# Certification Plan for INL Transuranic Waste

Advanced Mixed Waste Treatment Project

Approved:

(*Signature on file. See DCR-7194.*) 07/07/08

Enrique Torres
TRU Programs Manager

Date

Next Periodic Review: 12/31/08

| AMWTP MANAGEMENT PROCEDURE | | |
|---|---|---|
| MP-TRUW-8.1, Rev. 16 | Issued: 07/14/08 | Effective: 07/15/08 |
| **CERTIFICATION PLAN FOR INL TRANSURANIC WASTE** | | |

# DOCUMENT APPROVAL SHEET

**Document Type:** Compliance Plan **Document Number:** MP-TRUW-8.1

**Title:** Certification Plan for INL Transuranic Waste

**Author:** Gina Tedford **Phone:** 208 557-6449

**Document Owner:** Enrique Torres **Phone:** 208 557-6454

REVIEW CONCURRENCE AND APPROVAL SIGNATURES

Denote R for review concurrence, A for approval, as appropriate.

| Type or print name<br>Signature | R/A | Date | Organization Discipline | Mailing Address |
|---|---|---|---|---|
| Eric Schweinsberg<br>(Signature on file) | R | 07/02/08 | Site Project Manager | 850 Energy Drive, Suite 200<br>Idaho Falls, Idaho 83401-1502 |
| T. F. Fallon<br>(Signature on file) | R | 07/02/08 | Site QA Manager | 850 Energy Drive, Suite 200<br>Idaho Falls, Idaho 83401-1502 |
| Ava Holland<br>(Signature on file) | A | 07/07/08 | DOE-CBFO<br>QA Manager | DOE-CBFO<br>Carlsbad, NM 88221 |
| Donald C. Gadbury<br>(Signature on file) | A | 07/07/08 | DOE-CBFO<br>Director, Office of<br>National TRU Program | DOE-CBFO<br>Carlsbad, NM 88221 |

## REVISION LOG

| Revision Number | Date Approved | Pages Affected | Description of Revision |
|---|---|---|---|
| 0 | 08/01/02 | All | Initial issue. DCR-1230. Document issue date was 07/17/02. DOE/WIPP approval was received 07/30/02 thus the change in effective date to 08/01/02. |
| 1 | 12/19/02 | Various | DCR-1820. Correct procedure titles and numbers. Added verbiage to include manual data review. Added DOE-ID to the Document Approval Sheet in accordance with MP-DOCS-18.4. Document issue date was 12/19/02. DOE/WIPP approval was received 01/14/03 thus the change in effective date to 02/06/03. |
| 2 | 06/11/03 | Various | DCR-2117: Incorporate WIPP WAC Rev. 0.1 and QAPD Rev. 4 requirements. Correct procedure References in Section 4. Document issue date was 03/20/03. DOE/WIPP approval was received 04/03/03. The original signature page was lost and was resigned, thus the change in effective date is 06/11/03. |
| 3 | 10/07/03 | Various | DCR-2478. Updated to clarify QA Organization roles & responsibilities and to include reference to 40 CFR 194. These updates address EPA Finding discussed during CBFO Audit A 03-05. |
| 4 | 03/04/04 | Various | DCR-2633: Annual review and update and incorporate new headspace gas procedure References |
| 5 | 08/18/04 | Various | DCR-2825. Incorporate WIPP CH-WAC DOE/WIPP-02-3122 Revision 1 changes and incorporate facility procedures. |

| Revision Number | Date Approved | Pages Affected | Description of Revision |
|---|---|---|---|
| 6 | 11/15/04 | Various | DCR-3263. Incorporate the CH-WAC, DOE/WIPP 02-3122 Revision 2 changes and incorporate the draft Revision 3 changes addressing the proposed disposal acceptance criteria pertaining to $^{239}$Pu FGE limits for machine compacted waste. (WIPP memorandum CBFO:NTP:RJM:VW:04-2024:UFC:5822)<br><br>Revision 6 was rejected by CBFO. Revision 6 will not be issued. |
| 7 | 12/02/04 | 16 of 74 | See DCR-4026. |
| 8 | 04/25/05 | Various | DCR-4252 Incorporation of DOE/WIPP-02-3120, WIPP Waste Acceptance Criteria Revision 3 requirements. Incorporation of CBFO DRR comments. |
| 9 | 06/09/05 | 34 | DCR-4281. Incorporation of Class 1 Permit Modification Notification to Revise Language for Compacted 55-Gallon Drums With Rigid Liners, April 27, 2005 and WIPP Memorandum CBFO:OCT:KWW:VW:05-1164-UFC:5822. Incorporated the procedure to implement the UFGTP long-term objective. |
| 10 | 01/03/06 | All | DCR-4399. Implementation of Rev. 4 of CH-WAC. |
| 11 | 06/30/06 | All | DCR-5040. Various changes to reflect new contractor and laboratory titles, additional requirements from the WAC, OSM implementation, training program changes, and numerous editorial changes, corrections, and clarifications. |
| 12 | 01/04/07 | All | DCR-5542. Incorporate changes to the DOE/WIPP-02-03122, Transuranic Waste Acceptance Criteria (WAC) for WIPP, and DOE/CBFO-94-1012, Quality Assurance Program Plan (QAPD). |
| 13 | 07/26/07 | All | DCR-6071. Update the procedural reference titles for implementation of DOE/WIPP 02/3184 and DOE/WIPP 06-3345. CCP Analytical Laboratory Changes, delete MP-TRUW-8.16, WWIS Data Transfer from procedure. |

| Revision Number | Date Approved | Pages Affected | Description of Revision |
|---|---|---|---|
| 14 | 12/21/07 | All | DCR-6556. Incorporated requirements from DOE/WIPP-02-3122, WIPP WAC, Rev. 6.1. Periodic review. |
| 15 | 3/28/08 | All | DCR-6782. Incorporated CCP transportation and flammable gas changes for transition. |
| 16 | 07/07/08 | Appendix G | DCR-7194. Incorporated requirements from DOE/WIPP-02-3122, WIPP WAC, Rev. 6.2, and corrected revision log approval date for Rev. 15. |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## CONTENTS

1.0 INTRODUCTION ..... 1

2.0 RESPONSIBILITIES ..... 4

2.1 DOE Headquarters ..... 4

2.2 DOE Carlsbad Field Office ..... 4

2.3 DOE Field Elements ..... 5

2.4 TRU Waste Sites ..... 5

3.0 WIPP WASTE ACCEPTANCE REQUIREMENTS AND CRITERIA ..... 6

3.1 Summary of WIPP Authorization Basis ..... 6

3.2 Container Properties ..... 11

3.3 Radiological Properties ..... 16

3.4 Physical Properties ..... 23

3.5 Chemical Properties ..... 25

3.6 Data Package Contents ..... 28

4.0 WASTE ACCEPTANCE REQUIREMENTS AND CRITERIA FOR RH WASTE ..... 29

5.0 QUALITY ASSURANCE REQUIREMENTS ..... 30

5.1 Waste Characterization QA Requirements ..... 30

5.2 Waste Certification QA Requirements ..... 30

5.3 Waste Transportation QA Requirements ..... 30

5.4 Quality Assurance Program ..... 31

5.5 Personnel Qualification and Training ..... 39

5.6 Quality Improvement ..... 40

5.7 Documents and Records ..... 44

5.8 Performance Requirements ..... 46

5.9 Design Control ..... 47

5.10 Procurement ..... 47

5.11 Inspection and Testing ..... 48

5.12 Assessment Requirement ..... 49

5.13 Sample Control Requirements ..... 52

5.14 Scientific Investigation Requirements ..... 52

5.15 Software Requirements ..... 53

6.0 REFERENCES ..... 54

Appendix A – Radioassay Requirements for Contact-Handled Transuranic Waste ..... A1

Appendix B – $^{239}$Pu Equivalent Activity ..... B1

Appendix C – Glossary ..... C1

Appendix D – Payload Container Integrity Checklist ..... D1

Appendix E – Payload Management of TRU Alpha Activity Concentration ..... E1

Appendix F – Radiography Requirements for Contact-Handled Transuranic Waste ..... F1

Appendix G – Visual Examination Requirements for Contact-Handled Transuranic Waste for EPA Compliance ..... G1

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AIM | Association for Automatic Identification and Mobility |
| AK | acceptable knowledge |
| ALARA | as low as reasonably achievable |
| AMAD | activity mean aerodynamic diameter |
| AMWTF | Advanced Mixed Waste Treatment Facility |
| AMWTP | Advanced Mixed Waste Treatment Project |
| ASNT | American Society of Nondestructive Testing |
| ASTM | American Society for Testing and Materials |
| ANSI | American National Standards Institute |
| CAR | Corrective Action Report |
| CBFO | Carlsbad Field Office |
| CCA | Compliance Certification Application |
| CCP | Central Characterization Project |
| CFR | Code of Federal Regulations |
| CH | contact-handled |
| CH-DSA | Contact-Handled Documented Safety Analysis |
| CH-TRAMPAC | Contact-Handled Transuranic Waste Authorized Methods for Payload Control |
| Ci | curie |
| CNS | Chem-Nuclear Systems |
| CPR | cellulose, plastic, and rubber |
| DAS | drum assay system |
| DDA | differential die-away |
| DOE | U.S. Department of Energy |
| DOE-ID | Department of Energy Idaho Operations Office |
| DOT | U.S. Department of Transportation |
| dpm | disintegrations per minute |
| DQO | data quality objective |
| EDF | Energy Drive Facility |
| EPA | U.S. Environmental Protection Agency |
| FEIS | Final Environmental Impact Statement |
| FGE | fissile gram equivalent |

| | |
|---|---|
| HAC | Hypothetical Accident Condition |
| HWFP | Hazardous Waste Facility Permit |
| ICP | Idaho Cleanup Project |
| ID | Idaho |
| INL | Idaho National Laboratory |
| keV | kiloelectron volt |
| LCS | laboratory control sample |
| LLD | lower limit of detection |
| LWA | Land Withdrawal Act |
| M&TE | measuring and test equipment |
| mrem | milliroentgen equivalent man |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| nCi/g | nanocuries per gram |
| NCR | nonconformance report |
| NDA | nondestructive assay |
| NDE | nondestructive examination |
| NIST | National Institute of Standards and Technology |
| NMAC | New Mexico Administrative Code |
| NMED | New Mexico Environment Department |
| NRC | U.S. Nuclear Regulatory Commission |
| OJT | on-the-job training |
| OPCTCD | overpack payload container transportation certification document |
| PATCD | payload assembly transportation certification document |
| PCB | polychlorinated biphenyl |
| PCTCD | payload container transportation certification document |
| PE-Ci | $^{239}$Pu equivalent curies |
| QA | quality assurance |
| QAO | quality assurance objective |
| QAP | Quality Assurance Plan |
| QAPD | Quality Assurance Program Document |
| QAPjP | quality assurance project plan |
| QC | quality control |
| %R | percent recovery |
| RC | radiochemistry |
| RCRA | Resource Conservation and Recovery Act |
| rem | roentgen equivalent man |

| | |
|---|---|
| RH | remote-handled |
| RH-DSA | Remote-Handled Documented Safety Analysis |
| RH-TRAMPAC | Remote-Handled Transuranic Authorized Methods for Payload Control |
| RPD | relative percent difference |
| RSD | relative standard deviation |
| RTR | real-time radiography |
| | |
| SATR | Site Acceptance Test Reports |
| SAR | Safety Analysis Report |
| SEIS | Supplemental Environmental Impact Statement |
| SNM | special nuclear material |
| SPM | Site Project Manager |
| SPO | Site Project Office |
| SWB | standard waste box |
| | |
| TCO | Transportation Certification Official |
| TDOP | ten-drum overpack |
| TMU | total measurement uncertainty |
| TRAMPAC | Transuranic Waste Authorized Methods for Payload Control |
| TRU | transuranic |
| TRUPACT-II | Transuranic Package Transporter-Model II |
| TSDF | Treatment, Storage, and Disposal Facility |
| | |
| VE | Visual Examination |
| VEE | Visual Examination Expert |
| VOC | volatile organic compound |
| | |
| WAC | Waste Acceptance Criteria |
| WAP | Waste Analysis Plan |
| WCL | waste component limits |
| WCO | Waste Certification Official |
| WCP | Waste Certification Plan |
| WCPIP | Waste Characterization Program Implementation Plan |
| WIPP | Waste Isolation Pilot Plant |
| WSPF | Waste Stream Profile Form |
| WTES | WIPP TRAMPAC Evaluation Software |
| WTS | Waste Tracking System |
| WWIS | WIPP Waste Information System |

# 1.0 INTRODUCTION

The purpose of this document is to summarize the methods and procedures used by the Idaho National Laboratory (INL) Advanced Mixed Waste Treatment Project (AMWTP) to certify waste as compliant to the waste acceptance criteria (WAC) applicable to the transportation, storage, and disposal of contact-handled (CH) and remote-handled (RH) transuranic (TRU) waste at the Waste Isolation Pilot Plant (WIPP). The Central Characterization Project (CCP) provides transportation services through the CCP Certified Program as specified in the AMWTP Statement of Work (SOW). These criteria serve as the U.S. Department of Energy's (DOE's) primary directive for ensuring that CH and RH TRU waste is managed and disposed of in a manner that protects human health and safety and the environment.

The authorization basis of WIPP for the disposal of CH- and RH-TRU waste includes the Department of Energy (DOE) National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Reference 24) and the WIPP Land Withdrawal Act (LWA; Reference 25). Included in this document are the requirements and associated criteria imposed by these acts and the Resource Conservation and Recovery Act (RCRA, Reference 27), as amended, on the TRU waste destined for disposal at WIPP.

The AMWTP certifies CH-TRU waste payload containers to the waste acceptance criteria identified in this document. As shown in Figure 1.0, the Regulatory Basis of TRU Waste Acceptance Criteria, the flow-down of applicable requirements to the WAC are traceable to several higher-tier documents, including the WIPP operational safety requirements derived from the WIPP CH Documented Safety Analysis (CH-DSA; Reference 11), the WIPP RH Documented Safety Analysis (RH-DSA, Reference 20), the transportation requirements for CH wastes derived from the Transuranic Package Transporter-Model II (TRUPACT-II) and HalfPACT Certificate of Compliance (Reference 48 and 49), the transportation requirements for RH wastes derived from the CNS 10-160B and RH-TRU 72-B Packaging Certificates of Compliance (Reference 52 and 53), the WIPP LWA (Reference 25), the WIPP Hazardous Waste Facility Permit (Reference 47), and the U.S. Environmental Protection Agency (EPA) Compliance Recertification Decision and approval for PCB disposal (References 34, 17, 31, 45, 51) and the EPA's letter of approval of DOE's RH-TRU Waste Characterization Program (Reference 32). The solid arrows shown in Figure 1.0 represent the flow-down of all applicable payload container-based requirements. The two dotted arrows shown in Figure 1.0 represent the flow-down of all applicable payload container-based requirements. The dotted arrows shown in Figure 1.0 represent the flow down of summary level requirements only; i.e., sites must reference the regulatory source documents from the U.S. Nuclear Regulatory Commission (NRC) and the New Mexico Environment Department (NMED) for a comprehensive and detailed listing of the requirements.

This Certification Plan for INL Transuranic Waste, also referred to as the Certification Plan, does not address the subject of waste characterization relating to a determination of whether the waste is hazardous; rather, the AMWTP refers to the MP-TRUW-8.2, Quality Assurance Project Plan, for details of the sampling and analysis protocols to be used in determining compliance with the required physical and chemical properties of the waste. Requirements and associated criteria pertaining to a determination of the radiological properties of the waste, however, are addressed in Appendix A. The requirements and associated criteria pertaining to a determination of the radiological properties of RH waste are addressed in the Remote-Handled TRU Waste Characterization Program Implementation Plan (WCPIP, Reference 18). The collective information obtained from waste characterization records and acceptable knowledge (AK), serves as the basis for AMWTP to certify that its TRU waste satisfies the WIPP waste acceptance criteria.

Section 2.0 of this document identifies the responsible organizations and associated activities for ensuring that the TRU waste is managed in a manner that protects human health and safety and the environment.

Section 3.0 identifies the authorization basis of the CH requirements and lists the associated waste acceptance criteria relating to the physical, chemical, and radiological attributes of the waste as well as the properties of the applicable payload containers and packages themselves.

Section 4.0 identifies the authorization basis of the RH requirements and lists the associate waste acceptance criteria relating to the physical, chemical, and radiological attributes of the waste as well as the properties of the applicable payload containers and packaging themselves. Containers suspected to be RH-TRU waste will undergo preliminary characterization to ensure that the waste is candidate RH-TRU waste. RH-TRU waste will be transferred to the Idaho Cleanup Project (ICP) contractor for subsequent characterization, certification, and shipment to WIPP.

Section 5.0 summarizes the AMWTP Quality Assurance (QA) requirements relating to waste characterization, and certification that meet all applicable requirements of the Carlsbad Field Office (CBFO) Quality Assurance Program Document (QAPD; Reference 5). Characterization of TRU waste must be in accordance with the WIPP WAP (Reference 46), the WCPIP (Reference 18), and the WAC (Reference 13), and implemented in accordance with MP-TRUW-8.2 and this document. Certification of payload containers for shipment in the TRUPACT-II, HalfPACT, RH-TRU 72-B, or CNS 10-160B is performed under the CCP QA program, which provides confidence for both the shipper and the receiver that the requirements for the transportation system have been met.

The appendices provide supplemental information relating to radioassay (Appendix A, Radioassay Requirements For Contact-Handled Transuranic Waste) and radiotoxic inhalation hazard analyses (Appendix B, $^{239}$Pu Equivalent Activity). A glossary is provided in Appendix C, Glossary. Appendix D, Payload Container Integrity Checklist, addresses the visual examination

requirements and compliance criteria for determining if CH and applicable RH payload containers meet the criteria of Section 3.2.1 and Section 4.8.1. Appendix E, Payload Management of TRU Alpha Acceptance Criteria, specifies the policy and implementation methods for the payload management of TRU alpha activity concentration when overpacking waste containers. Finally, Appendices F and G provide the radiography and visual examination requirements relating to EPA's physical characterization requirements for CH waste. The WAC is a controlled document. The most current version of the WAC is available for downloading from the CBFO web page at http://www.wipp.energy.gov/library/wac/WAC.pdf. This Internet link is provided for informational purposes only and may change without prior public notification.

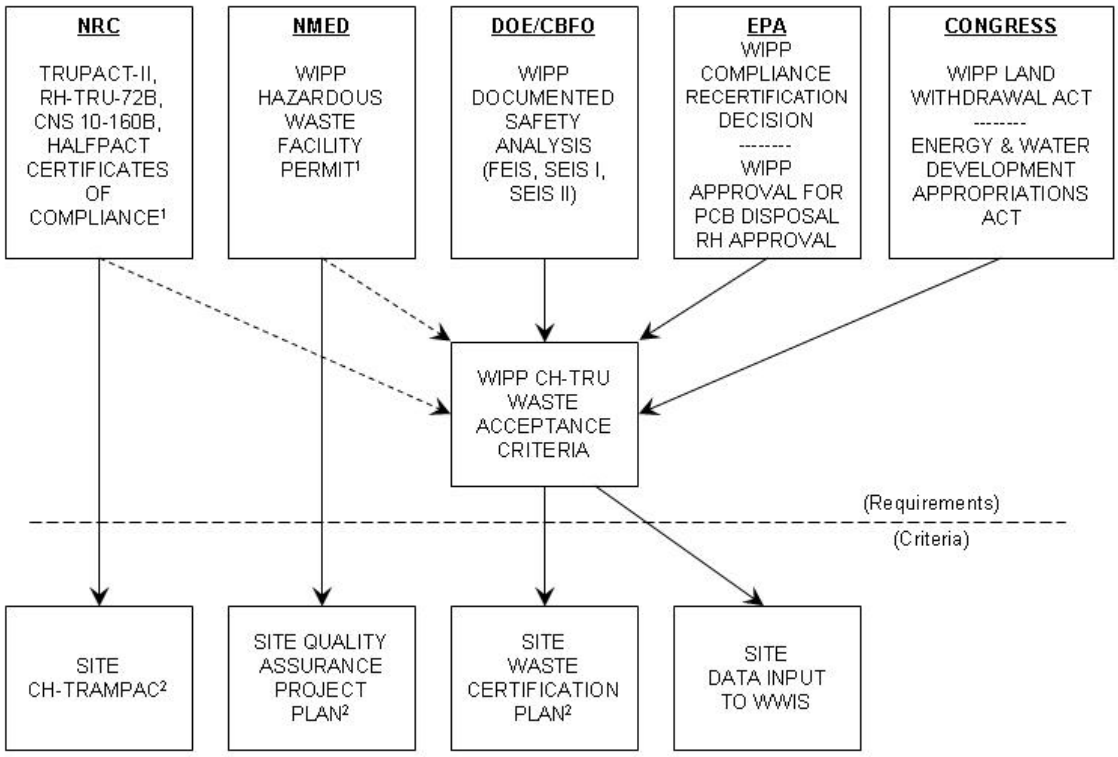


**Figure 1.0.** Regulatory Basis of TRU Waste Acceptance Criteria.

**NOTE 1:** *The TRUPACT-II Authorized Methods for Payload Controls (TRAMPACs) as referenced by the TRUPACT-II, HalfPACT, RH-TRU 72-B, and CNS 10-160B Certificates of Compliance and the WIPP Hazardous Waste Facility Permit provide detailed requirements. The WAC only provides an overview of these requirements.*

**NOTE 2:** *All work performed by the AMWTP must be performed under an approved QA program. The site-specific TRAMPACs can be a separate document or can be embodied in the site waste certification plan. The CNS 10-160B Safety Analysis Report (SAR) does not require the preparation of a site-specific TRAMPAC. Instead, acceptance methods for payload compliance for the CNS 10-160B cask are implemented by an NRC-approved site-specific Appendix to the 10-160B SAR.*

## 2.0 RESPONSIBILITIES

This section identifies the responsibilities of organizations that develop and approve the WIPP WAC and of those that oversee the implementation of the requirements defined herein. The responsibilities of the AMWTP to which these requirements apply are also identified in this section.

### 2.1 DOE Headquarters

The Assistant Secretary for Environmental Management (EM-1) provides policy and guidance for DOE environmental management sites, facilities, and operations.

### 2.2 DOE Carlsbad Field Office

The CBFO is responsible for the day-to-day management and direction of strategic planning and related activities associated with the characterization, certification, transportation, and disposal of defense TRU waste. The CBFO holds the applicable permits, certifications, and records of decision necessary for the operation and closure of the WIPP facility.

The CBFO assists the sites in resolving issues about the management of TRU waste as requested. The CBFO provides policy and oversight direction for TRU waste program activities related to site certification of waste for disposal at WIPP. The CBFO is also responsible for the following:

- Ensuring that the sites prepare implementation documentation and programs to meet the requirements and criteria in the WAC
- Overseeing activities associated with the:
  - characterization and certification of TRU waste
  - proper use of approved transportation packaging
  - receipt, management, and disposal of TRU waste at WIPP

- Providing a fleet of NRC-approved Type B transportation packaging for shipment of TRU waste from the sites to WIPP
- Ensuring that TRU waste accepted for management and disposal at WIPP complies with the WIPP Hazardous Waste Facility Permit, applicable laws, and regulations as described in the WAC
- Reviewing and approving proposed revisions to the WAC to ensure that environmental impacts associated with any revision are bounded by existing WIPP National Environmental Policy Act documentation including the Final Environmental Impact Statement (Reference 8), and related supplements (References 9 and 10)
- Reviewing and approving the site's waste certification plan, site-specific CH-TRAMPACs, QA plan, and QAPjP
- Performing site certification audits and surveillances
- Granting transportation and waste certification authority to sites.

### 2.3 DOE Field Elements

Each DOE Field Element is responsible for overseeing the management of the site TRU waste program in compliance with established CBFO requirements, policies, and guidelines; and providing liaison between the CBFO and the management and operating contractors.

### 2.4 TRU Waste Sites

The AMWTP is responsible for developing and implementing site-specific TRU waste program documents (plans) that address applicable requirements and criteria pertaining to packaging, characterization, and certification of defense TRU waste to WIPP for disposal. The AMWTP has prepared this Waste Certification Plan and associated QA Plan, and a QAPjP. The CCP TRAMPAC fulfills the Nuclear Regulatory Commission (NRC) approved CH-TRAMPAC requirements for payload compliance. Methods of compliance with each requirement and associated criterion to be implemented are described or specifically referenced and include procedural and administrative controls consistent with the CBFO QAPD (Reference 5). The AMWTP and CCP submit these program documents to the CBFO for review and approval prior to implementation. The AMWTP certifies that each TRU waste payload container meets the waste acceptance criteria contained in this document. The AMWTP QA requirements relating to waste characterization, certification, and transportation are contained in Section 5.0. The following AMWTP and CCP site-specific TRU waste program documents are submitted to CBFO for review and approval prior to implementation:

- MP-TRUW-8.1, Certification Plan for INL Transuranic Waste
- MP-TRUW-8.2, Quality Assurance Project Plan

- CCP-PO-003, CCP Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CCP CH-TRAMPAC).

Additional implementing procedures not listed above also require CBFO approval prior to implementation. The AMWTP Site Project Office, project level positions, and primary responsibilities are described in Section 5.4.1 of this document.

# 3.0 WIPP WASTE ACCEPTANCE REQUIREMENTS AND CRITERIA

The requirements and associated criteria for acceptance of defense TRU waste at WIPP for disposal are identified in the WAC. The acceptance criteria of the WAC describe the controlling (i.e., the most restrictive) requirements to be used by the AMWTP in preparing their waste for transportation to and disposal at the WIPP. In some instances the acceptance criteria and regulatory requirements are synonymous. WAC requirements are derived from several source documents, including, but not limited to, the following: the WIPP CH-DSA (Reference 11), the TRUPACT-II and/or HalfPACT Certificates of Compliance (References 48 and 49), the WIPP LWA (Reference 25), the Energy and Water Development Appropriations Act (Reference 26), the WIPP Hazardous Waste Facility Permit (Reference 46), Compliance Recertification Decision (Reference 34), the Initial Report for PCB Disposal Authorization (Reference 17), the EPA letter of approval to land dispose non-liquid PCBs at WIPP (Reference 31) and the Revision to the Record of Decision for the DOE's WIPP Disposal Phase (Reference 33). Definitions of terms used in this Certification Plan are included in Appendix C.

