HANFORD SITE
TRANSURANIC WASTE CERTIFICATION PLAN

HNF-2600, Revision 10

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HANFORD SITE TRANSURANIC WASTE CERTIFICATION PLAN HNF-2600

Revision 10

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ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
C of C	Certificate of Compliance
CAR	corrective action report
CBFO	Carlsbad Field Office
Certification Plan	*Hanford Site Transuranic Waste Certification Plan*
CFR	*Code of Federal Regulations*
CH	contact-handled
CH TRU	contact-handled transuranic
CH-WAC	*Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*
CIN	container identification number
CPR	cellulosics/plastic & rubber
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy-Richland Operations Office
DOT	U.S. Department of Transportation
dpm	disintegration(s) per minute
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FH	Fluor Hanford
FGE	fissile gram equivalent
FGE/g	mass values by ^{239}Pu FGE conversion factors
ICV	inner containment vessel
LDR	land disposal restriction
M&O	management and operating
mrem/hr	milliroentgen(s) equivalent man per hour
MS	mass spectrometry
NIST	National Institute of Standards and Technology
nCi/g	nanocurie(s) per gram
NCR	nonconformance report
NDA	nondestructive assay
NDE	nondestructive examination
NFT	Nuclear Filter Technology
NMED	New Mexico Environment Department
NRC	U.S. Nuclear Regulatory Commission
NTWP	National TRU Waste Program
OCA	outer containment assembly
OCV	outer containment vessel
OPCTCD	Overpack Payload Container Transportation Certification Document
PATCD	Payload Assembly Transportation Certification Document
PCB	polychlorinated biphenyl
PCTCD	Payload Container Transportation Certification Document

PDP	performance demonstration program
PE-Ci	plutonium-239 (^{239}Pu) equivalent-curie(s)
PFP	Plutonium Finishing Plant
Project	Hanford Site Transuranic Waste Certification Project
QA	quality assurance
QAO	quality assurance objective
QAPD	*Quality Assurance Program Document*
QAPD Procedures Matrix	*Hanford Site TRU Waste Project Quality Assurance Program Document Procedures Matrix*
QAPjP	*Hanford Site Transuranic Waste Characterization Quality Assurance Project Plan*
QC	quality control
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RH	remote-handled
RMS	root mean square
RTR	real-time radiography
SAR	safety analysis report
SPM	site project manager
SQAO	site quality assurance officer
SVOC	semivolatile organic compound
SW-846	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*
SWB	standard waste box
SWD	Solid Waste Disposal
TC	toxicity characteristic
TCO	transportation certification official
TDOP	ten-drum overpack
TIC	tentatively identified compound
TRAMPAC	*TRUPACT-II Authorized Methods for Payload Control*
TRU	transuranic
TRUCON	*TRUPACT-II Content Codes*
TRUPACT-II	Transuranic Package Transporter-II
TRUPACT-II SARP	*Safety Analysis Report for the TRUPACT-II Shipping Package*
TWBIR	*Transuranic Waste Baseline Inventory Report*
VOC	volatile organic compound
WAC	waste acceptance criteria
WAP	*Waste Analysis Plan* (Attachment B of *WIPP Hazardous Waste Facility Permit)*
WCO	waste certification official
WIPP	Waste Isolation Pilot Plant
WIPP SAR	*Waste Isolation Pilot Plant Safety Analysis Report*
WRAP	Waste Receiving and Processing
WSPF	*Waste Stream Profile Form*
WWIS	Waste Isolation Pilot Plant Waste Information System

DEFINITIONS

acceptable knowledge (AK). An EPA term, which includes process knowledge and results from previous testing, sampling, and analysis, associated with the waste. AK includes information regarding the raw materials used in a process or operation, process description, products produced, and associated wastes. AK documentation includes the site history and mission, site-specific processes or operations, administrative building controls, and all previous and current activities that generate a specific waste.

aluminum honeycomb spacer assembly. An assembly that is located within each end of the inner containment vessel (ICV) to provide:

1. A generous void volume to accommodate payload gas generation.
2. An energy-absorbing barrier between the payload and the ICV dished heads.

assay. The observation of spontaneous or stimulated nuclear radiations, interpreted to estimate the content of one or more radionuclides in a material.

assessment. Evaluation process used to measure the performance or effectiveness of a system and its elements. Assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, inspection, or surveillance.

audit. Planned and documented independent assessment to determine by investigation, examination, or evaluation of objective evidence, the adequacy of and compliance with established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance.

carbon composite filter. See filter vent.

certification authority. Authorization to certify TRU waste to the WIPP waste acceptance criteria (WAC) that is granted by the permittee to those TRU waste generator/storage sites whose TRU waste programs have been evaluated and found to be acceptable.

certified waste. Payload containers loaded with waste that has been verified to meet the criteria of the CH-WAC.

chemical compatibility. Assessing the properties of all potential chemicals (>1 weight percent) in a payload container. There must be no adverse safety or health hazards produced as a result of any mixtures that could occur.

combustible materials. Organic materials that are dominantly cellulosic (e.g., cotton, paper, cloth, wood, etc.), including plastics.

compressed gas. Compressed gases are those materials defined as such by 49 *Code of Federal Regulations* (CFR) 173, Subpart G.

contact-handled TRU waste. Transuranic waste packages that have a surface dose rate not greater than 200 mrem/hr.

content code. A uniform system applied to waste forms to group those with similar characteristics for purposes of shipment in TRUPACT-II.

corrosive materials. Corrosive materials are those defined as such by 40 CFR 261.22 (a)(l).

decay heat. Heat produced by radioactive emissions that are absorbed in the surrounding material.

defense TRU waste. Nuclear waste derived from the manufacture of nuclear weapons and operation of naval reactors. Associated activities include (a) naval reactors development, (b) weapons activities, including defense inertial confinement fusion, (c) verification and control technology, (d) defense nuclear materials production, (e) defense nuclear waste materials and by-products management, (f) nuclear waste and materials security and investigations, and (g) research and development. See permittee *Interim Guidance on Ensuring Waste Qualifies for Disposal at the Waste Isolation Pilot Plant.*

DOE field element. The first-line DOE field element that carries the organizational responsibility for (1) managing and executing assigned projects, (2) directing contractors who conduct the projects, and (3) ensuring that environment, safety, and health are integral parts of each project.

explosive materials. Explosive materials are those defined as such by 49 CFR 173, Subpart C.

filter vent. A filter vent is defined as filter media manufactured of carbon composite, Kevlar, stainless steel, or any material that enables the filter to meet the minimum performance specifications stipulated in the TRAMPAC.

fissile gram equivalent (FGE). The mass of a fissile radionuclide normalized to Pu-239.

flammable volatile organic compound (VOC). A headspace gas VOC that has a National Fire Protection Association (NFPA) flammability hazard degree of 3 or 4 and a flash point of less than 100°F or considered by EPA to be a significant fire hazard under WIPP repository conditions. Flammable headspace gas VOCs that are evaluated for the TRU waste project are listed in table 5.8-2 of the TRAMPAC.

free liquid. Liquid that is not sorbed on or in a host material such that it could spill or drain from its container.

G value. The number of molecules of gas species produced per 100 electron volts of decay energy absorbed by the waste.

germanium counter. An assay system that uses high-purity germanium (HPGe) detectors for measuring gamma radiation.

glovebox. A sealed box with windows and rubber gloves attached to ports such that an operator may work inside the box without risk of contamination.

headspace. That volume of any containment that is not occupied by the volume of waste material. Headspace is also used to refer to the gases contained in this volume. Headspace-gas volume in a drum is defined as the volume between the outer drum liner and the drum.

immobilized materials. Materials that are fixed in a solidified matrix (e.g., glass, ceramic, cement, concrete).

inner containment vessel (ICV). The assembly (comprised of a lid and body) providing a secondary level of containment for the payload. Within each end of the ICV is an aluminum honeycomb spacer assembly.

NaI(TI) drum counter. An assay system that uses sodium iodide scintillation detectors for measuring gamma radiation.

newly generated TRU waste. Waste generated after the development, approval, and implementation of a TRU waste characterization program that has been granted certification authority by the permittee. Newly generated TRU waste also includes any previously generated waste (see also retrievably stored waste) that undergoes any form of treatment, processing, or repackaging in accordance with an approved quality assurance project plan.

nondestructive assay (NDA). Assay methods for waste items that do not affect the physical or chemical form of the material.

nondestructive examination (NDE). Methods that allow examination of the contents of payload containers without affecting the chemical or physical forms of these items. See also radiography.

Oil-Dri. A trade name for a basically clay material absorbent.

operational day (also "when in operation"). A 24-hour period in which an NDA characterization system is to be used to perform measurements for TRU wastes.

operational week. Seven consecutive days, starting at 7 a.m. on Monday, in which an NDA characterization system performed WIPP-related measurements on one or more days in that week.

outer containment assembly. The assembly (comprised of a lid and body) providing a primary level of containment for the payload. The outer containment assembly (OCA) completely surrounds the inner containment vessel and consists of an exterior stainless steel shell, a relatively thick layer of polyurethane foam, and an inner stainless steel boundary, which forms the outer containment vessel (OCV).

outer containment vessel. The innermost boundary of the OCA.

overpack. A payload container placed around another container to control contamination or enclose a damaged container.

package. See shipping package.

packaging quality assurance plan. A site-specific document that defines the quality assurance (QA) and quality control (QC) activities applicable to usage of the NRC-approved packaging. This plan shall meet the requirements of 10 CFR Part 71, Subpart H. (The Hanford Site Packaging QA Plan is addressed in section 5.0 of the Certification Plan.)

packaging. The packaging is the container the waste is placed into for shipment that meets the requirements of 49 CFR 173, Subpart I, and 10 CFR 71.4. For TRU waste, the packaging is the reusable Type B shipping container for transport of TRU waste payload containers (e.g., TRUPACT-II or RH-TRU 72-B cask).

passive-active neutron counter. An assay system that uses passive neutron coincidence counting (PNCC) to measure neutrons that occur spontaneously (passive) and the differential die-away technique (DDT) to measure those that are induced as a result of neutron interrogation of fissile material (active).

payload. CH TRU waste contained within one of the approved configurations for shipment in the TRUPACT-II (e.g., fourteen 55-gallon drums, two SWBs, etc.). The payload is considered to include a lift pallet if SWBs are not used. Any dunnage used external to the 55-gallon drums or SWBs is also considered to be part of the payload.

payload container. The outermost container (e.g., 55-gallon drum, standard waste boxes [SWB]) for TRU waste material that is placed in a reusable Type B shipping container (e.g., TRUPACT-II or RH-TRU 72-B cask) for transport.

payload container assembly. An assembly of payload containers, such as a seven-pack of drums, that is intended to be handled and emplaced as a single unit.

payload pallet. A lightweight pallet with an aluminum honeycomb core used for loading and unloading fourteen 55-gallon drums of CH TRU waste at one time.

pipe component. A stainless steel container used for packaging specific waste forms within a 55-gallon drum. The pipe component is exclusively used as part of the pipe overpack.

pipe overpack. A payload container consisting of a pipe component positioned by dunnage within a 55-gallon drum with a rigid, polyethylene liner and lid. Fourteen pipe overpacks will fit within the TRUPACT-II packaging.

plutonium equivalent curie (PE-Ci). An equivalent radiotoxic hazard of a radionuclide normalized to ^{239}Pu.

polyethylene liners. Rigid drum liners molded from high-density polyethylene, typically with a wall thickness of about 0.09 inches (90 mils). The liner generally has a snap-on cover of the same material.

pressurized containers. Smaller containers within the payload container (e.g., aerosol cans), which may hold compressed gas.

^{239}Pu fissile gram equivalent. See fissile gram equivalent.

pyrophoric. 49 CFR 173.150 defines a pyrophoric as "a flammable solid which, under transport conditions, might cause fires through friction or retained heat, or, which can be ignited readily, and when ignited, burns vigorously and persistently so as to create a serious transportation hazard." This includes spontaneously combustible materials, water-reactive materials, and oxidizers. Examples of pyrophoric radionuclides are metallic plutonium and americium. Examples of nonradioactive pyrophorics are organic peroxides, sodium metal, and chlorates.

Quality Assurance Project Plan (QAPjP). A site-specific document that describes the methods used by TRU waste generator/storage sites to comply with the applicable requirements for TRU waste characterization specified in the Waste Isolation Pilot Plant (WIPP) waste analysis plan (WAP). The QAPjP incorporates qualitative or quantitative criteria for determining whether the waste characterization activities are being satisfactorily performed, describes all activities pertaining to TRU waste characterization required by the WAP, references site-specific procedural and administrative controls, and identifies organizations and positions responsible for implementing waste characterization and certification activities.

radioassay. All types of nondestructive or destructive assay techniques used to identify and quantify radionuclides in TRU waste. See also nondestructive assay (NDA) and radiochemical assay.

radiochemical assay. Destructive assay methods performed with wet samples in a radiochemical laboratory using separation techniques.

radiography. A nondestructive testing method, also referred to as nondestructive examination (NDE), that uses X-rays, gamma rays, or neutrons to inspect and determine the physical form of waste.

remote-handled transuranic waste. Packaged TRU waste whose external surface dose rate exceeds 200 mrem per hour. For the WIPP, there is an upper limit of 1000 rem per hour.

residual liquid. Liquids in quantities less than 1 volume percent of the external waste container and less than 1-inch in any internal container that result from liquid residues remaining in well-drained internal containers, condensation of moisture, and liquid separation from sludge/resin setting.

retrievably stored TRU waste. Waste generated after 1970 and before the development, approval, and implementation of a TRU waste characterization program that meets the requirements for certification authority. TRU waste that is generated outside the umbrella of the approved Hanford Site TRU Project may be managed as retrievably stored TRU waste to demonstrate compliance with applicable characterization and certification requirements.

shipper. A TRU waste generator/storage site that releases a TRUPACT-II or RH-TRU 72-B cask to a carrier for shipment.

shipping category. A grouping system for the transport of TRU waste payload containers that quantifies gas generation parameters for transport using the TRUPACT-II.

shipping package. The packaging with its radioactive contents, or payload, as presented for transportation (10 CFR 71.4). The package is denoted as the TRUPACT-II CH TRU waste shipping package, or equivalently, the TRUPACT-II shipping package, or TRUPACT-II package.

standard waste box (SWB). A payload container authorized for use with TRUPACT-II transportation packages that meets U.S. Department of Transportation (DOT) Specification 7A packaging, or equivalent, requirements. The SWB was designed specifically to fit TRUPACT-II. Two SWBs (one on top of another) can fit within the TRUPACT-II packaging.

ten-drum overpack. A specialized payload container authorized for use within the TRUPACT-II packaging. One SWB, six 85-gallon drums, or ten 55-gallon drums can fit inside a ten-drum overpack (TDOP). One TDOP will fit within the TRUPACT-II packaging.

tentatively identified compounds (TICs). Nontarget compounds identified using GC/MS. The reported concentrations for TICs will have a higher uncertainty associated with them than the reported target analyte concentrations.

test category. Payload containers that do not meet the analytical category limits are classified a test category.

TRAMPAC. *TRUPACT-II Authorized Methods for Payload Control* document developed to show how all waste parameters are controlled to ensure TRUPACT-II payloads meet all of the TRUPACT-II shipping requirements and limits.

transportation authority. Authorization for use of the TRUPACT-II or RH-TRU 72-B cask for transportation of TRU waste, which is granted by the permittee to those TRU waste generator/storage sites whose TRU waste programs have been evaluated and found to be acceptable.

transuranic (TRU) wastes. Wastes contaminated with alpha-emitting radionuclides of atomic number greater than 92 (e.g., the radioactive isotopes of plutonium), having half-lives greater than 20 years, and present in concentrations greater than 100 nanocuries per gram of waste.

TRU alpha (or á) activity concentration. The measured or reported sum of the activities for all TRU isotopes with half-lives greater than 20 years that predominately undergo alpha decay per unit mass of the waste.

TRU isotope. Any isotope with an atomic number greater than 92. For purposes of calculating PE-Ci, U-233 is treated as a TRU isotope.

TRU mixed waste. TRU waste that is co-contaminated with hazardous constituents as identified in 40 CFR Part 261, Subparts C and D.

TRU waste certification plan. A site-specific document that describes the methods used by TRU waste generator/storage sites to comply with each TRU waste acceptance criterion and requirement established in the CH-WAC. The certification plan shall include procedural and administrative controls and must describe all activities pertaining to TRU waste certification, including the required QA and QC activities applicable to the certification of TRU waste.

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

TRUPACT-II Content Codes (TRUCON). (1) A document containing a description of the waste stream, waste form, and packaging configuration for each waste content code authorized for shipment in a TRUPACT-II. (2) TRUCON codes are a shorthand representation of the chemical content and physical waste form of waste streams for use in the transportation safety analysis.

TRUPACT-II packaging. The packaging consisting of an OCA, ICV, and two aluminum honeycomb spacer assemblies.

