waste, TRA010029 was moved to this new material profile that does not include CERCLA waste.[9]

A new WDDF, number ATRX-13-006, was created for this drum to update information from the previous WDDF and to document the information on the most recent form revision.[23] A separate WDDF was created for the 2005-generated actinide standards. The 2005 waste is contained in a separate drum that is currently stored at ATR. TRA010029 does not contain waste from the 2005 waste generation.

4.4.2.4 IWTS Container Profile TRA010029. IWTS container profile number TRA010029 was created in 2001 under material profile 2913Q.[16,20] The container date 04/09/1991 was recorded on the container profile define screen to indicate the date the waste was generated, not the date the container profile was created. This container profile has been periodically updated since its creation to conform to changes in WGS policies and procedures and to maintain the most current required information. These updates are recorded in the Quality Record Log and Edit Log sections of the container profile. The drum has maintained its assignment to container profile number TRA010029 throughout the changes to different material profiles and WDDFs. The container profile is current as assigned to material profile number 5649N and WDDF number ATRX-13-006.[9,23]

5. WASTE MATERIAL INPUTS

The actinide standards were used periodically in TRA-661, but were generated as waste at the TRA-604 MTR source vault. Waste material inputs and their origin for this waste are identified in Table 1.

Table 1. Waste chemicals/constituents in Advanced Test Reactor actinide standards.[4,5,8,15]

Waste Chemicals/Constituents	CAS	Origin/Use
Nitric acid	7697-37-2	TRA-604 MTR source vault, Lab 104A and TRA-661 Alpha Wing labs/dissolution agent
Potassium phosphate	7778-53-2	TRA-604 MTR source vault, Lab 104A and TRA-661 Alpha Wing labs/neutralizer
Floor-Dry (diatomaceous earth)	61790-53-2	TRA-604 MTR source vault, Lab 104A and TRA-661 Alpha Wing labs/absorbent

The waste contains approximately 25 vol% debris material generated during packaging, including empty glass containers, a pen, a screwdriver, aviation snips, plastic gloves, and poly bags (See Section 4.3).[5,8,15]

6. CHARACTERIZATION INFORMATION

6.1 Radiological Characterization

The radionuclide composition for the actinide standards is based on data provided by research project personnel for the original actinide standards with known isotopic activities. The isotopic composition and activities of this waste was revised from the original activities to account for decay (see Section 2).[19] The final radiological characterization is recorded in IWTS container profile TRA010029.[16] It is not low-level waste or mixed low-level waste. Table 2 provides a list of the radionuclides and their concentrations based on the container profile radiological report.[24]

Table 2. Radionuclide content.[16,24]

Radionuclide	Concentration (nCi/g)
Am-241*	2.62E+02
Am-243	1.79E+01
Bi-212	1.36E+00
Cm-244	1.53E+03
Np-237	7.45E+00
Np-239	1.79E+01
Pa-233	7.45E+00
Pb-212	1.36E+00
Po-212	8.70E-01
Po-216	1.36E+00
Pu-238*	6.39E-02
Pu-239*	9.35E-01
Pu-240*	6.30E+02
Pu-241	5.08E+00
Ra-224	1.36E+00
Rn-220	1.36E+00
Th-228	1.36E+00
Tl-208	4.87E-01
U-232	1.32E+00
U-236	3.90E-02

*WIPP reportable radionuclides

6.1.1 Uranium Content

This waste does not contain greater than 1% depleted or enriched uranium.

6.1.2 Waste Classification

This waste is classified as non-mixed TRU waste.

6.2 RESOURCE CONSERVATION AND RECOVERY ACT DETERMINATIONS

6.2.1 Ignitable, Corrosive, and Reactive Characteristics

Waste with hazardous waste codes for ignitable, corrosive, and reactive characteristics will not be shipped to AMWTP. This waste does not contain ignitable, corrosive, or reactive components. Waste with potential corrosive properties were treated (i.e., liquids neutralized and absorbed prior to waste container closure).[15,16]

6.2.2 Toxicity Characteristics

This ATR waste consists of actinide standards, isolated radioisotopes used as laboratory standards, tracers, and targets and was not prepared with heavy metals or organic compounds. This waste does not contain hazardous waste codes for metals or organic constituents that are associated with toxicity characteristics.