## 3.1 Summary of WIPP Authorization Basis

The purpose of Section 3.0 and related appendices is to present the requirements and associated criteria that must be met for CH-TRU waste to be transported to, managed at, and disposed of at the WIPP. The requirements and associated criteria are organized under five major headings: Container Properties, Radiological Properties, Physical Properties, Chemical Properties, and Data Package Contents. Only TRU waste from a properly characterized and approved waste stream may be certified as meeting the requirements and associated criteria contained in this Certification Plan. Any waste payload container from a waste stream that has not been preceded by a permittee approved Waste Stream Profile Form (WSPF), is not acceptable for disposal at WIPP (Reference 46, Attachment B, Section B-1c; Reference 46, Module II, Section II.C.3.I).

Site-specific plans and procedures shall contain details of the processes, controls, techniques, tests, and other actions to be applied to each TRU payload container, waste stream, and shipment. Methods of compliance with each requirement shall be described and the specific procedure cited. These methods of compliance shall include procedural controls, administrative controls, and waste generation process controls. The QA requirements applicable to waste characterization, certification, and transportation are addressed in various sections of this Certification Plan and are briefly summarized in Section 5.0. The data resulting from the implementation of the plans and procedures will form the basis for verifying that TRU waste to be sent to WIPP is certified to meet the WAC by the responsible site certifying official(s).

Sites shall transmit required characterization, certification, and shipping data to WIPP using the WIPP Waste Information System (WWIS). The WWIS is an electronic database equipped with edit/limit checks to ensure that the data representing the waste payload containers are in compliance with the WAC. Before shipping TRU waste payload containers from a WIPP-accepted waste stream, sites shall transmit the required waste characterization, certification, and shipping data via WWIS to WIPP. Sites may be periodically requested to transmit payload container radiography reports or other data to WIPP. The WIPP will not accept any waste shipments for disposal if the waste payload container information has not been correctly submitted and approved for shipment by the WWIS Data Administrator. The WWIS User's Manual (Reference 7) provides the information needed to perform tasks associated with transmittal of the payload container's characterization, certification, and shipment information to WIPP.

Sites will be notified of revisions to external regulatory requirements by CBFO. Revisions of requirements in referenced documents not controlled by the DOE (but by, for example, the EPA, NRC, or NMED) shall have precedence over the values specified here if they are more restrictive. These changes will be incorporated in future revisions of the WAC

### 3.1.1 DOE Operations and Safety Requirements for WIPP

The WIPP CH-DSA (Reference 11), addresses TRU waste handling and emplacement operations. The waste accepted for emplacement in the WIPP must conform to the CH-DSA and the associated technical safety requirements (Reference 12). The CH-DSA documents the safety analyses that develop and evaluate the adequacy of the WIPP safety bases necessary to ensure the safety of workers, the public, and the environment from the hazards posed by WIPP waste receiving, handling, and emplacement operations. The CH-DSA establishes and evaluates the adequacy of the safety bases in response to plant normal and abnormal operations and postulated accident conditions.

### 3.1.2 NRC Transportation Safety Requirements

Acceptable methods for payload compliance are defined in the TRUPACT-II and HalfPACT Certificates of Compliance and implemented by the CH-TRAMPAC (Reference 50). For shipments to WIPP, each site must prepare a site-specific CH-TRAMPAC describing how it will ensure compliance with each payload parameter. The CH-TRAMPAC shall contain sufficient detail to allow reviewers to adequately understand and evaluate the compliance methodology for each payload parameter.

Sites shall have a packaging QA program that defines the QA activities that apply to the use of NRC-approved transportation packaging equivalent to Title 10 of the Code of Federal Regulations (10 CFR) Part 71, Subpart H, (Reference 36).

### 3.1.3 NMED Hazardous Waste Facility Permit Requirements

TRU waste is classified as TRU-mixed waste if it contains hazardous constituents regulated under the New Mexico Hazardous Waste Act (Reference 47). Only TRU mixed-waste and TRU waste that have been characterized in accordance with the WAP and that meet the Treatment, Storage, and Disposal Facility (TSDF), waste acceptance criteria as presented in the Hazardous Waste Facility Permit (HWFP) conditions B-1c, II.C.3.a through II.C.3.I of the WIPP HWFP will be accepted at the WIPP facility for disposal in the permitted underground hazardous waste disposal unit.

The AMWTP has developed and implemented a QAPjP that addresses all the applicable requirements specified in the WIPP WAP. In accordance with Attachment B5 of the WAP, the QAPjP includes the qualitative and/or quantitative criteria for determining whether the waste characterization program is being satisfactorily performed. All QAPjPs are reviewed and approved by the CBFO.

### 3.1.4 EPA Requirements

#### 3.1.4.1 EPA Compliance Recertification Decision

Title 40 CFR 194.24(c) states that the DOE shall specify the limiting values for waste components to be emplaced in the repository (Reference 40). The EPA's Compliance Recertification Decision (Reference 34) identifies the repository limits for several waste components including free water, metals, and cellulose, plastic, and rubber (CPR). Although the Recertification does not specify limiting values for the activities and masses of specific radionuclides, it identifies the listed values for a number of radionuclides that are considered in the Performance Assessment. To demonstrate that the cumulative total activities of the specified radionuclides ($^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs) are consistent with the levels used for the Performance Assessment and the Recertification, reporting, and tracking of the specified radionuclides ($^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr,

and $^{137}Cs$) is necessary (see Appendix A). TRU waste payload containers shall contain more than 100 nanocuries per gram of waste (nCi/g) of alpha-emitting TRU isotopes with half-lives greater than 20 years, as specified in Section 3.3.3 of the WAC (LWA, Reference 25).

The repository limit for free water is a maximum of 1,684 cubic meters ($m^3$) and is met by the residual liquid criterion specified in Section 3.4.1.

The limits for metals are a minimum of $2 \times 10^7$ kilograms (kg) for ferrous metals and $2 \times 10^3$ kg for nonferrous metals. These limits will be met in the total repository inventory by the metals that constitute the payload containers alone; thus, WIPP tracks the number and type of payload containers emplaced in the repository as reported in the WWIS by the sites.

The repository limit for CPR is a maximum of $2.2 \times 10^7$ kg. Sites are required to estimate the CPR weights and report these estimates in the WWIS on a payload container basis as required by Section 3.6.1.

Sites must quantify and report the activities and masses of specific radionuclides for the purpose of tracking the total radionuclide inventory of the repository as specified in Section 3.3.1 of the WAC. The presence or absence of these specific radionuclides is determined from AK, radioassay, or both in accordance with Appendix A. The results of this determination are reported in the WWIS on a payload container basis.

#### 3.1.4.2 EPA Approval for PCB Disposal

Polychlorinated biphenyl contaminated TRU and PCB contaminated TRU waste mixed with a hazardous waste including PCB remediation waste, PCB Articles, and PCB bulk product waste may be stored and disposed at the WIPP (References 17, 31, 45, and 51).

Waste streams identified as containing PCBs shall be brought to the attention of the CBFO in order that a determination can be made regarding their acceptability at WIPP.

### 3.1.5 Land Withdrawal Act Requirements

The term "WIPP" means the Waste Isolation Pilot Plant project authorized under Section 213 of the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Pub. L. 96-164; 93 Stat. 1259-1265), to demonstrate the safe disposal of radioactive waste materials generated by atomic energy defense activities (Reference 24, Section 2[19]). Hence, by law, WIPP can accept only radioactive waste generated by atomic energy defense activities of the United States (Reference 24, Section 2[19]).

The DOE and its predecessor agencies were engaged in a broad range of activities that fall under the heading of atomic energy defense activities. A TRU waste is eligible for disposal at WIPP if it has been generated in whole or in part by one or more of the following functions (References 28 and 29):

- Naval reactors development
- Weapons activities, including defense inertial confinement fusion
- Verification and control technology
- Defense nuclear materials productions
- Defense nuclear waste and materials by-products management
- Defense nuclear materials security and safeguards and security investigations
- Defense research and development.

Using AK, DOE sites must determine that each waste stream to be disposed of at WIPP is "defense" TRU waste.

High-level radioactive waste or spent nuclear fuel shall not be transported, emplaced, nor disposed of at WIPP (Reference 25, Section 12). Also, no TRU waste may be transported by or for the DOE to or from WIPP, except in packages (1) the design of which has been certified by the NRC, and (2) that have been determined by the NRC to satisfy its quality assurance requirements (Reference 25, Section 16[a]).

### 3.1.6 Energy and Water Development Appropriations Act (Title III, General Provisions).

The following language has appeared in various sections of Title III of the Energy and Water Development Appropriations Act for every fiscal year since 1999:

> "None of the funds in this Act may be used to dispose of transuranic waste in the Waste Isolation Pilot Plant, which contains concentrations of plutonium in excess of 20 percent by weight for the aggregate on any material category on the date of enactment of this Act, or is generated after such date." (Reference 26)

The CBFO encourages the TRU waste sites to work with the DOE Headquarters General Counsel to obtain a determination of compliance with this language for high plutonium content material/waste that is ultimately planned for disposal at the WIPP prior to initiating TRU waste characterization activities. Evidence used to support a determination of compliance as well as the compliance decision must be included in the waste stream AK documentation. This information must also be included in the AK summary accompanying WSPFs submitted to the CBFO.

## 3.2 Container Properties

### 3.2.1 Description

*Acceptance Criterion*. Each payload container shall be assigned to a payload shipping category (Reference 50, Section 5.1.1). Authorized payload containers types include:

- 55-gallon drums
- 55-gallon drums (containing a pipe component)
- 85-gallon drums[1]
- 100-gallon drums
- Standard waste boxes (SWBs, either direct loaded, containing up to four 55-gallon drums, or containing one bin)
- Ten-drum overpacks (TDOPs, either direct loaded, containing up to ten 55-gallon drums, up to six 85-gallon drums, or one SWB).

Payload containers shall meet U.S. Department of Transportation (DOT) Specification 7A, Type A, packaging requirements (Reference 12, Section 5.6.2; Reference 46, Attachment M1, Section M1-1b; Reference 31, Section VI.F). Payload containers must be made of steel and be in good and unimpaired condition prior to shipment from the sites. To demonstrate compliance with the requirement that payload containers be in good and unimpaired condition, the exterior of all payload containers shall undergo 100% visual inspection prior to loading into an authorized package. The results of this visual inspection shall be documented using the Payload Container Integrity Checklist contained in Appendix D. A payload container in good and unimpaired condition (1) does not have significant rusting, (2) is of sound structural integrity, and (3) does not show signs of leakage. Significant rusting is a readily observable loss of metal due to oxidation (e.g., flaking, bubbling, or pitting) that causes degradation of the payload container's structural integrity. Rusting that causes discoloration of the payload container surface or consists of minor flaking is not considered significant. A payload container is not of sound structural integrity if it has breaches or significant denting or deformation. Breaching is defined as a penetration in the payload container that exposes the internals of the container. Significant denting or deformation is defined as damage to the payload container that results in creasing, cracking, or gouging of the metal, or damage that affects payload container closure. Dents or deformations that do not result in creasing, cracking, or gouging or affect payload container closure are not considered significant. Sites will report to the WWIS the number and types of payload containers planned for shipment to the WIPP (Reference 34, Appendix WCL).

1 The term "85-gallon drum" includes 75- to 88-gallon drums.

*Compliance*. Authorized payload containers are controlled and verified in accordance with CCP-TP-033, CCP Shipping of CH TRU Waste..

MP-PCMT-15.1, Acquisition of Materials and Services, and MP-PCMT-15.21, Materials Management, provide the protocol for procuring and inspecting payload containers (e.g., drums, standard waste boxes [SWB], and ten-drum overpacks [TDOP]) to ensure compliance with U.S. Department of Transportation (DOT) Specification 7A, Type A, packaging requirements

Operators visually inspect 100% of the payload containers to determine if the payload container meets the criterion detailed in Appendix D in accordance with INST-OI-11, Waste Container Handling, and CCP-TP-033. Payload containers that do not meet the container integrity visual inspection are overpacked prior to shipment. The numbers and types of payload containers planned for shipment to WIPP are reported to the WWIS in accordance with MP-TRUW-8.5, TRU Waste Certification.

### 3.2.2 Weight Limits and Center of Gravity

*Acceptance Criterion*. See the CH-TRAMPAC for weight limits and center of gravity requirements (Reference 50).

*Compliance*. Containers are weighed on calibrated scales in accordance with INST-OI-14, Drum Assay Operations; or INST-FOI-01, In-Plant Drum Assay Operations, as applicable. Calibrations of the scales are performed in accordance with the NIST Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices (Reference 56), or an equivalent standard and INST-CMNT-10.5.1, Calibration and Control of Measuring and Test Equipment. The CCP TCO confirms the individual payload container weights using the WWIS Payload Container Transportation Certification Document (PCTCD) to verify compliance with CCP-PO-003 weight limits and center of gravity requirements. Weights are reported to the WWIS in accordance with MP-TRUW-8.5.

Additional weight limits may be implemented based on restrictions identified by procurement specifications and testing. These restrictions will also be addressed in the applicable work instructions as they are identified.

Using the WWIS shipping module, the CCP TCO confirms that the TRUPACT-II or HalfPACT payload assemblies are evaluated for compliance with the weight requirements identified in CCP-PO-003, using the location and weight of the individual payload containers. These weights are based on calculated payload assembly weights, TRUPACT-II or HalfPACT weights, and the reported truck weight, in accordance with CCP-TP-033. No center of gravity requirements exist for HalfPACT payloads.

### 3.2.3 Assembly Configurations

*Acceptance Criterion*. See the CH-TRAMPAC for payload assembly configuration requirements (Reference 50).

*Compliance*. The maximum number of containers per TRUPACT-II or HalfPACT and the authorized packaging configurations are controlled in accordance with CCP-TP-033.

### 3.2.4 Removable Surface Contamination

*Acceptance Criterion*. Removable surface contamination on CH-TRU waste payload containers, payload assemblies, and packaging shall not exceed 20 disintegrations per minute (dpm)/ 100 square centimeters ($cm^2$) alpha and 200 dpm/100 $cm^2$ beta-gamma (Reference 46, Attachment M1, Section M1-1d [2]; Reference 44; and Reference 38). The fixing of surface contamination to meet these criteria is not allowed by WIPP in accordance with best management practices for ensuring worker radiation dose as low as reasonable achievable (ALARA).

*Compliance*. Radiological technicians survey each container in accordance with INST-OI-09, INST-OI-11, CCP-TP-033, and CCP-TP-086, CCP CH Packaging Payload Assembly, as applicable. Containers that exceed allowable surface contamination levels are decontaminated and/or overpacked. Surveys on the loaded TRUPACT-II are performed in accordance with DOE/WIPP 02-3184. Results are reported to the WWIS in accordance with MP-TRUW-8.5**.**

### 3.2.5 Identification/Labeling

*Acceptance Criterion*. Each payload container to be shipped in a TRUPACT-II or a HalfPACT shall be labeled with a unique payload container identification number using bar code labels permanently attached in conspicuous locations (Reference 50, Section 2.4). The unique payload container identification number shall include a site identifier as a prefix (Reference 50, Section 6.2.1).

The payload container identification number shall be in medium to low density Code 39 bar code symbology as required by American National Standards Institute (ANSI) standard ANSI/ Association for Automatic Identification and Mobility (AIM) BC1-1995 (Reference 55) in characters at least one inch high and alphanumeric characters at least one-half inch high. In the case of 55-, 85-, and 100-gallon drums, a minimum of three bar code identification labels shall be placed at approximately equal intervals around the circumference of the drum (120 degrees for 3 labels, 90 degrees for 4 labels, etc.) so that at least one label is clearly visible when the drums are assembled into a payload (i.e., a label must be visible after slip sheets and wrapping are applied). In the case of SWBs, bar code labels are required on the flat sides of the SWB (Reference 2). For TDOPs, a minimum of one bar code is required.

Payload containers shall be marked "Caution Radioactive Material" using a yellow and magenta label as specified in 10 CFR § 835 (Reference 38). Those payload containers whose contents are also RCRA regulated (mixed-TRU) shall be additionally marked "Hazardous Waste" as specified in 40 CFR § 262.32 (Reference 41). For TRU and TRU-mixed wastes containing PCBs, the payload containers shall be marked in accordance with 40 CFR § 761.40 (Reference 45). Additionally, DOT Type B packages (i.e., TRUPACT-II and HalfPACT) containing PCBs must be properly marked in accordance 40 CFR § 761.40 (References 31 and 45).

If an empty 55-, 85-, or 100-gallon drum is used as dunnage to complete a payload configuration, dunnage containers shall be labeled with the following information:

- Unique payload container identification number
- "EMPTY" or "DUNNAGE."

If a seven-pack of only dunnage 55-gallon drums, a four-pack of only dunnage 85-gallon drums, a three-pack of only dunnage 100-gallon drums, or a dunnage SWB is used in the TRUPACT-II, the container(s) shall be labeled only "EMPTY" or "DUNNAGE." The unique container identification number label is not required for these containers (Reference 40, Section 2.4.1).

*Compliance*. Payload containers certified for shipment by the AMWTP, are labeled in medium to low density Code 39 bar code symbology as required by ANSI standard ANSI/AIM BC1-1995 in characters at least one inch high and alphanumeric characters at least one-half inch high in the following format: BNXXXXXXXX, where BN represents AMWTP (formerly operated by BNFL, Inc.) and XXXXXXXX represents a sequential number generated by the WTS. The WTS also verifies that the identification number is unique and that duplicate container identification numbers do not exist. Empty containers used as dunnage are labeled with a unique container identification number and "EMPTY" or "DUNNAGE."

Payload containers are marked "Caution Radioactive Material" using a yellow and magenta label as specified in 10 CFR § 835. Those payload containers whose contents are also RCRA regulated (mixed-TRU) are additionally marked "Hazardous Waste."

For TRU and TRU-mixed wastes containing PCBs, the payload containers shall be marked in accordance with 40 CFR § 761.40. Additionally, DOT Type B packages (i.e., TRUPACT-II and HalfPACT) containing PCBs must be properly marked in accordance 40 CFR § 761.40.

Payload containers are labeled in accordance with INST-OI-11 and/or INST-FOI-20, Supercompactor and Post-Compaction Operations, as applicable.

The CCP TCO ensures that each payload container is clearly marked with a unique identification number (bar code), radioactive material, hazardous waste and EPA hazardous waste numbers, and, when applicable, PCB labels in accordance with CCP-TP-086 and CCP-TP-033.

### 3.2.6 Dunnage

*Acceptance Criterion*. See the CH-TRAMPAC for payload assembly configuration requirements (Reference 50). To maximize the efficiency of disposal operations at the WIPP, the use of dunnage drums should be minimized. In the event the use of dunnage drums cannot be avoided, the preferred practice for maximizing the efficiency of waste handling and the utilization of disposal room capacity is to ship them in assemblies (e.g., a seven-pack assembly of 55-gallon drums).

*Compliance*. The use of dunnage is minimized through load management. Dunnage containers, when used, are inspected in accordance with CCP-TP-033, to ensure compliance with packaging requirements required by CCP-PO-003. Dunnage containers are reported in the WWIS in accordance with CCP-TP-033.

### 3.2.7 Filter Vents

*Acceptance Criterion*. Payload containers that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) shall be aspirated for a specific length of time as described in the CH-TRAMPAC to ensure equilibration of any gases that may have accumulated in the closed payload container (Reference 50, Section 5.3.1).

Each payload container shall have one or more filter vents (Reference 12, Section 5.6.2; Reference 50, Section 2.5.1; Reference 46, Attachment M1-1b). These filter vents shall meet the specifications of the WIPP Hazardous Waste Facility Permit and CH-TRAMPAC, as applicable (Reference 46, Attachment M1, Section M1-1d (1); Reference 50, Section 2.5.1). The model number of each filter vent or combination of filter vents installed on a payload container shall be reported to the WWIS. A listing of approved CBFO filter vent models is provided on the CBFO Web Page (http://www.wipp.energy.gov/transport.htm). This Internet link is provided for informational purposes only and may change without prior public notification.

*Compliance*. QA procedures provide protocol for procuring and inspecting filters to ensure compliance with CCP-PO-003 and WIPP Hazardous Waste Facility Permit specifications for filter vents, which are performed in accordance with MP-PCMT-15.1 and MP-PCMT-15.21.

Payload containers that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) are vented and aspirated in accordance with INST-OI-43, HGAS Sampling and Analysis Operations, INST-OI-45, Drum Filter Installation; or INST-OI-50, WMF-615 Filter Insertion Operations, as applicable. In addition, the Central Characterization Project (CCP) ensures that payload containers that have been stored in an unvented condition are vented and aspirated in accordance with DOE/WIPP-06-3345, Waste Isolation Pilot Plant Flammable Gas Analysis.

Payload containers are verified prior to payload assembly to ensure the filter diffusivity has been met, as specified in Section 2.5 of CCP-PO-003 and are verified by the CCP TCO in accordance with CCP-TP-033 or CCP-TP-086 (as applicable). The model number of each filter or combination of filters installed in a payload container is recorded and reported to the WWIS in accordance with MP-TRUW-8.5 or CCP-TP-030, CCP CH TRU Waste Certification and WWIS Data Entry.

### 3.3 Radiological Properties

With respect to the required radiological properties identified within this section, they can be divided into two distinct groups

The first group includes the activities and masses of the ten WIPP-tracked radionuclides (i.e., $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs) and the TRU alpha activity concentration (i.e., >100 nCi/g of alpha-emitting TRU isotopes with half lives greater than 20 years) of the waste. This set of radiological properties is regulated by the EPA in accordance with 40 CFR Parts 191 and 194 (References 39 and 40). Estimates of their activities and masses shall be derived from a system of controls certified by CBFO that includes AK, computations, measurements, sampling, etc. (Reference 6, Appendix TRU Waste). Appendix A provides the methods and requirements by which to characterize the radiological composition of the CH-TRU waste utilizing radioassay techniques.

The second group includes the remaining radionuclides contributing to the $^{239}$Pu fissile gram equivalent (FGE), the $^{239}$Pu equivalent curies (PE-Ci), and the decay heat of the payload container. This set of radiological data is regulated both by the NRC as specified in the CH-TRAMPAC (Reference 50) and the CBFO as required by the WIPP Technical Safety Requirements (Reference 12). PE-Ci quantities shall be calculated for each payload container in accordance with Appendix B. Any CH-TRAMPAC compliant method may be used to quantify the remaining radiological properties at the discretion of the shipping facility. Appendix A provides recommended radioassay methods by which to characterize the remaining radiological properties. However, the resulting data (e.g., AK from Safeguards and Security data), the source/method from which the data was generated, and the basis for the reliability of the data shall be submitted to and approved by CBFO prior to use.

In addition, CCP performs nondestructive assay (NDA) measurements in support of the AMWTP using the SuperHENC in accordance with CCP-PO-002, CCP Transuranic Waste Certification Plan, and CCP-TP-146, CCP SuperHENC Operating Procedure.

### 3.3.1 Radionuclide Composition

*Acceptance Criterion*. The activities and masses of $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs shall be established on a payload container basis for purposes of tracking their contributions to the total WIPP radionuclide inventory (Reference 6, Appendix TRU Waste). The estimated activities and masses, including their associated total measurement uncertainties (TMU) expressed in terms of one standard deviation, for these ten radionuclides shall be reported to the WWIS on a payload container basis. For any of these ten radionuclides whose presence can be substantiated from AK, direct measurement, computations, or a combination thereof, and whose measured data are determined to be below the lower limit of detection (LLD) for that radionuclide, the site shall report the character string "< LLD" to the WWIS for the activity and mass of that radionuclide; otherwise a value of zero shall be reported. Quantitative estimates for LLD shall not be used when calculating related radiological properties of the waste such as TRU alpha activity concentration, $^{239}$Pu FGE, decay heat, etc. See Appendix A, Section A.3, of this document for information pertaining to the development and application of LLD

In addition, all radionuclides other than the ten WIPP-tracked radionuclides (i.e., $^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs) that contribute to 95% of the radioactive hazard for the payload container shall be reported on the TRUPACT-II or HalfPACT bill of lading or manifest in accordance with 49 CFR § 172.203 and 49 CFR § 173.433 (References 42 and 43). The activities and masses of these other radioisotopes shall also be reported to the WWIS along with their associated TMU, expressed in terms of one standard deviation for each waste container.

*Compliance*. The quantity of radionuclides in each payload container along with the associated TMU values (expressed in terms of one standard deviation) is determined using the NDA method described in Appendix A and is performed in accordance with INST-OI-14 or INST-FOI-01. Each radionuclide quantity and its associated TMU are transferred from the drum assay system (DAS) to the WTS. The method used to perform the calculations for the radionuclides and associated TMU values are documented in the Canberra Industries, Genie 2000 Spectroscopy System Customization Tools, NDA 2000 Technical Reference Manual, and Total Measurement Uncertainty for the AMWTP Integrated Waste Assay Systems, CI-IDA-NDA-0055.

The WTS reports the character string "<LLD" to the WWIS for the activity and mass of the ten tracked radionuclides ($^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs) whose presence can be substantiated from AK, direct measurement, computations, or a combination thereof, and whose measured data are determined to be below the lower limit of detection (LLD) for that radionuclide; otherwise, a value of zero is reported. Electronic or manual entry of data into the WWIS is performed in accordance with MP-TRUW-8.5. In addition to the ten WIPP-tracked radionuclides, $^{235}$U is also quantified, if present above its LLD, in order to calculate the $^{239}$Pu FGE for compliance with the TRUPACT-II and the HalfPACT requirements. All radionuclides other than the ten WIPP-tracked radionuclides that contribute to 95% of the radioactive hazard for each payload container are also stored in the WTS.