TRUPACT-II user. Organizations or facilities that prepare a TRUPACT-II for release to a carrier for shipment. Users ensure, via their TRUPACT-II user program, that the payload, inspection, testing, closing, and release for shipment of the TRUPACT-II meets the requirements of the TRUPACT-II chain of custody (COC). Users may also perform minor maintenance on the TRUPACT-II.

twist and tape. A method of bag closure for waste consisting of gathering the neck of the bag, twisting tightly, and wrapping tightly with plastic tape. Often called "horsetail."

validation. An activity that demonstrates or confirms that a process, item, data set, or service satisfies the requirements defined by the user. Data validation requirements for the TRU waste project are described in the QAPjP.

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. Data verification requirements for the TRU waste project are described in the QAPjP.

visual examination (VE) technique. A process of verification for newly generated waste involving two independent verifications of the physical form of the waste container contents. The process consists of the first operator confirming and documenting the contents (e.g., inventory) of the container at the time of packaging. A second operator documents concurrence of the waste container contents. Corrective actions are taken if either the first or the second operator cannot confirm the waste contents (e.g., inventory).

volatile organic compounds (VOC). For the purposes of the TRU waste project, those gas VOCs listed in the *WIPP Hazardous Waste Facility Permit Waste Analysis Plan (WAP)* Table B-1 and any additional compounds tentatively identified by the VOC analytical procedures used to satisfy TRU waste characterization requirements specified in the WAP.

waste acceptance criteria. Criteria developed for the safe disposal of TRU waste in the WIPP, meeting the very long-term disposal requirements of the WIPP underground salt bed.

waste certification. Formal and documented activities associated with waste processing and records required to certify that the waste has been characterized and meets the requirements of the CH-WAC.

waste characterization. The process of determining that TRU waste meets the requirements of the WAP by the acceptable performance of the activities defined by site-specific, permittee-approved TRU waste project documents.

waste form. The physical form of the waste (e.g., sludge, combustibles, metals, etc.).

waste material type. Further divisions of waste types based on gas generation potential expressed as the G value for hydrogen.

waste matrix code. A method for assigning a treatability parameter that addresses the overall bulk physical/chemical form of the waste. Parameters are defined in DOE/LLW-217, *DOE Waste Treatability Group Guidance*.

waste matrix code group. A term used in the WIPP-WAP to group waste streams related to physical and chemical properties.

waste package assembly. An assembly of waste packages, such as a seven-pack of drums that is intended to be handled and emplaced in a single unit by the WIPP waste handling system.

waste packaging. The process of filling a payload container with waste and remaining within the controls applied to layers of confinement and other WIPP waste acceptance criteria.

waste stream. Waste material generated from a single process or from an activity that is similar in material, physical form, and hazardous constituents.

waste type. Waste type refers to physical types of waste such as debris, soils and gravels, solidified inorganics, solid inorganics, solidified organics, and solid organics.

1.0 INTRODUCTION

As a generator of transuranic (TRU) and TRU mixed waste destined for disposal at the Waste Isolation Pilot Plant (WIPP), the Hanford site must ensure that its TRU waste meets the requirements of U.S. Department of Energy (DOE) O 435.1, *Radioactive Waste Management*, and DOE/WIPP-02-3122, *Contact-Handled (CH) Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (CH-WAC). CH-WAC requirements are derived from the *WIPP Technical Safety Requirements*, *WIPP Safety Analysis Report*, *TRUPACT-II SARP*, *WIPP Land Withdrawal Act*, *WIPP Hazardous Waste Facility Permit*, *Quality Assurance Program Document* (QAPD), and Title 40 *Code of Federal Regulations* (CFR) 191/194 "Compliance Certification Decision." The CH-WAC establishes the specific physical, chemical, radiological, and packaging criteria for acceptance of defense TRU waste shipments at WIPP. The CH-WAC also requires that participating DOE TRU waste generator/treatment/storage sites produce site-specific documents, including a certification plan, that describe their program for managing TRU waste and TRU waste shipments before transferring waste to WIPP. In addition, the QAPD specifies the need to develop a quality assurance (QA) plan that meets all applicable requirements of the QAPD.

Waste characterization activities provide much of the data upon which certification decisions are based. Waste characterization requirements for TRU waste and TRU mixed waste are established in the *WIPP Hazardous Waste Facility Permit Waste Analysis Plan* (WIPP-WAP). The *Hanford Site Quality Assurance Project Plan* (QAPjP) (HNF-2599) implements the applicable requirements in the WAP and includes the qualitative and quantitative criteria for making hazardous waste determinations. The Hanford site must also ensure that its TRU waste destined for disposal at WIPP meets requirements for transport in the Transuranic Package Transporter-II (TRUPACT-II). The U.S. Nuclear Regulatory Commission (NRC) establishes the TRUPACT-II requirements in the *Safety Analysis Report for the TRUPACT-II Shipping Package* (TRUPACT-II SAR) and the *TRUPACT-II Authorized Methods for Payload Control (TRAMPAC).* Hanford's QA packaging plan is defined in section 4.0 of this document, consistent with 10 CFR Part 71, Subpart H.

In addition, a TRU waste is eligible for disposal at WIPP only if it has been generated in whole or in part by one or more of the activities listed in Section 10101(3) of the Nuclear Waste Policy Act. DOE sites must determine that each waste stream to be disposed of at WIPP is "defense" TRU waste. (See also the definition of "defense" TRU waste.) Only CH TRU wastes meeting the requirements of the QAPjP, WIPP-WAP, CH-WAC, and other requirements documents described above will be accepted for transportation and disposal at WIPP.

Figure 1-1 illustrates the hierarchy of regulatory requirements for TRU waste certification and reflects the flowdown of requirements from higher-level documents to site-level program documents and implementing procedures. To ensure future changes to the CH-WAC and other relevant requirements documents are appropriately reflected, this *Hanford Site Transuranic Waste Certification Plan* (certification plan) will be reviewed at least annually and updated as necessary.

This certification plan establishes the programmatic framework and criteria within which the Hanford site ensures that CH TRU wastes can be certified as compliant with the CH-WAC and *TRAMPAC*. This certification plan does not address remote-handled (RH) defense TRU forms. RH TRU waste will not be shipped or accepted at WIPP until it has been addressed. This certification plan includes the following sections:

- Section 2.0, "Certification Project Organization at the Hanford Site," identifies Hanford site organizations involved in the TRU waste certification project (the project), describes the interaction between the characterization, certification, and transportation personnel, and lists the responsibilities of key project officials.

- Section 3.0, “Compliance Plan for CH-WAC,” summarizes the CH-WAC requirements and describes Hanford site TRU Project activities and specific documents that implement and verify compliance with each requirement.

- Section 4.0, “Compliance Plan for TRAMPAC,” summarizes the TRAMPAC requirements and describes Hanford site TRU Project activities and practices that demonstrate compliance with the TRUPACT-II SAR.

- Section 5.0, “Quality Assurance Plan,” describes how the Hanford site TRU Project complies with the *Quality Assurance Program Document,* CH-WAC, and 10 CFR Part 71, Subpart H, quality assurance (QA) requirements for TRU waste certification and use, maintenance, and control of packages used to store and transport waste to WIPP in compliance with U.S. Department of Transportation (DOT) and NRC requirements.

This certification plan, which includes the compliance plan for TRAMPAC and associated QA plan, together with the QAPjP establish the basis for the Hanford site’s TRU waste characterization, certification, and transportation packaging operations. The QA plan also meets applicable requirements of the QAPD. These documents are submitted to the Carlsbad Field Office (CBFO) for review and approval.

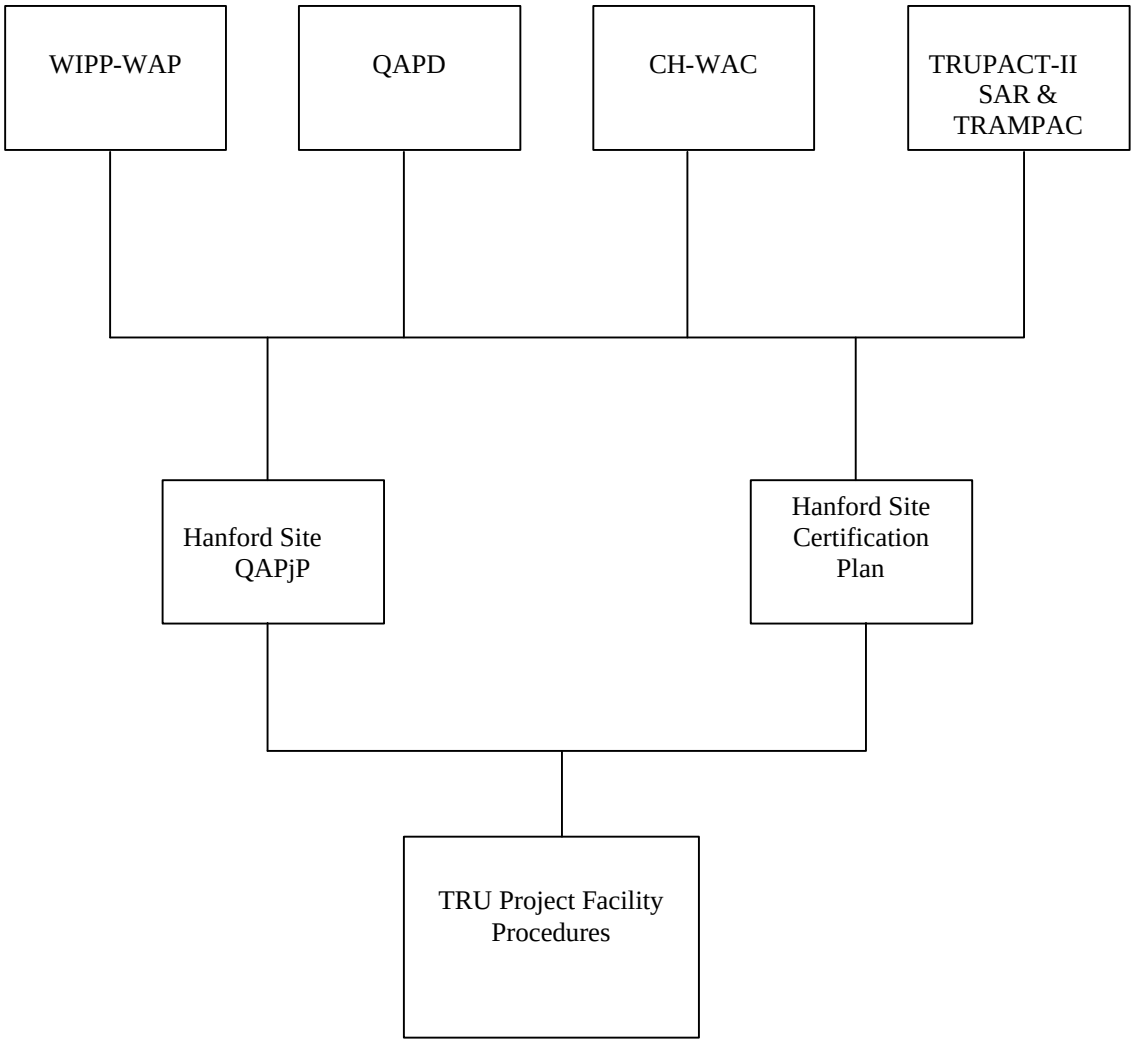


Figure 1-1. Hanford Site TRU Waste Certification Document Hierarchy

2.0 CERTIFICATION PROJECT ORGANIZATION AT THE HANFORD SITE

The responsibilities for TRU waste management at the Hanford site are distributed within various organizations. This section identifies the Hanford site organizations involved in the project and describes the responsibilities of and interactions between these organizations. Delegation of authority for decision making will be designated to the lowest appropriate level within the various organizations. This section also contains generalized process flow diagrams for TRU waste certification activities associated with newly generated and retrievably stored TRU waste, summarizes the use of acceptable knowledge (AK) in the certification project, and describes the document control and records management process.

2.1 ORGANIZATION AND RESPONSIBILITIES

Figure 2-1 is a functional organization chart pertaining to TRU waste characterization, certification, and payload assembly activities at the Hanford site. The following subsections identify the organizations that oversee the project and describe the roles and responsibilities of key positions within the project charged with implementing the requirements defined in this certification plan.

2.1.1 Manager, Permittee Office of the National TRU Waste Program (NTWP)

The manager of the National TRU Waste Program (NTWP) executes program functions related to characterization of waste for disposal at the WIPP. The NTWP manager manages the NTWP team, which is responsible for TRU waste characterization.

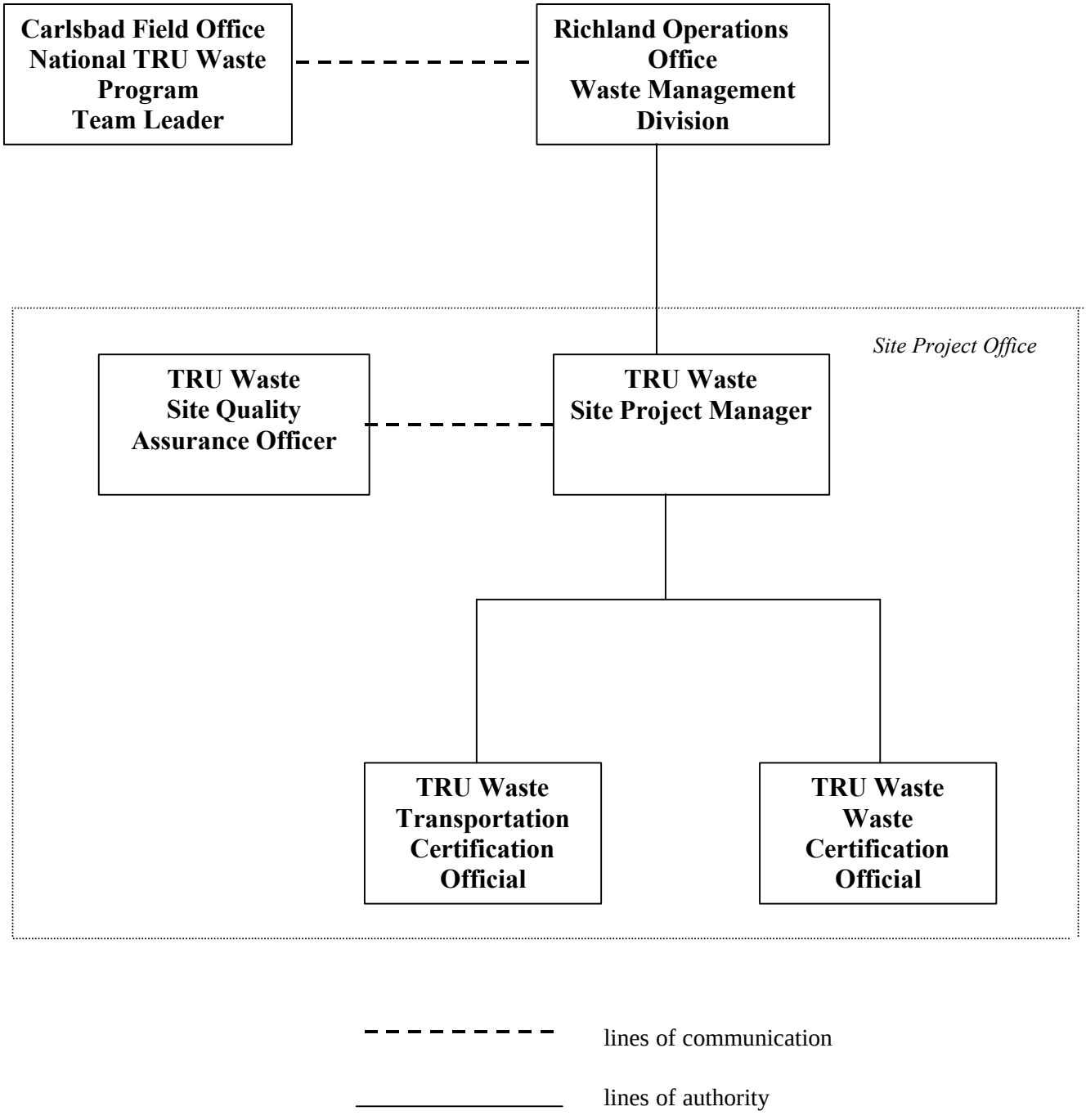
2.1.2 Team Leader or Designee, National TRU Waste Program (NTWP)

The NTWP team leader or designee assists sites in preparing their waste for shipment to WIPP for disposal. The NTWP team leader or designee develops options, recommendations, and guidelines for program activities and provides overall technical oversight of the TRU waste program activities at participating DOE sites. The NTWP team leader or designee, in conjunction with the permittee QA manager, is responsible for conducting audits of all activities associated with TRU waste characterization and certification described in the *WIPP Hazardous Waste Facility Permit* and associated WAP and QAPD. The NTWP team leader or designee reviews and approves this certification plan before its implementation. The permittee QA manager also reviews and approves this certification plan.