6.2.3 Listed Waste (F, P, U, and K)

This waste does not contain Environmental Protection Agency hazardous waste constituents associated with degreasing or used as solvents (HWNs F001 through F005) or from other non-specific sources (HWNs F006 through F039).

This waste does not contain discarded, unused, commercial chemical products; off-specification species; a manufacturing intermediate; or contain spill residues thereof that would meet the listing of P or U-listed hazardous waste as identified in 40 CFR 261.33.

Nitric acid was used in preparation of the laboratory-prepared actinide standards as dilute acidic solutions. All acidic solutions were neutralized and absorbed before packaging in this drum. No free liquids remained in the container after the absorption and packaging process.[5,8,15]

Hydrofluoric acid was not used in the process that generated this material and is not present in this waste. The U134 HWN is not applicable.

Beryllium was not used in the process that generated this material and is not present in this waste. The P015 HWN is not applicable.

The ATR TRU waste is not hazardous waste from specific sources listed in 40 CFR 261.32 (i.e., K-listed hazardous waste) and they have not been mixed with, derived from the treatment of K-listed wastes, or contain spill residues thereof. The waste materials in this waste stream are not assigned K-listed HWNs.

7. TOXIC SUBSTANCES CONTROL ACT POLYCHLORINATED BIPHENYLS DETERMINATIONS

Polychlorinated biphenyls are not used in any of the processes associated with this waste and are not present in this waste stream. Polychlorinated biphenyls contaminated waste or items greater than or equal to50 ppm will not be shipped to AMWTP.

8. PROHIBITED ITEMS

This waste was packaged as a single waste stream and none of the following prohibited items were present in this waste during packaging:[1]

- High-level waste
- Spent nuclear fuel
- Sealed containers greater than 4 L

- Hazardous waste
- Non-radionuclide pyrophoric materials
- Waste containing elemental mercury
- Waste containing polychlorinated biphenyls
- Non-defense waste
- Waste managed as non-TRU
- Waste containing pressurized containers/compressed gases/aerosol cans
- Waste with any amounts of liquids
- Corrosive waste
- Ignitable waste
- Reactive, pyrophoric, shock sensitive, explosives, and unstable waste
- Waste not in conformance with this process knowledge document and/or the AMWTP waste stream profile (i.e., Form 1900)
- Waste that is shielded
- Containers with poor integrity
- Incompatible waste within the same container
- Waste with fissile gram equivalents greater than 200 value.
- Remote-handled waste (waste containers having a dose rate greater than200mR/hr at contact).

9. WASTE PACKAGING

The 18 waste actinide standards were individually bagged and packaged in a filtered 55-gallon steel drum equipped with a vented 90-mil poly liner. The drum is overpacked in a filtered DOT 7A Type A drum. All waste liquids were neutralized with potassium phosphate and treated with absorbent material (diatomaceous earth) until no liquids remained. Additional materials generated during the packaging, including the empty glass containers, a pen, hand tools, and plastic gloves, were also bagged and placed in the 55-gallon drum.[5,8,15]

Waste shipped to AMWTP will be packaged and shipped in accordance with the DOE Order 435.1, "Radioactive Waste Management," LWP-8300, and MP-TRUW-8.40, "INL Non-AMWTP Radioactive or Mixed Waste Acceptance."[1,2]

Shipment of the waste will be authorized by citing an approval issued by AMWTP prior to shipment. Waste to be shipped to AMWTP is packaged as follows:[1, 2, 3]

1. The ATR container dose rate is less than 200 mR/hr at contact.
2. Waste items were bagged and were placed into 55-gallon poly lined drum and vented appropriately.
3. Individual bags are packaged in Floor-Dry absorbent as a stabilizing material in a vented poly liner.
4. Surface contamination on outer waste containers will be less than 200 dpm/100 cm^2 beta-gamma and less than 20 dpm/100 cm^2 alpha.
5. Waste is packaged in vented 55-gallon drum overpacked in a filtered DOT 7A, Type A, 85-gal drum.
6. This TRU waste container is vented with a filter. The internal drum liner is vented and the inner drum is filtered.

7. The TRU waste container does not contain incompatible waste.
8. The waste does not contain residual free liquids, but does contain absorbed radioactive fluids that will remain immobile during transport, storage, and disposal.
9. The methods of closure for plastic bags greater than 4 L used for waste confinement twist and tape or fold and tape closure.

10. REFERENCES

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