The quantity of each radionuclide comprising 95% of the radioactive hazard whose value is above the LLD and its associated TMU expressed in terms of one standard deviation are reported to the WWIS for each waste container and on the TRUPACT-II or the HalfPACT bill of lading or manifest for each shipment.

### 3.3.2 $^{239}$Pu Fissile Gram Equivalent

*Acceptance Criterion*. For each payload container, the sum of $^{239}$Pu FGE plus two times its associated TMU, expressed in terms of one standard deviation, shall comply with the limits in Table 3.3.2.1 (Reference 12, Section 5.6.1; Reference 50, Section 3.1.1). The values calculated for $^{239}$Pu FGE and its associated TMU (expressed in terms of one standard deviation) shall be reported to the WWIS for each payload container.

See the CH-TRAMPAC for $^{239}$Pu FGE limits applicable to the TRUPACT-II and/or HalfPACT packaging (Reference 50).

**Table 3.3.2.1**
**$^{239}$Pu FGE Limits for Payload Containers**

| Payload Containers | Beryllium Mass Limit[a] | $^{239}$Pu FGE Limit[b] |
|---|---|---|
| **Non-Machine Compacted Waste** | | |
| 55- (excluding pipe overpacks), 85-, and 100-gallon drums | ≤ 1% by weight of the waste | ≤ 200 |
| 55-gallon drum configured as a pipe overpack (i.e., a standard, S100, S200, or S300 pipe overpack) | ≤ 5 kg | ≤ 200 |
| SWB | ≤ 1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 325 |
| TDOP | ≤ 1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 325 |
| 55- (excluding pipe overpacks), 85-, and 100-gallon drums | >1% by weight of the waste up to 100 kg | ≤ 100 |
| SWB | >1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 100 |
| TDOP | >1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 100 |
| **Machine-Compacted Waste** | | |
| 55- (excluding pipe overpacks), 85-, and 100-gallon drums | ≤ 1% by weight of the waste | ≤ 200[d] |
| SWB | ≤ 1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 185 |
| TDOP | ≤ 1% by weight of the waste up to 18.14 kg and is particulate[c] | ≤ 185 |

a. Beryllium includes both the metal (Be) and its oxide (BeO).
b. The FGE limit given applies to the payload container regardless of $^{240}$Pu content in the package.
c. Particulate beryllium includes fines or shavings.
d. The $^{239}$Pu FGE limit of 200 applies to waste that has been compacted such that the distribution and form of polyethylene in the waste does not exceed 0.646 gram/cubic centimeter (g/cm$^3$), i.e., 70% of the theoretical full density of polyethylene (0.923g/cm$^3$). If 70% of the theoretical full density of polyethylene is exceeded, then the $^{239}$Pu FGE limit shall not exceed 170 FGE unless the dimensions of the payload containers (e.g., 100-gallon drums) ensure a minimum 0.5" separation between their compacted waste contents and other axially adjacent payload containers (Reference 12, Section 5.6.1).

*Compliance*. Beryllium content is verified and documented in accordance with MP-TRUW-8.13, Collection, Review, and Management of Acceptable Knowledge Documentation. AK documentation identifies physical properties of the waste, which is augmented through INST-OI-12, Real-Time Radiography Operations (Drum); INST-OI-34, Non-Facility Visual Examination Operations; INST-FOI-17, Facility Visual Examination Operations; or INST-FOI-20.

The $^{239}$Pu FGE quantities in each drum container along with the associated TMU values (expressed in terms of one standard deviation) is calculated for each container using the radionuclide values determined by the DAS and the associated $^{239}$Pu FGE values tabulated in the American National Standards Institute/American Nuclear Society (ANSI/ANS) Standard 8.15-1981, Nuclear Criticality Control of Special Actinide Elements. The method that is used to perform the calculations for the $^{239}$Pu FGE and its associated TMU is documented in the Canberra Industries, Genie 2000 Spectroscopy System Customization Tools, NDA 2000 Technical Reference Manual, and Total Measurement Uncertainty for the AMWTP Integrated Waste Assay Systems, CI-IDA-NDA-0055. The calculated $^{239}$Pu along with its associated TMU are transferred from the DAS to the WTS in accordance with INST-OI-14 or INST-FOI-01. The WTS evaluates each payload container for compliance with the limits in Tables 3.3.2.1. The values calculated for $^{239}$Pu FGE and its associated TMU (expressed in terms of one standard deviation) are reported to the WWIS for each payload container in accordance with MP-TRUW-8.5.

### 3.3.3 TRU Alpha Activity Concentration

*Acceptance Criterion*. TRU waste payload containers shall contain more than 100 nCi/g of alpha-emitting TRU isotopes with half-lives greater than 20 years. Without taking into consideration the TMU, the TRU alpha activity concentration for a payload container is determined by dividing the TRU alpha activity of the waste by the weight of the waste. The weight of the waste is the weight of the material placed into the payload container (i.e., the net weight of the container). The weight of the waste is typically determined by subtracting the tare weight of the payload container (including the weight of the rigid liner and any shielding external from the waste, if applicable) from the gross weight of the payload container. In the event waste containers (e.g., 55-gallon drums) that have been radioassayed are overpacked in a payload container (e.g., in an SWB), sites shall sum the individual TRU alpha activity values of the individual waste containers and divide by the sum of the individual net waste weights (i.e., less container, shielding, and liner weights as appropriate) to determine the activity per gram for the payload container. Waste containers selected for payload management shall comply with the policy for the management of TRU alpha activity concentration (see Appendix E). Loading a 55-gallon pipe-overpack with cans is considered direct loading - not overpacking for the purposes of calculating the weight of the container. The TRU alpha activity concentration shall be reported to the WWIS; however, there are no reporting requirements for its associated TMU (Reference 25, Section 2[18]; Reference 6, Chapter 4).

*Compliance*. The TRU alpha activity in each drum is determined from the alpha-emitting TRU isotopes with half-lives greater than 20 years. The TRU alpha activity is determined using the DAS in accordance with INST-OI-14 or INST-FOI-01.

The TRU alpha activity concentration for each payload container is calculated by dividing the TRU alpha activity by the net weight of the container (weight of the waste). The net weight of the container is determined by subtracting the tare weight of the container (including the weight of the rigid liner and any shielding external to the waste, if applicable) from the gross weight of the container. The TRU alpha activity concentration is transferred from the DAS and stored on the WTS. In the event a waste drum is overpacked in a payload container, the reported TRU alpha activity concentration for the payload container is determined by summing the TRU alpha activity values of the individual waste containers and dividing by sum of the net waste weights of the individual waste containers.

The WTS software evaluates each payload container for compliance with the TRU alpha activity concentration limit (>100nCi/g). The TRU alpha activity concentration and the associated TMU are reported to the WWIS in accordance with MP-TRUW-8.5.

### 3.3.4 $^{239}$Pu Equivalent Activity

*Acceptance Criterion*. $^{239}$Pu equivalent curie (PE-Ci) limits are shown in Table 3.3.4. PE-Ci quantities shall be calculated for each payload container (see Appendix B) and reported to WIPP using the WWIS. There are no reporting requirements for the associated TMU (Reference 12, Section 5.6.2).

Table 3.3.4
$^{239}$Pu equivalent curie (PE-Ci) limits

| Payload Container | Packing Configuration | PE-Ci Limit |
|---|---|---|
| 55-, 85-, and 100-gallon drum | Direct loaded – all approved waste forms other than solidified/vitrified waste | ≤ 80 PE-Ci |
| SWB | Direct loaded (or a bin) – all approved waste forms other than solidified/vitrified waste | ≤ 560 PE-Ci |
| TDOP | Direct loaded – all approved waste forms other than solidified/vitrified waste | ≤ 560 PE-Ci |
| 85-gallon drum | Overpacking an undamaged[a] 55-gallon drum – all approved waste forms other than solidified/vitrified waste | ≤ 1,100 PE-Ci |
| SWB, TDOP | Overpacking an assembly of undamaged[a] 55- or 85-gallon drums with no single payload container within the assembly exceeding 1,100 PE-Ci – all approved waste forms other than solidified/vitrified waste | ≤ 1,200 PE-Ci |
| TDOP | Overpacking an undamaged[a] SWB – all approved waste forms other than solidified/vitrified waste | ≤ 1,200 PE-Ci |
| Pipe overpacks (standard, S100, S200, and S300) | All approved waste forms | ≤ 1,800 PE-Ci |
| All | Solidified/vitrified waste | ≤ 1,800 PE-Ci |

a. An undamaged container provides an additional barrier should a breach occur in the overpack. When overpacking one or more damaged waste containers, direct loaded PE-Ci limits apply.

*Compliance*. The PE-Ci for each drum is determined using the DAS in accordance with INST-OI-14 or INST-FOI-01. The DAS calculates the PE-Ci value based on the methodology described in Appendix B. PE-Ci values are transferred from the DAS and stored in the WTS. The WTS calculates the PE-Ci value for overpack configurations and evaluates compliance. The PE-Ci value is reported to the WWIS for each payload container in accordance with MP-TRUW-8.5.

### 3.3.5 Radiation Dose Equivalent Rate

*Acceptance Criterion.* The external radiation dose equivalent rate of individual payload containers shall be ≤ 200 milliroentgen equivalent man (mrem)/hour (hr) at the surface with the exception of the S100 and S300 pipe overpacks which are limited to ≤ 179 mrem/hr and ≤ 155 mrem/hr, respectively, at the surface (Reference 50, Section 3.2; Reference 12, Section 5.6.2). Internal payload container shielding shall not be used to meet this criterion, except for authorized shielded payload container configurations such as the use of 55-gallon drums containing a pipe component (Reference 50, Section 2.9). Total dose equivalent rate and the neutron contribution to the total dose equivalent rate shall be reported for each payload container in the WWIS (Reference 46, Attachment B, Table B-8).

See the CH-TRAMPAC for the associated package requirements (Reference 51).

*Compliance*. Containers are surveyed by radiological technicians and documented in accordance with INST-OI-11, INST-FOI-20 or CCP-TP-086. The highest measured combined dose rate at the drum surface is entered in the WWIS in accordance with MP-TRUW-8.5 or CCP-TP-030.

The TRUPACT-II or HalfPACT is also surveyed and the combined dose rate at the surface and 2 m from any side is recorded on the shipping documentation and reported in WWIS. Dose rates for beta-gamma and neutron dose are reported separately.

### 3.3.6 Decay Heat

*Acceptance Criterion*. See the CH-TRAMPAC for decay heat requirements (Reference 50).

*Compliance*. Decay heat values are determined using the DAS in accordance with INST-OI-14, or INST-FOI-01. The total decay heat from the radioactive decay of the radioisotopes within an individual payload container, and the total decay heat from all payload containers in a TRUPACT-II or HalfPACT are determined using the method described in Appendix A. The sum of the calculated value of the decay heat and the total measurement uncertainty at one standard deviation is transferred from the DAS and stored in the WTS.

The WTS and the WWIS verifies the analytical decay heat limit derived for specific shipping categories presented in Appendix 5.1 of CCP-PO-003. The decay heat value and the associated TMU are reported to the WWIS in accordance with MP-TRUW-8.5.

## 3.4 Physical Properties

### 3.4.1 Residual Liquids

*Acceptance Criterion*. Liquid waste is prohibited at WIPP. Residual liquids containing PCBs are prohibited at WIPP. Waste shall contain as little residual liquid as is reasonably achievable

by pouring, pumping, and/or aspirating, and internal containers shall contain less than 1 inch or 2.5 centimeters of liquid in the bottom of the container. The total residual liquid in any payload container (e.g., 55-gallon drum, standard waste box, etc.) shall be less than 1 percent by volume of that payload container. If visual examination methods are used in lieu of radiography, then the detection of any liquids in non-transparent internal containers will be addressed by using the total volume of the internal container when determining the total volume of liquids within the payload container (Reference 12, Section 5.6.2; Reference 46, Module II, Section II.C.3.a; Reference 46, Attachment B, Sections B-1c and B-3c; Reference 50, Section 2.6.1; Reference 6, Appendix TRU Waste; Reference 31, Conditions of Approval, II.A.2).

*Compliance*. The total residual liquid in any payload container is verified through INST-OI-12; INST-OI-16, Drum Coring Operations; INST-OI-73, Manual Drum Coring Operations; INST-OI-34; INST-FOI-17; or INST-FOI-20, in conjunction with MP-TRUW-8.13. If VE methods are used in lieu of RTR, then the detection of any liquids in non-transparent internal containers will be addressed by using the total volume of the internal container when determining the total volume of liquids. Internal containers are restricted to less than 1 inch or 2.5 centimeters (cm) of liquid in the bottom of the payload container as estimated during the examination process.

When the sum of all liquids exceeds one percent of the payload container volume or liquids have been identified in rigid containers above specified limits, the container is segregated and sent for future treatment.

The WTS stores a description of the location of any liquid detected and an estimate of the volume. Residual liquids containing PCBs are prohibited at WIPP.

When visual examination (VE) is used, the liquids identified will be removed and treated as appropriate at the Advanced Mixed Waste Treatment Facility (AMWTF).

### 3.4.2 Sealed Containers

*Acceptance Criterion*. Sealed containers that are greater than 4 liters (nominal) are prohibited except for Waste Material Type II.2 packaged in a metal container (Reference 50, Section 2.8.1).

All waste containers with unvented rigid containers greater than 4 liters (exclusive of rigid poly liners) shall be subject to innermost layer of containment sampling or shall be vented prior to initiating drum age and equilibrium criteria (Reference 46, Attachment B1, Section B1-1a[1]).

*Compliance*. The absence of sealed containers greater than 4 liters (nominal) are verified through INST-OI-12, INST-OI-34, INST-FOI-17, or INST-FOI-20 in conjunction with MP-TRUW-8.13, Collection, Review, and Management of Acceptable Knowledge Documentation. Payload containers with sealed containers greater than 4 liters will be supercompacted or segregated for future treatment.

When VE is used, the VE operators remove and/or vent sealed containers.

### 3.5 Chemical Properties

#### 3.5.1 Pyrophoric Materials

*Acceptance Criterion*. Pyrophoric radioactive materials shall be present only in small residual amounts (≤1 percent by weight) in payload containers and shall be generally dispersed in the waste. Radioactive pyrophorics in concentrations greater than 1 percent by weight and all nonradioactive pyrophorics shall be reacted (or oxidized) and/or otherwise rendered nonreactive prior to placement in the payload container.

Nonradionuclide pyrophoric materials are not acceptable at WIPP (Reference 12, Section 5.6.2; Reference 46, Module II, Section II.C.3.b; Reference 50, Section 4.1.1).

*Compliance*. Nonradionuclide pyrophoric material is subject to the same controls as explosives (e.g., procurement controls and safety assessments). In general, pyrophoric materials are not permitted in TRU process areas. Processes that require the use of pyrophoric materials require a safety analysis that is used to determine the applicable controls. Generator sites administrative, operational and QA procedures dictate the quantity of pyrophoric materials that enter processes, which are limited and controlled. Operating procedures require that pyrophoric materials be rendered chemically safe by processing before being placed in payload containers (e.g., oxidation at high temperature in the presence of oxygen).

No pyrophoric materials or pyrophoric radionuclides exceeding one percent of the waste weight have been identified in any of the AK documentation, content code evaluations, or sampling programs.

#### 3.5.2 Hazardous Waste

*Acceptance Criterion*. Hazardous wastes not occurring as co-contaminants with TRU wastes (non-mixed hazardous wastes) are not acceptable at WIPP. Each CH-TRU mixed waste container shall be assigned one or more EPA hazardous waste numbers, as appropriate. Only EPA hazardous waste numbers listed as allowable in the Hazardous Waste Facility Permit may be managed at WIPP. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at WIPP as long as the TSDF waste acceptance criteria are met (Reference 46, Attachment B, Section B-1b, Reference 46, Module II, Section II.C.4). Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (EPA hazardous waste numbers of D001, D002, or D003) are not acceptable at WIPP. (Reference 46, Attachment B, Section B-1c, Reference 46, Module II, Sections II.C.3.c, II.C.3.g, and II.C.4, Reference 12, Section 5.6.2).

*Compliance*. AK documentation identifies physical and chemical properties of the waste which is augmented by data collected using INST-OI-12, INST-FOI-20, INST-OI-34, or INST-FOI-17.

Representative sampling of homogeneous waste is accomplished through coring or other EPA-approved sampling in accordance with INST-OI-16 or INST-OI-73. The following CCP analytical procedures are used to resolve the assignment of EPA hazardous waste numbers:

- CCP-TP-182, CCP Determination of Metals by ICP-AES for TRU Waste Characterization
- CCP-TP-181, CCP Determination of Mercury by CVAA for TRU Waste Characterization
- CCP-TP-183, CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel
- CCP-TP-184, CCP Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry
- CCP-TP-185, CCP Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry
- CCP-TP-186, CCP Determination of Nonhalogenated Volatile Organics by Gas Chromatography
- CCP-TP-187, CCP Sample Preparation for Semivolatile Organic Compounds.

Representative headspace gas sampling and analysis of debris waste streams, performed in accordance with INST-OI-43 is used to determine the types and concentrations of VOCs in the void volume in order to resolve the assignments of EPA Hazardous Waste Numbers.

Waste Stream Profile Forms (WSPFs) document the hazardous waste numbers for payload containers in a waste stream. EPA hazardous waste numbers are reported in the WWIS in accordance with MP-TRUW-8.5.

### 3.5.3 Chemical Compatibility

*Acceptance Criterion*. TRU waste containing incompatible materials or materials incompatible with payload container and packaging materials, shipping container materials, other wastes, repository backfill, or seal and panel closure materials are not acceptable for transport in the TRUPACT-II and HalfPACT or for disposal at the WIPP. Chemical constituents shall conform to the lists of allowable materials in Tables 4.3-1 through 4.3-8 of the CH-TRAMPAC, as applicable. Other chemicals or materials not identified in these tables are allowed provided that they meet the requirements specified in Section 4.3.1 of the CH-TRAMPAC (Reference 46, Attachment B, Section B-1c, Reference 46, Module II, Section II.C.3.d; Reference 50, Sections 4.3 and 4.4).

*Compliance*. Potential chemical incompatibilities were evaluated by the NRC for each content code, between one content code and another and between each content code and the TRUPACT-II inner containment vessel (ICV) and the o-ring seals to ensure that the chemical processes do not threaten the safe transport of the TRUPACT-II and HalfPACT. Only waste with an approved TRUCON code will be shipped in the TRUPACT-II and HalfPACT.

Waste generated by new processes, or an existing process that has changed, will be evaluated by the WIPP CH-TRU Payload Engineer to ensure that compliance with the transportation requirements of CCP-PO-003 can be demonstrated

Waste compatibilities with backfill, seal, and panel closure materials are verified through the use of approved CH-TRUCON codes.

All payload containers selected for shipment to WIPP are evaluated with the WIPP TRAMPAC Evaluation Software (WTES) to ensure that waste being shipped belongs to an approved CH-TRUCON Code.

### 3.5.4 Explosives, Corrosives, and Compressed Gases

*Acceptance Criterion*. Waste shall contain no explosives, corrosives, or compressed gases (pressurized containers) (Reference 12, Section 5.6.2; Reference 46, Attachment B, Section B-1c; Reference 46, Module II, Sections II.C.3.e.and II.C.3.g, Reference 50, Section 4.2.1).

*Compliance*. Most generator sites did not allow explosives in the same facility as TRU waste. Waste generating processes were assessed for safety hazards such as potential explosive hazards and potential inadvertent production of explosive materials. Corrosive liquids were neutralized or absorbed by the generator sites before being shipped to the INL. Content code assessments have been performed to ensure liquids have been adequately neutralized.

AK documentation identifies physical and chemical properties of the waste that is augmented by using INST-OI-12, INST-OI-34, INST-FOI-17, or INST-FOI-20. For homogeneous wastes, sampling and analysis confirm the absence of corrosives.

Containers that contain compressed gases (pressurized containers) are segregated and sent for future treatment. Payload containers that contain explosives are segregated and documented on a nonconformance report (NCR).

### 3.5.5 Headspace Gas Concentrations

*Acceptance Criterion*. The headspace gas of payload containers shall be sampled and analyzed in accordance with an approved site-specific QAPjP, as defined in the WIPP WAP

(Reference 46, Attachment B), and site specific TRAMPAC (Reference 50, Section 5.2), respectively.

*Compliance*. Containers randomly selected from summary category S5000 (debris) waste undergo headspace gas sampling and analysis in accordance with INST-OI-43, to resolve the assignment of EPA hazardous waste numbers for debris waste streams.

Waste containers intended for shipment in the TRUPACT-II or HalfPACT are sampled and analyzed by CCP to establish the concentration of flammable gas, volatile organic compounds (VOCs), hydrogen, and methane in accordance with DOE/WIPP-06-3345, Waste Isolation Pilot Plant Flammable Gas Analysis.

### 3.5.6 Polychlorinated Biphenyls Concentrations

*Acceptance Criterion*. For TRU and TRU-mixed wastes containing PCBs meeting the conditions of approval in Reference 31, the payload container data entered into the WWIS shall include the earliest date of waste generation (i.e., the date of removal from service for disposal), the date of waste certification for disposal, and the date the waste was sent to the WIPP for disposal (Reference 31, Section III.D.4). Additionally, the estimated weight of the PCBs in kilograms (as recorded on the uniform hazardous waste manifest) and a description of the type of PCB waste (e.g., PCB remediation waste, PCB bulk product waste, etc.) shall be entered into the WWIS (Reference 45, § 761.207(a)(2) and § 761.180). Hanford, Idaho National Laboratory, Savannah River Site, Oak Ridge Reservation, Knolls Atomic Power Laboratory, and Los Alamos National Laboratory are authorized to ship their TRU and TRU-mixed wastes containing PCBs to WIPP (Reference 33).

*Compliance*. AK documentation identifies the waste streams known to contain PCBs. The presence or absence of residual liquids and items suspected of containing PCBs (i.e., ballasts, transformers) are verified through INST-OI-12, INST-OI-34, or INST-FOI-17. Payload containers identified with prohibited PCBs (e.g., liquids) will be segregated and sent for future treatment. PCB out-of-service date, concentration, and description (e.g., remediation waste, bulk, etc.) are reported in WWIS per MP-TRUW-8.5.

## 3.6 Data Package Contents

### 3.6.1 Characterization and Certification Data

*Acceptance Criterion*. Sites shall prepare a WSPF for each waste stream. Each WSPF shall be approved by the CBFO prior to the first shipment of that waste stream. Characterization and certification information for each payload container shall be submitted to the WWIS and approved by the Data Administrator. Sites are required to estimate the CPR weights and report these estimates in the WWIS on a payload container basis. Any payload container from a waste stream that has not been preceded by an appropriate certified WSPF is not acceptable at WIPP (Reference 46, Module II, Section II.C.3).

*Compliance*. The SPM or designated alternate prepares the WSPF and Characterization Information Summary (CIS) in accordance with MP-TRUW-8.14, Preparation of Waste Stream Profile Forms, and transmits a copy of the WSPF, CIS, and AK Summary Report to the WIPP for review and approval. This transmittal is coordinated with the initial characterization data transfer to the WWIS in accordance with or MP-TRUW-8.5, for the Data Administrator review and approval. Payload containers from a waste stream that does not have an approved WSPF will not be certified and shipped.

Payload containers are certified and sent to WWIS in accordance with MP-TRUW-8.5 for the Data Administrator review and approval. Data will only be entered into the WWIS after all reviews and quality assurance checks are complete and all open nonconformance documentation is satisfactorily closed.

The policies and methods described in Appendix E for the management of TRU alpha activity concentrations with each TRU waste payload container disposed of at WIPP are performed in accordance with MP-TRUW-8.5.

### 3.6.2 Shipping Data

*Acceptance Criterion*. Sites shall prepare either a bill of lading or a uniform hazardous waste manifest for CH-TRU waste shipments as required by the transportation requirements. The land disposal restriction notification for CH-TRU mixed waste shipments shall state that the waste is not prohibited from land disposal. (Reference 46, Attachment B, Section B-4b (2); Reference 50, Section 6).

*Compliance*. The CCP TCO verifies that all requirements for the transportation parameters have been met and completion of the signature authorizes payload containers for shipment in the TRUPACT-II in accordance with CCP-TP-033.

The AMWTP prepares a bill of lading or a uniform hazardous waste manifest, as applicable, for each CH-TRU waste shipment in accordance with MP-TRUW-8.12, Waste Receipt and Shipping Inspection.

## 4.0 WASTE ACCEPTANCE REQUIREMENTS AND CRITERIA FOR RH WASTE

This section identifies the requirements and associated criteria for acceptance of RH-TRU waste to be transported, managed, and disposed of at the WIPP.

Containers suspected to be RH-TRU waste will undergo preliminary characterization to ensure that the waste is candidate RH-TRU waste. RH-TRU waste will be transferred to the ICP contractor for subsequent characterization, certification, and shipment to WIPP.

# 5.0 QUALITY ASSURANCE REQUIREMENTS

Quality assurance is an integral part of TRU waste characterization, certification, transportation, and operation activities. This section defines the QA program requirements that provide confidence that TRU waste characterization and certification activities are performed satisfactorily. The QA requirements applicable to WIPP are addressed in the QAPD (Reference 5).

The AMWTP is responsible for developing, documenting, and implementing a site-specific QA plan that address the elements of the QAPD that apply to its program. This section defines the AMWTP QA program requirements for TRU waste characterization and certification activities. This *Certification Plan* will be submitted to the CBFO for approval before TRU wastes are characterized, certified, or shipped to WIPP. The CBFO and the Management and Operating Contractor will conduct audits and surveillances to ensure compliance with this plan.

## 5.1 Waste Characterization QA Requirements

MP-TRUW-8.2 documents the QA and quality control (QC) activities applicable to TRU characterization. Analytical laboratories analyzing WIPP waste characterization samples for the AMWTP have established documented QA/QC programs.