2.1.3 DOE-Richland Waste Management Division

The U.S. DOE-Richland Operations Office (RL) Waste Management Division is responsible for project execution and oversight and serves as an interface between permittee and the Hanford site. The RL TRU waste program manager ensures that certification plan activities comply with applicable DOE orders, the WAP, QAPD, WAC, TRUPACT-II SAR, and all applicable federal and state regulations. The RL TRU waste program manager also ensures that resources and funding are available to accomplish TRU waste certification activities.

Figure 2-1. Hanford Site TRU Waste Certification Project Functional Organization Chart



2.1.4 Site Project Manager

The site project manager (SPM) is the principal point of contact with DOE (including permittee, NTWP, and RL) for technical activities associated with TRU waste. The SPM provides programmatic support for Hanford site TRU waste organizations involved in TRU waste storage, characterization, certification, and transportation activities. The SPM coordinates with the Hanford site waste certification official (WCO) and transportation certification official (TCO) and oversees project activities to ensure that Hanford site TRU waste is characterized and certified compliant with WIPP requirements. Specific project responsibilities assigned to the SPM include the following:

- Reviewing and approving the Hanford site QAPjP and certification plan.
- Ensuring that the Hanford site compliance plan for TRAMPAC and associated documents are revised, reviewed, approved, and implemented as necessary to maintain authorization for shipping TRU waste to WIPP.
- Ensuring project personnel receive appropriate training and orientation.
- Selecting, prioritizing, and tracking waste to be sampled and analyzed.
- Validating and verifying project-level analytical data.
- Reconciling analytical data with data quality objectives (DQOs).
- Certifying Waste Stream Profile Form (WSPF) data.
- Obtaining AK information from waste generators regarding U.S. Environmental Protection Agency (EPA) hazardous waste numbers.
- Submitting quality assurance/quality control (QA/QC) reports to DOE field offices.
- Transmitting testing, sampling, and analytical data to Carlsbad Field Office (CBFO), the permittee.
- Assisting the Hanford site QA officer (SQAO) in defining and standardizing project assessment criteria and preparing responses to deficiency reports, such as corrective action reports (CARs), generated by permittee internal or other external assessment organizations.
- Halting certification activities if problems affecting the quality of certification processes or work products exist.
- Notifying personnel of nonconformances in accordance with WMP-400, *Waste Isolation Pilot Plant Procedures,* Section 1.3.2, “TRU Nonconforming Item Reporting and Control.”

The SPM may delegate any of these activities to another individual; however, the SPM retains responsibility for ensuring that project requirements are met.

2.1.5 Hanford Site Quality Assurance Officer (SQAO)

The SQAO provides QA oversight and planning for TRU waste characterization and certification and oversees the implementation of the QAPjP and the QA requirements of the certification plan. The SQAO's general responsibilities include the following:

- Scheduling and conducting QA assessments.
- Reviewing and approving the QAPjP, certification plan, and implementing procedures.
- Coordinating internal and external audits and assessments to verify compliance.
- Reviewing and approving supplier and subcontractor QA plans as appropriate.
- Tracking and evaluating trends in compliance with QA objectives (QAOs) established in the QAPjP by performing the following:
  - Ensuring that testing, sampling, and analytical facilities are assessed.
  - Ensuring that nonconformance reports (NCRs) or CARs that affect project activities are prepared, when appropriate.
  - Tracking and trending nonconformances.
  - Verifying corrective actions have been taken to resolve nonconformances.
  - Validating and verifying data at the project level.
  - Submitting QA/QC reports to the SPM, as needed.
  - Preparing and submitting semiannual QA summary reports to the SPM.
- Coordinating responses to deficiency reports (e.g., CARs) generated by permittee or other external assessment organizations.
- Providing QA oversight for data package assembly and interface with the WIPP Waste Information System (WWIS).
- Stopping certification activities if problems affecting the quality of certification processes or work products exist.
- Having direct access to responsible management at a level where appropriate action can be affected.
- Being sufficiently independent from cost and schedule considerations.
- Having the organizational freedom to communicate with management.
- Having no assigned responsibilities unrelated to the QA program that would prevent appropriate attention to QA matters.

- Developing, establishing, and interpreting QA policy, and ensuring effective implementation.

- Interfacing, as appropriate, with the permittee staff, participants, and other stakeholders on QA matters.

- Assisting subordinate organizations with quality planning, documentation, quality measurements, and problem identification and resolution.

- Providing guidance to all applicable subordinate organizations concerning identification, control, and protection of QA records.

The SQAO may designate one or more individuals to perform the above functional responsibilities but retains ultimate responsibility for ensuring compliance with project requirements.

2.1.6 Hanford Site Waste Certification Official (WCO)

The Hanford site WCO is responsible for certifying all data and information necessary to document that all TRU waste payload containers prepared for shipment to WIPP meet all specified criteria. The WCO coordinates activities related to waste characterization and works closely with the SQAO to effect QC of the project. Specific duties and responsibilities of the WCO include the following:

- Certifying that waste packages meet CH-WAC requirements.

- Interfacing with the SPM, TCO, and SQAO on matters related to waste characterization and certification.

- Implementing the following project QA activities:
  - Reviewing and approving this certification plan.
  - Ensuring that waste characterization and certification documents are managed as QA records in the designated repository.
  - Preparing NCRs and CARs, and documenting corrective actions.
  - Coordinating with the SQAO to analyze trends in project nonconformances for waste characterization-related activities.
  - Assisting the SQAO in preparing responses to deficiency reports (e.g., CARs) generated by permittee or other external assessment organizations.

- Stopping waste characterization activities if problems affecting the quality of certification processes or work products exist.

- Ensuring the data on characterization and certification entered into the WWIS are accurate and demonstrate the acceptability of the waste for transport to and disposal at the WIPP.

The WCO may designate one or more individuals to perform these responsibilities but retains ultimate responsibility for ensuring that project requirements are met.

2.1.7 Hanford Site Transportation Certification Official (TCO)

The Hanford site TCO ensures that the site-specific TRU waste packaging and transportation activities comply with the TRAMPAC and DOT requirements specified in 49 CFR 173 and NRC requirements in 10 CFR 71. The TCO verifies payload containers and payload assemblies and ensures compliance with all packaging and records requirements. The TCO obtains WIPP authority to ship and ensures that all requirements are met before the transportation packaging is released to a carrier for transport. Specific TCO responsibilities include the following:

- Ensuring that the Hanford site compliance plan for TRAMPAC and associated documents are revised, reviewed, approved, and implemented, as necessary, for the Hanford site to maintain authorization for offsite shipments of TRU waste.

- Interfacing with the originating facility to develop and maintain procedures to load the TRUPACT-II in accordance with the TRUPACT-II SAR, TRAMPAC, and CH-WAC to ensure that all payloads meet all applicable requirements.

- Maintaining Hanford site TRUPACT-II Content Codes (TRUCON) in accordance with the TRUCON document, and requesting revisions from permittee, as necessary.

- Interfacing with the SPM, WCO, and SQAO on matters related to payload certification and offsite transportation of TRU waste.

- Reviewing and approving this certification plan.

- Reviewing all payload data sheets, and documenting compliance with all packaging and shipping requirements described in this certification plan.

- Preparing and signing bills of lading, uniform hazardous waste manifests (UHWM), and land disposal restriction (LDR) notifications, as appropriate.

Shipping activities related to the TRUPACT-II and WIPP acceptance include the following:

- Ensuring compliance with applicable DOT and NRC regulations.

- Providing guidance to waste generators to assist their efforts to comply with the TRAMPAC and CH-WAC criteria and requirements in implementing procedures affecting characterization, QA, and waste certification.

- Ensuring that the proper shipping category, TRUCON codes, and Hanford site waste form number are assigned to each container and shipment.

- Reviewing all payload data sheets and Hanford site records to guarantee and document compliance with all packaging and shipping requirements.

- In conjunction with the WCO, ensuring all waste containers and shipments are certifiable for transport and all documentation packages are complete and accurate.

- Ensuring all data entered into the WWIS is accurate and demonstrates the acceptability of the waste for transport to and disposal at the WIPP.

The TCO may designate one or more individuals to perform these responsibilities but retains ultimate responsibility for ensuring that certification-related project requirements are met.

2.2 WASTE CHARACTERIZATION/CERTIFICATION PROCESS

The Hanford site TRU waste process for characterizing and certifying waste and preparing it for transport to WIPP involves a series of operations based on whether the waste is retrievably stored or newly generated and the physical form of the waste. Newly generated TRU waste is defined as TRU waste generated after the New Mexico Environment Department (NMED) notifies WIPP, by approval of the final audit report, that the Hanford site has satisfactorily implemented the characterization requirements of the WAP.

Initially, acceptable knowledge (AK) is used to delineate all TRU waste containers into waste streams and assign an appropriate waste matrix code group category based on the physical form of the waste and the waste contents. AK is also used to make determinations regarding EPA hazardous waste numbers, radionuclide composition, and prohibited item restrictions. AK information for each waste stream is assessed and verified through evaluation of results from applicable testing, sampling, and analytical activities.

Waste characterization requirements for retrievably stored and newly generated wastes differ, as summarized below.

- Radiography and/or visual examination (VE) are used to identify and/or confirm the waste matrix code group category and waste material parameter designations and identify prohibited items. All retrievably stored waste containers undergo radiography. Radiography is confirmed by VE on a randomly selected number of containers in each retrievably stored waste stream. For newly generated waste, physical form and prohibited items are verified during packaging using the VE technique. The VE technique is not the same process as VE that is performed to verify radiography. The VE technique involves two independent verifications of the physical form of the waste and contents at the time of packaging. The first operator documents the content of the waste container, providing a written inventory of actual or estimated weights of each item place in the container. The operator also documents that prohibited article(s) are not present. A second, independent operator provides additional verification by reviewing the waste contents and ensuring correct reporting of the waste container content. Corrective actions are taken if either the first or second operator cannot independently confirm the waste designations.

- Radioassay data identify and quantify radionuclide composition and concentration. All TRU waste containers from newly generated and retrievably stored waste streams undergo radioassay.

- Headspace-gas sampling and analysis provide data to determine potential flammability and confirm EPA hazardous waste numbers of each waste container. All TRU waste containers from newly generated and retrievably stored waste streams or randomly selected containers from waste streams that meet the conditions for reduced headspace-gas sampling listed in the QAPjP, section B-3a(1), undergo headspace-gas sampling and analysis.

- Sampling and analysis of homogeneous wastes provide data to confirm listed and toxicity characteristic EPA hazardous waste numbers and quantify hazardous constituent concentration. The RCRA-regulated constituents in newly generated homogenous solid waste streams are documented and verified at the time of generation based on AK and sampling and analysis. For continuous processes that result in newly generated homogeneous wastes (except soil/gravel waste streams), initial sampling is conducted, and process control parameters are established to develop a baseline control chart for the process. The parameter limits for a waste-generating process are established in specific written procedures for the process. Process performance relative to the established parameter limits is determined through annual sampling of the process, which is conducted on a random basis. If the parameter limits are exceeded, the waste stream is recharacterized according to procedures and methods specified for retrievably stored waste. In cases where control charting is not useful in controlling hazardous waste constituents, homogeneous wastes are characterized in process batches as described in the QAPjP, section B-3d(1)(a). The number of newly generated soil/gravel waste containers to be randomly sampled and analyzed is determined through a statistical selection process. Using a similar approach, a statistically selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed to confirm waste constituents.

- On a case-by-case basis, in consultation with the CBFO, certain waste streams may be characterized using sampling and analysis results from another TRU waste generator/storage site that has received certification authority from CBFO. Homogenous waste solid sampling and analysis, headspace-gas sampling and analysis, radioassay, and radiography/visual examination are all examples of characterization techniques that may be performed by other sites. The data will be useable to certify waste so long as it was gathered using plans and procedures that have been evaluated through an audit conducted by CBFO and deemed to meet the requirements of the WIPP Hazardous Waste Permit, QAPD, and CH-WAC.

Radioassay and analytical facilities (i.e., headspace gas and homogeneous waste stream analysis) are qualified through participation in the applicable performance demonstration program (PDP). The PDP program supports the determination of a facility to meet QA objectives.

The SPM reconciles waste characterization data against applicable data quality objectives (DQOs). Data quality objectives are qualitative and quantitative statements that specify WIPP program technical and quality objectives. DQOs are determined through the DQO process. The DQOs for the waste characterization activities are contained in the WAP, attachment B3.

On a case-by-case basis, in consultation with CBFO, the SPM may choose to accept data validation and verification and data quality objective (DQO) reconciliation performed by other sites that have been granted waste certification authority by CBFO.

Figures 2-2a through 2-2f and 2-3a through 2-3e illustrate the typical process flow for retrievably stored and newly generated TRU waste, respectively. Certain characterization activities identified for retrievably stored waste may be applied to newly generated waste and vice versa, provided that compliance with waste characterization requirements can be adequately demonstrated. In addition, variance from the depicted flow path within each process may be necessary to address technical or operational needs. Sections 3.0 and 4.0 detail the methods of compliance and verification for each certification-related process and identify applicable implementing procedures.

2.2.1 Waste Stream Documentation

Hanford site waste generators produce waste stream documentation to meet Hanford site waste acceptance criteria and support the waste stream approval process. Waste stream information is supplied on site-specific forms and attachments. At a minimum, generators provide the following waste stream information:

- Generator information
- Waste stream name
- Waste generating process description
- Radiological information (e.g., classification, reportable radionuclides, characterization method)
- Chemical constituent information (e.g., chemicals present, concentration ranges, characterization methods)
- Land disposal restriction (LDR) information, including identification of underlying hazardous constituents, if applicable
- Waste type information (e.g., physical state, inert materials, and stabilizing agents and/or absorbents used)
- Packaging information (e.g., container type and size, maximum weight)
- Additional attachments, including process flow information, analytical data, container drawings, or other waste acceptance information.

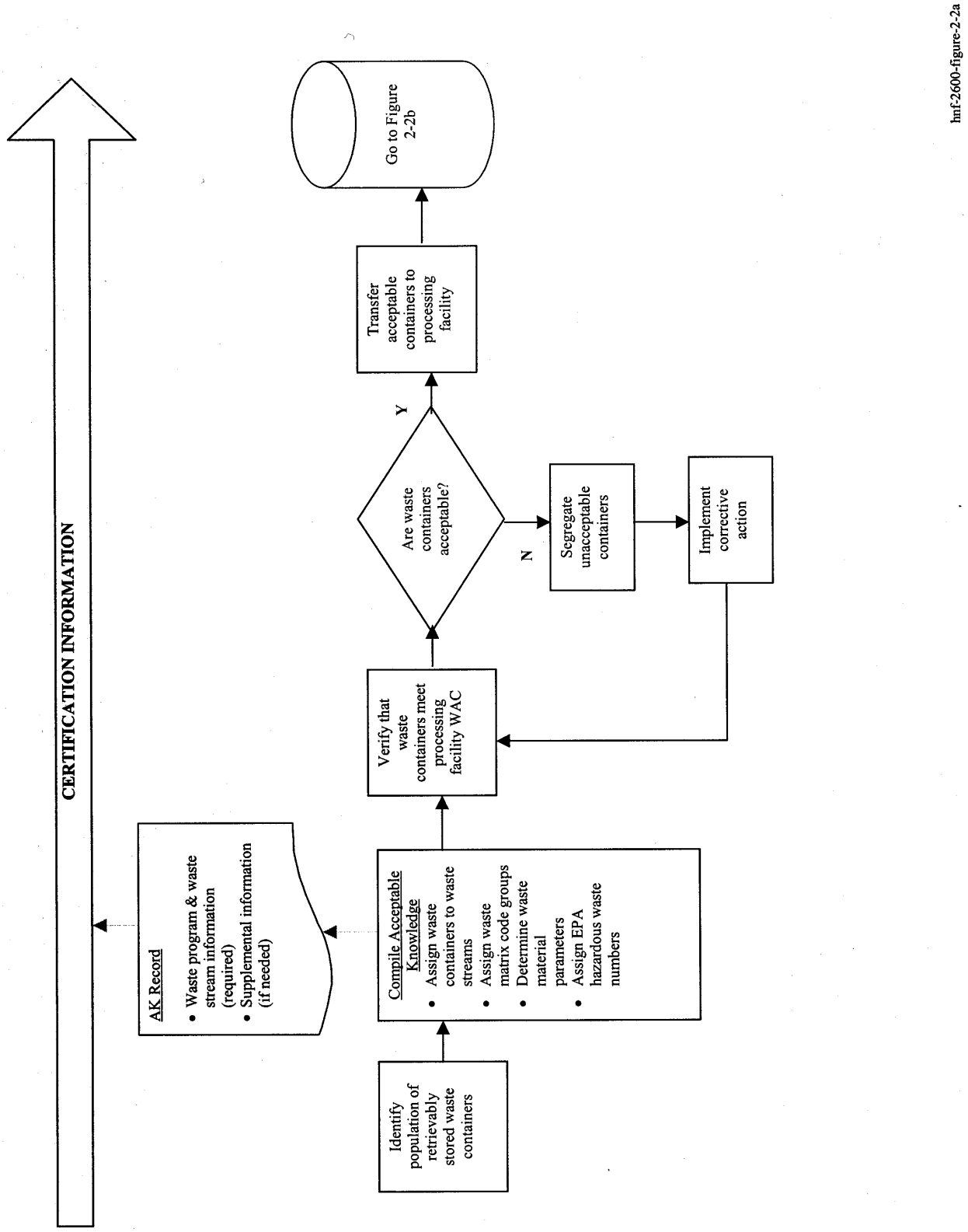


Figure 2-2a. Certification Flow for Retrievably Stored TRU Waste.

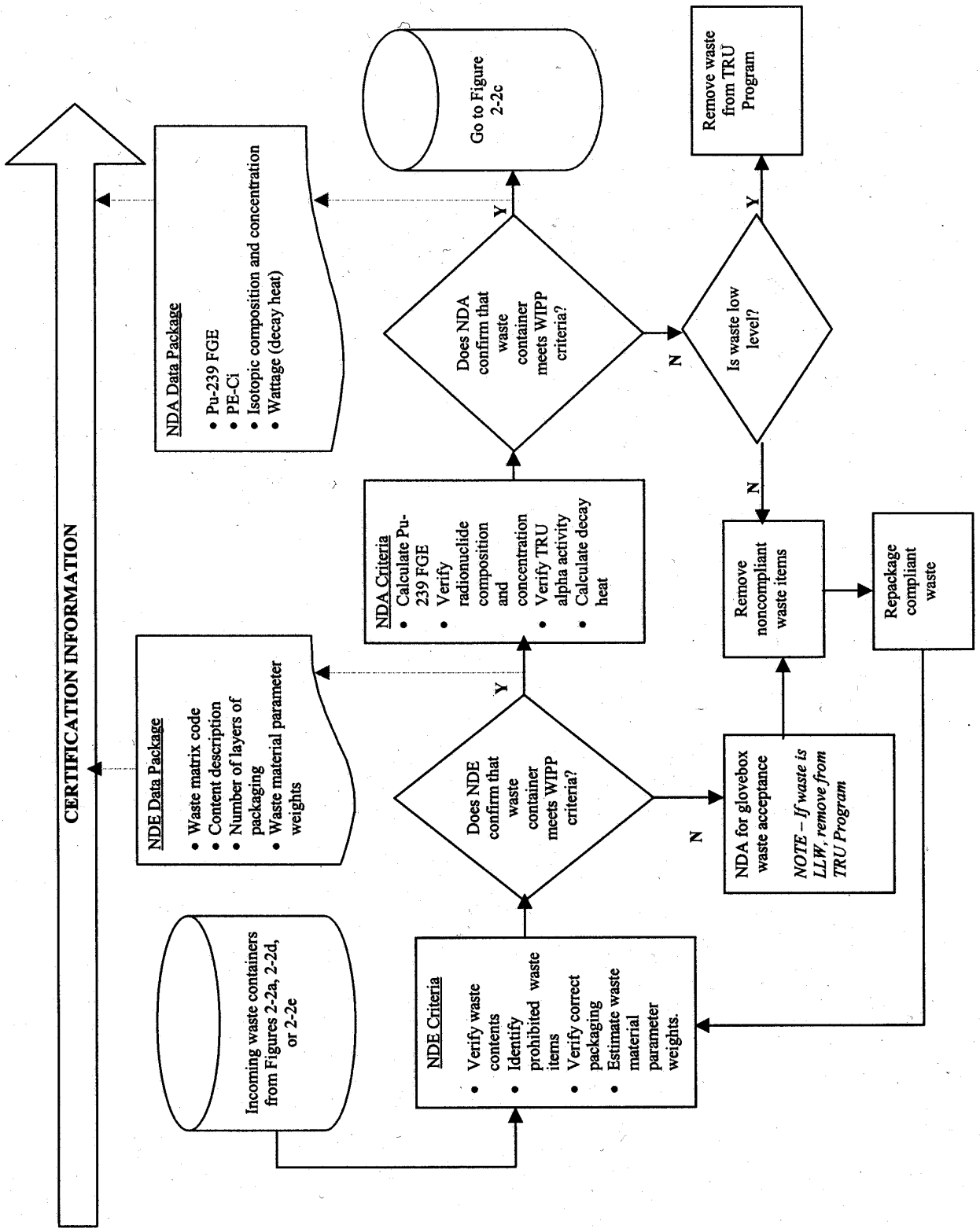


Figure 2-2b. Certification Flow for Retrievably Stored TRU Waste (continued)

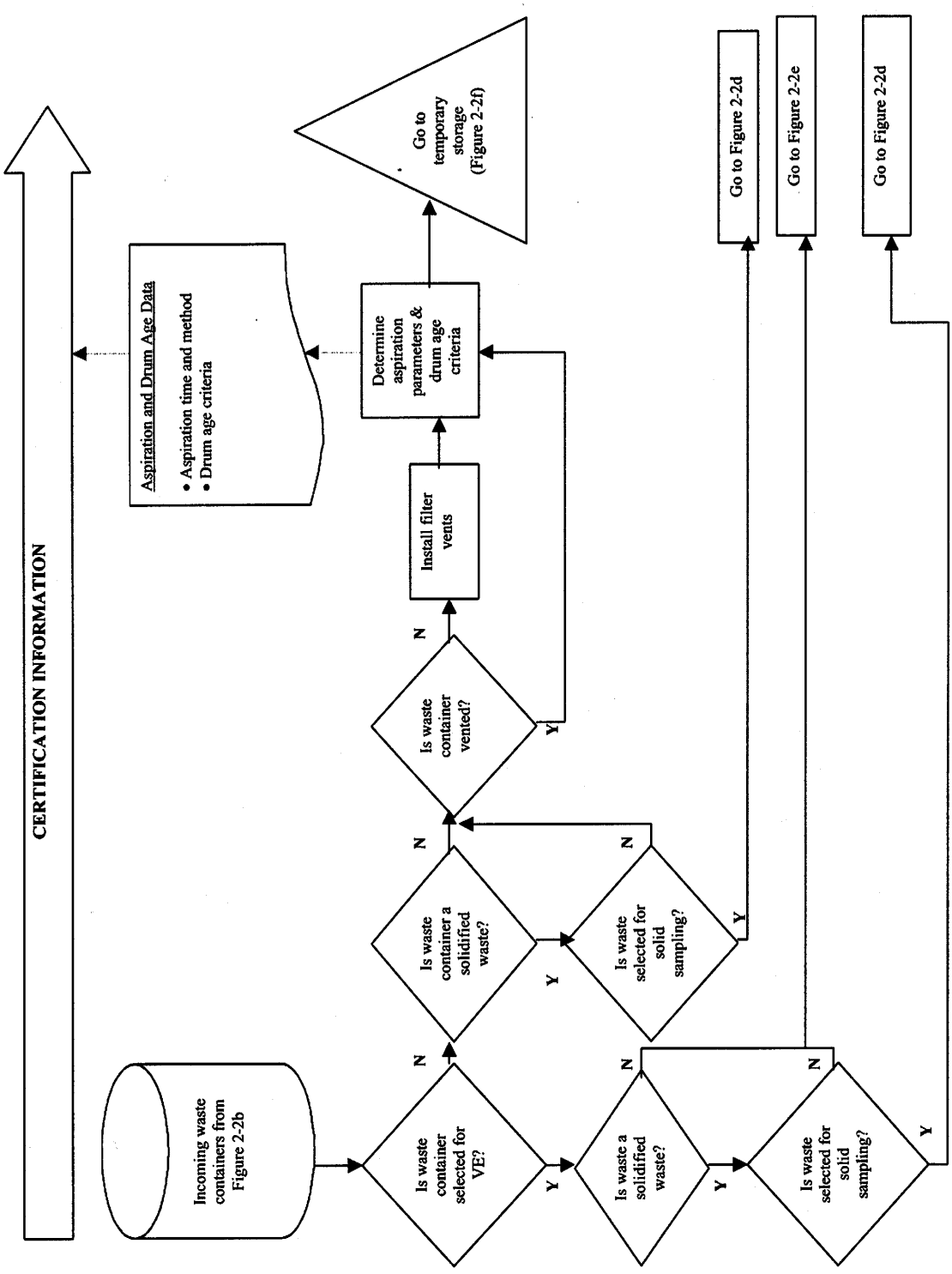


Figure 2-2c. Certification Flow for Retrievably Stored TRU Waste (continued)

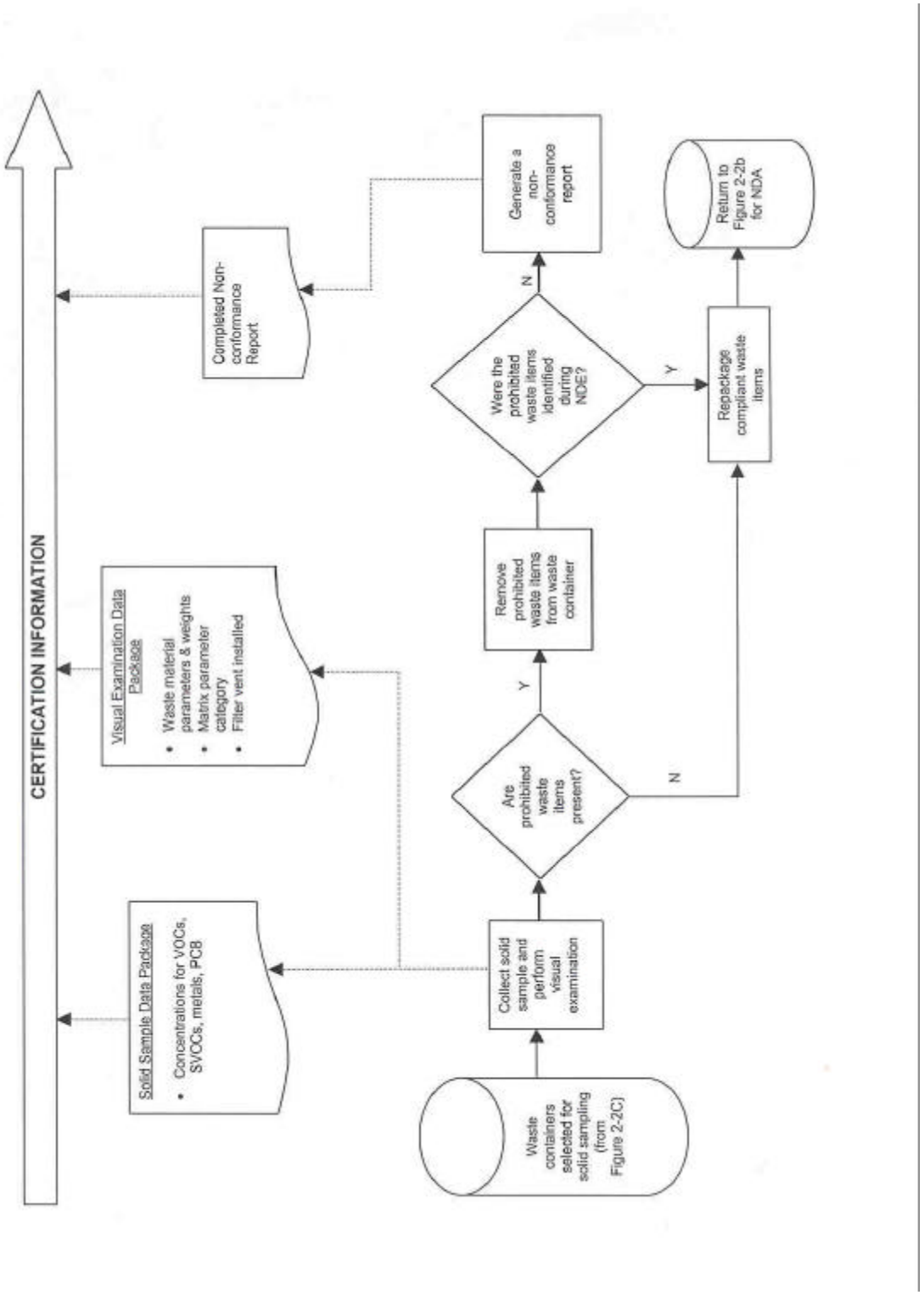


Figure 2-2d. Certification Flow for Retrievably Stored TRU Waste (continued)

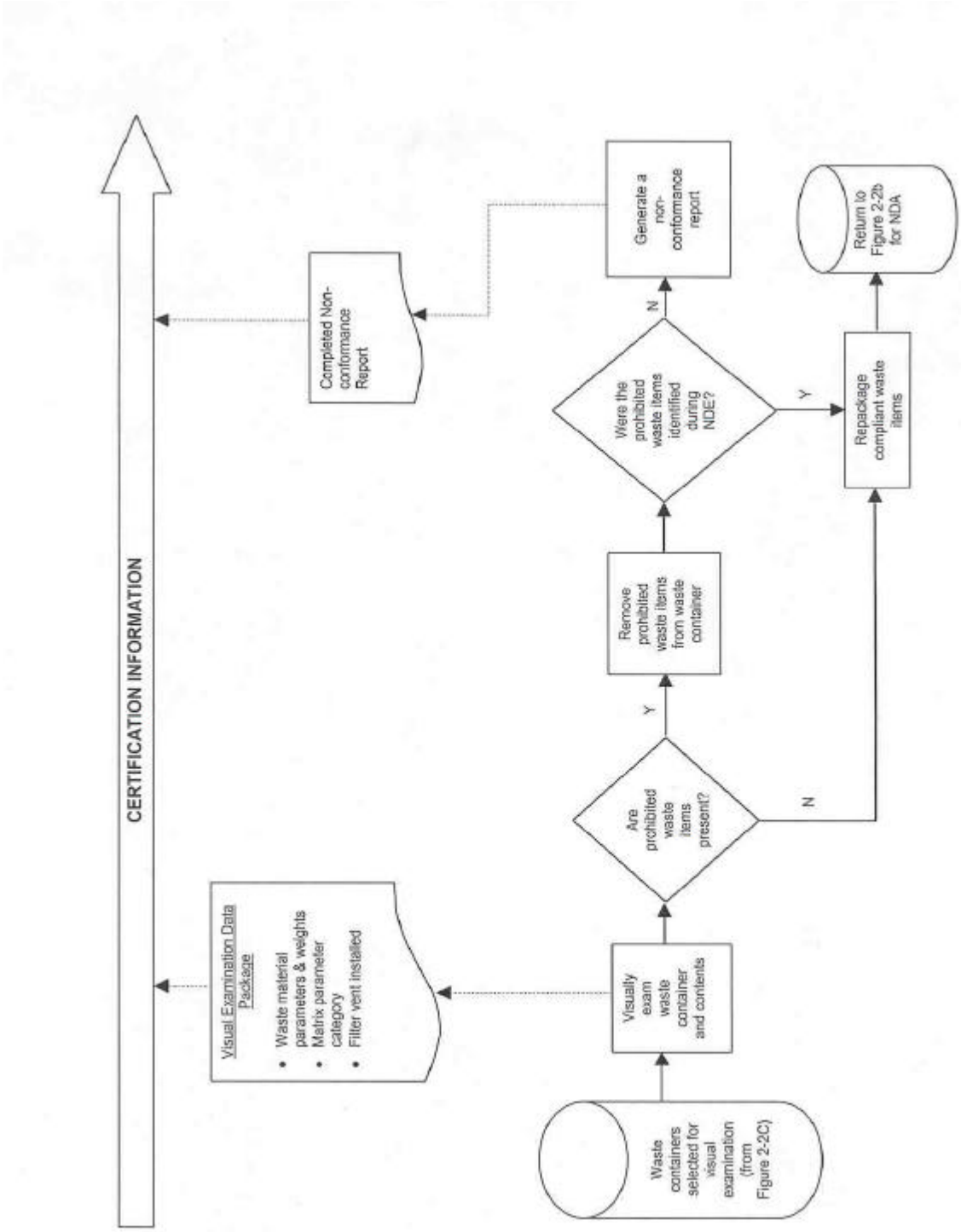


Figure 2-2e. Certification Flow for Retrievably Stored TRU Waste (continued)