Data quality objectives are qualitative and quantitative statements that specify WIPP program technical and quality objectives; they are determined through the data quality objective process. The data quality objectives for waste characterization activities relating to physical and chemical properties of the waste are contained in the QAPjP. The radioassay data quality objectives are given in Appendix A of this document.

Corrective Action Reports (CARs) applicable to the QAPjP requirements shall be resolved prior to waste shipment (Reference 46, Attachment B6, Section B6-4).

## 5.2 Waste Certification QA Requirements

This document, MP-TRUW-8.1, Certification Plan for INL Transuranic Waste, describes the QA and QC activities applicable to certification of TRU waste to the WAC and also complies with the requirements of the QAPD.

## 5.3 Waste Transportation QA Requirements

The AMWTP characterizes and certifies CH TRU waste for shipment to WIPP; however the shipment of the waste will be performed by CCP.

CCP-PO-003 describes the QA and QC activities applicable to the specific parameters of the transportation packaging methods for payload control. The development, usage, operation, and

maintenance of the transportation systems are conducted under the CCP QA program approved by the DOE-CBFO. These documents control the use of the NRC-certified packaging and comply with DOE/WIPP 02-3183, CH Packaging Program Guidance (Reference 14), and RH Packaging Program Guidance (Reference 19), as applicable.

### 5.4 Quality Assurance Program

The AMWTP Quality Assurance Program (QAP) is based on the WIPP QAPD (Reference 5) elements outlined below. Table 5.1 provides a cross-reference of identical or related QA requirement elements from 10 CFR 830 Subpart A (Reference 37) and 10 CFR 71 Subpart H (Reference 36).

- **Organization and QA Program** (QAP) documents the organizational structure, primary interfaces, functional responsibilities, levels of authority, and lines of communication for activities affecting quality, and identifies the activities and items to which the QA program applies.
- **Personnel Qualification and Training** identifies the AMWTP qualification and training programs and plans established to ensure personnel are provided training to perform their assignments and maintain job proficiency.
- **Quality Improvement** describes the processes to detect and prevent conditions adverse to quality, pursue continuous quality improvement, and control and correct nonconforming items.
- **Documents and Records** describes the processes for preparation, review, approval, issue, use, revision, and control of the AMWTP documents and records.
- **Work Processes** identifies the processes by which work conditions, equipment, and special processes are controlled to ensure quality.
- **Procurement** identifies the technical and QA requirements for procured items and services.
- **Inspection and Testing** identifies the processes for inspection and testing.
- **Assessment Requirements** describes the requirements for conducting management and independent assessments to measure management effectiveness, item quality, and process effectiveness and to promote improvement.
- **Sample Control Requirements** identifies the requirements for the control of waste samples, including identification, handling, storing, shipping, and archiving.
- **Scientific Investigation Requirements** describes the requirements for defining, controlling, verifying, and documenting scientific investigations.

- **Software Requirements** specifies the requirements for developing, procuring, maintaining, and using software.

**Table 5.1.** Quality Assurance Requirements Cross-Reference Table

| QAPD and Certification Plan Section [a] | Equivalent Section in 10 CFR 830 Subpart A, Nuclear Safety Management | Equivalent Section in 10 CFR § 71, Subpart H, Quality Assurance |
|---|---|---|
| Organization and QA Program | Program | QA Organization<br><br>QA Program |
| Personnel Qualification and Training | Personnel Training and Qualification | QA Program |
| Quality Improvement | Quality Improvement | Corrective Action<br><br>Nonconforming Materials, Parts, or Components |
| Documents<br>Records | Documents and Records | Document Control<br><br>QA Records |
| Work Processes | Work Processes | Instructions, Procedures, and Drawings<br><br>Identification and Control of Materials, Parts, and Components<br><br>Control of Special Processes |
| Procurement | Procurement | Procurement Document Control<br><br>Control of Purchased Material, Equipment, and Services |
| Inspection and Testing | Work Process and Acceptance Testing | Internal Inspection<br>Test Control<br>Control of Measuring and Test Equipment<br>Inspection, Test, and Operating Status<br><br>Handling, Storage, and Shipping |
| Assessment Requirements | Management Assessment<br>Independent Assessment | Audits |
| Sample Control Requirements | Work Processes | Not applicable |
| Scientific Investigation Requirements | Not applicable | Not applicable |
| Software Requirements | Not applicable | Not applicable |

a. Reference 40 CFR 194.22 source requirements.

### 5.4.1 AMWTP TRU Program Organization

The TRU Program organization is part of the overall AMWTP organization. This section describes the principal organizations involved, the project level positions, and their primary responsibilities. Data generation organizations also support the AMWTP. The central organizational structure is depicted in Figure 5.1.

President and General Manager has overall responsibility for all aspects of the AMWTP, which includes permitting, operations, characterization, and certification.

Plant Manager is responsible for the production, maintenance, and implementation necessary to support waste treatment and disposal.

TRU Programs Manager has overall responsibility for successfully accomplishing activities subject to the QAPD requirements. Management provides the necessary planning, organization, direction, control, resources, and support to achieve their defined objectives. Management is responsible for planning, performing, and improving the work.

The TRU Programs Manager is also responsible for establishing and implementing policies, plans, and procedures that control the quality of work, consistent with the provisions of the Certification Plan.

The TRU Programs Manager's responsibilities include the following:

- Ensuring that adequate technical and QA training are provided for personnel performing activities subject to the QAPD
- Ensuring compliance with all applicable regulations, DOE orders and requirements, and applicable Federal, state, and local laws
- Ensuring that personnel adhere to procedures for the generation, identification, control, and protection of QA records
- Exercising the authority and responsibility to stop unsatisfactory work such that cost and schedule do not override environmental, safety, or health considerations
- Developing, implementing, and maintaining plans, policies, and procedures that implement the QAPD requirements
- Identifying, investigating, reporting, and correcting quality problems.

Quality Assurance Manager has the authority and overall responsibility to independently assess the organization's effective implementation of the QA program to verify the achievement of quality. The QA Manager has direct access and organizational freedom to communicate with responsible management where appropriate action can be effected and is sufficiently independent from cost and schedule considerations.

The Quality Assurance Manager's responsibilities include the following:

- Reviewing the QAPjP and subsequent revisions
- Scheduling and conducting QA assessments
- Maintaining liaison with participant QA organizations and other affected organizations
- Ensuring the preparation, review, and issuance of QA plans and procedures that implement the provisions of the QAPD
- Reviewing and approving supplier and subcontractor QA plans
- Tracking or performing trend analysis of quality problems and reporting quality problem areas
- Providing for the administrative processing of documentation concerning conditions adverse to quality
- Developing, establishing, and interpreting QA policy and ensuring effective implementation
- Interfacing, as appropriate, with CBFO staff, participants, and other stakeholders on QA matters
- Assisting subordinate organizations with QA planning, documentation, quality measurement, and problem identification and resolution
- Providing guidance to all applicable subordinate organizations concerning identification, control, and protection of QA records
- Summarizing all relevant information on the QA/QC activities during the period in a semi-annual report and distributing it to DOE and the SPM.

The QA Manager ensures that the QA organization has sufficient authority, access to work areas, and organizational freedom to identify quality problems, recommend solutions, verify implementation of solutions and ensure that unsatisfactory conditions are controlled until proper disposition has occurred.

Site Project Manager (SPM) has overall responsibility for ensuring that TRU waste is successfully characterized in accordance with the WIPP-WAP and meets the requirements of the WIPP-WAC and the CH-TRAMPAC, RH-TRAMPAC, and MP-TRUW-8.2, as applicable. The SPM (or designated alternate) responsibilities include:

- Reviewing and approving the QAPjP and subsequent revisions before it is submitted to CBFO for approval
- Waste selection and tracking
- Data validation/verification
- Data reconciliation with data quality objectives (DQOs)
- Assignment of EPA Hazardous Waste Numbers
- QA/QC reports to DOE-ID
- Data transmittal to CBFO.

The SPM reviews the semiannual report, comments if appropriate, and forwards a copy of the report with comments to DOE-ID.

Waste Certification Official (WCO), or designated alternate, is responsible for documenting and certifying that all TRU waste payload containers prepared for shipment to the WIPP meet all the requirements specified in the WAC, and for transmitting the waste certification data to the WIPP. The WCO is responsible for final compilation and approval of TRU Waste Certification Statements.

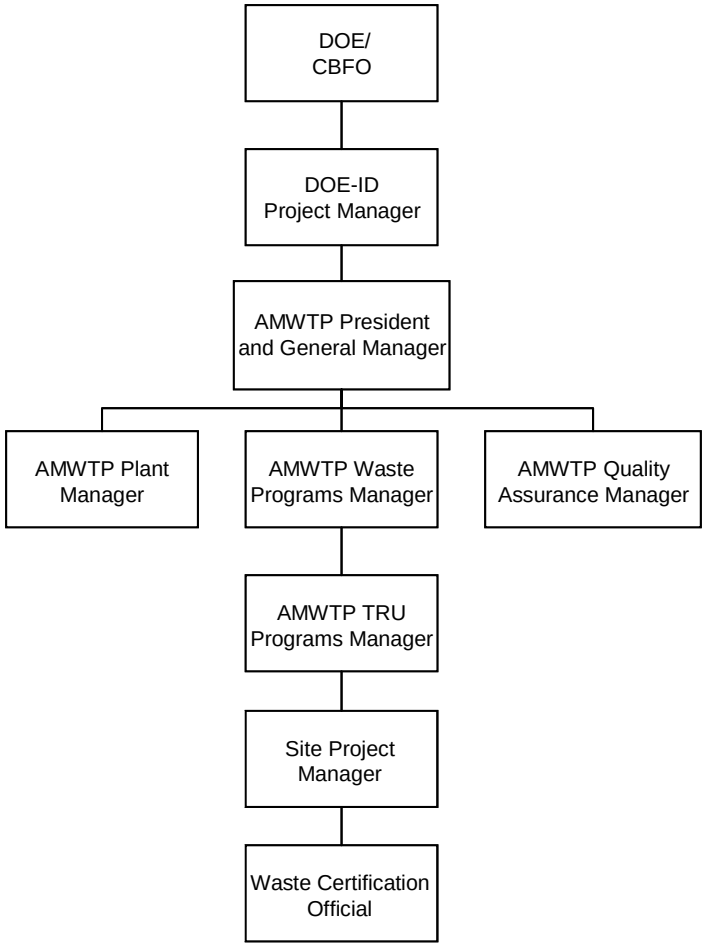


**Figure 5.1.** AMWTP TRU Program Organization Structure.

### 5.4.2 AMWTP QA Program Description

This QAP applies to items and activities affecting AMWTP quality. The QA Organization verification of the achievement of quality is accomplished through reviews, assessments, surveillances, inspections, and approval and control of records and documents. All personnel involved with TRU waste characterization, and certification are responsible for the quality of their activities and products. If work is delegated, the individual making the delegation retains responsibility for the delegated work. The QA Manager and the responsible manager will resolve disputes related to QAP requirements.

AMWTP TRU Program personnel plan certification activities and document this process. Planning documentation is subject to review by TRU Program management and subject matter experts (SMEs). Project planning documentation consists of the documents discussed in this

section, implementing procedures, and training plans. These documents establish performance criteria and methods to measure performance relevant to the AMWTP. All Site Project Office (SPO) personnel are accountable for ensuring quality within their assigned areas of responsibility. The QA Manager (or designee) is responsible for verifying the achievement of quality requirements and evaluating the effectiveness of this QAP, which is accomplished through internal reporting procedures, assessments, and surveillances performed in accordance with MP-M&IA-17.1, Management Assessments; MP-M&IA-17.2, Independent Assessments; and MP-M&IA-17.3, Surveillances, respectively.

AMWTP management at all levels has established communication channels that provide timely and wide dissemination of information related to performance, which includes:

- QA program status
- Status and resolution of significant quality problems
- Lessons learned
- Quality improvement
- Results of trend analysis.

### 5.4.3 Implementation of the CBFO QA Program

The provisions of the AMWTP QAP are implemented through the use of numerous program documents and procedures. The relationships between the various external requirements sources and AMWTP programmatic and implementing documents are depicted in Figure 5.2, AMWTP TRU Program document hierarchy. Implementing procedures are listed within sub-tier program plans, matrices, or other documents. Documents that collectively define these activities are presented in Figure 5-2.

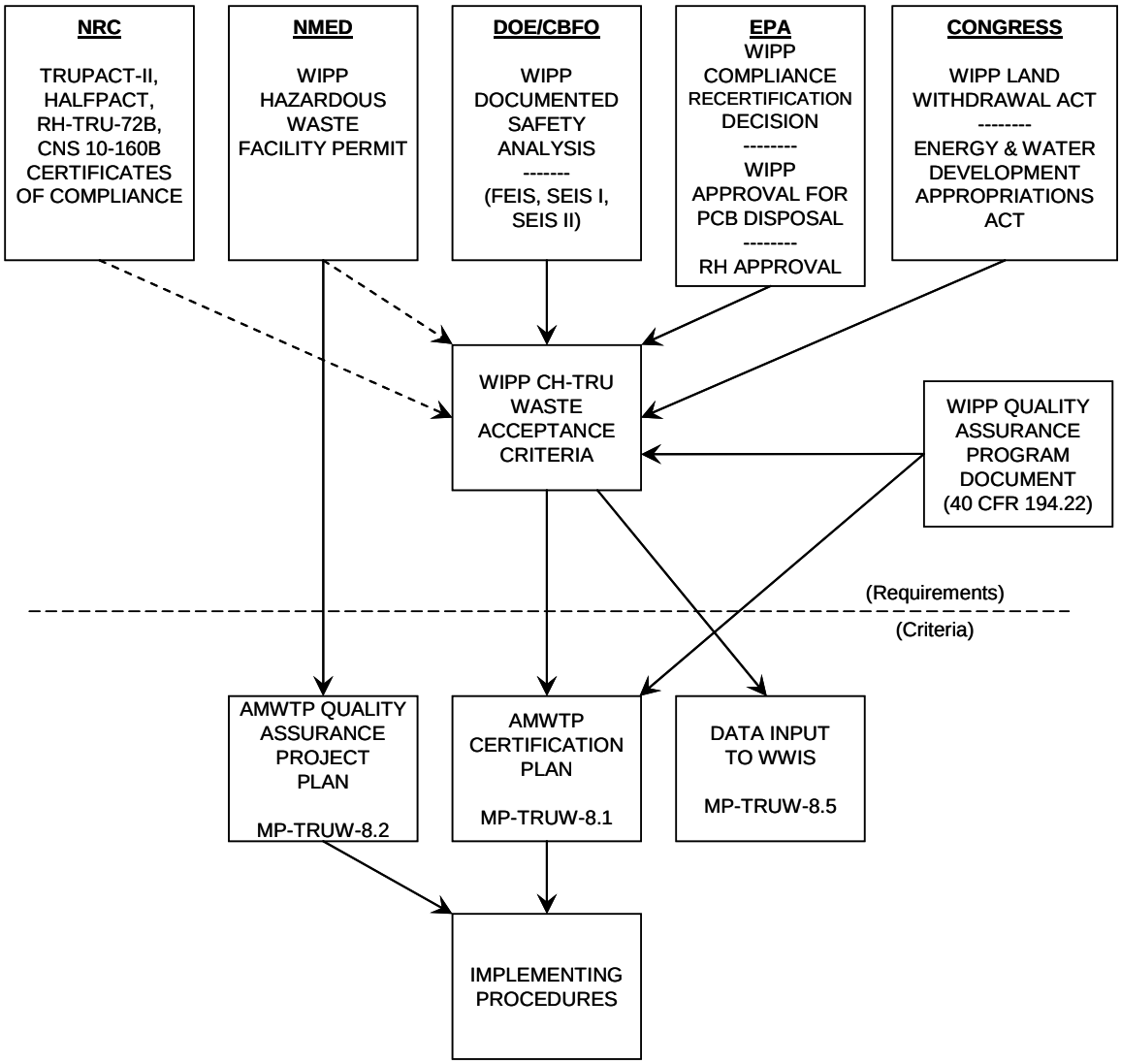


**Figure 5.2.** AMWTP TRU Program document hierarchy.

### 5.4.4 Graded Approach

Implementation of the AMWTP QAP is based on the application of the graded approach. The levels of analysis, documentation, verification, and other controls are applied commensurate with an item's risk and importance. The AMWTP graded approach process is implemented in accordance with MP-Q&SI-5.6, Graded Approach. The AMWTP QA Manager is responsible for review and concurrence with quality level designations for the AMWTP systems, structures, and components. MP-Q&SI-5.6 is submitted to the CBFO QA Manager for approval.

## 5.5 Personnel Qualification and Training

Personnel performing waste characterization and certification activities affecting quality are qualified and trained to ensure that suitable proficiency is achieved and maintained in the performance of their assigned tasks.

### 5.5.1 Qualification

The appropriate managers, with support of the training organization, determine job positions and qualification standards for each job category relevant to the AMWTP. Task responsibilities for personnel are analyzed to ensure education, experience, and training prerequisites is commensurate with minimum requirements specified in accordance with MP-RTQP-14.6, Job Analysis.

### 5.5.2 Training

Managers ensure that AMWTP personnel receive indoctrination and training on the scope, purpose, and objectives of the WIPP Program and the specific Quality Assurance Objectives (QAOs) of the tasks being performed. Personnel performing activities affecting quality are trained according to their respective training plans to ensure they achieve and maintain proficiency prior to performing any tasks subject to these QAP requirements. Personnel receive training, including on-the job training and hands-on training, as needed, to achieve initial proficiency and continuing training requisite with their activities and level of responsibility to maintain proficiency; and adapt to changes in technology, methods, job responsibilities and authority, and QA implementing procedures in accordance with MP-RTQP-14.1, Preparation and Administration of Individual Training Plans, and MP-RTQP-14.4, Personnel Qualification and Certification.

Training is designed, developed, conducted, and evaluated in accordance with approved AMWTP training procedures. Training programs may include classroom instruction, practical hands-on experience, supervised on-the-job training, self-paced individual study, and written, oral, or practical demonstration of worker competence.

The period of effectiveness for qualification associated with special processes, operations that require special skills, and the requalification criteria are specified or referenced in MP-RTQP-14.4 or supporting training program plans.

Nondestructive examination (NDE), helium leak testing, and NDA are considered to be characterization processes; therefore, personnel performing NDE and helium leak testing are qualified to a program based on the American Society of Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, June 1980 Edition. Later editions of SNT-TC-1A may be used as long as the minimum requirements of the June 1980 edition are met. Personnel performing NDA are qualified to ASTM C1490, Standard Guide for Selection, Training and Qualification of Nondestructive Assay (NDA) Personnel. Training is subject to ongoing review to determine instruction and training program effectiveness and shall be upgraded whenever improvements or enhancements are identified.

Personnel performing TRU Program activities affecting quality receive indoctrination in the following:

- General criteria, this QAP, and applicable codes, regulations, and standards
- Specific criteria, including the QAPjP, Certification Plan, CH-TRAMPAC, and any implementing procedures, as applicable.

Auditable records documenting the required training and qualifications are maintained as QA records and controlled in accordance with MP-RTQP-14.19, Training Records Administration.

### 5.6 Quality Improvement

AMWTP personnel continually evaluate and improve project activities. Personnel are responsible for identifying nonconforming items and processes that do not meet established requirements in accordance with MP-Q&SI-5.4, Identification of Nonconforming Conditions, and MP-Q&SI-5.3, Corrective Action.

#### 5.6.1 Quality-Affecting Problems

Quality-affecting problems, items, services, and processes that do not meet established requirements are identified, documented, reported, controlled, and corrected. Management at all levels foster a "no-fault" attitude to encourage the identification of nonconforming items and processes.

Quality-affecting problems involve noncompliance with a QA program requirement or a nonconforming item that does not conform to specific requirements (i.e., suspect or counterfeit items or data). A noncompliance with QA program requirements is classified either as a condition adverse to quality or as a significant condition adverse to quality.

### 5.6.2 Nonconforming Items

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure. Nonconforming items are those that do not meet the AMWTP requirements, procurement document criteria, or approved work procedures. All AMWTP personnel are responsible for promptly reporting any nonconformance condition identified as adverse to quality to management. Nonconformance reports (NCRs) are processed electronically in the AMWTP issues management system TrackWise.

MP-Q&SI-5.4 also assigns responsibilities to AMWTP organizations and personnel to identify, report, control, evaluate the nonconformances, obtain and document a disposition, determine cause, track, and define corrective action for reported nonconforming items. It also describes the methods to identify nonconforming items by marking, tagging, segregating, or other methods that do not adversely affect the end use. Identification of nonconforming items is not solely reliant on administrative means.

An NCR is prepared for each nonconformance identified, including or referencing, as appropriate, results of laboratory analysis, QC tests, audit reports, internal memoranda, or letters. The NCR provides the following information:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Method(s) or suggestions for correcting the nonconformance (corrective action)
- Schedule for completing the corrective action
- An indication of the potential ramifications and overall usability of the data, if applicable
- Any approval signatures specified in the site nonconformance procedures.

The SPM (or designated alternate) oversees the NCR process and is responsible for identifying and tracking all nonconformances and reporting to CBFO. The SPM and the QA organization are notified when a nonconformance related to the waste characterization and certification processes is observed or detected. Operations, QA, and the SPM are responsible for evaluating nonconformances and taking appropriate corrective action.

The CBFO receives written notification within five calendar days of any non-administrative nonconformances related to the applicable requirements in the WAP (that is, a failure to meet a DQO specified by the WAP) which is first identified during the SPM review. Notification is also required when the results of sampling and analysis are inconsistent with acceptable knowledge documentation. NCRs are submitted to CBFO within 30 calendar days of identification of the deficiency (Reference 46, Section B3-13) in accordance with MP-Q&SI-5.4.

### 5.6.3 Conditions Adverse To Quality

A condition adverse to quality is an all-inclusive term used in reference to failures, malfunctions, deficiencies, and nonconforming items, materials, parts, components, data, and processes. Significant conditions adverse to quality are those that, if uncorrected, could have a serious effect on safety, operability, waste characterization and certification, or effective implementation of the QA program.

Conditions adverse to quality are investigated, documented, and classified according to their significance, including the extent of the condition and the impact on completed work. As appropriate, corrective action plans are developed, documented and implemented as soon as practicable. Any condition adverse to quality determined to be noncompliant with a WAP condition or requirement will be documented in accordance with MP-Q&SI-5.3 for development of a corrective action plan to meet the requirements of Section 5.6.4.

Significant conditions adverse to quality are reported and evaluated by the AMWTP QA Manager (or designee), other relevant regulatory compliance organizations (e.g., environmental and safety), and the responsible management, to determine if a work suspension is necessary. If a work suspension is warranted, the AMWTP QA Manager (or designee) verifies and documents the completion of applicable corrective actions prior to any management action releasing the work suspension. AMWTP work suspensions are processed in accordance with MP-Q&SI-5.4.

The QA Manager (or designee) ensures quality in the TRU Program by identifying and reporting conditions adverse to quality, analyzing trends, reporting and tracking nonconformances, and implementing corrective actions in accordance with MP-Q&SI-5.1, Investigations and Root Cause Analysis. These quality improvement activities detect and prevent unacceptable quality problems and thereby increasing accuracy and reliability, and reducing variability

The CBFO is notified of CARs that relate to violations of the AMWTP QAPjP. Corrective action plans relating to these violations of the QAPjP address corrective action planning and follow-up for significant conditions adverse to quality. Instructions governing these activities are detailed in procedures referenced in MP-Q&SI-5.4.

### 5.6.4 Corrective Action

Corrective actions are planned and prepared for all significant conditions adverse to quality and for any violation of the WAP. The quality systems established for corrective actions and reporting are described in MP-Q&SI-5.3. The AMWTP identifies and implements corrective actions before TRU waste is shipped to WIPP. Corrective Action Reports generated by CBFO are tracked in hard copy and processed per CBFO instructions. These corrective actions address considerations including:

- Remedial Action – Actions to resolve the initial problem

- Investigative Actions – Assess the extent and impact of the significant condition adverse to quality
- Root Cause Determination – Root cause of the problem
- Actions necessary to prevent recurrence
- Schedule – Responsible personnel, responsibilities, and expected completion dates for the required actions
- Verification of corrective action implementation.

### 5.6.5 Improvement Analysis and Trending

Performance data are identified, collected, and routinely analyzed to identify opportunities to improve items, services, activities, and processes. Analysis of quality performance data serves to identify trends adverse to quality. These analyses shall consider information from external sources and not be limited to one type of work or to one organization. Reports of conditions adverse to quality are evaluated to identify adverse quality trends and root causes, with results reported to responsible management and to the applicable quality assurance organization. The QA Manager (or designee) is responsible for generating a trend analysis report semiannually in accordance with INST-Q&SI-5.1.1, Trending.

When conditions adverse to quality are identified on a recurring basis, actions are taken to evaluate those conditions in order to minimize their impact and to preclude recurrence. For recurring conditions adverse to quality, management shall, as appropriate:

- Determine the events leading to the occurrences
- Develop an understanding of the technical and work activities associated with the conditions adverse to quality
- Ascertain and identify any generic implications and impacts on completed work
- Determine the extent to which similar quality problems, or precursors to the problem, have been recognized by the responsible organization
- Determine the effectiveness of any corrective actions that were taken
- Consider suspending work associated with the applicable activity
- Suggest actions that can be taken by the responsible organization to preclude recurrence.

## 5.7 Documents and Records

### 5.7.1 Document Control

Documents that specify quality requirements or establish activities affecting quality are controlled to ensure that accurate and current documents are used. AMWTP personnel prepare and control documents supporting quality in accordance with MP-DOCS-18.4, Document Control. Document owners ensure that documents are developed, reviewed for adequacy, correctness, completeness, and are approved and revised, as needed. Document control personnel verify proper document approval and ensure the documents are distributed to the appropriate personnel.