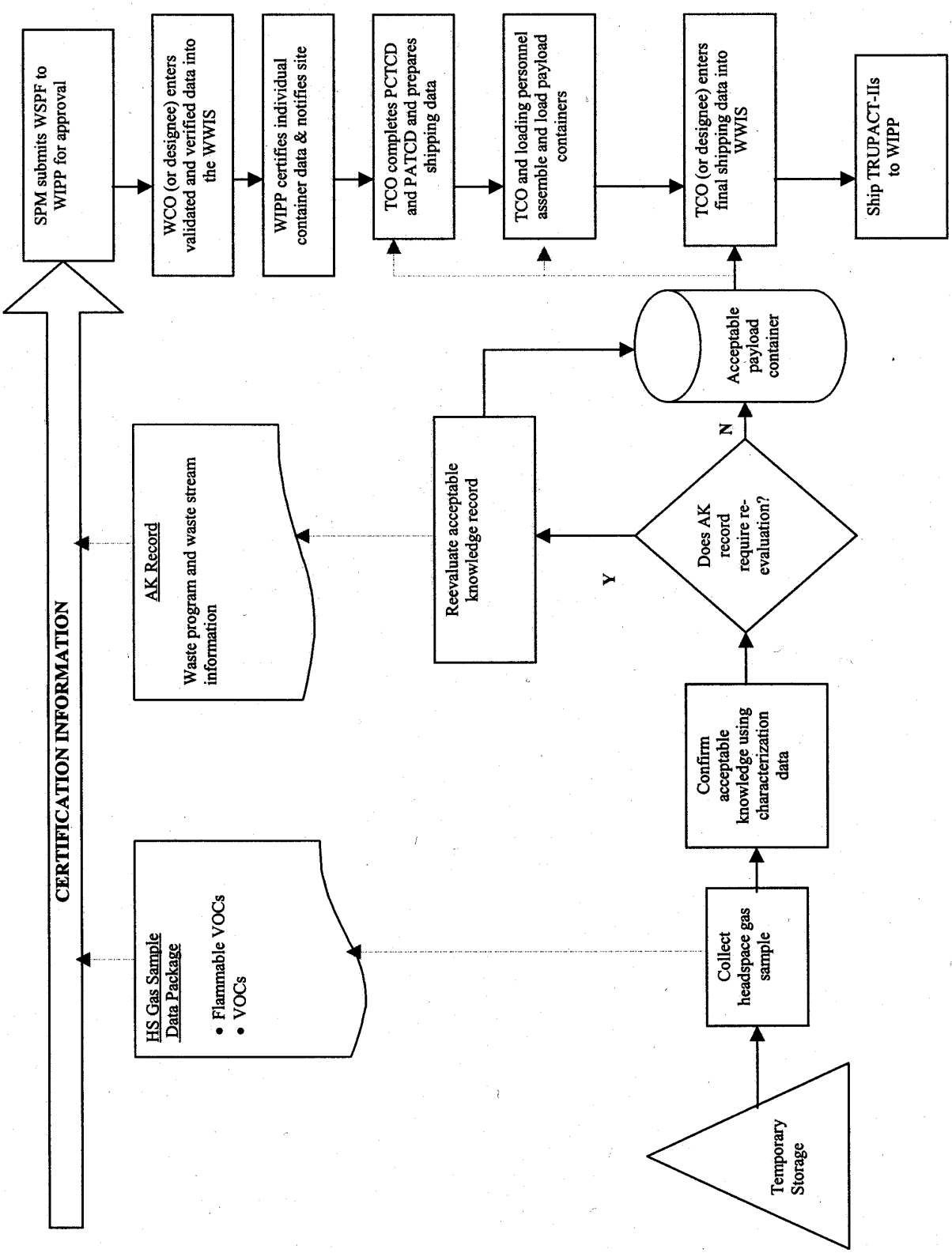


Figure 2-2f. Certification Flow for Retrievably Stored TRU Waste (concluded)

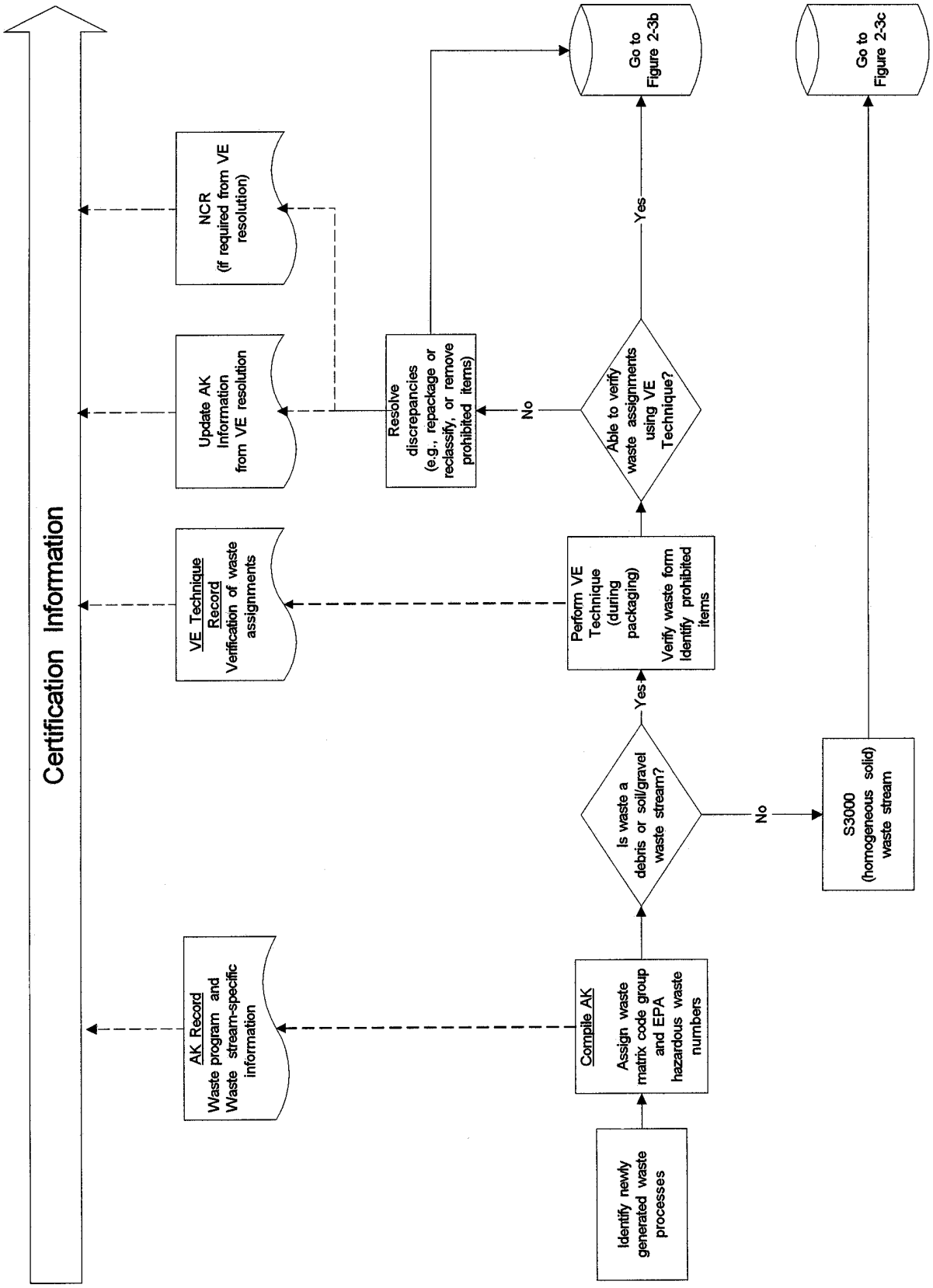


Figure 2-3a. Certification Flow for Newly Generated TRU Waste

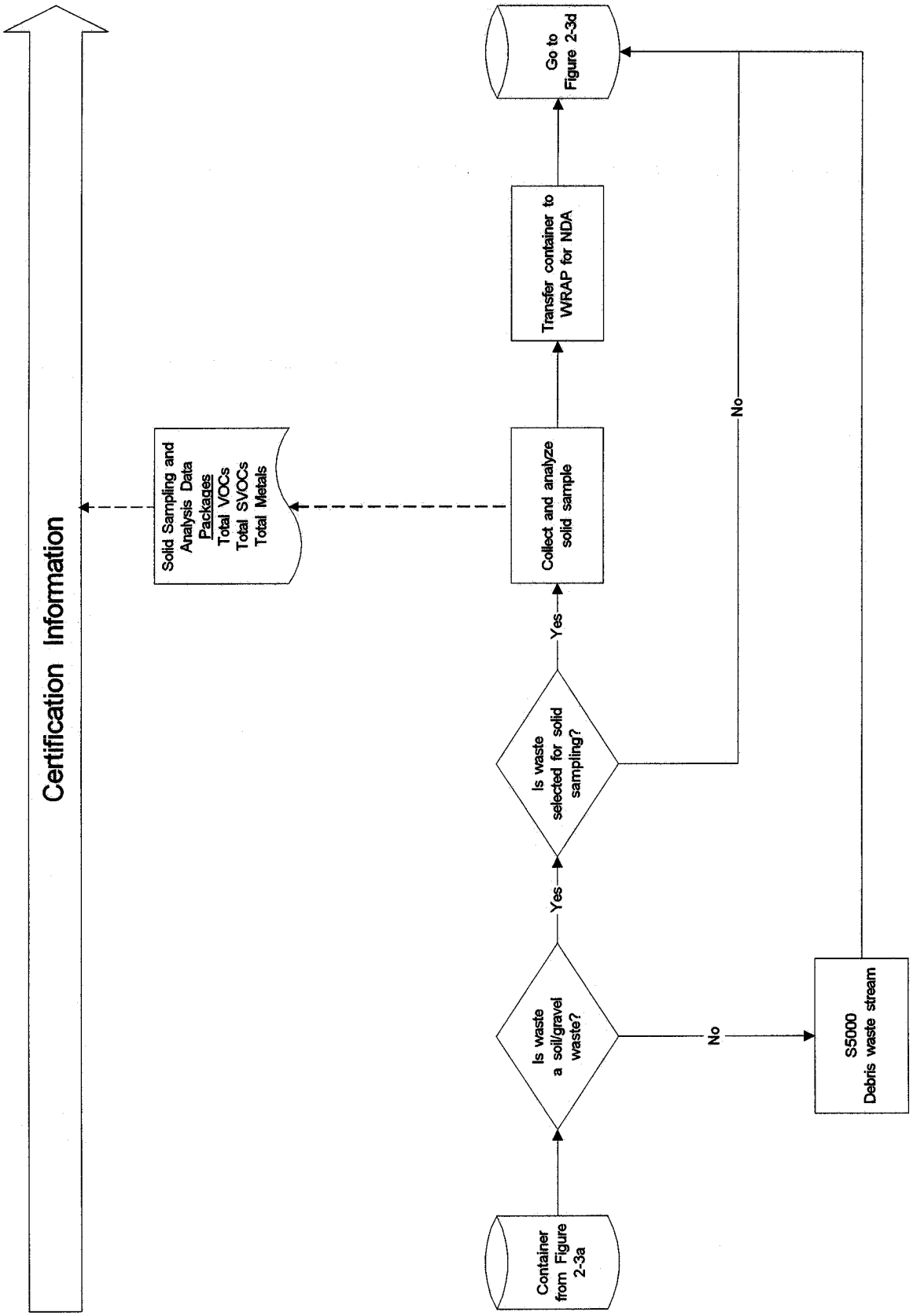


Figure 2-3b. Certification Flow for Newly Generated TRU Waste (Continued)

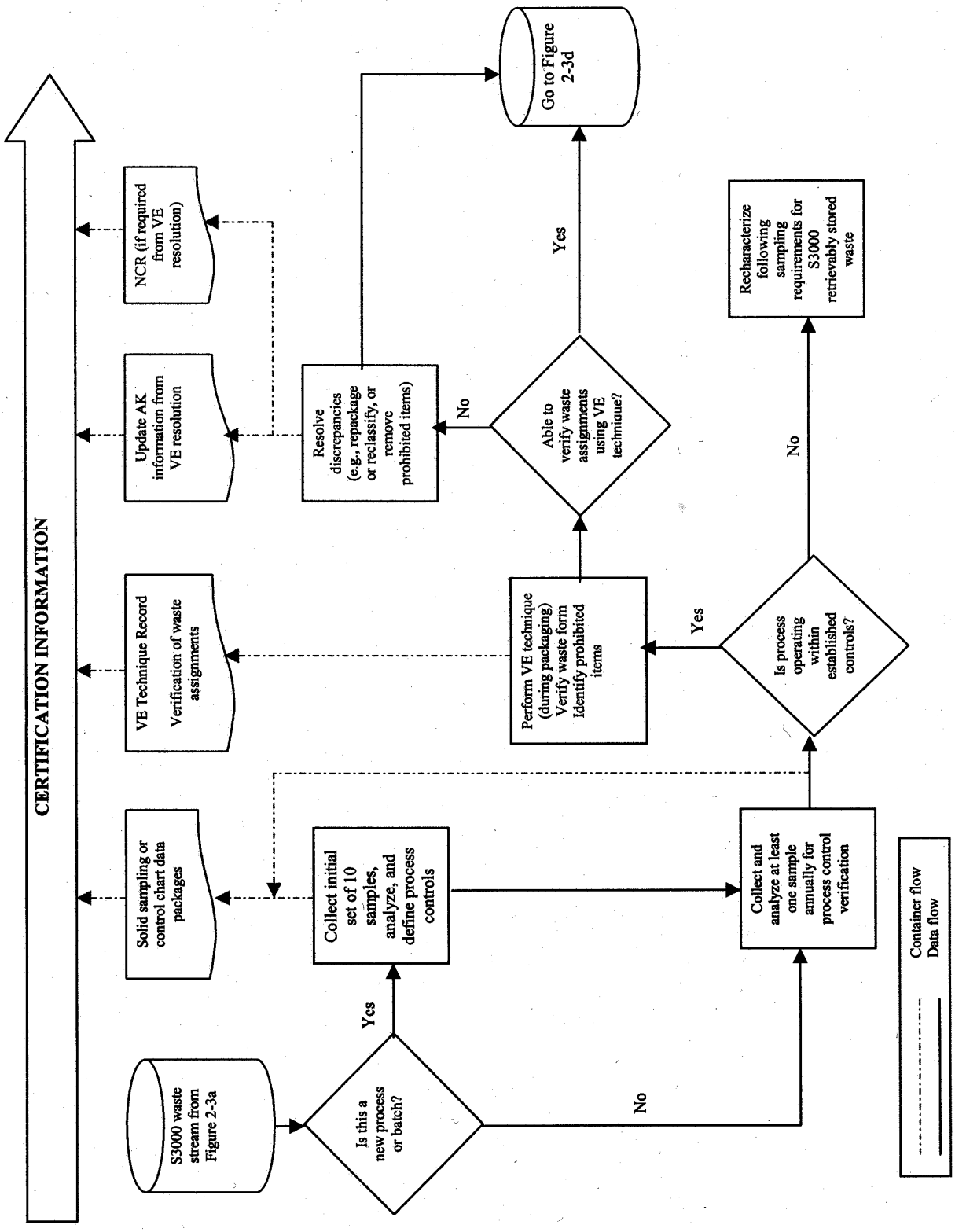


Figure 2-3c. Certification Flow for Newly Generated TRU Waste (Continued)

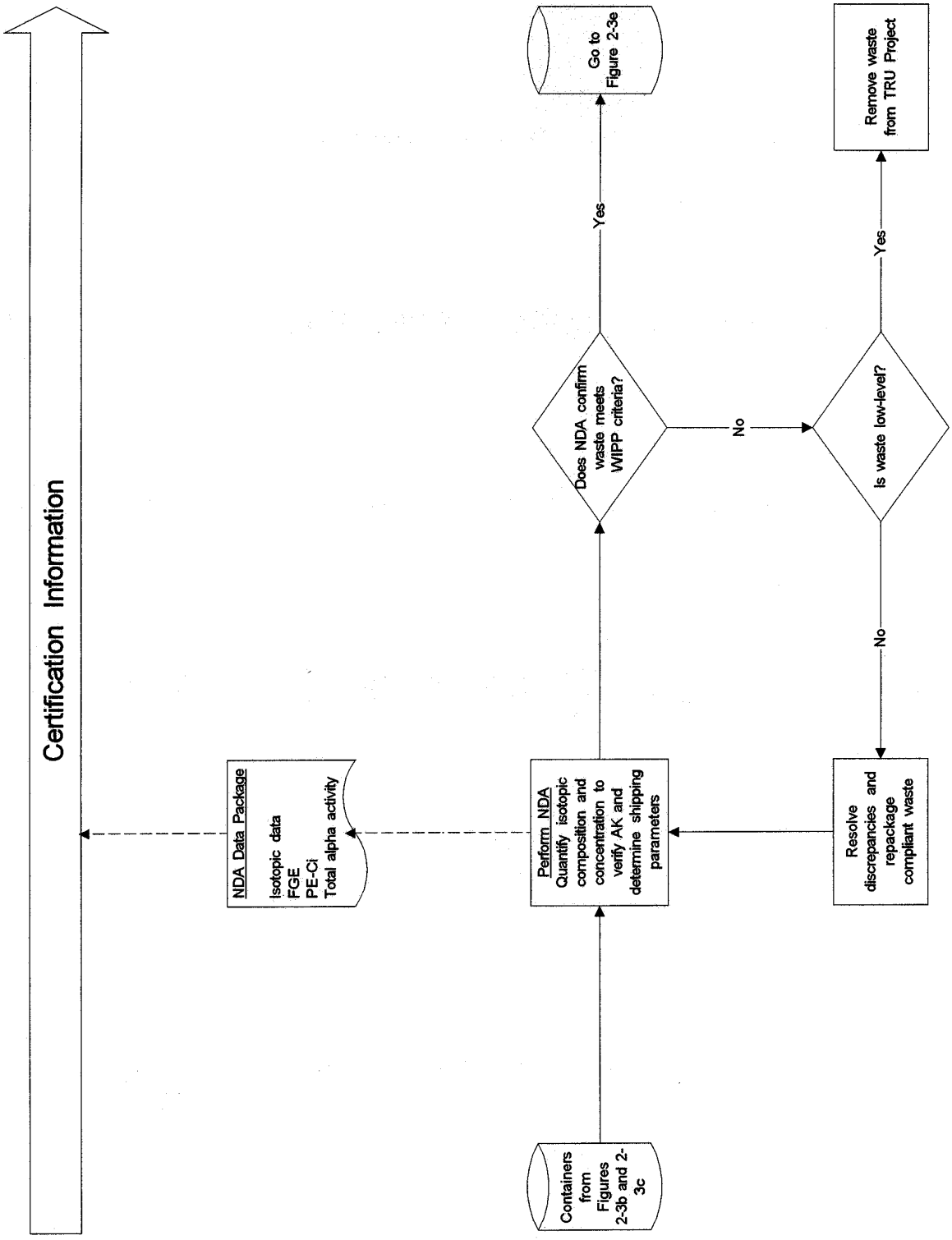


Figure 2-3d. Certification Flow for Newly Generated TRU Waste (Continued)

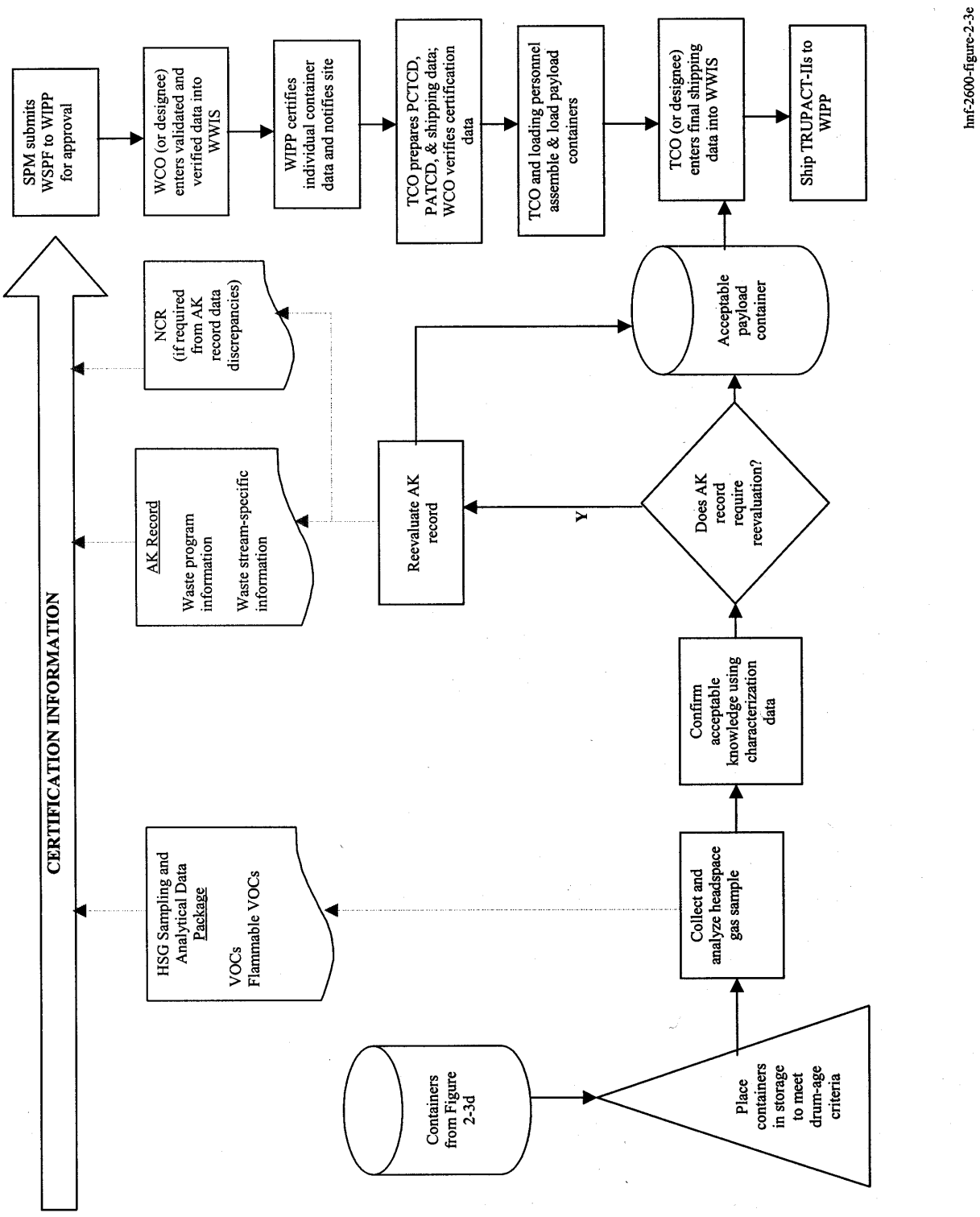


Figure 2-3e. Certification Flow for Newly Generated TRU Waste (Concluded)

Information supplied by waste generators is supplemented with information gathered during TRU Project characterization and certification activities to meet data requirements for completing the permittee Waste Stream Profile Form (WSPF) and WWIS submittals.

2.2.2 Acceptable Knowledge Documentation

The Hanford site uses AK to assign waste matrix code groups, TRUCON codes, and EPA hazardous waste numbers and to determine the waste material parameters and radionuclides present in waste streams. For each TRU waste stream (and/or waste stream lot), AK information is compiled in an auditable record; confirmed through radiography, VE, VE technique, radiological assay, headspace-gas sampling and analysis, and homogenous waste sampling and analysis (applicable to homogenous solids and soil/gravel waste streams only); and audited periodically to ensure adequacy of the information.

Information compiled to document AK on a site-wide and facility-specific basis includes TRU waste management project information, waste stream information, and supplemental documentation (including reference lists), as needed. The SPM (or designee) reviews waste stream documentation and data packages resulting from radiography, VE, VE technique, headspace-gas sampling and analysis, and solidified waste sampling and analysis (as appropriate) to confirm waste matrix code group designations, EPA hazardous waste numbers, and waste material parameter designations using AK. Changes to EPA hazardous waste numbers are identified and justified based on confirmatory testing data. AK information is reevaluated if discrepancies are identified between AK documentation and data from confirmatory testing.

2.2.3 Waste Characterization and Certification Data Reporting

The SPM (or designee) reconciles TRU waste characterization data with DQOs and completes a WSPF for each Hanford site TRU waste stream to be disposed at the WIPP. Summaries of waste stream information and reconciliation of DQOs comprise WSPF attachments. WMP-400, Section 7.1.1, “Transuranic Waste Characterization Data Quality Objectives Reconciliation and Reporting,” specifies the information required to complete the WSPF and describes the process for reconciling waste characterization data with project-required parameters, preparing data summary reports, and correlating container identification to data packages.

Before shipping TRU waste containers from a WIPP-accepted and approved waste stream, the SPM transmits waste characterization, certification, and shipment data to the WIPP using the WWIS. The WWIS has electronic and edit/limit checks to ensure that the data representing the waste containers are in compliance with the applicable characterization and certification criteria. WMP-400, Section 7.1.5, “WIPP Waste Information System Data Entry and Reporting,” describes the process for entering and reporting required data on payload containers and assemblies into the WWIS. WIPP will only accept waste container shipments for disposal if the waste container information has been correctly submitted to the WWIS and approved for shipment by the WIPP data administrator.

2.2.4 Qualification of Existing Data

The qualification process shall be conducted in accordance with approved procedures that provide for documentation of the decision process, the factors used in arriving at the choice of the qualification method, and the decision that the data are qualified for their intended use. Existing data shall be qualified using one or a combination of the following methods:

1. Determination that the data were collected under a QA program that is equivalent in effect to ASME NQA-1-1989 edition; ASME NQA-2a-1990 addenda, Part 2.7, to ASME NQA-2-1989 edition; and NQA-3-1989.

    a. Qualifications of personnel or organizations generating data

    b. Technical adequacy of the equipment and procedures used to collect and analyze the data

    c. Environmental conditions under which the data were obtained (if germane)

    d. Quality and reliability of the measurement control program under which the data were generated

    e. Extent to which data demonstrate properties of interest (e.g., physical, chemical, geologic, or mechanical)

    f. Extent to which conditions generating the data may partially meet requirements of this QAPD

    g. Prior uses of the data and the associated verification processes

    h. Prior peer or other professional reviews of data and their results

    i. Extent and reliability of the documentation associated with the data

    j. Extent and quality of corroborating data or confirmatory testing results

    k. Degree to which data generating processes were independently audited

    l. The importance of the data in showing that the repository design meets the performance objectives

2. The use of corroborating data, with the data relationships and inferences clearly identified and justified.

3. Confirmatory testing that is performed and documented.

4. Peer review conducted in a manner that is compatible with NUREG-1297, *Peer Review for High-Level Nuclear Waste Repositories*.

   a. Peer reviews shall be performed when the adequacy of information or the suitability of procedures and methods essential to showing that a repository system meets its performance requirements with respect to safety and calculations, or reference to previously established standards and practices.

   b. Peer reviews performed in support of WIPP compliance activities shall be documented, as shall all peer review processes

5. Peer reviews are used for the following activities:

   - Conceptual models selected and developed by DOE
   - Waste characterization analysis as required in 40 CFR 194.24(b)
   - Engineered barrier evaluation as required in 40 CFR 194.44.

2.2.5 Quality Assurance Compliance Application Data

Any compliance application shall provide, to the extent practical, information that describes how all data used to support the compliance application has been assessed for quality characteristics, including:

- Data accuracy: the degree to which data agree with an accepted reference or true value
- Data precision: a measure of the mutual agreement between comparable data gathered or developed under similar conditions, expressed in terms of standard deviation
- Data representativeness: the degree to which data accuracy and precision represent a characteristic of a population, a parameter, variations at a sampling point, or environmental conditions
- Data completeness: a measure of the amount of valid data obtained compared to the amount that was expected
- Data comparability: a measure of the confidence with which one data set can be compared to another.

2.3 CERTIFICATION PROJECT DOCUMENT CONTROL AND RECORDS MANAGEMENT

This certification plan, which includes the compliance plan for TRAMPAC and associated QA plans, together with the Hanford site QAPjP establish the basis for the Hanford site's TRU waste characterization, certification, and transportation packaging operations. These documents are submitted to permittee for review and approval. The individuals identified in table 2-1 review and/or approve this certification plan and any revisions. The SPM (or designee) reviews this certification plan at least annually and schedules revisions, reviews, approvals, and distribution.

Table 2-1. Review, Approval, and Control Requirements for the Hanford Site Certification Plan

Organization/Reviewer	Review and approval	Change approval	Change control
National TRU Waste Program Team Leader	X	X[a]	–
Carlsbad Field Office Quality Assurance Manager	X	X	–
Site Project Manager	X	X	X[b]
Site Quality Assurance Officer	X	X	–
Waste Certification Official	X	X	–
Transportation Certification Official	X	X	–

Note: – = not required.
[a]Changes affecting performance criteria or data quality only.
[b]Ensures compliance with records management requirements.

Project personnel develop, maintain, and control this certification plan in accordance with WMP-400, Section 1.4.1, "TRU Document Control." Project personnel generate records of characterization, certification, packaging, and transportation activities and review these records to ensure compliance with project requirements. Records are collected, processed, stored, and maintained in accordance with records management requirements established in WMP-400, Section 1.5.1, "TRU Records Management."

3.0 COMPLIANCE PLAN FOR CH-WAC

This section describes how the Hanford site complies with the requirements and associated criteria for WIPP acceptance of CH TRU waste, including transportation safety requirements (e.g., acceptable methods for payload compliance) defined in the TRUPACT-II SAR, TRAMPAC (for compliance with 10 CFR 71, Subpart H), *WIPP Hazardous Waste Facility Permit* requirements for TRU mixed waste established in the WAP, and EPA environmental compliance requirements established in the 40 CFR 191/194, "Compliance Certification Application."

CH-WAC requirements are organized under five major categories: 1) container properties, 2) radiological properties, 3) physical properties, 4) chemical properties, and 5) data package contents.

Subsections 3.1 through 3.6 correlate with the organization in the CH-WAC for CH TRU waste requirements and identify methods of compliance to meet each requirement. Procedures that implement the process controls, techniques, tests, and other actions to be applied to each TRU payload container, waste stream, and shipment are also identified. Appendix A summarizes the CH-WAC and TRAMPAC requirements and identifies the Hanford site documents and procedures that implement each requirement. The numbering of CH-WAC requirements in appendix A correlates with the numbering system in the following subsections. Waste shipped to WIPP must comply with the most restrictive of the CH TRU requirements established in the CH-WAC and TRAMPAC. Therefore, only the most restrictive requirements are described in this subsection. In addition, because many CH-WAC and TRAMPAC requirements overlap, this subsection refers to section 4.0 of this document, where appropriate, for applicable methods of compliance and verification for both CH-WAC and TRAMPAC requirements.

3.1 SUMMARY OF WIPP AUTHORIZATION BASIS

Revisions of requirements in referenced documents controlled by agencies or organizations other than DOE (e.g., EPA, NMED, NRC) shall have precedence over values quoted in this certification plan. Changes incorporated in future revisions of the CH-WAC will be reflected in future revisions of this certification plan. Requests for exceptions (variances) to requirements must be submitted formally to the permittee for approval. The permittee cannot approve exceptions (variances) to external requirements that are controlled by organizations other than DOE without first obtaining changes to the controlling authorizations.

Only waste that is preceded by an approved WSPF will be shipped to WIPP. Only payload containers from a properly characterized and approved waste stream can be certified as meeting the requirements and associated criteria in this certification plan. The Hanford site shall submit characterization, certification, and shipping data to WIPP using the WWIS before shipment of that waste. Any payload containers with unresolved discrepancies associated with hazardous waste characterization will not be managed or disposed at WIPP until the discrepancies are resolved in accordance with requirements established in the WAP. Corrective action reports applicable to WAP requirements shall be resolved before waste shipment. Throughout this subsection and the discussions of compliance and verification methods, it can be assumed, unless otherwise noted, that if a requirement is not met, project personnel will

segregate the nonconforming item and initiate an NCR or CAR in accordance with WMP-400, Section 1.3.2, "TRU Nonconforming Item Reporting and Control," or WMP-400, Section 1.3.3, "TRU Corrective Action Reporting and Control." Corrective action will be taken in accordance with WMP-400, Section 1.3.1, "TRU Corrective Action Management," to resolve nonconformances. Also see subsection 5.3 of this certification plan for more details about the NCR/CAR process.

3.1.1 DOE Operations and Safety Requirements for WIPP

3.1.1.1 Requirements

The WIPP safety analysis report (SAR) addresses CH TRU waste handling and emplacement operations at the WIPP site. The waste accepted for emplacement in the WIPP must conform to the WIPP SAR and the associated technical safety requirements. The WIPP SAR 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 WIPP SAR establishes and evaluates the adequacy of the safety bases in response to plant normal and abnormal operations and postulated accident conditions.

3.1.1.2 Compliance and Verification

CH waste sent to WIPP will be certified in accordance with the HNF-2599 (*Hanford Site Transuranic Waste Characterization Quality Assurance Project Plan [QAPjP]),* HNF-2600, CH-WAC, and TRAMPAC requirements. Thus, waste containers certified by Hanford will be compliant with the WIPP SAR and associated technical safety requirements.

3.1.2 NRC Transportation Safety Requirements for the TRUPACT-II

3.1.2.1 Requirements

Acceptable methods for payload compliance are defined in the TRUPACT-II Certificate of Compliance (C of C) and implemented by the TRAMPAC. For shipments to WIPP, a site-specific TRAMPAC will be prepared describing how it will ensure compliance with each payload parameter. This site-specific TRAMPAC shall contain sufficient detail to allow reviewers to adequately understand and evaluate the compliance methodology for each payload parameter.