#### 5.7.1.1 Document Preparation, Review, Approval, and Issuance

Instructions, procedures, and drawings are reviewed for adequacy, correctness, and completeness prior to approval and issuance. MP-DOCS-18.1, Developing Written Work Instructions, addresses approved AMWTP policies and procedures for the initiation, preparation, review, and revision control of work instructions, and MP-DOCS-18.3, Developing Management Procedures, addresses approved AMWTP policies and procedures for the initiation, preparation, review, and revision control of management procedures for all quality-related activities. Non-routine/temporary processes may be addressed by making temporary changes in procedures and plans. CBFO approves quality-affecting changes prior to implementation.

Qualified and independent personnel review all quality documents for adequacy, correctness, and completeness prior to approval and issuance. MP-DOCS-18.4 identifies the individuals and/or organizations responsible for the preparation, review, approval, and issuance of controlled documents.

- Documents are controlled during the review and approval phase, by the document owner.
- The requesting organization identifies the applicable criteria for the review. These criteria consider technical adequacy, accuracy, completeness, and compliance with established requirements.
- Pertinent background information or data are made available by the organization requesting the review if the information is not readily available to the reviewer.
- The review will be performed by individuals other than the originator.
- Reviewers are technically competent in the subject area being reviewed.
- The organization or technical discipline affected by the document reviews the document according to the established review criteria.

- The appropriate quality assurance organization reviews documents that translate CBFO QAPD, or other CBFO, requirements.
- Review comment documentation is resolved by the document owner. Evidence of review comment resolution is maintained in the document case files.
- Designated individuals or organizations issue documents.

Distribution and use of controlled documents and forms that document or prescribe work, including changes and editorial corrections to documents are described in MP-DOCS-18.4.

Changes to WAP-related plans and procedures are reviewed and approved by the SPM and the QA Manager. All non-administrative changes are reviewed and evaluated to determine whether changes will affect performance criteria or data quality, such as sample handling and custody requirements, sampling and analytical procedures, quality assurance objectives, calibration requirements, or QC sample acceptance criteria. Any changes to WIPP-WAP related plans or procedures that could positively or negatively impact data quality (that is, those changes that require prior approval of WIPP as defined in Section B5-2 of the WIPP-WAP) shall be reported to CBFO within five (5) days of identification by the Project Level review.

### 5.7.2 Records

A QA record is an authenticated record that provides objective evidence of the quality of items and/or activities. QA records are controlled and maintained to certify compliance with requirements and to reflect completed work. The QA records are identified, indexed, classified, controlled, maintained, and dispositioned by records management personnel as described in MP-DOCS-18.2, Records Management.

Records related to waste characterization are maintained in the testing, sampling, or analytical facility files at the AMWTP or at the WIPP Records Archive Facility. Contract laboratories forward testing, sampling, and analytical QA documentation along with batch data reports, to the Energy Drive Facility (EDF). Raw data obtained by testing, sampling, and analyzing TRU waste in support of this document is identifiable, legible, and provides documentary evidence of quality.

Records that are designated as lifetime records shall be maintained for the life of the waste characterization program plus six years or transferred for permanent archival storage to the WIPP Records Archive Facility. Waste characterization records designated as nonpermanent records shall be maintained for ten years from the date of record generation and then dispositioned according to the approved records inventory and disposition schedule, or at the WIPP Records Archive Facility,. If the AMWTP ceases to operate, records will be transferred before closeout for management at the WIPP Records Archive Facility.

All records relevant to an enforcement action under the WIPP Permit (Reference 46), regardless of disposition, will be maintained by the AMWTP until NMED determines that the records are no longer needed for enforcement action. The records will then be dispositioned as specified in MP-DOCS-18.2.

### 5.8 Performance Requirements

The work processes and items supporting and affecting quality are controlled through approved plans and procedures. Technical and QA personnel comply with the applicable technical standards and administrative controls described in procedures, which are reviewed and approved by the SPM (or designee), the QA Manager (or designee), and cognizant management for use in the TRU Program. Cognizant managers ensure personnel perform work following established procedures. These procedures provide the following information:

- Organizational and individual responsibilities
- Training and qualification requirements
- Technical, regulatory, and QA requirements
- Step-by-step instructions for the process (prepared by an SME of the cognizant organization)
- Equipment specifications
- Methods and criteria for ensuring and verifying the acceptability of equipment and materials used in the process (e.g., calibration)
- Requirements, precautions, process parameters, and other limiting conditions
- Products of the process
- Quantitative and/or qualitative criteria for determining that prescribed process activities have been performed satisfactorily
- Records generated by the process
- Package and design control of equipment and materials.

The SPM and cognizant managers ensure that activities are controlled and conducted in accordance with process-specific procedures that describe and control work processes applicable to TRU waste characterization and certification. If equipment is designed for TRU waste characterization and certification, site personnel comply with requirements of the QAPD for design control. Each individual performing the work is responsible for ensuring that work processes are controlled and comply with established criteria. Facility managers are responsible for ensuring that workers have the correct procedures, materials, and training to perform quality work. All instructions and procedures are maintained current with a documented and controlled

method of revision. Instructions, procedures, and drawings are readily available to AMWTP personnel at locations requiring their use.

Fabrication, installation, and inspection processes that have an effect upon the quality of items or services important to safety are controlled by process procedures.

Special processes controlled under this QAP are NDE, NDA, and helium leak testing. These processes are controlled through the use of approved procedures

### 5.9 Design Control

Design Control is not applicable to the AMWTP TRU Program QA requirements

### 5.10 Procurement

The AMWTP ensures that procurement of items and services important to safety and quality meet requirements and perform as intended. Procurement controls are also applicable to equipment and services that directly affect testing, sampling, and analytical data quality. Project personnel adhere to procurement and record-keeping practices established in written procedures

The procurement criteria are implemented according to the procedures specified in the following subsections.

#### 5.10.1 Procurement Document Control

The AMWTP Acquisition Services Manager and AMWTP QA Manager ensure personnel control procurement documents in accordance with MP-PCMT-15.1. Procurement documents supporting waste management must include required specifications and acceptance criteria. Procurement documents are reviewed by appropriate organizations and engineering disciplines to ensure that they contain adequate scope of work, technical requirements, supplier QA program requirements, and provisions for acceptance.

#### 5.10.2 Control of Purchased Items and Services

The AMWTP Acquisition Services Manager and QA Manager ensure that personnel control items and services purchased (including supplier evaluations and inspections) in accordance with MP-PCMT-15.21. Documentary evidence that items, material, and equipment conform to the procurement specifications is provided before installation or use of the item, material, and equipment, and is retained in accordance with MP-PCMT-15.1. Potential suppliers of goods and services will have their own QA program or will comply with applicable AMWTP requirements. Measures are established to ensure that materials, parts, and components used for repair work for maintenance purposes, are adequately identified to preclude the use of incorrect or defective items. Also, where replacement of limited-life items is specified, measures are established to preclude use of items whose shelf life or time in operation has expired.

### 5.10.3 Control of Subcontractors

MP-PCMT-15.1 also applies to subcontractors who perform work that directly affects the quality of characterization and certification data. Subcontractors are required to establish procurement controls and a QA program to ensure that purchased materials, equipment, and services conform to AMWTP procurement and QAP procedures. The controls must include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products on delivery. Subcontractors are subject to periodic assessments and audits at intervals consistent with the importance, complexity, and quantity of the product or services provided, to ensure compliance with procurement requirements.

Subcontractors may support activities under a "staff augmentation" role or for procurement of products and services. The staff augmentation subcontractors operate under the purview of this QAP and are subject to all applicable requirements for the AMWTP-related functions they perform. All subcontractors who support the AMWTP will be informed of the need to perform operations in compliance with QAPD requirements.

## 5.11 Inspection and Testing

Equipment is tested, inspected, and identified, in accordance with MP-PCMT-15.21. AMWTP personnel identify and control items (e.g., items with limited shelf or operating lives, materials, equipment, samples) and ensure that only correct and accepted items are used. This procedure addresses planning, parameters for evaluation, techniques to be used, and qualification of inspection and test personnel; hold points, documentation, acceptance criteria, and organizational responsibilities.

AMWTP personnel routinely test and inspect items and processes and control, calibrate, and maintain equipment to ensure proper operation and data quality. MP-PCMT-15.21 implements an inspection program that establishes criteria for inspection of activities affecting quality by, or for, the organization performing the activity, and to verify conformance with the requirements for accomplishing the activity. Personnel performing the inspections are independent from the individuals performing the activity being inspected. Equipment modifications, repairs, and replacement are inspected in accordance with the original design and inspection requirements, unless an approved alternative exists. The inspection program also provides for identification and documentation of deficiencies discovered during the inspection. Identification and documentation of deficiencies are accomplished in accordance with MP-Q&SI-5.4.

Measures are established to indicate, by the use of markings, tags, stamps, labels, routing cards, or other suitable means, the status of inspections and tests performed. These measures provide for the identification of items that have satisfactorily passed required inspections and tests, where necessary, to preclude inadvertent bypassing of the inspections and tests.

Measuring and test equipment with the necessary range and accuracy is provided to qualified personnel for the inspection, test, and acceptance of material, parts, components, and systems. Equipment accuracy is ensured by periodic calibration that is traceable to national standards or a documented equivalent basis for calibration.

The AMWTP ensures that equipment used for inspection and testing is properly controlled, calibrated, and maintained in accordance with MP-CMNT-10.5, Calibration of Measuring and Test Equipment Program.

The test control program is established for items and services important to safety. No testing requiring a test control program relative to waste payload containers will be performed under this program.

### 5.12 Assessment Requirement

The AMWTP participates in an assessment program to ensure compliance with applicable QA requirements. Management assessments are performed on every level of management. Qualified personnel who are independent from the activities being assessed perform independent assessment and surveillance activities. The CBFO and external regulatory agencies also conduct assessments of the AMWTP. The QA Manager, or designee, tracks deficiencies identified during assessments and the corrective actions to resolve deficiencies according to MP-Q&SI-5.3.

#### 5.12.1 Management Assessments

The AMWTP managers periodically assess the performance of their organization to determine the effectiveness of QAP provisions that enable the organization to comply with requirements of the WIPP-WAP, QAPD, WIPP-WAC, and CH-TRAMPAC, as applicable. Managers evaluate the QAP effectiveness by focusing on the identification and resolution of both systemic and management issues and problems, and by identifying strengths and weaknesses to facilitate actions to improve quality, efficiency and cost-effectiveness. The management assessment should include an introspective evaluation to determine whether the entire integrated management system effectively focuses on meeting strategic goals. Management assessments are conducted as described in MP-M&IA-17.1. The SPM is responsible for ensuring that assessments affecting TRU Program characterization and certification are conducted regularly and reported at least annually on relevant findings.

#### 5.12.2 Independent Assessments

Documented independent assessments are used to measure item service and quality, process adequacy and effectiveness, and to promote improvement. AMWTP personnel and facilities are subject to periodic independent assessments as identified by the QA Manager, or designee. The QA Manager, or designee, ensures that characterization facilities and analytical laboratories are assessed.

Assessment teams include one or more qualified assessors, one of whom must be a certified lead assessor. Assessment personnel qualifications are addressed in MP-Q&SI-5.8, Qualifying Supply Chain Inspectors, Auditors, Lead Auditors, and Technical Specialists.

The assessment team is made up of a team leader appointed by the QA Manager, or designee, and team members and technical specialists selected by the team leader in conjunction with the QA Manager. The team leader provides indoctrination and supervision of the team, organizes and directs the assessment, establishes the scope of the assessment, prepares a plan for conducting the assessment, and prepares and issues an assessment report to the management of the assessed organization and any affected organizations. The assessment team members and technical specialists prepare the assessment checklist, conduct the assessment, brief the management of the assessed organization on a daily basis, and prepare presentation for the exit. Independent assessments are performed in accordance with MP-M&IA-17.2.

The QA Manager, or designee, ensures the acceptable knowledge process and waste stream documentation is evaluated through internal assessments by the AMWTP quality organization and assessments by auditors or observers external to the AMWTP.

### 5.12.3 Surveillances

The surveillance program is conducted primarily to monitor work in progress and to follow up on corrective actions. Surveillance results are reported and monitored similarly to other assessment activities. Surveillances are performed in accordance with MP-M&IA-17.3.

### 5.12.4 CBFO Audits

Facilities participating in characterization, certification, and shipment of waste to WIPP are subject to CBFO audits, as discussed in Attachment B6 of the WIPP-WAP (B-4b [1][iii]). CBFO will conduct an initial audit prior to certifying AMWTP for shipment of TRU mixed waste to the WIPP facility. This initial audit will establish an approved baseline that will be reassessed annually. These audits are the responsibility of the CBFO QA manager, who coordinates these audits through the SPM.

The CBFO is responsible for granting or suspending a site's authority to certify and ship TRU waste based upon an assessment of their documented TRU waste program and its implementation. Subsequent to the initial audit, the CBFO will perform audits at least annually. CBFO may also perform unannounced audits and surveillance's at the AMWTP to confirm continued compliance with the approved plans.

### 5.12.5 Reports to Management

The QA Manager or designee shall summarize all relevant information on the QA/QC activities during the period in a semi-annual report. The QA Manager or designee reports these independent assessment results to the SPM in accordance with MP-TRUW-8.26, Reports to Management. The SPM shall review the report; comment if appropriate, and then forward a copy of the report with comments to the DOE Field Office and the AMWTP General Manager. The annual QA report includes the following information, as appropriate:

- Any changes to the AMWTP QAPjP
- Identification of any significant QA/QC problems, recommended solutions, and corrective actions
- An assessment of QC data collected during the period, including the frequency of repeated analyses, reasons they were repeated, and corrective actions
- Discussions of whether QAOs have been met and any resulting impact on decision making
- Limitations on the use of measurement data
- Status of Performance Demonstration Program (PDP) results
- Results of audits and surveillances conducted during the period.

The AMWTP and supporting facilities participate in the Headspace Gas Sampling (HGS) and Solids Sampling PDP as summarized in the AMWTP QAPjP. PDP samples are processed according to the facility procedures applicable to the specific testing or analytical characterization activity being assessed. Results are reported to CBFO for evaluation and approval of the system.

The AMWTP also participates in the NDA PDP as summarized in the Appendix A of this document. The AMWTP demonstrates compliance with the QAO for precision and accuracy by performing replicate processing of a mock waste container containing quantities of TRU isotopes for each range for which the measurement system is to be qualified. Results are reported to CBFO for evaluation and approval of the system.

## 5.13 Sample Control Requirements

AMWTP personnel and supporting contractors follow procedures to ensure proper documentation and tracking of sample possession from the time of collection/identification, through handling, preservation, shipment, transfer, analysis, storage, and final disposition. Sample control procedures used by personnel are described in MP-TRUW-8.2; INST-OI-16; INST-OI-73; and MP-TRUW-8.34, WIPP Sample Shipments.

AMWTP personnel ship samples in compliance with the DOT regulations and Project QA requirements.

## 5.14 Scientific Investigation Requirements

The AMWTP uses data validation as a systematic process for reviewing data to ensure that data are of known and documented quality and that the required data quality objectives are met. Results of the review may require that qualifiers be placed on the use of the data.

All data is reviewed and approved by qualified personnel prior to being reported. Personnel performing validation at the AMWTP are trained to the existing industry standardized training requirements (e.g., ASTM C1490, Standard Guide for Selection, Training and Qualification of Nondestructive Assay [NDA] Personnel).

The Independent Technical Reviewer is independent of the collection activities and the results of the review are documented as defined in MP-TRUW-8.8, Level I Data Validation. The review ensures the following as applicable:

- Data is recorded so that it is clearly identifiable and traceable to the source of generation.
- Data transferred and reduced from logbooks, data sheets, and radioassay instrumentation are evaluated to determine if the data was collected in a technical correct manner.
- Deviations are documented.
- QA results are complete and documented correctly.
- Results are compared to the acceptance criteria to determine if the data is valid.

- Data that are determined to be rejected, superseded, or otherwise unsuited for their intended use, are controlled to prevent their inadvertent use. Controls include the identification, segregation, and disposition of inadequate data. The basis for the disposition of erroneous data is justified and documented in accordance with MP-Q&SI-5.4.

- All data records from logbooks, data sheets, or radioassay instrumentation are maintained in accordance with MP-DOCS-18.2.

### 5.15 Software Requirements

Computer software used in the manipulation or production of data in the processing, gathering, or generation of information whose output is relied upon to make design, analytical, operational, or compliance related decisions in the performance of waste characterization, waste transportation, or waste acceptance is developed and maintained in a controlled manner. Computer hardware/software configurations used in AMWTP activities are developed, documented, verified, validated, tested, and controlled prior to use in compliance with requirements contained in the QAPD. Instructions governing these activities are detailed in MP-CD&M-11.2, Software Quality Assurance.

## 6.0 REFERENCES

**NOTE:** *The current revision of the referenced documents is applicable. The Internet links are provided for information purposes only and may change without prior notification.*

**DOE Documents**

1. DOE Order 414.1C, *Quality Assurance*, U.S. Department of Energy. (http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf)

2. DOE Guide 435.1-1, *Implementation Guide for Use with DOE M 435.1-1,* Chapter III, Section III.L, U.S. Department of Energy. (http://www.directives.doe.gov/pdfs/doe/doetext/neword/435/g4351-1ch3.pdf)

3. DOE Order 460.1, *Packaging and Transportation Safety*, Department of Energy, Washington D.C. (http://www.directives.doe.gov/pdfs/doe/doetext/neword/460/o4601b.html)

4. DOE Order 460.2, *Departmental Materials Transportation and Packaging Management*, U.S. Department of Energy, Washington D.C. (http://www.directives.doe.gov/pdfs/doe/doetext/neword/460/o4602a.pdf)

5. DOE/CBFO-94-1012, *Quality Assurance Program Document*, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/qapd/qapd.pdf)

6. DOE/WIPP 2004-3231, *Title 40 Code of Federal Regulations (CFR) Part 191, Compliance Recertification Application for the Waste Isolation Pilot Plant*, U. S. Department of Energy, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/CRA/BaselineTool/Index.htm)

7. DOE/CBFO-97-2273, *WIPP Waste Information System User's Manual,* U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico. (http://www.wipp.energy.gov/wwis/WWISUsersGuideRev%208.pdf)

8. DOE/EIS-0026, *Final Environmental Impact Statement for the Waste Isolation Pilot Plant,* U.S. Department of Energy, 1980, Washington D.C.

9. DOE/EIS-0026-FS, *Final Supplemental Environmental Impact Statement for the Waste Isolation Pilot Plant,* U.S. Department of Energy, 1990, Washington D.C.

10. DOE/EIS-0026-S-2, *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement,* U.S. Department of Energy, 1997, Washington D.C. (http://www.wipp.energy.gov/library/seis/summary-1o4.pdf)

11. DOE/WIPP-95-2065, *Waste Isolation Pilot Plant Contact Handled (CH) Waste Documented Safety Analysis*, U.S. Department of Energy, Waste Isolation Pilot Plant, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/chdsa/index.pdf)

12. DOE/WIPP-95-2125, *Waste Isolation Pilot Plant Contact Handled (CH) Technical Safety Requirements*, U.S. Department of Energy, Waste Isolation Pilot Plant, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/CHdsa/Rev10/CH_TSRwithPgChg2007-001.pdf

13. DOE/WIPP 02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, U. S. Department of Energy, Carlsbad Field Office, Waste Isolation Pilot Plant, Carlsbad, New Mexico.

14. DOE/WIPP 02-3183, *CH Packaging Program Guidance,* U. S. Department of Energy, Waste Isolation Pilot Plant, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/t2omi/t2omi.htm)

15. DOE/WIPP 02-3184, *CH Packaging Operations Manual*, U. S. Department of Energy, Waste Isolation Pilot Plant, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/t2omi/t2omi.htm)

16. DOE/WIPP-02-3185, *CH Packaging Maintenance Manual,* U. S. Department of Energy, Waste Isolation Pilot Plan, Carlsbad, New Mexico. (http://www.wipp.energy.gov/library/t2omi/t2omi.htm)

17. DOE/WIPP 02-3196, *Waste Isolation Pilot Plant Initial Report for PCB Disposal Authorization*, U.S. Department of Energy, Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. (http://www.wipp.energy.gov/rcradox/final/02-3196_PCB_Initial_3-19-02_4-29-02.pdf)

18. DOE/WIPP 02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*, U.S. Department of Energy, Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. (http://www.wipp.energy.gov/rcradox/wcpip.pdf)

19. DOE/WIPP 02-3283, *RH Packaging Program Guidance*, U.S. Department of Energy, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy. (http://www.wipp.energy.gov/documents_Transportation.htm)

20. DOE/WIPP 03-3174, *Waste Isolation Pilot Plant Remote-Handled (RH) Transuranic Waste Documented Safety Analysis*, U.S. Department of Energy, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy. (http://www.wipp.energy.gov/library/RHdsa/RH_DSA_Rev0_with_Pg_Chg_004_APPROVED.pdf)

21. DOE/WIPP 06-3178, *Waste Isolation Pilot Plant Remote-Handled (RH) Technical Safety Requirements*, U.S. Department of Energy, Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. (http://www.wipp.energy.gov/library/RHdsa/RH_TSR_Rev0_pg_chgs_thru_006.pdf

22. WP 08-PT.07, *RH-TRU 72-B Cask Removal Lid Canister Handling and Operation Manual*, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy.

23. WP 08-PT.12, *RH-TRU 72-B Cask Welded Lid Canister Handling and Operation Manual*, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy.

**Regulatory Basis**

24. Public Law 96-164, *93 Sta.1259. National Security and Military Applications of Nuclear Energy Authorization Act,* 1980, Section 213(a). (http://thomas.loc.gov/cgi-bin/bdquery/z?d096:SN00673:TOM:/bss/d096query.html)

25. Public Law 102-579, 106 Stat. 4777, 1992 (as amended by Public Law 104-201, 1996), *Waste Isolation Pilot Plant Land Withdrawal Act*. (http:www.wipp.energy.gov/library/CRA/BaselineTool/Documents/Regulatory%20Tools/10%20WIPPLWA1996.pdf)

26. Public Law 109-103, Energy and Water Development Appropriations for Fiscal Year 2005, November 19, 2005.

27. 42 U.S.C. 6901 et seq. *Resource Conservation and Recovery Act (RCRA)* of 1988.

28. 42 U.S.C. 2011 et seq. *Atomic Energy Act* of 1954. (http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0980/ml022200075-vol1.pdf#pagemode=bookmark&page=14)

29. 42 U.S.C 10141. *Nuclear Waste Policy Act* of 1982. (http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0980/ml022200075-vol1.pdf#pagemode=bookmark&page=277)

30. EPA-QA/G-4, *Guidance for the Data Quality Objectives Process*, U.S. Environmental Protection Agency. Washington, DC, Quality Assurance Management Staff, U.S. Environmental Protection Agency. (http://www.epa.gov/swerust1/cat/epaqag4.pdf)

31. U. S. Environmental Protection Agency, Letter and enclosed *Conditions of Approval* from Carl E. Edlund (Director, Multimedia Planning and Permitting Division, EPA) to Davis C. Moody (Manager, Carlsbad Field Office, DOE), dated September 20, 2007, granting approval for WIPP to dispose of TRU and TRU-mixed wastes containing PCBs. (http://www.wipp.energy.gov/rcradox/final/WIPP-EPAapproval05-15-03.pdf)

32. U. S. Environmental Protection Agency, Letter and Enclosures from Frank Marcinowski (Director, Radiation Protection Division) to R. Paul Detwiler (Acting Manager, Carlsbad Field Office), dated March 16, 2004. (http://www.wipp.energy.gov/rcradox/RH-EPAFinal3-26-04.pdf)

33. 69 FR 39456. Revision to the Record of Decision for the *Department of Energy's Waste Isolation Pilot Plant Disposal Phase*. Federal Register 69: 39456-39459, June 30, 2004, Department of Energy, Washington, D.C. (http://www.em.doe.gov/vgn/images/porta/cit_1819/26/31/92604PCB%20ROD%20Fed%20Reg%20063004%20p39456-9.pdf)

34. 71 FR 18011, *Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with Disposal Regulations: Recertification Decision: EPA Final Rule*. Federal Register71:18010-18021, April 10, 2006, Radiation Protection Division, Washington, D.C. (http://www.epa.gov/radiation/wipp/reg.htm#final rule)

35. 10 CFR § 71, *Packaging and Transportation of Radioactive Material*. Code of Federal Regulations (CFR), Washington http://www.access.gpo.gov/nara/cfr/waisidx_04/10cfr71__04.htmlD.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoaccess.gov/cfr/index.html)

36. 10 CFR 71, Subpart H, *Quality Assurance*, Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

37. 10 CFR 830, Subpart A, *Nuclear Safety Management*, Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

38. 10 CFR 835, *Occupational Radiation Protection*, Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

39. 40 CFR 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes*. Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

40. 40 CFR 194, *Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plants Compliance with the 40 CFR § 191 Disposal Regulations,* Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

41. 40 CFR 262, *Standards Applicable to Generators of Hazardous Waste*, Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

42. 49 CFR 172, *Shipping Papers: Additional Description Requirements,* Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

43. 49 CFR § 173, *Shippers–General Requirements for Shipments and Packaging*, Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

44. 49 CFR 173.443, *Contamination Control,* Code of Federal Regulations (CFR), Washington D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoacess.gov/cfr/index.html)

45. 40 CFR § 761 *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions*. Code of Federal Regulations, Washington, D.C., Office of the Federal Register, National Archives and Records Administration. (http://www.gpoaccess.gov/cfr/index.html)

46. NM4890139088-TSDF, *Waste Isolation Pilot Plant Hazardous Waste Facility Permit*, New Mexico Environment Department, Santa Fe, New Mexico. (http://www.wipp.energy.gov/library/rcrapermit/rcrapermit.htm)

47. New Mexico Hazardous Waste Act, NMSA 1978, 74-4-1 through 74-4-14

**U. S. Nuclear Regulatory Commission (NRC)**

48. U. S. Nuclear Regulatory Commission (NRC), *Certificate of Compliance*, *NRC Docket No 71-9218* (TRUPACT-II), Office of Regulatory Procedures, Washington D.C. (http://www.wipp.energy.gov/library/Chsar/Documents/CH%20PACKAGE%20CofCs.pdf#page=3)

49. U. S. Nuclear Regulatory Commission (NRC), *Certificate of Compliance, NRC Docket No 71-9279* (HalfPACT), Office of Regulatory Procedures, Washington D.C. (http://www.wipp.energy.gov/library/Chsar/Documents/CH%20PACKAGE%20CofCs.pdf#page=20)

50. U.S. Nuclear Regulatory Commission (NRC), *Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC).* Washington, D.C., Office of Regulatory Procedures, U.S. Nuclear Regulatory Commission. (http://www.wipp.energy.gov/library/CHsar/Documents/CH-TRAMPAC.pdf)

51. U.S. Nuclear Regulatory Commission, *Remote-Handled Transuranic Waste Authorized Methods for Payload Control (RH-TRAMPAC)*. Washington D.C., Office of Regulatory Procedures, U.S. Nuclear Regulatory Commission (http://www.wipp.energy.gov/Documents_Transportation.htm)

52. U.S. Nuclear Regulatory Commission, Certificate of Compliance. NRC Docket No. 71-9204, Office of Regulatory Procedures, U.S. Nuclear Regulatory Commission, Washington D.C.