A packaging QA program that defines the QA activities that apply to the use of NRC-approved transportation packagings equivalent to 10 CFR Part 71, Subpart H, shall be prepared.

3.1.2.2 Compliance and Verification

CH waste sent to WIPP will be certified in accordance with HNF-2599 and HNF-2600 requirements. Section 4.0 of this document outlines the site-specific TRAMPAC requirements to meet NRC transportation safety requirements for use of the TRUPACT-II shipping vessel. A site-specific QA plan is outlined in section 5.0 of this document, consistent with 10 CFR Part 71, Subpart H.

3.1.3 NMED Hazardous Waste Facility Permit Requirements

3.1.3.1 Requirements

TRU waste is classified as TRU mixed waste if it contains hazardous constituents regulated under Resource Conservation and Recovery Act (RCRA). Only TRU mixed waste and TRU waste that have been characterized in accordance with the WIPP-WAP and meet the treatment, storage, and disposal facility (TSDF) waste acceptance criteria as presented in permit conditions II.C.3.a through II.C.3.k of the *WIPP Hazardous Waste Facility Permit* will be accepted at the WIPP facility for disposal in the permitted underground hazardous waste disposal unit.

Before disposal, a QAPjP that addresses all the applicable requirements specified in the WIPP-WAP shall be implemented. In accordance with attachment B5 of the WIPP-WAP, the QAPjP will include the qualitative or quantitative criteria for making a hazardous waste determination. All site QAPjPs will be reviewed and approved by the CBFO.

3.1.3.2 Compliance and Verification

CH waste sent to WIPP will be certified in accordance with HNF-2599 and HNF-2600 requirements. The Hanford site QAPjP (HNF-2599) implements the applicable requirements in the WIPP-WAP for mixed and nonmixed TRU waste characterization activities and includes the qualitative and quantitative criteria for making hazardous waste determinations. The Hanford site QAPjP is approved by CBFO.

3.1.4 EPA Compliance Certification Decision Requirements

3.1.4.1 Requirements

Title 40 CFR Part 194.24(c) specifies the limiting values for waste components for acceptance to WIPP. Appendix WCL (waste component limits) of the compliance certification application (CCA) identifies the repository limits for several waste components, including free water and metals, and cellulose, plastic, and rubber (CPR). Although the CCA does not specify limiting values for the activities and masses of specific radionuclides, table 4-6 of the CCA 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 compliance certification decision, 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, as required by table 4-10 of the CCA. 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 CH-WAC.

The WIPP limit for free water is a maximum of 1684 m^3 and is met by the residual liquid criterion specified in section 3.4.1 of the CH-WAC.

The limits for metals are a minimum of 2×10^7 kg for ferrous metals and 2×10^3 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 (see section 3.2.1 of the CH-WAC).

The WIPP limit for CPR is a maximum of 2×10^7 kg. The CPR weights must be estimated and reported in the WWIS on a payload container basis as required by section 3.6.1 of the CH-WAC.

Ten specific radionuclides must be quantified and reported for masses and activity for the purpose of tracking the total radionuclide inventory at WIPP, as specified in section 3.3.1 of the CH-WAC. The presence or absence of these specific radionuclides is determined from AK, radioassay, or both in accordance with appendix A of the CH-WAC. The results of this determination are reported in the WWIS on a payload container basis.

3.1.4.2 Compliance and Verification

CH waste sent to WIPP will be certified in accordance with HNF-2599 and this document. Subsection 3.3.1 and appendix E of this document outline the specific requirements and compliance activities related to radiological properties performed consistent with the CH-WAC. HNF-2599 identifies compliance activities meeting the other EPA compliance certification requirements (e.g., free liquids, metals, CPR).

3.1.5 Land Withdrawal Act Requirements

3.1.5.1 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. Hence, by law, WIPP can accept only radioactive waste generated by Atomic Energy defense activities of the United States.

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:

- 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 neither be transported, emplaced, nor disposed of at WIPP. 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 QA requirements.

3.1.5.2 Compliance and Verification

Only CH TRU defense waste characterized in accordance with the WIPP-WAP, CH-WAC, and consistent with the Hanford site QAPjP and this certification plan will be transported to WIPP for disposal. Each TRU waste stream is evaluated to determine whether the waste is designated defense. This determination is documented in the AK documentation as required by WMP-400, Section 7.1.9, “Acceptable Knowledge Documentation Management.”

3.2 CONTAINER PROPERTIES CRITERIA AND REQUIREMENTS

3.2.1 Payload Container Description

3.2.1.1 Requirements

CH TRU waste shall only be shipped in noncombustible DOT 7A, Type A, 55-gallon drums (either direct loaded or containing pipe overpacks [POCs]), standard waste boxes (SWBs) (either directed loaded or containing up to four direct-loaded 55-gallon drums), and ten-drum overpacks (TDOPs) (either containing up to ten direct-loaded 55-gallon drums, six 85-gallon drum overpacks, or one SWB) in the TRUPACT-II. Containers shall comply with the specifications in the TRUPACT-II SAR and the TRAMPAC document. All payload containers shall be made of steel and inspected to ensure they are in good and unimpaired condition before shipment (using the container integrity checklist in appendix D of the CH-WAC). The exterior of the container shall undergo 100 percent visual examination (VE) and be documented. Each payload container shall be assigned a payload shipping category. The number and types of payload containers will be reported to WWIS planned for shipments to WIPP.

3.2.1.2 Compliance and Verification

See subsection 4.1.1.2

3.2.2 Container Weight and Center of Gravity

3.2.2.1 Requirements

Individual payload container weights shall be limited to the weight capacities that meet DOT 7A, Type A, requirements or the weight limits specified by TRUPACT-II restrictions, whichever is less.

Table 3-1 defines the weight limits that apply to CH TRU waste payload containers, loaded TRUPACT-IIs, and TRUPACT-II shipments. In addition, weight limit calculations must

include the measurement error. Because all weight criteria must be met, different payload configurations are restricted by different requirements. For example, a payload assembly of fourteen 55-gallon drums may not be greater than 7,265 pounds, even though the maximum weight of a single 55-gallon drum may be 1,000 pounds. Although the maximum weight of the payload assembly must not exceed 7,265 pounds, the weight available for the CH TRU waste payload assembly will be less, depending on the as-built weight of the TRUPACT-II to be used (the average as-built weight of a production TRUPACT-II is 12,705 pounds). The weight available for the CH TRU waste payload assembly is obtained by subtracting the as-built weight of a TRUPACT-II from the maximum gross weight of 19,250 pounds. The maximum gross weight per TRUPACT-II is specified based on an approximate as-built weight of 13,050 pounds and an average payload weight of 6,200 pounds. This is usually the limiting weight for two TRUPACT-IIs per shipment. The DOT limit of 80,000-pounds gross vehicle weight rating must also be met. This is the limiting weight for three TRUPACT-IIs per shipment.

Table 3-1. Container and Assembly Weight Criteria

Component	Maximum Gross Weight (lbs.)
Individual Payload Container--Required for Certification	
55-gal. steel drum (must also meet restrictions in DOT 7A, Type A, specification	≤1,000
SWB	≤4,000
TDOP	≤6,700
Pipe Overpack Payload Container--Required for Certification	
Pipe overpack 6-in. diameter, in a 55-gal. drum	≤328
Pipe overpack 12-in. diameter, in a 55-gal. drum	≤547
S100 pipe overpack	≤ 650
S200 pipe overpack	≤ 547
Payload Container Assembly--After Waste is Certified	
Payload container assembly (fourteen 55-gal. drums or 2 SWBs)	≤7,265
TRUPACT-II	≤19,250
Truck (loaded tractor/trailer)	≤80,000

Source: TRAMPAC, section 2.3.1.1 and CH-WAC, table 3.2.2.

The center of gravity of a loaded TRUPACT-II shall be determined by the weights and locations of the individual CH TRU waste payload containers. The total weight of the top seven-pack of drums (including POCs) or an SWB shall be less than or equal to the total weight of the bottom seven-pack of drums or an SWB. The total weight of the top five 55-gallon drums or three 85-gallon drums in a TDOP shall be less than or equal to the total weight of the bottom five 55-gallon drums or three 85-gallon drums, respectively. The scale calibration shall be in accordance with the *National Institute of Standards and Technology (NIST) Handbook 44* or equivalent.

3.2.2.2 Compliance and Verification

See subsection 4.1.3.2.

3.2.3 Assembly Configurations

3.2.3.1 Requirements

Payload container assembly configurations authorized for shipment in the TRUPACT-II shall be in accordance with table 3-2, below.

Table 3-2. Maximum Number of Containers per TRUPACT-II and Authorized Packaging Configurations

Maximum Number of Containers	Authorized Packaging
14	55-gal. drums
14	55-gal. drums, each containing one pipe component (standard, S100, S200)
2	SWBs
2	SWBs, each containing one bin
2	SWBs, each containing up to four 55-gal. drums
1	TDOP, containing up to ten 55-gal. drums
1	TDOP, containing up to six 85-gal. drums (each overpacking one 55-gal. drum)
1	TDOP, containing one SWB
1	TDOP, containing one bin within an SWB
1	TDOP, containing up to four 55-gal. drums within an SWB

Source: TRAMPAC, section 2.1.1 and CH-WAC, section 3.2.1.

3.2.3.2 Compliance and Verification

See subsection 4.1.1.2.

3.2.4 Removable Surface Contamination (Payload Containers)

3.2.4.1 Requirements

The removable surface contamination for each CH TRU waste payload container or payload container assembly must be measured and documented before shipment. Removable surface contamination on CH TRU waste payload containers, payload assemblies, and packagings shall not be greater than 20 disintegrations per minute (dpm) per 100 cm^2 for alpha-emitting radionuclides or 200 dpm per 100 cm^2 for beta-gamma emitting radionuclides. Fixing surface contamination to meet the above criteria is not permitted.

3.2.4.2 Compliance and Verification

A Hanford site radiological control technician (RCT) surveys TRU waste containers and container assemblies for removable surface contamination before the containers are loaded for shipment. The RCT assesses removable contamination and documents the results in accordance with WRP1-OP-1225, "Radiological Support of TRUPACT-II Shipping and Receiving." If the RCT determines that removable contamination exceeds 20 dpm per 100 cm^2 for alpha-emitting radionuclides or 200 dpm per 100 cm^2 for beta-gamma emitting radionuclides, project personnel determine whether surface contamination can be removed to meet established limits. If compliance with removable surface contamination limits cannot be achieved, project personnel segregate and disposition noncompliant container(s) in accordance with nonconformance and corrective action procedures. The survey results are added to the container data package as described in WMP-400, Section 7.1.8, "Transuranic Waste Container Management Activities." The TCO confirms removable surface contamination survey results in accordance with WMP-400, Section 7.1.8.

3.2.5 Container Identification/Labeling

3.2.5.1 Requirements

Each CH TRU waste payload container shall be uniquely identified by means of labels permanently attached in conspicuous locations. The labels shall contain a unique container identification number (CIN) consisting of site and container information. The CIN shall be in medium- to low-density Code 39 bar code symbology (per ANSI/AIM BC1-1995) in characters at least 1-inch high, and alphanumeric characters at least 0.5-inches high. The bar code identification labels shall be placed at three locations about 120 degrees apart so that at least one label is clearly visible when drums are assembled into a seven pack (e.g., a label must be visible after slip-sheets and wrapping are applied). Labels are required on the flat sides of SWBs. For TDOPs, a minimum of one bar code is required. Each CH TRU waste payload container shall be marked with the shipping category after verification of all payload parameters. Containers shall be marked in accordance with 10 CFR 835 and/or 40 CFR 262.32, as applicable. See subsection 3.2.6 for dunnage container labeling requirements.

Payload containers shall be marked "Caution Radioactive Material" with the yellow and magenta label, consistent with 10 CFR 835. Those payload containers that are RCRA regulated will have the hazardous waste label affixed in accordance with 40 CFR Section 262.32.

3.2.5.2 Compliance and Verification

All waste containers currently in the Central Waste Complex (CWC) have a permanent bar code label containing a unique identification number. Generators procure waste containers with bar code labels affixed in accordance with the Hanford site's container management program. Before loading containers in the TRUPACT-II, WIPP bar code labels are added in three locations to each drum such that each bar code label is approximately 120 degrees apart around the drum. For SWBs, labels are required on flat sides. One label is required per TDOP.

After verifying all payload parameters, project personnel mark each container with the appropriate site and container information and shipping category description (see subsection 4.4.1). The TCO verifies compliance with container marking requirements by visually inspecting all TRU waste containers and their labels and comparing them to the container data package before shipment, in accordance with WMP-400, Section 7.1.8. The TCO confirms the appropriate shipping category and documents compliance on the payload container transportation certification document (PCTCD) and verifies the container marking as described in WMP-400, Section 7.1.8.

3.2.6 Dunnage

3.2.6.1 Requirements

If too few payload containers meeting all payload container and transportation requirements are available, dunnage must complete one of the configurations specified in table 3-2. Empty 55-gallon drum(s) or an empty SWB may be used as dunnage, as specified in section 3.2.5 of the CH-WAC and appendix 2.1 of the TRAMPAC. If an empty drum is used as dunnage to complete a seven-pack in a shipment to WIPP, the drum shall be labeled "EMPTY" or "DUNNAGE" and have a container marking in accordance with subsection 3.2.5 of this certification plan, as appropriate. Dunnage containers shall have open vent ports (e.g., vent ports shall not be plugged or filtered). If a seven pack of only dunnage 55-gallon drums or a dunnage of SWB is used, the container(s) shall be labeled only "empty" or "dunnage." The unique CIN label is not required for a seven pack of dunnage, 55-gallon drums, or a dunnage SWB. The use of dunnage should be minimized. The use of dunnage is reviewed and approved concurrently with the review and approval of shipment assemblies by the WWIS data administrator on a case-by-case basis.

3.2.6.2 Compliance and Verification

See subsection 4.1.2.1.

3.2.7 Filter Vents

3.2.7.1 Requirements

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 TRAMPAC to ensure equilibration of any gases that may have accumulated in the closed payload container.

Each payload container shall have one or more filter vents that meet the specifications of appendix 2.5 of the TRAMPAC. 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 available CBFO filter vent models is provided on the CBFO web page (http://www.wipp.ws/transport.htm). This Internet link is provided for informational purposes only and may change.

3.2.7.2 Compliance and Verification

See subsection 4.1.5.2.

3.3 RADIOLOGICAL PROPERTIES CRITERIA AND REQUIREMENTS

3.3.1 Radionuclide Composition

3.3.1.1 Requirements

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 17, appendix WCL). 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.

In addition to the ten WIPP-tracked radionuclides, the activity of other radionuclides contributing to FGE, PE-Ci, or decay heat that are used to determine (e.g., correlate or scale) the activity of one of the ten WIPP-tracked isotopes or otherwise contributes to at least 95 percent of the total radiological hazard must also be determined in order to meet TRAMPAC, DOT, and/or NRC requirements. PE-Ci shall be determined in accordance with appendix E of this document, and any TRAMAPAC-compliant method may be used to determine the other radiological properties. Appendix E provides radioassay requirements by which to characterize the waste. 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 before use. These other isotopes shall be reported on the TRUPACT-II bill of lading (BOL) or manifest in accordance with 49 CFR § 172.203 and 49 CFR § 173.433. 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.

3.3.1.2 Compliance and Verification

Nondestructive assay (NDA) personnel perform measurements of each TRU waste container using calorimetry, gamma energy assay (GEA), or imaging passive/active neutron (IPAN) systems to determine the radioactive material composition and quantify radionuclide masses. The requirements for NDA are presented in appendix E of this certification plan, and the equipment and procedures are approved by CBFO.

NDA personnel at the Waste Receiving and Processing (WRAP) facility follow NDA procedures described in WRP1-OP-0906, "Gamma Energy Assay Operations," and WRP1-OP-0905, "Imaging Passive/Active Neutron Assay Operations." NDA personnel at WRAP quantify radionuclide values in accordance with WMP-350, *Waste Receiving and Processing Facility,* Section 2.2, "Calculation of Assay Results." NDA personnel at WRAP use acceptable knowledge (AK) data and assay measurements and calculations to establish an isotopic profile of each waste container, which is reported in batch data reports in accordance with WMP-350, Section 2.3, "Data Management," and Section 2.8, "WRAP NDA Measurement Control Program."

NDA personnel at the Plutonium Finishing Plant (PFP) follow one of three NDA procedures listed below:

- ZA-948-385, "NDA Using GeniePC" or
- ZA-948-392, "NDA Using NDA 2000" or
- ZA-948-393, "NDA Using the Room 172 ANTECH Calorimeters"

NDA personnel at PFP calibrate the various assay systems in accordance with one of the three procedures listed below:

- ZA-400-301, "Energy and Efficiency Setup and Baseline Determination Using GeniePC" or
- ZA-400-303, "Energy and Efficiency Setup and Baseline Determination Using NDA 2000" or
- ZA-400-304, "ANTECH Calorimeter Calibration"

NDA personnel at PFP quantitate radionuclide values in accordance with ZA-400-302, "Calculation of Assay Results." NDA personnel at PFP use AK data and assay measurements and calculations to create an isotopic profile of each waste container, which is reported in batch data reports in accordance with FSP-PFP-5-8, *Plutonium Finishing Plant Administration*, Section 16.2, "Data Management."