53. U.S. Nuclear Regulatory Commission, Certificate of Compliance. NRC Docket No. 71-9212, Office of Regulatory Procedures, U.S. Nuclear Regulatory Commission, Washington D.C. (http://www.wipp.energy.gov/Documents_Transportation.htm)

54. Safety Analysis Report for Chem-Nuclear Systems Model CNS 10-160B Type B Radwaste Shipping Cask, NRC Docket No. 71-9204. Office of Regulatory Procedures, U.S. Nuclear Regulatory Commission, Washington D.C.

**Codes and Standards**

55. ANSI/AIM BC1-1995, *Uniform Symbology Specification* – Code 39, American National Standards, Inc.

56. NIST, Handbook 44, 1996, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*, National Institute of Standards and Technology, Office of Weights and Measures, Washington, D.C.

**Central Characterization Project Procedures**

57. CCP-PO-002, *CCP Transuranic Waste Certification Plan*

58. CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*

59. CCP-TP-030, *CCP CH TRU Waste Certification and WWIS Data Entry*

60. CCP-TP-033, *CCP Shipping of CH TRU Waste*

61. CCP-TP-086, *CCP CH Packaging Payload Assembly*

62. CCP-TP-146, *CCP SuperHENC Operating Procedure*

63. CCP-TP-181, *CCP Determination of Mercury by CVAA for TRU Waste Characterization*

64. CCP-TP-182, *CCP Determination of Metals by ICP-AES for TRU Waste Characterization*

65. CCP-TP-183, *CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel*

66. CCP-TP-184, *CCP Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry*

67. CCP-TP-185, *CCP Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*

68. CCP-TP-186, *CCP Determination of Nonhalogenated Volatile Organics by Gas Chromatography*

69. CCP-TP-187, *CCP Sample Preparation for Semivolatile Organic Compounds*

70. DOE/WIPP-06-3345, *Waste Isolation Pilot Plant Flammable Gas Analysis*, Carlsbad, New Mexico, Waste Isolation Pilot Plant, U.S. Department of Energy.

# Appendix A
# Radioassay Requirements
# for Contact-Handled Transuranic Waste

## A-1 Introduction

To support the radiological characterization data required by WIPP, the AMWTP performs nondestructive assay (NDA) on each payload container to:

- Track the WIPP radionuclide inventory, by isotopic activity and mass, for those radionuclides listed in Section 3.3.1,
- Demonstrate that each payload container disposed of at the WIPP contains TRU waste as specified in Section 3.3.3, and
- Verify that applicable transportation and facility limits on individual payload containers and assemblies for FGE, PE-Ci, and decay heat are not exceeded, as specified in Section 3.3.2, 3.3.4, 3.3.6.

The radioassay process quantifies at least one of the more prevalent radionuclides known to be present in the waste. The remaining listed radionuclides present in the waste in significant quantities will be identified by direct measurement of isotopic ratios as discussed in Section A.2. The isotopic ratios are then used to quantify radionuclides based on the assay value.

The requisite data on isotopic ratios and quantities will be derived from AK (see Section A.2), radioassay or both using CBFO approved NDA, instruments and procedures. The AMWTP technically justifies that the AK and/or radioassay techniques, instruments, and procedures used:

- Are appropriate for the specific waste stream and waste content code descriptions being assayed, and
- Will result in unbiased values for the cumulative activity and mass of the WIPP radionuclide inventory.

The AMWTP uses four Drum Assay Systems to evaluate the NDA techniques to quantify the radionuclides entrained in the TRU waste drums. The DASs are designed to accommodate both 55-gallon and 83/85-gallon drums. The measurement techniques used with the drum assay systems are passive neutron multiplicity counting, active neutron counting using the differential die-away (DDA) technique, gamma-ray isotopic analysis and quantitative gamma-ray energy analysis. The high-resolution gamma-ray measurements provide direct information on the isotopic composition of the plutonium (Pu), uranium (U), americium (Am), and other isotopes in the waste or isotopic ratios. The integrated information from the neutron measurements, gamma-ray measurements, and Acceptable Knowledge (AK) are used to determine the isotopic material composition, quantify the radionuclide masses, and compute the associated derived quantities for each payload container.

AMWTP will not use existing radioassay data collected prior to the implementation of a quality assurance program pursuant to 40 CFR § 194.22 (a) (1) to characterize and certify payload containers for disposal at WIPP.

Proposals for alternative approaches to identification and quantification of radioisotopes (e.g., quantification of isotopic ratio AK on a waste stream basis) must be submitted to CBFO for review and approval. CBFO will report such proposals to EPA for consideration prior to issuing approval.

Controlled changes to radioassay (NDA or radiochemistry) related plans or procedures are managed through a document control process described in the QAPD. The Site Project Manager and the Site QA Manager review all such changes and report to the CBFO those changes that could impact compliance with the criteria in this document. The SPM ensures that site approved changes to radioassay related plans or procedures affecting either the performance criteria or data quality of certified systems/processes are not used in the collection of waste certification data prior to CBFO's review and approval. Relating testing, calibration, and training performed in accordance with these site-approved changes, however, is not precluded from being conducted prior to CBFO's review and approval. (Memorandum from CBFO to Distribution, CBFO:NTP:RMK:VW:02-2734:UFC:5822, July 29, 2002)

## A.2 Radionuclide Isotopic Ratios

Establishing isotopic ratios for use in quantifying radionuclides is performed by direct measurement of each container using the WIPP-certified AMWTP Drum Assay Systems (DASs). Sites may opt to qualify AK as permitted by 40 CFR § 194.22(b) by performing confirmatory testing using WIPP-certified radioassay systems. The AMWTP performs an assay on each container characterized for disposal at WIPP. When direct measurements of isotopic ratios do not yield useable data as a result of technical reasons (e.g., lack of sufficient signal or poor counting statistics), AK is used. All such instances will be documented and appropriately dispositioned.

### A.2.1 Methods for Confirmation of Isotopic Ratio AK

As a minimum, to confirm existing AK data, it is necessary to compare the ratio of the two most prevalent radionuclides in the isotopic mix. For weapons and reactor grade plutonium, these are typically $^{239}$Pu and $^{240}$Pu. For heat source waste, the predominant radionuclides are typically $^{238}$Pu and $^{239}$Pu. Measured isotopic ratios for $^{241}$Am may confirm existing AK by waste stream. However, due to the fluctuation of $^{241}$Am in certain waste streams, it may become necessary to measure $^{239}$Pu to $^{241}$Am isotopic ratios on all containers in that waste stream.

$^{241}$Am is the daughter of $^{241}$Pu, which decays with a half-life of about 14 years. If the time since the chemical separation of the plutonium is known, the quantity of measured $^{241}$Am can be used to calculate the quantity of $^{241}$Pu. This assumes there was no $^{241}$Am in the waste just after the chemical separation and that no $^{241}$Am was added to or removed from the waste during the time since the separation. Since $^{241}$Am is an indirect measurement of $^{241}$Pu, it could be compared (by ratio) to any plutonium isotope ($^{239}$Pu or $^{240}$Pu) associated with weapons and reactor grade plutonium.

For weapons grade and reactor grade waste, isotopic ratio values for $^{238}$Pu can be assumed to be valid in AK data if the values for $^{239}$Pu and $^{240}$Pu have been confirmed. Because $^{242}$Pu cannot be measured using NDA methods, the contribution of $^{242}$Pu isotopic ratio is calculated by correlation technique.

For some of the generator sites that were involved primarily in weapons production, the fissile isotopes $^{235}$U and $^{233}$U and the fissionable isotope $^{238}$U may not have been measured when the transuranic waste was originally assayed (i.e., using non-WIPP-certified systems), primarily because the plutonium isotopes were the radionuclides of interest to the generator site. However, other forms of AK may be available. If so, then the AK can be confirmed by data generated on a WIPP-certified system. If valid AK does not exist, then the data generated on a WIPP-certified system can only be used to detect or calculate $^{238}$U, $^{235}$U, and $^{233}$U or to confirm their absence. Because $^{234}$U cannot be measured using NDA methods, the isotopic ratios for $^{234}$U may be calculated from the $^{235}$U enrichment. Values, or lack thereof, for $^{137}$Cs can be confirmed by the data generated on a WIPP-certified system. This is typically done by measuring $^{137}$Cs directly, or by comparing the NDA measured $^{241}$Am 662 kiloelectron volt (keV) peak to the other $^{241}$Am peaks (e.g., the 125 keV or 721 keV peaks) to determine if the 662 keV peak's intensity is consistent with the expected $^{241}$Am intensity.

A disproportionate response for the 662 keV peak relative to the other $^{241}$Am peaks may indicate the presence of $^{137}$Cs. $^{90}$Sr may be calculated from the value for $^{137}$Cs and AK. If detected, a waste container's concentration of $^{137}$Cs can be used to derive a value of $^{90}$Sr, through the application of the appropriate scaling factor(s). All scaling factors used will be technically sound and based on known, documented relationships or correlations. The data report for the waste containers for which the $^{90}$Sr, value is derived in this manner shall reflect the use of a scaling factor(s) and provide sufficient documentation to enable its independent calculation. Finally, the gamma spectra must be carefully examined for significant presence of other radionuclides to ensure compliance with transportation requirements. Data obtained for radionuclides other than the WIPP-tracked radionuclides presented above are required to address confounding isotope issues (i.e., masking) with regard to NDA.

The technique used to confirm that the absence or the ratio of non-measurable radionuclides are valid for the radioassay method used to confirm AK are documented in RPT-TRUW-03, Drum Assay Technical Review Report.

### A.2.2 Acceptable Knowledge (AK) Documentation

The use of AK information concerning the radiological composition of a waste stream will be documented either in the AK summary report for the waste characterization of the waste stream or in another controlled document approved by the Site Project Manager. Should this information be contained in AK package(s) prepared to meet other general waste characterization requirements, it need not be duplicated in other controlled documents that address the radiological properties of the waste stream; however, all relevant information must be included in the AK record. The AMWTP AK process is controlled and documented in accordance with MP-TRUW-8.13, Collection, Review, and Management of Acceptable Knowledge Documentation. The following discussion is included for the sake of completeness.

#### A.2.2.1 Required Elements

This section identifies the required radiological information that the AMWTP must maintain for a waste stream. A TRU waste generator site or waste characterization facility may use AK to delineate the distribution of the 10 WIPP-tracked radioisotopes within a TRU waste stream and the presence or absence of isotopes. The type and quantity of supporting documentation may vary by waste stream and shall be compiled in a written record that shall include a summary identifying all sources of information used to delineate the waste stream's isotopic distribution. The basis and rationale for the delineation shall be clearly summarized in an AK report and traceable to referenced documents. Assumptions made in this delineation shall be identified. The following information shall be included as part of the AK written record:

- Map of the site with the areas and facilities involved in TRU mixed waste generation, treatment, and storage identified
- Facility mission description as related to radionuclide-bearing materials and their management, e.g., routine weapons production, fuel research & development and experimental processes
- Description of the specific site locations (such as the area or building) and operations relative to the isotopic composition of the TRU wastes they generated, e.g., plutonium recovery, weapons fabrication, pyrochemical operations and waste incineration
- Waste identification or categorization schemes used at the facility relevant to the waste material's isotopic distribution, e.g., the use of codes that correlate to a specific isotopic distribution, and a description of the isotopic composition of each waste stream
- Information regarding the waste's physical and chemical composition that could affect the isotopic distribution, e.g., processes used to remove ingrown $^{241}$Am or alter its expected contribution based solely on radioactive decay kinetics

- Statement of all numerical adjustments applied to derive the material's isotopic distribution, e.g., scaling factors, decay/ingrowth corrections and secular equilibrium considerations
- Specification of the isotopic ratios for the 10 WIPP-tracked radionuclides ($^{241}$Am, $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, $^{233}$U, $^{234}$U, $^{238}$U, $^{90}$Sr, and $^{137}$Cs) and, if applicable, the radionuclides that comprise 95% of the radiological hazard on a waste stream, waste stream subpopulation, or container basis

### A.2.2.2 Supplemental Acceptable Knowledge Information

Each generator site or measurement facility shall obtain supplemental AK information, dependent on availability. The amount and type of this information cannot be mandated, but sites shall collect information as appropriate to support their contention regarding the waste's isotopic distribution. This information will be used to compile the waste's AK written record. Supplemental AK documentation that may be used includes, but is not limited to, information from the following sources:

- Safeguards & Security, Materials Control & Accountability and other nuclear materials control systems or programs and the data they generated.
- Reports of nuclear safety or criticality, or accidents/excursions involving the use of special nuclear material (SNM) or nuclear material.
- Waste packaging, waste disposal, building or nuclear material management area logs or inventory records, and site databases that provide information on SNM or nuclear materials.
- Test plans, research project reports or laboratory notebooks that describe the radionuclide content of materials used in experiments.
- Information from site personnel (e.g., documented interviews).
- Historical analytical data relevant to the isotopic distribution of the waste stream.

### A.2.2.3 Discrepancy Resolution

If there is a discrepancy between AK information related to isotopic ratios or composition, the site will evaluate the sources of the discrepancy to determine if the discrepant information is credible. Information that is not credible or information that is limited in its applicability to WIPP characterization will be identified as such and the reasons for dismissing it will be justified in writing in accordance with MP-TRUW-8.13, Collection, Review, and Management of Acceptable Knowledge Documentation. Limitations concerning the information will be documented in the AK record and summarized in the AK report. In the event that the discrepancy cannot be resolved, the site will perform direct measurements for the impacted population of containers.

If discrepancies result in a change to the original determinations, the AK summary will be updated

## A.3 Data Quality Objectives

The data quality objectives for WIPP certifiable radiological characterization data are established in Section 3.3 of this Certification Plan. They are summarized below in Table A-3 as they apply to individual payload containers. The AMWTP does not use radiochemistry (RC) or calorimetry methods to characterized TRU waste for disposal at WIPP.

**Table A-3 Data Quality Objectives for Radioassay**

| Requirement | DQO | Confidence[a] |
|---|---|---|
| TRU $\alpha$-activity concentration > 100 nCi/g[b] | A > LLD | N/A |
| Fissile mass ≤ FGE limit | $FGE + 2\sigma_{TMU}(FGE) \leq$ FGE limit | 97.5% |
| Decay heat ≤ CH-TRAMPAC limit | $DH + 1\sigma_{TMU}(DH) \leq L_{CH\text{-}TRAMPAC}$ | 84% |

a. Confidence means the statistical level of confidence that the limit is exceeded or not exceeded depending on the requirements of the individual data quality objectives. The confidence is derived from the specified DQOs, which assume contributions to TMU are normally distributed.

b. TRU waste determinations shall be in accordance with the policy for the management of TRU alpha activity concentrations when overpacking waste containers (see Appendix E).

There are no stipulated data quality objectives for PE-Ci or individual isotope activities (except as they impact the requirements listed above). However, at a minimum, radioassay programs must be capable of identifying, measuring, and reporting the presence or absence of:

- The ten radionuclides identified in Section 3.3.1 for tracking of the WIPP radionuclide inventory (see Section A.2.1),
- $^{235}U$, in order to calculate FGE, as required in Section 3.3.2 for compliance with transportation requirements, and
- Other radionuclides whose presence contributes to 95% of the radioactive hazard, as specified in Section 3.3.1, for compliance with transportation requirements.

In support of the above requirements, the Canberra Site Acceptance Test Reports (SATR) for the Integrated Waste Assay Systems, CI-IDA-NDA-0051, CI-IDA-NDA-0052, CI-IDA-NDA-0053, and CI-IDA-NDA-0054 documents and provides technical justification for the following determinations.

*Lower Limit of Detection:* The lower limit of detection (LLD) for the DAS has been determined. Only DAS measurement modalities that have an LLD of 100 nCi/g or less are used to perform TRU/low-level waste discrimination measurements. Background and container specific interferences are factored into LLD determinations. The LLD is that level of radioactivity which, if present, yields a measured value greater than the critical level with a 95% probability, where the critical level is defined as that value which measurements of the background will exceed with 5% probability. Because the LLD is a measurement-based parameter, it is not feasible to calculate LLDs for radionuclides that are not determined primarily by measurement, e.g., $^{90}$Sr. In such cases, the AMWTP has derived and documented the equivalent of an LLD, i.e., a reporting threshold for a radionuclide(s), when it is technically justified. For purposes of reporting radionuclide data in the WWIS, this value will be the equivalent of an LLD. References A3 and A4 provide information in developing the LLD.

*Total Measurement Uncertainty (TMU):* The method used to calculate the TMU for the quantities in Table A-3 must be documented and technically justified in the Canberra Industries, Total Measurement Uncertainty for the AMWTP Integrated Waste Assay Systems, CI-IDA-NDA-0055. Compliance with this requirement will be evaluated in reviews of the TMU documentation package for each assay system by CBFO.

*Calibration Procedures and Frequencies:* Each DAS has been calibrated before initial use. During calibration or re-calibration, system correction factors are established and algorithms adjusted such that the value of percent recovery (%R) is set equal to 100%, i.e., the system is calibrated to 100 %R. The range of applicability of system calibrations is specified in SATR. The matrix/source surrogate waste combination(s) used for calibration are representative of the

- Activity range(s) or gram loading(s), and
- Relevant waste matrix characteristics (e.g., densities, moderator content, and container size) planned for measurement by the system.

Calibration(s) shall be performed in accordance with consensus standards, when such standards exist. If consensus standards are not used, full documentation of the calibration technique is provided to and approved by CBFO prior to performing WIPP related assays. Primary calibration standards shall be obtained from suppliers maintaining a nationally accredited measurement program. When primary standards are not available, the standards are correlated with primary standards obtained from a nationally accredited measurement program.

*Calibration Verification:* Notwithstanding the need to calibrate individual components for replacement, changes or adjustments (e.g., energy calibration of a detector), verification of the DAS calibration is performed after any one of the following occurs:

- Major system repairs and/or modifications
- Replacement of the measurement system's components, e.g., detector, neutron generator or supporting electronic components that have the capacity to affect data
- Significant changes to the system's software
- Relocation of the system.

Calibration verification shall consist of demonstrating that the system is within the range of acceptable operation. Secondary standards can be used for the calibration verification if their performance has been correlated with the calibration standard. If a verification of the measurement system's calibration or other test demonstrates that the system's response has significantly changed, a re-calibration of the system shall be performed. Calibrated verification tests, along with acceptance criteria are detailed in INST-TRUW-8.1.1, Drum Assay Post-Maintenance Calibration & Verification.

*Calibration Confirmation*: In order to confirm that the calibration of each DAS was correctly established, the accuracy and precision of each DAS are determined after each calibration or re-calibration by performing replicate measurements of a non-interfering matrix. Calibration confirmation replicate measurements are performed on containers of the same nominal size as those in which actual waste is assayed and according to INST-OI-14, Drum Assay Operations or INST-FOI-01, In-Plant Drum Assay Operations. The number of replicate measurements to be performed is documented and technically justified. The replicate measurements are performed using nationally recognized standards, or certified standards derived from nationally recognized standards that span the range of use. The standards used to calculate accuracy are not the same as those used for the system calibration. Accuracy is reported as %R. The applicable range for accuracy shall not exceed $\pm$ 30% on a non-interfering matrix. Precision is reported as percent relative standard deviation (% RSD). The % RSD shall not exceed the values listed in Table A-3.2 for the corresponding number of replicate measurements in a non-interfering matrix. Calibration confirmation tests are conducted and documented in accordance with CI-IDA-NDA-0035, Calibration Verification & Confirmation Procedure for the Integrated Waste Assay System (IWAS) at AMWTP and SATR.

**Table A-3.2**
**Upper Limits for %RSD vs. Number of Replicates**

| Number of Replicates | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max %RSD[a] | 1.8 | 6.6 | 10.0 | 12.3 | 14.0 | 15.2 | 16.2 | 17.1 | 17.7 | 18.3 | 18.8 | 19.3 | 19.7 | 20.0 |

a. The values listed are derived from the measured standard deviation of the replicate measurements using:

$$\frac{s}{\mu} \bullet 100\% < \sqrt{\frac{(0.292) \bullet \chi^2_{0.05,n-1}}{n-1}} \bullet 100\%$$

where s is the measured standard deviation, n is the number of replicates, μ is the true value, $\chi^2_{0.05,n-1}$ is the critical value for the upper 5% tail of a one sided chi-squared distribution with n-1 degrees of freedom, and 0.292 corresponds to a 95% upper confidence bound on the true system precision limit of 29.2%.

## A.4 Quality Control

Section 5.0 of this Certification Plan summarizes the QA requirements relating to waste characterization, certification, and transportation that meet all applicable requirements of the CBFO QAPD. The AMWTP DAS uses calibration and operating procedures that have been written, approved, and controlled. Nonconforming items and processes that do not meet established criteria are identified, controlled and corrected in accordance with MP-Q&SI-5.4, Identification of Nonconforming Conditions, and MP-Q&SI-5.3, Corrective Action.

### A.4.1 General Requirements

*Radioassay Training*: Only appropriately trained and qualified personnel are allowed to perform radioassay and data validation/review. Standardized Training requirements for radioassay personnel are based upon existing industry standardized training requirements (e.g., ASTM C1490, Standard Guide for Selection, Training and Qualification of Nondestructive Assay [NDA] Personnel [Reference A8]) and meet the specifications in the QAPD. Requalification of radioassay personnel shall be based upon evidence of continued satisfactory performance and must be performed at least every two years. Personnel receive training requisite with their activities and level of responsibility in accordance with MP-RTQP-14.4, Personnel Qualification and Certification. The period of effectiveness for qualification and the requalification criteria are also specified.

*Software QC Requirements:* All computer programs and revisions thereof used for radioassay meet the applicable requirements in the QAPD (Reference A2, Section 6.0) and are performed in accordance with MP-CD&M-11.2, Software Quality Assurance.

*Comparison Programs*: The AMWTP participates in any relevant measurement comparison program(s) sponsored or approved by the CBFO. Such programs may be conducted as part of the NDA performance demonstration program (References A7 and A10) or through other third parties (Reference: WIPP Compliance Recertification Application, including Annual Reports to the EPA).

### A.4.2 NDA QC Requirements

The assay procedures cited in various American Society for Testing and Materials (ASTM) and American National Standards Institute (ANSI) standards (References A9 and A11 to A15) and NRC standard practices and guidelines (Reference A16) as referenced in this Appendix are recommended for use at all testing facilities.

*Background Measurement*s: Background measurements are performed and recorded at least once per operational day, unless otherwise approved by CBFO. Contributions to background due to radiation from nearby radiation producing equipment, standards or wastes are engineered into the facility and DAS design and controlled in accordance with INST-OI-14, Drum Assay Operations or INST-FOI-01, In-Plant Drum Assay Operations.

*Instrument Performance Measurements:* Performance checks on the calibrated and operable DAS (both gamma and neutron modalities) are performed and recorded as described in INST-OI-14, Drum Assay Operations, or INST-FOI-01, In-Plant Drum Assay Operations. Performance checks shall include daily efficiency checks and checks for spectrometric instruments, peak position and resolution checks, and weekly matrix correction with an interfering matrix.

Both radioactive sources and surrogate waste matrix containers (both non-interfering and interfering) are used. At least once per operational week an interfering matrix must be used to assess the long-term stability of the NDA instrument's matrix correction. Surrogate waste containers must reflect the type of waste, e.g., debris, sludge, currently being assayed. To verify calibration, radioactivity standards must be selected such that, over a six-month period, the operating range of the assay system is tested in each applicable surrogate waste matrix. The use of interfering and non-interfering matrices provides a realistic assessment of the assay system's performance over time, and will assist measurement personnel in detecting potential problems relative to the matrices currently assayed by the measurement system.

Interfering surrogate matrix containers must be constructed in such a way that the waste characteristics do not change over time.

Radioactive sources should be long-lived, easy to position relative to the detector(s), and of sufficient radioactivity to obtain good results with relatively short count times.

*Data Checks*: Background and performance measurements (standardization, daily performance verification, and weekly check with an interfering matrix drum) are evaluated against established criteria at the time of the measurements to determine acceptability of the DAS. At least once per week, the background and performance measurement results are reviewed and evaluated to monitor performance trends in accordance with MP-TRUW-8.8, Level I Data Validation. If daily performance checks result in data that are outside the acceptable range, the required responses in Table A-4.2 shall be followed.

**Table A-4.2**
**Range of Applicability**

| Category | Acceptability Range[a] | Required Response |
|---|---|---|
| Acceptable Range | $\|Data\|^c \leq 2\sigma^b$ | No action required. |
| Warning Range | $2\sigma^b < \|Data\| \leq 3\sigma^b$ | If the first performance check rerun is less than 2σ, then proceed with waste assay measurements. If the first performance check rerun is greater than 3σ, then go to the response required for the "Action Range." If the first performance check rerun is between 2σ and 3σ, then make one more performance measurement (i.e., a second run). If that measurement is less than 2σ, then proceed with waste assay measurements; otherwise go to the response for the "Action Range." |
| Action Range | $\|Data\| > 3\sigma^b$ | If a daily performance verification check result from the first run is greater than 3σ or if the Required Response described above leads to the Action Range, then work stops for the affected DAS and the occurrence is documented and appropriately dispositioned (e.g., a non-conformance report is initiated).<br><br>The DAS is removed from service pending successful resolution of all necessary actions, and all assays performed since the last acceptable daily performance verification check is suspect, pending satisfactory resolution. Recalibration or calibration verification is required prior to returning the system back to service. |

a. Reference A15
b. "σ" - the standard deviation is only based on the reproducibility of the data check measurements themselves. This is not TMU.
c. Absolute Value

### A.4.3 Radiochemistry QC Requirements

AMWTP does not use RC methods to characterize TRU waste for disposal at WIPP. Assay standards are prepared and used as indicated in the standard test methods.

## A.5 Data Management

### A.5.1 Data Review and Validation

All radioassay data must be reviewed and approved by qualified personnel prior to being reported. At a minimum, the data must be reviewed by a technical reviewer and approved by the site project manager or their designee(s). Personnel are qualified as specified in MP-RTQP-14.4. The validation process described in MP-TRUW-8.8 and MP-TRUW-8.9, Level II Data Validation, includes verification that the applicable quality controls specified in Section A.4 have been met.

### A.5.2 Data Reporting

Radioassay data are reported to the site project office on a testing batch basis. Batches are defined, as a suite of waste containers undergoing radioassay using the same testing equipment. For NDA, the AMWTP specifies the size of the testing batch as needed, without regard to waste matrix.

The AMWTP submits testing batch data reports (either by the WTS or hard copy) for each testing batch to the site project office, as defined in MP-TRUW-8.8. Radioassay testing batch data reports shall consist of the following:

- Testing facility name, testing batch number, container numbers included in that testing batch, and signature release by the site project manager or their designee(s).
- Table of contents
- Background and performance data or control charts for the relevant time period.
- Data validation per the QAPD (Reference A2, Section 5.3.2) and as described in MP-TRUW-8.8.
- Separate testing report sheet(s) for each container in the testing batch that includes:
  - Title "Radioassay Data Sheet"
  - Method used for radioassay (i.e., procedure identification)
  - Date of radioassay
  - Activities and/or masses of individual radioisotopes present and their associated TMUs (curies and/or grams)
  - Operator signature/date
  - Reviewer signature/date.

Other radiological properties to be documented for each container include:

- Decay heat expressed in Watts (W) and its associated TMU
- Total $^{239}$Pu FGE expressed in grams (g) and its associated TMU
- TRU alpha activity concentration expressed in curies/gram (Ci/g) and its associated TMU
- Total $^{239}$Pu equivalent activity expressed in curies (Ci).

These derived radiological properties are stored in WTS.

Radioassay data for each performance check (i.e., daily performance check and weekly interfering matrix performance check) and each container is transferred from the DAS to the WTS.

TMU is reported in terms of one standard deviation on the DAS and the WTS reports

### A.5.3 Data and Records Retention

The following nonpermanent records are maintained at the AMWTP for maintenance, and are documented and retrievable by testing batch number, in accordance with the QAPD:

- Testing batch reports
- All raw data, including instrument readouts, calculation records, and radioassay QC results
- All instrument calibration reports, as applicable.

## A.6 Quality Characteristics Assessment

Per 40 CFR § 194.22(c), there are five "quality characteristics" that have to be assessed. These quality characteristics and the method by which they are assessed are described in the following sections.

### A.6.1 Data Accuracy

Per 40 CFR § 194.22(c)(1), *Data Accuracy* is defined as "the degree to which data agree with an acceptable reference or true value." For the AMWTP NDA methods, this quality characteristic is met and maintained as described in section A.3. The AMWTP does not use RC methods for characterizing CH-TRU waste.

### A.6.2 Data Precision

Per 40 CFR § 194.22(c)(2), *Data Precision* is defined as "a measure of the mutual agreement between comparable data gathered or developed under similar conditions expressed in terms of standard deviation." For AMWTP NDA methods, this quality characteristic is met and maintained as described in Section A.3. The AMWTP does not use RC methods for characterizing CH-TRU waste.

### A.6.3 Data Representativeness

Per 40 CFR § 194.22(c)(3), *Data Representativeness* is defined as "the degree to which data can accurately and precisely represent a characteristic of a population, a parameter, variations at a sampling point, or environmental conditions." For NDA and RC methods, this quality characteristic for the waste stream is met and maintained through 100% measurement confirmation on a payload container basis. For NDA, since the entire waste container is subjected to measurement, representativeness pertaining to the actual measurement is not applicable. The AMWTP does not use RC methods for characterizing CH-TRU waste.

### A.6.4 Data Completeness

Per 40 CFR § 194.22(c)(4), *Data Completeness* is defined as "a measure of the amount of valid data obtained compared to the amount that was expected." For NDA methods, this quality characteristic is met and maintained by requiring 100% valid results. For the AMWTP NDA program, any results indicating the NDA measurement was invalid require re-measurement. The AMWTP does not use RC methods for characterizing CH-TRU waste.

### A.6.5 Data Comparability

Per 40 CFR § 194.22(c)(5), *Data Comparability* is defined as "a measure of confidence with which one data set can be compared to another." For NDA methods, this quality characteristic is addressed by ensuring that all data are produced under the same system of controls. These controls apply to all aspects of the data generation process, including: procurement of analytical instruments; calibration and operation of assay equipment according to industry standards; preparation and use of standardized instrument and data review procedures; and, training of equipment operators and technical/data review personnel to the QAPD, as specified in Section A.4.1. All NDA, and RC systems and methods are approved by CBFO prior to use in generating waste characterization data. Additionally, comparison of measured data with AK derived or based values, as applicable, provides a means to assess comparability on a waste stream basis. Although no specific confidence level is specified, these controls provide comparability among all data generated under this program. Sites using radioassay systems shall participate in measurement comparison programs as specified in Section A.4.1

## References

**NOTE:** *The current revision of the referenced documents is applicable. The Internet links are provided for information purposes only and may change without prior notification.*

A1. U.S. Nuclear Regulatory Commission. *Peer Review for High-Level Nuclear Waste Repositories, NUREG-1297,* Washington D.C., Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission.

A2. U.S. Department of Energy. *Quality Assurance Program Document*. DOE/CBFO-94-1012. Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. http://www.wipp.energy.gov/library/qapd/qapd.pdf

A3. Currie, Lloyd A., 1968. *Limits for Qualitative Detection and Quantitative Determination. Anal.Chem.* 40: 586-93.

A4. EPA, 1980. *Upgrading Environmental Radiation Data.* EPA 520/1-80-012, Washington D.C., Office of Radiation Programs, U. S. Environmental Protection Agency.

A5. K. C. Smith, R. A. Stroud, K. L. Coop, and J. F. Bresson. 1998. *Total Measurement Uncertainty Assessment for Transuranic Waste Shipments to the Waste Isolation Pilot Plant*. Proceedings of the 6th Nondestructive Assay Waste Characterization Conference, Salt Lake City, Utah, Nov. 17-19, 1998, pp.21-37.

A6. K. L. Coop, J. F. Bresson, M. E. Doherty, B. M. Gillespie, and D. R. Davidson. *Standardized Total Measurement Uncertainty Reporting for WIPP.* Nondestructive Assay Interface Working Group, Salt Lake City, Utah, May 22, 2000.

A7. U.S. Department of Energy. *Performance Demonstration Program Plan for Nondestructive Assay of Boxed Wastes for the TRU Waste Characterization Program*. DOE/CBFO-01-1006. Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. http://www.wipp.energy.gov/library/pdp/DOE-CBFO-01-1006Rev0.pdf

A8. American Society for Testing and Materials. *Standard Guide for Selection, Training and Qualification of Nondestructive Assay (NDA) Personne*l, ASTM C1490, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials

A9. American National Standards Institute. *Radiometric Calorimeters – Measurement Control Program*, ANSI N15.54, American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

A10. U.S. Department of Energy. *Performance Demonstration Program Plan for Nondestructive Assay of Drummed Wastes for the TRU Waste Characterization Program*. DOE/CBFO-01-1005. Carlsbad, New Mexico, Carlsbad Field Office, U.S. Department of Energy. http://www.wipp.energy.gov/library/pdp/DOE-CBFO-01-1005Rev0.1.pdf

A11. American Society for Testing and Materials. *Standard Test Method for Determination of Plutonium Isotopic Composition by Gamma-Ray Spectrometry*. ASTM C1030, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.

A12. American Society for Testing and Materials. *Standard Test Method for Nondestructive Assay of Nuclear Material in Scrap and Waste by Passive-Active Neutron Counting Using a $^{252}$Cf Shuffler.* ASTM C1316, Philadelphia, Pennsylvania, American Society for Testing and Materials.

A13. American Society for Testing and Materials. *Standard Test Method for Nondestructive Assay of Special Nuclear Material in Low Density Scrap and Waste by Segmented Passive Gamma-Ray Scanning.* ASTM C1133, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.

A14. American Society for Testing and Materials. *Standard Test Method for Nondestructive Assay of Plutonium, Tritium and $^{241}$Am by Calorimetric Assay*. ASTM C1458, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.

A15. American National Standards Institute. *Nondestructive Assay Measurement Control and Assurance*, ANSI N15.36. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

A16. U.S. Nuclear Regulatory Commission. 1984. *Nondestructive Assay of Special* Nuclear *Material Contained in Scrap and Waste.* Regulatory Guide 5.11, Washington, DC, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission.

A17. American National Standards Institute. *Plutonium-Bearing Solids Calibration Techniques for Calorimetric Assay.* ANSI N15.22-1987, American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

A18. Canberra Industries, *Genie 2000 Spectroscopy System Operation*

A19. Canberra Industries, *Genie 2000 Spectroscopy System Customization Tools*

A20. Canberra Industries, *NDA 2000 Technical Reference Manual*

A21 Canberra Industries, *NDA 2000 Users Manual*

A22. Canberra Industries, *Total Measurement Uncertainty for the AMWTP Integrated Waste Assay Systems*, CI-IDA-NDA-0055.

A23. Canberra Industries, *Neutron Multiplicity Counter Characterization Report for the Integrated Waste Assay System*, Unit 1, 34000.

A24. Canberra Industries, *Neutron Multiplicity Counter Characterization Report for the Integrated Waste Assay System*, Unit 2, 34001.

A25. Canberra Industries, *Neutron Multiplicity Counter Characterization Report for the Integrated Waste Assay System*, Unit 3, 34034.

A26. Canberra Industries, *Neutron Multiplicity Counter Characterization Report for the Integrated Waste Assay System*, Unit 4, 34035.

A27. Canberra Industries, *Differential Die-Away Analysis Characterization Report for the Integrated Waste Assay System,* Unit 1, 34002.

A28. Canberra Industries, *Differential Die-Away Analysis Characterization Report for the Integrated Waste Assay System,* Unit 2, 34003.

A29. Canberra Industries, *Differential Die-Away Analysis Characterization Report for the Integrated Waste Assay System,* Unit 3, 34036.

A30. Canberra Industries, *Differential Die-Away Analysis Characterization Report for the Integrated Waste Assay System,* Unit 4, 34037.

A31. Canberra Industries, *Q2 Calibration Report for the Integrated Waste Assay System*, Unit 1, 34004.

A32. Canberra Industries, *Q2 Calibration Report for the Integrated Waste Assay System*, Unit 2, 34005.

A33. Canberra Industries, *Q2 Calibration Report for the Integrated Waste Assay System*, Unit 3, 34038.

A34. Canberra Industries, *Q2 Calibration Report for the Integrated Waste Assay System*, Unit 4, 34039.

A35. Canberra Industries, *Site Acceptance Test Reports (SATR) for the Integrated Waste Assay Systems* Unit 1 at AMWTP, CI-IDA-NDA-0051.

A36. Canberra Industries, *Site Acceptance Test Reports (SATR) for the Integrated Waste Assay Systems* Unit 2 at AMWTP, CI-IDA-NDA-0052.

A37 Canberra Industries, *Site Acceptance Test Reports (SATR) for the Integrated Waste Assay Systems* Unit 3 at AMWTP, CI-IDA-NDA-0053.

A38. Canberra Industries, *Site Acceptance Test Reports (SATR) for the Integrated Waste Assay Systems* Unit 4 at AMWTP, CI-IDA-NDA-0054

A39. Canberra Industries, *Calibration Verification & Confirmation Procedure for Integrated Waste Assay (IWAS) at AMWTP,* CI-IDA-NDA-0035.

A40. *Drum Assay Technical Review Report*, RPT-TRUW-03.

A41. *Drum Assay Post-Maintenance Calibration and Verification,* INST-TRUW-8.1.1.

A42 *Surveillances*, MP-M&IA-17.3.

# Appendix B
# $^{239}$Pu Equivalent Activity

The concept of $^{239}$Pu equivalent activity (PE-Ci) is intended to eliminate the dependency of radiological analyses on specific knowledge of the radionuclide composition of a TRU waste stream. A unique radionuclide composition and/or distribution are associated with most TRU waste streams at each site. By normalizing all radionuclides to a common radiotoxic hazard index, radiological analyses that are essentially independent of these variations can be conducted for the WIPP facility. $^{239}$Pu, as a common component of most defense TRU wastes, was selected as the radionuclide to which the radiotoxic hazard of other TRU radionuclides could be indexed.

Modeled operational releases from the WIPP facility, including both routine and accident-related, are airborne. There are no known significant liquid release pathways during the operational phase of the facility. This, and the fact that TRU radionuclides primarily represent inhalation hazards, allows a valid relationship to be established, which normalizes the inhalation hazard of a TRU radionuclide to that of $^{239}$Pu for the purpose of the WIPP radiological analyses. In effect, the radiological dose consequences of an airborne release of a quantity of TRU radioactivity with a known radionuclide distribution will be essentially identical to that of a release of that material expressed in terms of a quantity of $^{239}$Pu. To obtain this correlation, the 50-year effective whole-body dose commitment or dose conversion factor for a unit intake of each radionuclide will be used.

For a known radioactivity quantity and radionuclide distribution, the $^{239}$Pu equivalent activity is determined using radionuclide-specific weighting factors. The $^{239}$Pu equivalent activity (AM) can be characterized by:

$$AM = \sum_{i=1}^{K} A_i / WF_i$$

where $K$ is the number of TRU[2] radionuclides, $A_i$ is the activity of radionuclide $i$, and $WF_i$ is the PE-Ci weighting factor for radionuclide $i$.

$WF_i$ is further defined as the ratio

$$WF_i = E_o / E_i$$

where $E_o$ (rem/ μCi) is the 50-year effective whole-body dose commitment due to the inhalation of $^{239}$Pu particulates with a 1.0 μm activity median aerodynamic diameter (AMAD) and a weekly pulmonary clearance class, and $E_i$ (rem/ μCi) is the 50-year effective whole-body dose commitment due to the inhalation of radionuclide ($i$) particulates with a 1.0 μm activity median

2 TRU as designated in this equation refers to any radionuclide with an atomic number greater than 92 and including $^{233}$U.

aerodynamic diameter and the pulmonary clearance class resulting in the highest 50-year effective whole-body dose commitment.

Weighting factors calculated in this manner are presented in Table B-1 for radionuclides typically present in CH-TRU waste. If other TRU radionuclides are determined to be present in the payload container, their weighting factors can be obtained from the values of $E_o$ and $E_i$ contained in DOE/EH-0071 (Reference B1).

**Table B-1**

**PE-Ci Weighting Factors for Selected Radionuclides**

| Radionuclide | Pulmonary Clearance Class[a] | Weighting Factor |
|---|---|---|
| $^{233}U$ | Y | 3.9 |
| $^{237}Np$ | W | 1.0 |
| $^{236}Pu$ | W | 3.2 |
| $^{238}Pu$ | W | 1.1 |
| $^{239}Pu$ | W | 1.0 |
| $^{240}Pu$ | W | 1.0 |
| $^{241}Pu$ | W | 51.0 |
| $^{242}Pu$ | W | 1.1 |
| $^{241}Am$ | W | 1.0 |
| $^{243}Am$ | W | 1.0 |
| $^{242}Cm$ | W | 30.0 |
| $^{244}Cm$ | W | 1.9 |
| $^{252}Cf$ | Y | 3.9 |

a. (W) Weekly, (Y) Yearly

## References

B1. U.S. Department of Energy. *Internal Dose Conversion Factors for Calculation of DOSE to the Public.* DOE/EH-0071, July 1988

# Appendix C
# Glossary

**Acceptable knowledge (AK)** - Any information about the process used to generate waste, material inputs to the process, and the time period during which the waste was generated, as well as data resulting from the analysis of waste, conducted prior to or separate from the waste certification process authorized by EPA's Certification Decision, to show compliance with Condition 3 of the certification decision (Appendix A of 40 CFR 194).

**Activity** - A measure of the rate at which a material emits nuclear radiation, usually given in terms of the number of nuclear disintegrations occurring in a given length of time. The common unit of activity is the curie, which amounts to 37 billion ($3.7 \times 10^{10}$) disintegrations per second. The International Standard unit of activity is the becquerel and is equal to one disintegration per second.

**Administrative controls** - Provisions relating to organization and management, procedures, record keeping, assessment, and reporting necessary to ensure the safe operation of the facility.

**Atomic energy defense activities** - Activities of the Secretary of Energy (and predecessor agencies) performed in whole or in part in carrying out any of the following functions: naval reactors development; weapons activities, including defense inertial confinement fusion; verification and control technology; defense nuclear material production; defense nuclear waste and materials by-product management; defense nuclear materials security investigations; and defense research and development.

**Authorization basis** - Those aspects of the facility design and operational requirements relied upon by DOE to authorize the operation of nuclear facilities and processes.

**Characterization** - Sampling, monitoring, and analysis—whether by review of AK, nondestructive examination, NDA, RC, headspace gas analysis, or chemical analysis of the volatile or semi-volatile organic compounds or metals—to identify and quantify the constituents of a waste material.

**Chemical compatibility** - Assessing the properties of chemicals in a payload container (>1 weight percent); there must be no adverse safety or health hazards produced as a result of any mixtures that occur.

**CNS 10-160B** – An NRC-certified Type B transportation packaging used for transportation of RH TRU wastes.

**Completeness** - The percentage of measurements made which are judged to be valid measurements. The completeness goal is to generate a sufficient amount of valid data based on program needs. Valid results for analytical, radioassay, and radiography data are those that were obtained when the laboratory or testing facility demonstrated that the instrumentation and method were in control; that is, that all calibration, verification, interference, and zero matrix checks met acceptance criteria. Valid samples are those collected and submitted for analysis that were representative and met all preservation requirements upon arrival at the laboratory.

**Compressed gas** - Compressed gases are those materials defined as such by 49 CFR § 173, Subpart G.

**Contact-handled transuranic waste** - Transuranic waste with a surface dose rate not greater than 200 millirem/per hour.

**Contact-handled transuranic waste authorized methods for payload control (CH-TRAMPAC)** – The governing document for shipments in the Transuranic Package Transporter-II (TRUPACT-II) and HalfPACT packagings.

**Content code** - A uniform system applied to waste forms to group those with similar characteristics for purposes of shipment in the TRUPACT-II, HalfPACT, and RH-TRU 72-B packagings.

**Corrosive/Corrosivity** - A solid waste exhibits corrosivity if a sample of the waste is either aqueous and has a pH $\leq 2$ or $\geq 12.5$, or it is a liquid and corrodes steel at a rate >6.35 mm (0.250 inch) per year at a test temperature of 55º (130ºF). (40 CFR § 261.22)

**Curie** - A unit of activity equal to 37 billion ($3.7 \times 10^{10}$) disintegrations per second.

**Disposal** - Permanent isolation of TRU waste from the accessible environment with no intent of recovery, whether or not such isolation permits the recovery of such waste.

**Dose conversion factor** - A numerical factor used in converting radionuclide uptake (curies) in the body to the resultant radiation dose (rem).

**Dose equivalent rate** - The radiation dose equivalent delivered per unit time (e.g., rem per hour).

**Drum** - Includes 55-gallon, 85-gallon, and 100-gallon drums as described in the CH-TRAMPAC and WIPP Hazardous Waste Facility Permit.

**Fissile gram equivalent** - An isotopic mass of radionuclide normalized to $^{239}$Pu.

**Fissile material** - Any material consisting of or containing one or more radionuclides that can undergo neutron-induced fission with neutrons of essentially zero kinetic energy (e.g., thermal neutrons) such as $^{233}$U, $^{235}$U, and $^{239}$Pu.

**HalfPACT** - An NRC-certified Type B transportation packaging used for transportation of CH-TRU wastes.

**Hazardous waste** - Those wastes which are designated hazardous by EPA (or state) regulations. For a detailed description, see 40 CFR § 261.3. Hazardous wastes are listed in 20.4.1 NMAC, Subpart II (40 CFR § 261) and/or exhibit one of the four characteristics in 20.4.1 NMAC, subpart II (40 CFR § 261) (i.e., ignitability, corrosivity, reactivity, and toxicity).

**Headspace** - The total contained volume of a container minus the volume occupied by the waste material.

**Headspace gas** - The gas within the headspace of a container.

**Lower Limit of Detection** - The level of radioactivity, which, if present, will yield a measured value greater than the critical limit with a 95% probability. The critical limit is defined as that value which measurements of the background will exceed with a 5% probability.

**Machine-compacted waste** -Waste whose volume has been reduced using a mechanical process.

**Overpack** - A container put around another container.

**Package** - (1) A packaging plus its contents. (2) The reusable Type B shipping container (i.e., TRUPACT-II, HalfPACT, RH-TRU 72-B, CNS 10-160B) loaded with TRU waste payload containers, which has been prepared for shipment in accordance with the package QA program. (3) In the regulations governing the transportation of radioactive materials, the packaging, together with its radioactive contents, as presented for transport.

**Packaging** - The reusable Type B shipping container for transport of TRU waste payload containers (i.e., TRUPACT-II, HalfPACT, RH-TRU 72-B, or CNS 10-160B).

**Packaging quality assurance program** - A site-specific document that defines the quality assurance and quality control activities applicable to usage of the NRC-approved packaging. This program shall meet the requirements of 10 CFR § 71, Subpart H.

**Payload container** - The outermost container (i.e., drum, SWB, TDOP, or canister) for TRU waste material that is placed in a reusable Type B shipping container (i.e., TRUPACT-II, HalfPACT, RH-TRU 72-B, or CNS 10-160B) for transport.

**Payload assembly** - An assembly of payload containers qualified for transport in a TRUPACT-II, HalfPACT or CNS 10-160B.

**Pipe overpack** - A packaging configuration consisting of a vented cylindrical pipe component surrounded by dunnage within a vented 55-gallon drum with a rigid polyethylene liner and vented lid.

**Plutonium equivalent activity** - An equivalent radiotoxic hazard of a radionuclide normalized to $^{239}Pu$.

**Precision** - A measure of mutual agreement among individual measurements of the same property made under prescribed similar conditions; often expressed as a standard deviation or relative percent difference.

**Pyrophoric** - Materials that may ignite spontaneously in air or that emit sparks when scratched or struck, especially with materials such as steel. A flammable solid that, under transport conditions, might cause fires through friction or retained heat or that can be ignited readily and, when ignited, burns vigorously and persistently so as to create a serious transportation hazard. Included in the pyrophoric definition are spontaneously combustible materials, water reactive materials, and oxidizers. Examples of nonradioactive pyrophorics are organic peroxides, sodium metal, and chlorates.

**Radioassay** - Methods used to identify and quantify radionuclides in TRU waste. Radioassay includes NDA and RC.

**Radiography** - A nondestructive testing method that uses x-rays to inspect and determine the physical form of waste.

**Radionuclide** - A nuclide that emits radiation by spontaneous transformation.

**Remote-handled transuranic waste** - Transuranic waste with a surface dose rate of 200 millirem per hour or greater.

**Remote-handled transuranic waste authorized methods for payload control (RH-TRAMPAC)** - The governing document for shipments in the RH-TRU 72-B packaging.

**RH 72B Canister** - Container that is transported in the RH-TRU 72B Cask.

**RH-TRU 72B Cask** - An NRC-certified Type B transportation packaging used for transportation of RH TRU shipments.

**Shipper** - A TRU waste site that releases NRC-approved packaging to a carrier for shipment.

**Shipping category** - A shipping category is defined by the following parameters: chemical composition of the waste (waste type), gas generation potential of the waste material type (quantified by the g-value for hydrogen), and gas release resistance (type of payload container and type and maximum number of confinement layers used).

**Sites** - Department of Energy TRU waste generator/storage sites.

**Standard waste box** - A metal payload container authorized for use within the TRUPACT-II or HalfPACT packaging, that has been tested by DOE to meet DOT Specification 7A Type A requirements.

**Summary category group** - Used to segregate TRU mixed wastes into broad groups having similar physical forms. The summary category groups include homogeneous solids (S3000) that are at least 50 percent by volume solid process residues, soil/gravel (S4000) that is at least 50 percent by volume soil/gravel, and debris (S5000) that is at least 50 percent by volume materials that meet the criteria specified in 20.4.1.800 New Mexico Administrative Code (incorporating 40 CFR 268.2[g]). If a waste does not include at least 50 percent of any given category by volume, then the summary category group assigned shall be the same as that constituting the greatest volume of waste for that waste stream (Reference 47, Attachment B).

**Ten-drum overpack** - A metal payload container authorized for use within the TRUPACT-II packaging, that has been tested by DOE to meet DOT Specification 7A Type A requirements.

**Test Category** - Payload containers that do not meet the analytical category decay heat limits or whose concentration of flammable VOCs in the headspace exceeds 500 ppm are classified as test category (CH-TRAMPAC, Section 5.2.2.3).

**Trace chemicals/materials** - Chemicals/materials that occur individually in the waste in quantities less than 1 weight percent. The total quantity of trace chemicals/materials not listed as allowed materials for a given waste material type in any payload container is restricted to less than 5 weight percent (CH-TRAMPAC, Section 4.3.1, RH-TRAMPAC, Section 4.3.1).

**TRU isotope** – An isotope of any element having an atomic number greater than uranium (i.e., 92).

**TRU waste –** Waste containing more than 100 nCi of alpha-emitting isotopes per gram of waste, with half-lives greater than 20 years, except for:

1. High-level radioactive waste
2. Waste that the Secretary of Energy has determined, with the concurrence of the administrator of the EPA, does not need the degree of isolation required by the disposal regulations, or
3. Waste that the NRC has approved for disposal on a case-by-case basis in accordance with 10 CFR 61 (Land Withdrawal Act, Section 2, Subsection 18).

**TRU-mixed waste** - TRU waste that is also a hazardous waste as defined by the Hazardous Waste Act and 20.4.1.200 NMAC (incorporating 40 CFR § 261.3) (Hazardous Waste Facility Permit, Module I, Section I.D.6).

**TRUPACT-II** - An NRC-certified Type B transportation packaging used for transportation of CH-TRU wastes.

**Verification** - The act of authenticating or formally asserting the truth that a process, item, data set, or service is, in fact, that which is claimed. Data verification is the process used to confirm that all review and validation procedures have been completed.

**Volatile organic compounds** - For the purposes of the TRU waste program, those RCRA-regulated VOCs listed in the WIPP WAP and any additional compounds tentatively identified by VOC analytical procedures used to satisfy program requirements (i.e., any compound containing carbon and hydrogen with any other element that has a vapor pressure of 77.6 mL of mercury (1.5 psia) or greater under actual storage conditions).

**Waste Acceptance Criteria** - Constraints (limits) on the physical, chemical, and radiological properties of TRU waste and its packaging as determined by WIPP's authorization basis requirements. TRU waste will not be approved for shipment to and disposal at the WIPP until it has been certified as meeting these criteria. Waste acceptance criteria ensure that TRU waste is managed and disposed of in a manner that protects human health and safety and the environment.

**Waste analysis plan** - The waste analysis plan includes test methods, details of planned waste sampling and analysis, a description of the waste shipment screening and verification process, and a description of the QA/QC program. Sites are required to implement the applicable requirements of the WIPP WAP (Hazardous Waste Facility Permit, attachment B).

**Waste characterization** - The process of determining that TRU waste meets the requirements of the WAC by the acceptable performance of the activities defined by CBFO-approved site-specific plans.

**Waste certification** - Formal and documented declaration by sites that waste has been characterized and meets the requirements of the WIPP WAC.

**Waste matrix code** – A DOE-developed coding system for grouping waste streams that have similar matrix constituents, especially for treatment objectives. This coding system allows waste streams within the DOE TRU waste system that have similar physical and chemical waste for properties to be categorized together (Transuranic Waste Baseline Inventory Report, DOE/CAO-95-1121).

**Waste stream** - A waste stream is waste material generated from a single process or from an activity which is similar in material, physical form, and hazardous constituents (Hazardous Waste Facility Permit, Attachment B).

# Appendix D
# Payload Container Integrity Checklist

The operator is to visually examine 100% of the payload container exterior to determine if the payload container meets the criteria of Section 3.2.1. At a minimum, sites shall incorporate the questions and criteria contained in the following checklist into applicable site procedures. This payload container inspection shall be performed and documented as a part of the TRUPACT-II and HalfPACT loading process. Any YES answer on the inspection checklist will result in the operator discontinuing the inspection, marking the payload container as unacceptable for shipment, and removal of the payload container from the shippable inventory. Before the rejected container can be shipped, it must undergo appropriate corrective actions (e.g., evaluation, repackaging, overpacking, etc.), as applicable. All containers must have an acceptable and complete inspection checklist documenting that it meets the DOT 7A criteria.

| Container Examination | Discussion of Criteria | Compliance | |
|---|---|---|---|
| 1. Is the payload container obviously degraded? | Obviously degraded means clearly visible and potentially significant defects in the payload container or payload container surface. | YES | NO |
| 2. Is there evidence that the payload container is, or has been, pressurized? | Pressurization can be indicated by a fairly uniform expansion of the sidewalls, bottom or top. Past pressurization can be indicated by a notable outward deflection of the bottom or top. Verify that the payload container is not warped. | YES | NO |
| 3. Is there any potentially significant rust or corrosion such that wall thinning, pin holes, or breaches are likely or the load bearing capacity is suspect? | Rust shall be assessed in terms of its type, extent, and location. Pitting, pocking, flaking, or dark coloration characterizes potentially significant rust or corrosion. This includes the extent of the payload container surface area covered, thickness, and, if it occurs in large flakes or built-up (caked) areas. Rusted payload containers may not be accepted if:<br>• Rust is present in caked layers or deposits<br>• Rust is present in the form of deep metal flaking, or built-up areas of corrosion products<br>In addition, the location of rust should be noted; for example on a drum: top lid; filter region; locking chine; top one-third, above the second rolling hoop; middle one-third, between the first and second rolling hoops; bottom one-third, below the second rolling hoop; and on the bottom.<br>Payload containers may still be considered acceptable if the signs of rust show up as:<br>• Some discoloration on the payload container<br>• If rubbed would produce fine grit or dust or minor flaking (such that wall thinning does not occur) | YES | NO |

| Container Examination | Discussion of Criteria | Compliance | |
|---|---|---|---|
| 4. Are any of the following apparent?<br>• wall thinning<br>• pin holes<br>• breaches | Wall thinning, pin holes, and breaches can be a result of rust/corrosion (see discussion on #3). | YES | NO |
| 5. Are there any split seams, tears, obvious holes, punctures (of any size), creases, broken welds, or cracks? | Payload containers with obvious leaks, holes or openings, cracks, deep crevices, creases, tears, broken welds, sharp edges or pits, are either breached or on the verge of being breached. Verify that there is no warpage that could cause the container to be unstable or prevent it from fitting properly in the applicable package. | YES | NO |
| 6. Is the load-bearing capacity suspect? | The load-bearing capacity could be reduced for excessive rust (see discussion for #3), wall thinning (see discussion for #4), breaches, cracks, creases, broken welds, etc. (see discussion for #5) | YES | NO |
| 7. Is the payload container improperly closed? | Inspect the fastener and fastener ring (chine) if applicable for damage or excessive corrosion. Check the alignment of the fastener to ensure that it is in firm contact around the entire lid and the payload container will not open during transportation. | YES | NO |
| 8. Are there any dents, scrapes, or scratches that make the payload container's structural integrity questionable or prevent the top and bottom surfaces from being parallel? | Deep gouges, scratches, or abrasions over wide areas are not acceptable. If top and bottom surfaces are not parallel, this would indicate that the container is warped. Dents should be less than ¼ inch deep by 3 inches long and between ½ inch to 6 inches wide. All other dents must be examined to determine impact of structural integrity | YES | NO |
| 9. Is there discoloration which would indicate leakage or other evidence of leakage of material from the payload container? | Examine the payload container regions near the filter vents, top lid fittings, bottom fittings, welds, seams and intersections of one or more metal sheets or plates. Payload containers must be rejected if evidence of leakage is present | YES | NO |

| Container Examination | Discussion of Criteria | Compliance | |
|---|---|---|---|
| 10. Is the payload container bulged? | For the purposes of this examination, bulging is indicated by:<br>• A fairly uniform expansion of the sidewalls, bottom, or top (e.g., in the case of a drum, either the top or bottom surface protrudes beyond the planar surface of the top or bottom ring,<br>• A protrusion of the side wall (e.g., in the case of a drum, beyond a line connecting the peaks of the surrounding rolling hoops or a line between a surrounding rolling hoop and the bottom or top ring), or<br>• Expansion of the sidewall (e.g., in the case of a drum, such that it deforms any portion of a rolling hoop). | YES | NO |

## References

D1. INEEL Engineering Design File "Waste Container Integrity Evaluation for Storage," EDF-RWMC-705, September 25, 1996. Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID.

D2. Title 49 CFR § 173, Subpart 475, "Quality Control Requirements Prior to Each Shipment of Class 7 (Radioactive) Materials." Code of Federal Regulations, Washington, D.C., Office of the Federal Register, National Archives and Records Administration.

D3. DOE/RL-96-57, Section 2.5.5. "Test & Evaluation Document for the U. S. Department of Transportation Specification 7A Type A Packaging. (Formerly WHC-EP-0558).

# Appendix E
# Payload Management of TRU Alpha Activity Concentration

## E.1 Scope

The policies and methods for the management of TRU alpha activity concentration within each TRU waste payload container disposed of at WIPP are set out below. They are based on the definition of TRU waste in the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act (LWA), Public Law 102-579. 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…" (Section 2[18]).

This appendix pertains specifically to the payload management of TRU alpha activity concentration of waste containers selected for overpacking.

## E.2 Policies

The National TRU Waste Program has established the following policies for managing TRU alpha activity concentration in compliance with the LWA: (References E1 E2, and E3):

- The TRU alpha activity concentration limit for TRU waste (>100 nCi/g) applies to the TRU waste stream as a whole.

- Waste containers belonging to a TRU waste stream may vary in their TRU alpha activity concentration, some containing >100 nCi/g and some containing ≤ 100 nCi/g. Using process knowledge in combination with radioassay measurements to determine the presence of transuranic isotopes within the waste stream, generator sites define a TRU waste stream based on its potential to include waste containers with a TRU alpha activity concentration in excess of 100 nCi/g.

- Waste containers belonging to the same TRU waste stream may be overpacked into a payload container (e.g., SWB or TDOP) provided the TRU alpha activity concentration of the payload container exceeds 100 nCi/g.

## E.3 Prerequisites for Implementation

- Each waste container selected for payload management must be part of the TRU waste stream identified in the AK summary report for that waste stream (References E2 and E3).

- The AMWTP will submit to the CBFO, for its review and approval, applicable plans and procedures for making TRU waste determinations based on payload management practices that involve overpacking of waste containers (Reference E2).

- CBFO will notify EPA of the AMWTP seeking such authorization prior to CBFO's approval of the AMWTP to manage TRU alpha activity concentration using payload management. The WIPP will not accept payload managed waste for disposal until EPA has received notice (Reference E3).

## E.4 Implementation and Practice

- Each TRU waste stream selected for payload management must include in its acceptable knowledge summary report an estimate of the total waste volume and the percentage of the waste volume that is above and below 100 nCi/g. (It should be noted that this information, although based on the best available AK information, is preliminary and subject to the performance of WIPP certified NDA measurements and cannot and will not be used as a measure of AK accuracy) (Reference E3).

- Each waste container selected for payload management must contain at least one TRU isotope (e.g., $^{238}$Pu, $^{239}$Pu, $^{240}$Pu, $^{242}$Pu, etc.) whose activity exceeds the LLD of the radioassay system used to characterize the waste (Reference E2 and E3). The applicability of LLD will vary from system to system and may be on a container basis. Sections 3.3.1 and A.3 of this document provide the applicable requirements for determining and reporting LLDs.

- Each waste container selected for payload management may only be overpacked into a payload container (e.g., SWB or TDOP) with other waste containers from the same TRU waste stream (Reference E4).

- The TRU alpha activity concentration of the payload container is determined according to Section 3.3.3 of this document.

## References

E1. Public Law 102-579, 106 Stat. 4777, 1992 (as amended by Public Law 104-201, 1996). Waste Isolation Pilot Plant Land Withdrawal Act.

E2. Letter to Mr. Frank Marcinowski (Director, Office of Radiation and Indoor Air, U.S. Environmental Protection Agency), from Dr. Ines R. Triay (Manager, Carlsbad Field Office, U.S. Department of Energy). August 4, 2003.

E3. Letter to Dr. Ines R. Triay (Manager, Carlsbad Field Office, U.S. Department of Energy) from Mr. Frank Marcinowski (Director, Office of Radiation and Indoor Air, U.S. Environmental Protection Agency), August 8, 2003.

E4. Waste Isolation Pilot Plant Hazardous Waste Facility Permit, NM4890139088-TSDF, New Mexico Environmental Department, Santa Fe, New Mexico.

# Appendix F
# Radiography Requirements
# for
# Contact-Handled Transuranic Waste

## F.1 Radiography Requirements for Contact-Handled Waste

Radiography aids in the examination and identification of containerized waste. All activities required to achieve radiography objectives are described in INST-OI-12. This appendix applies to radiography of CH waste; requirements for radiography of RH waste are found in the WCPIP.

A radiography system (e.g., real-time radiography or digital radiography/computed tomography), normally consists of an x-ray-producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and an operator control and data acquisition station. Although these six components are required, it is expected there will be some variation within a given component between sites. The radiography system shall have controls or an equivalent process, which allow the operator to control image quality. On some radiography systems, it should be possible to vary the voltage between 150 and 400 kilovolts to provide an optimum degree of penetration through the waste.

To perform radiography, the waste container is scanned while the operator views the video monitor. An audio/video recording is made of the waste container scan and is maintained as a non-permanent record. A radiography data form is also be used to document the Waste Matrix Code; verify there are no ignitable, reactive, or corrosive wastes present by verification that there are no liquids in excess of the WAC limits and there are no compressed gases; and estimated waste material parameter weights of the waste.

The estimated waste material parameter and weights for CH waste is determined by compiling an inventory of waste items, residual materials, and packaging materials. The items on this inventory are sorted by waste material parameter and combined with a standard weight look-up table to provide an estimate of waste material parameter weights.

Containers whose contents prevent full examination of the remaining contents shall be subject to visual examination unless the site certifies that visual examination would provide no additional relevant information for that container using acceptable knowledge for the waste stream.

For containers, which contain classified shapes and undergo radiography, the radiography recording shall be considered classified. The radiography data forms will not be considered classified.

## F.2 Radiography Training

The radiography system involves qualitative and semi quantitative evaluations of visual displays. Operator training and experience are the most important considerations for assuring quality controls in regard to the operation of the radiography system and for interpretation and disposition of radiography results. Only trained and qualified radiography operators shall be allowed to operate radiography equipment.

Standardized training and qualification requirements for radiography operators are based upon existing industry standard training requirements and comply with the training and qualification requirements as detailed in MP-RTQP-14.4.

The AMWTP has developed a training program that provides radiography operators with both formal and on-the-job (OJT), training. Radiography operators are instructed in the specific waste generating practices, typical packaging configurations, and associated waste material parameters expected to be found in each Waste Matrix Code at the site. The OJT and apprenticeship is conducted by an experienced, qualified radiography operator prior to qualification of the training candidate. Radiography operators are trained on the types of waste that are generated, stored, or characterized at the AMWTP.

The training program contains the following elements:

- Project Requirements
- State and Federal Regulations
- Basic Principles of Radiography
- Radiographic Image Quality
- Radiographic Scanning Techniques
- Application Techniques
- Radiography of Waste Forms
- Standards, Codes, and Procedures for Radiography
- Site-Specific Instruction.

The training program also contains On-the-Job Training which addresses:

- System Operation
- Identification of Packaging Configurations
- Identification of Waste Material Parameters
- Weight and Volume Estimation
- Identification of Prohibited Items.

Radiography test drums contain items common to the waste streams to be generated and stored at the AMWTP. The test drums are divided into layers with varying packing densities or different drums may be used to represent different situations that may occur during radiography examination at the site. Test drums shall be representative of the waste matrix codes for which WSPF approval is sought. Test drums shall be examined and successfully identified prior to waste stream shipment. The following is a list of required elements of a radiography test drum:

- A punctured aerosol can
- Pigtails on poly liners (horsetail bag)
- Pair of coveralls
- Empty bottle
- Irregular shaped pieces of wood
- Empty one-gallon paint can
- Full container
- Aerosol can with fluid
- One-gallon bottle with three tablespoons of fluid
- One-gallon bottle with one cup of fluid (upside down)
- Leaded glove or leaded apron
- Wrench.

These items shall be successfully identified by the operator as part of the qualification process. Qualifications of radiography operators shall, at a minimum, encompass the following requirements:

- Successfully pass a comprehensive exam based upon training enabling objectives. The comprehensive exam will address all of the radiography operations, documentation, characterization and procedural elements stipulated in this WAC.

- Perform a practical capability demonstration in the presence of appointed site radiography subject matter expert. The person will be an experienced radiography operator who is also qualified as an OJT trainer.

Requalifications of operators are based on evidence of continued satisfactory performance (primarily audio/video recording reviews), and shall be done at least every two years. Unsatisfactory performance will result in disqualification. Unsatisfactory performance is defined as the misidentification of a prohibited item in a training drum or a score of less than 80% on the comprehensive exam. Retraining and demonstration of satisfactory performance are required before a disqualified operator is again allowed to operate the radiography system.

A training drum with internal containers of various sizes is scanned biannually by each operator. The audio/video recording is then be reviewed by a supervisor to ensure that operator's interpretations remain consistent and accurate. Imaging system characteristic shall be verified on a routine basis.

## F.3 Quality Control

Independent replicate scans and replicate observations of the video output of the radiography process are performed under uniform conditions and procedures. Independent replicate scans are performed on one waste container per day or once per testing batch, whichever is less frequent. Independent observations of one scan (not the replicate scan), are also made once per day or once per testing batch, whichever is less frequent, by a qualified radiography operator other than the individual who performed the first examination. A testing batch is a suite of waste containers undergoing radiography using the same testing equipment. A testing batch can be up to 20 waste containers without regard to waste matrix.

Oversight functions include periodic audio/video recording reviews of accepted waste containers by a qualified radiography operator other than the operator who dispositioned the waste container. The results of this independent verification are made available to the radiography operator.

## F.4 Data Review and Validation

A testing batch data report for data validation and QA purposes is required when radiography is used to characterize waste. A testing batch data report (or equivalent) includes data pertaining to radiography for up to 20 waste containers or samples.

All measurement data must be reviewed and approved by qualified personnel prior to being reported. Reviews shall meet the requirements of the QAPD. At a minimum, the data must be reviewed by an independent technical reviewer and approved by the SPM or designee. This review shall be performed by an individual other than the data generator who is qualified to have performed the initial work. The independent technical reviewer verifies, at a minimum, the following information:

- Data generation and reduction were conducted in a technically correct manner in accordance with the methods used (verification of procedure and revision).

- Data were reported in the proper units and correct number of significant figures.
- Calculations have been verified by a valid calculation program, a spot check of verified calculation programs, and/or 100 percent check of all hand calculations.
- Values that are not verifiable to within rounding or significant difference discrepancies must be rectified prior to completion of independent technical review.
- The data have been reviewed for transcription errors.
- The testing QA documentation for batch data reports is complete and includes, as applicable, raw data, calculation records, calibration records (or references to an available calibration package), list of containers in the batch, and QC sample results. Corrective action will be taken to ensure that all batch data reports are complete and include all necessary raw data prior to completion of the independent technical review.
- QC sample results are within established control limits and, if not, the data have been appropriately dispositioned using the nonconformance process. This shall include complete summarized qualitative and quantitative data for all waste containers with data flags or qualifiers.
- Radiography tapes have been reviewed (independent observation) on a waste container basis at a minimum of once per testing batch or once per day of operation, whichever is less frequent.
- The container contains no indication that there are liquids in excess of this waste acceptance criteria, no indication of compressed gas, no indication of incompatible wastes, and the physical form matches the Waste Matrix Code.
- The appropriate QAOs have been met.

All data is approved by the SPM or designee. The SPM verifies, at a minimum, the following information:

- Data generation-level independent technical review, validation, and verification have been performed as evidenced by the completed review checklists and appropriate signature release. Batch data review checklists are complete.

- Batch data reports are complete and data are properly reported (e.g., data are reported in the correct units and with the correct number of significant figures).
- Data meet all applicable Quality Assurance Objectives.

The SPM provides a SPM Summary and a Data Validation Summary for each Batch Data Report. These reports are combined and consist of a detailed checklist documenting that the batch has been adequately reviewed and that the data meet Program objectives.

To ensure that data of known and documented quality are generated, each participating measurement facility shall implement a documented facility QA program. Facility QA programs shall specify qualitative and quantitative acceptance criteria for the QC checks of this program, and corrective actions to be taken when these criteria are not satisfied. Only appropriately trained and qualified personnel shall be allowed to perform data validation/review.

# Appendix G
# Visual Examination Requirements for Contact-Handled Transuranic Waste for EPA Compliance

## G.1 Visual Examination Requirements for Contact-Handled Waste

This appendix applies to visual examination requirements of CH waste; requirements for visual examination of RH waste are found in the WCPIP.

In lieu of radiography, the CH waste container contents may be verified directly by performing VE on the waste container contents. Visual examination may also be performed using the VE Technique during packaging or repackaging of waste.

The VE Technique does not require audio/video recordings of the examination; the examination is documented on a data form and certified with signatures from two qualified VE operators. If the second operator cannot verify the descriptions of the first operator, corrective actions will be taken in accordance with the established QA Program. Visual examination is conducted to describe all contents of a waste container and includes estimated or measured weights of the contents. The description clearly identifies all discernible waste items, residual materials, packaging materials, and waste material parameters. All VE activities shall be documented on VE data forms. In addition, VE performed in lieu of radiography shall be documented on audio/video recordings and on VE data forms.

Visual examination video recordings of containers that contain classified shapes shall be considered classified information. Visual examination data forms will not be considered classified information.

## G.2 Visual Examination Training

Visual examination consists of a semi-quantitative and qualitative evaluation of the waste container contents and is recorded on audio/video recording media. Standardized training for VE has been developed to include both formal classroom training and OJT. Personnel performing VE are instructed in the specific waste generating processes, typical packaging configurations, and the waste material parameters expected to be found in each Waste Matrix Code at the site. The OJT and apprenticeship is conducted by an operator experienced and qualified in VE prior to qualification of the candidate. The training shall be site-specific to include the various waste configurations at the site. Training and qualification requirements for VE are detailed in MP-RTQP-14.4. VE Technique operators need only be trained to the physical forms and packaging configurations used on the waste stream that they are examining and packaging. Visual examination personnel are requalified once every two years.

Training shall address the following required elements:

- Project requirements
- State and Federal Regulations
- Application Techniques

- Site-Specific Instruction.

Training shall also include On-the-Job Training that addresses:

- Identification of Packaging Configurations
- Identification of Waste Material Parameters
- Weight and Volume Estimation
- Identification of Prohibited Items.

Each visual examination facility shall designate one or more VEEs. The VEE is familiar with the waste generating processes and with all types of waste being characterized at that site. The VEE shall be responsible for the overall direction and implementation of the visual examination at the AMWTP. The VEE receives training in the same elements as the visual examination personnel with both formal training and on-the-job training. Qualification of a VEE is based on familiarity with waste generating processes, familiarity with the types of waste being characterized, and meeting the training requirements discussed above. Consistent with other VE personnel, the VEE is requalified once every two years. MP-RTQP-14.4 specifies qualification and training requirements for the VEE.

## G.3 Method

Visual examination recorded on video/audio media shall meet the following minimum requirements:

- The video/audio media shall record the waste packaging event for the container such that all waste items placed into the container are recorded in sufficient detail and shall contain an inventory of waste items in sufficient detail that another trained visual examination expert can identify the associated waste material parameters.

- The video/audio media shall capture the waste container identification number

- The personnel loading the waste container shall be identified on the video/audio media or on packaging records traceable to the loading of the waste container

- The date of loading of the waste container will be recorded on the video/audio media or on packaging records traceable to the loading of the waste container.

VE Technique performed using two operators shall meet the following minimum requirements:

- At least two site personnel shall approve the data forms or packaging logs attesting to the contents of the waste container

- The data forms or packaging logs shall contain an inventory of waste items in sufficient detail that a trained VEE can identify the associated waste material parameters
- The container identification number shall be recorded on the data forms or packaging logs.

A description of the waste container contents is recorded on a VE data form. The description clearly identifies all waste material parameters and provides enough information to estimate weights of waste material parameters. In cases where bags are not opened, a brief written description of the contents of the bags shall contain an estimate of the amount of each waste type in the bags. The written records of VE are supplemented with the audio/videotape recording, if applicable.

## G.4 Data Review and Validation

A testing batch data report for data validation and QA purposes is required when VE is used to characterize waste. A testing batch data report (or equivalent) includes data pertaining to VE for up to 20 waste containers or samples.

All measurement data is reviewed and approved by qualified personnel prior to being reported. Reviews shall meet the requirements of the QAPD. At a minimum, the data is reviewed by an independent technical reviewer and approved by the SPM or designee. This review is performed by an individual other than the data generator who is qualified to have performed the initial work. The independent technical reviewer verifies, at a minimum, the following information:

Data generation and reduction were conducted in a technically correct manner in accordance with the methods used (verification of procedure and revision).

- Data were reported in the proper units and correct number of significant figures.
- Calculations have been verified by a valid calculation program, a spot check of verified calculation programs, and/or 100 percent check of all hand calculations.
- Values that are not verifiable to within rounding or significant difference discrepancies must be rectified prior to completion of independent technical review.
- The data have been reviewed for transcription errors.
- The testing QA documentation for batch data reports is complete and includes, as applicable, raw data, calculation records, and list of containers in the batch. Corrective action will be taken to ensure that all batch data reports are complete

and include all necessary raw data prior to completion of the independent technical review.

- The container contains no indication that there are liquids in excess of this waste acceptance criteria, no indication of compressed gas, no indication of incompatible wastes, and the physical form matches the Waste Matrix Code.
- The appropriate QAOs have been met.

All data must be approved by the SPM or designee. The SPM verifies, at a minimum, the following information:

- Data generation-level independent technical review, validation, and verification have been performed as evidenced by the completed review checklists and appropriate signature release. Batch data review checklists are complete.
- Batch data reports are complete and data are properly reported (e.g., data are reported in the correct units and with the correct number of significant figures).
- Data meet all applicable Quality Assurance Objectives.

The SPM provides a SPM Summary and a Data Validation Summary for each Batch Data Report. These reports are combined and consist of a detailed checklist documenting that the batch has been adequately reviewed and that the data meet Program objectives.

To ensure that data of known and documented quality are generated, each participating measurement facility shall implement a documented facility QA program. Facility QA programs shall specify qualitative and quantitative acceptance criteria for the QC checks of this program, and corrective actions to be taken when these criteria are not satisfied. Only appropriately trained and qualified personnel are allowed to perform data validation/review.