The WCO and/or TCO report NDA batch data to WWIS and appropriate container certifications and shipping documents in accordance with WMP-400, Sections 7.1.5; 7.1.7, "TRU Waste Container Management Activities"; and 7.1.8.

3.3.2 Fissile Material Quantity (^{239}Pu Fissile Gram Equivalents [FGE])

3.3.2.1 Requirements

The fissile or fissionable radionuclide content, expressed in terms of ^{239}Pu fissile gram equivalent (FGE) plus two times the measurement error (expressed in terms of one standard deviation), of CH TRU waste payload containers shall not be greater than 200 grams per 55-gallon drum or pipe overpack, or 325 grams per SWB or ten-drum overpack (TDOP). A TRUPACT-II shall be acceptable for transport only if the ^{239}Pu FGE plus two times the measurement error is no greater than 325 grams for a payload of fourteen 55-gallon drums, two SWBs, or one TDOP, or 2,800 grams for a payload of 14 pipe overpacks. Table 3-1 of the TRAMPAC lists the ^{239}Pu FGE of many radionuclides. Table 3-3 (below) defines the maximum allowable quantity of fissile material, expressed as ^{239}Pu FGE, for CH TRU waste in the TRUPACT-II. The ^{239}Pu FGE of the radionuclides and associated measurement error in each waste container shall be reported to WIPP using the WWIS. Payload containers must meet both the TRUPACT-II and the CH-WAC repository requirements for criticality. The total ^{239}Pu FGE for a TRUPACT-II shall be calculated and recorded in the payload assembly transportation certification document (PATCD).

Table 3-3. ^{239} Pu FGE Limits

Payload Container	^{239}Pu FGE Limit (grams)
55-gal. drum (including pipe overpacks)	≤200
SWB	≤325
TDOP	≤325
TRUPACT-II (14 55-gal. drums, 2 SWBs, 1 TDOP)	≤325
TRUPACT-II (14 pipe overpacks, including S100 and S200 POCs)	≤2800

Source: CH-WAC, table 3.3.2

3.3.2.2 Compliance and Verification

See subsection 4.2.1.2 of this document.

3.3.3 TRU Alpha Activity Concentration

3.3.3.1 Requirements

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. 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 reporting to the WWIS; however, there are no reporting requirements for its associated TMU.

3.3.3.2 Compliance and Verification

NDA personnel measure TRU alpha activity concentration in accordance with the NDA process described in appendix E. Assay data are validated and verified at WRAP in accordance with WMP-350, Section 2.3, or at PFP in accordance with FSP-PFP-5-8, Section 16.2, and submitted in batch data reports to the site project office (SPO). The waste certification officer/transportation certification officer (WCO/TCO) confirms TRU alpha activity in accordance with WMP-400, Section 7.1.8 and reports it to WWIS in accordance with WMP-400, Section 7.1.5. (There are no reporting requirements for the TRU alpha activity TMU.) Project personnel manage waste containers with TRU alpha activity concentrations that do not exceed 100 nCi/g as low-level waste.

3.3.4 ^{239}Pu Equivalent Activity (PE-Ci)

3.3.4.1 Requirements

PE-Ci quantities shall be calculated in accordance with appendix B of the CH-WAC for each payload container. Assay methods will be approved by CBFO before use. In accordance with the limits stated in table 3-4 of the CH-WAC, PE-Ci quantities shall be limited to the following for each payload container.

Table 3-4. PE-Ci Limits

Waste Container	Packing Configuration	Pu-239 PE-Ci Limit
55-gal. drum in good condition	Direct load – all approved waste forms	≤ 80
	Direct load – solidified/vitrified waste only	≤ 1,800
	Overpacked into an 85-gal. drum, SWB, or TDOP – all approved waste forms	≤ 1,100
	Overpacked into an 85-gal. drum, SWB, or TDOP – solidified/vitrified waste only	≤ 1,800
55-gal. drum in damaged condition	Overpacked into an 85-gal. drum, SWB, or TDOP – all approved waste forms	≤ 80, ≤ 130, ≤ 130 respectively
	Overpacked into an 85-gal. drum, SWB, or TDOP – solidified/vitrified waste only	≤ 1,800[a]
55-gal. pipe component in good condition	Direct load – all approved waste forms	≤ 1,800
85-gal. drum in good condition	Overpacked into a TDOP – all approved waste forms	≤ 1,100
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800
85-gal. drum in damaged condition	Overpacked into a TDOP – all approved waste forms	≤ 130
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800 [a]
SWB in good condition	Direct load (or a bin) – all approved waste forms	≤ 130
	Direct load (or a bin) – solidified/vitrified waste only	≤ 1,800
	Overpacked into a TDOP – all approved waste forms	≤ 1,100
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800
SWB in damaged condition	Overpacked into a TDOP – all approved waste forms	≤ 130 [a]
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800 [a]

[a] The PE-Ci limit applies to the overpack container, not to individual containers that are damaged and overpacked.

PE-Ci quantities shall be reported to WIPP using WWIS. There are no TMU reporting requirements.

3.3.4.2 Compliance and Verification

NDA personnel calculate the activity of the CH TRU waste container as PE-Ci according to the methodology in appendix E and report this to WIPP using WWIS. Project personnel identify payload containers exceeding limits stated in table 3-4, segregate them, and disposition them in accordance with approved nonconformance and corrective action management. The WCO/TCO verifies compliance of the PE-Ci limits in accordance with WMP-400, Section 7.1.8. PE-Ci quantity will be reported in WWIS consistent with WMP-400, Section 7.1.5. (There are no reporting requirements for PE-Ci TMU.)

3.3.5 Radiation Dose Rate

3.3.5.1 Requirements

The external radiation dose rates of individual payload containers and the loaded TRUPACT-II shall be limited to ≤ 200 mrem/hr at contact and ≤ 10 mrem/hr at 2 meters for the TRUPACT-II only, as specified in 3.3.5 of the CH-WAC. Internal payload container shielding shall not be used to meet these requirements, except for the pipe component configuration. Total dose rate, including neutron contributions to the payload container, shall be reported into WWIS.

3.3.5.2 Compliance and Verification

For dose rate measurement, see subsection 4.2.2.2. These measurements will be reported to WIPP using WWIS consistent with WMP-400, Sections 7.1.5 and 7.1.8.

3.3.6 Decay Heat

3.3.6.1 Requirements

The sum of the decay heat for each payload container plus its TMU shall be less than or equal to the limits of the assigned shipping category specified in table 5.5-1 of appendix 5.5 of the TRAMPAC. For those payload containers that exceed the decay heat limit, a determination of compliance with the unified flammable (gas/VOC) concentration limit as specified in the TRAMPAC allows the payload container to be shipped in the TRUPACT-II package under test category (see subsection 3.5.5). The values calculated for decay heat and its associated TMU (expressed in terms of one standard deviation) shall be reported to the WWIS for each payload container.

3.3.6.2 Compliance and Verification

See subsection 4.4.1.2.

3.4 PHYSICAL PROPERTIES CRITERIA AND REQUIREMENTS

3.4.1 Liquids

3.4.1.1 Requirements

Liquid waste is prohibited at WIPP. CH TRU waste shall contain as little residual liquid as is reasonably achievable by pouring, pumping, or aspirating. Internal containers (e.g., bottles, cans) shall contain less than 1 inch (2.5 cm) of liquid in the bottom of the container. The aggregate volume of residual liquid in a payload container shall be less than 1 volume percent of the payload container. For sites that choose to use VE in lieu of NDE, the detection of any liquid waste in nontransparent inner containers, detected from shaking the container, will be handled by assuming that the container is filled with liquid and adding this volume to the total liquid volume for the payload container.

3.4.1.2 Compliance and Verification

See subsection 4.1.6.2.

3.4.2 Sealed Containers

3.4.2.1 Requirements

Payload containers shall be verified to be free of sealed containers greater than 4 liters (L).

3.4.2.2 Compliance and Verification

See subsection 4.1.8.2

3.5 CHEMICAL PROPERTIES CRITERIA AND REQUIREMENTS

3.5.1 Pyrophoric Materials

3.5.1.1 Requirements

Pyrophoric radioactive materials shall be present only in small residual amounts (less than 1 percent by weight) in payload containers and shall be generally dispersed in the waste. Radioactive pyrophorics in concentrations equal to or greater than 1 percent by weight and all nonradioactive pyrophorics shall be reacted (or oxidized) and/or otherwise rendered nonreactive before placement in the payload container. Nonradionuclide pyrophoric materials are not acceptable at WIPP.

3.5.1.2 Compliance and Verification

See subsection 4.3.1.2.

3.5.2 Hazardous Waste

3.5.2.1 Requirements

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 codes as appropriate. Only EPA hazardous waste codes listed as allowable in the *Hazardous Waste Facility Permit* may be managed at WIPP. Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (EPA hazardous waste numbers of D001, D002, or D003) are not acceptable at WIPP. In the context of the CH-WAC, hazardous waste codes are synonymous with hazardous waste numbers.

3.5.2.2 Compliance and Verification

Project personnel review AK information and implement one or more of the procedures identified in appendix A to characterize waste streams through headspace-gas sampling and analysis (on all waste containers) and homogeneous waste sampling and analysis (for nondebris waste streams). For homogeneous waste streams, toxicity characteristic and spent solvent EPA hazardous waste numbers are assigned based upon the analytical results and AK. For debris waste, EPA hazardous waste numbers are assigned based on AK. Toxicity characteristic (TC) and spent solvent EPA hazardous waste numbers are assigned to debris waste streams based on headspace-gas sampling and analytical results if AK indicates the waste might contain a constituent in excess of the regulatory level. If data are insufficient to demonstrate that the concentration of the constituent is less than the regulatory level, the EPA hazardous waste number for the identified constituent is applied to the waste stream. The SPM (or designee) reviews the analytical data to ensure that chemical constituents in the waste are allowable (section 3.5.2 of the CH-WAC). At the discretion of the SPM, additional sampling of the waste stream from which any nonconforming container originated may be performed to determine whether the container is anomalous or is representative of the entire waste stream.

Project personnel identify hazardous constituents in CH TRU wastes and record the data in accordance with applicable data management procedures. The TCO or WCO verifies that data are entered in the WWIS. The TCO ensures the uniform hazardous waste manifest (UHWM) reflects the hazardous waste codes as described in WMP-400, Section 2.1.5, “TRU Transportation Logistics.” The WCO and TCO confirm the hazardous waste criteria in accordance with WMP-400, Section 7.1.8.

3.5.3 Chemical Compatibility

3.5.3.1 Requirements

CH TRU mixed waste must not contain chemicals that would cause adverse reactions with other payload containers during handling or disposal. The CH TRU mixed waste must be compatible with backfill, seal, and panel closure materials at the WIPP facility; container and packaging material; and other waste. Only wastes that have been shown to meet the requirements consistent with section 3.5.3 of the CH-WAC are acceptable at WIPP.

Other chemicals or materials not consistent with the chemicals listed in the TRAMPAC, Tables 4-1 through 4-8, are allowed provided they meet the requirements for trace elements/constituents as described in subsection 4.3.3 of this document.

3.5.3.2 Compliance and Verification

See subsection 4.3.4.2.

3.5.4 Explosives, Corrosives, and Compressed Gases

3.5.4.1 Requirements

Waste shall contain no explosives, corrosives, or compressed gases (pressurized containers).

3.5.4.2 Compliance and Verification

See subsection 4.3.2.2.

3.5.5 Headspace Gas VOC Concentrations

3.5.5.1 Requirements

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, to determine volatile organic compound (VOC) concentrations.

Flammable VOCs are restricted to equal to or less than 500 ppm in the payload container headspace. For those payload containers that exceed the flammable VOC limit, a determination of compliance with the unified flammable (gas/VOC) concentration limit as described in the TRAMPAC allows the payload container to be shipped in the TRUPACT-II under the test category.

Test category payload containers shall be tested to quantify the hydrogen/methane, VOC, and total gas generation rates (as appropriate) for purposes of determining if all applicable limits are met.

3.5.5.2 Compliance and Verification

Headspace-gas sampling of payload containers shall be sampled and analyzed in accordance with HNF-2599 (Hanford site QAPjP). Evaluation of results is done in accordance with subsection 4.4.2.2 of this document.

3.5.6 Polychlorinated Biphenyl Concentration

3.5.6.1 Requirements

TRU waste with polychlorinated biphenyl (PCB) concentrations equal to or greater than 50 ppm (as determined by AK or sampling and analysis) is not allowed for disposal in the WIPP.

3.5.6.2 Compliance and Verification

Project personnel use AK and/or verification, testing, sampling, and analysis to demonstrate compliance with the PCB requirement. Waste generators use the VE technique during packaging of newly generated waste to verify that there is no indication that the waste materials contain PCBs greater than 50 ppm. Project personnel sample and analyze solidified organic sludge (S3220) waste streams for PCBs. For retrievably stored homogeneous waste streams other than S3220, project personnel use AK and randomly sample a statistically selected portion of each waste stream for VOCs, semi-volatile organic compounds (SVOCs), (including PCBs) and metals analyses. Field screening may be used to confirm AK for soils. Sampling and analysis is conducted in accordance with applicable procedures specified in the QAPjP. For retrievably stored debris waste, project personnel compile, record, and evaluate AK in accordance with WMP-400, Section 7.1.9, to demonstrate compliance with the PCB requirement. The WCO and TOC verify compliance with the PCB requirements in accordance with WMP-400, Section 7.1.8, and consistent with section 3.5.6 of the CH-WAC.

3.6 DATA PACKAGES CONTENTS

3.6.1 Characterization and Certification Data

3.6.1.1 Requirements

Sites shall prepare a WSPF for each waste stream. Each WSPF shall be approved by the CBFO before 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.

3.6.1.2 Compliance and Verification

Project personnel verify compliance with the data package requirements by reviewing data packages in accordance with WMP-400, Section 7.1.6, “Transuranic Waste Project-Level Data Validation and Verification.” The TCO and WCO ensure the WWIS data are entered into the system and transmitted to the WIPP for approval before waste shipment in accordance with WMP-400, Section 7.1.5.

The TCO and WCO verify the WSPF is complete and approved in WWIS consistent with WMP-400, Sections 7.1.1 and 7.1.5.

3.6.2 Shipping Data

3.6.2.1 Requirements

The TCO shall complete payload container transportation certification documents (PCTCDs) or overpack payload container transportation certification documents (OPCTCDs) and authorize the TRUPACT-II package for shipment by completing and signing the PATCD. Sites shall also prepare a bill of lading (BOL) for CH TRU waste shipments in accordance with 49 CFR 172, Subpart C, or UHWM in accordance with 40 CFR 262.23, and an LDR notification in accordance with the State of New Mexico Hazardous Waste Management regulations, as applicable. The LDR notification for CH TRU waste shipments shall state that the waste is not prohibited from land disposal.

3.6.2.2 Compliance and Verification

The TCO or alternate confirms that the auditable data package is complete in accordance with WMP-400, Section 7.1.8. If deficiencies are identified, the TCO and SPM resolve any deficiencies, and the data package is reviewed again.

The TCO prepares a TRUPACT-II PCTCD or OPCTCD in accordance with the TRAMPAC for each payload container before loading the container into a TRUPACT-II. The TCO completes the PCTCD or OPCTCD to certify an individual payload container and a PATCD to certify the payload assembly for shipping in accordance with WRP1-OP-0521, "Receive and Load TRUPACT Containers," which is based on section 6.0 of the TRAMPAC. Transportation and Packaging (T&P) personnel prepare a BOL or UHWM at the direction of the TCO. For nonmixed waste shipments, a BOL is prepared in accordance with the requirements of 49 CFR 172, Subpart C. A UHWM is prepared for mixed waste shipments in accordance with 40 CFR 262.23. With the initial shipment of each TRU mixed waste stream, an LDR one-time notification shall be prepared by the TCO or at the direction of the TCO, consistent with 40 CFR 268.7. Shipping data are prepared in accordance with WMP-400, Section 7.1.8 (consistent with the CH-WAC, WIPP-WAP, and TRAMPAC, appendices 6.1 and 6.2).

The project records custodian maintains the generator copy of the BOL, LDR, and/or the UHWM, as applicable, on file in accordance with WMP-400, Section 1.5.1.

T&P personnel perform final inspection and approval of the shipping documents. Transportation procedures are included in WMP-400, Section 2.1.5.

4.0 HANFORD COMPLIANCE PLAN FOR TRAMPAC

This section describes CH TRU waste management practices and procedures used at the Hanford site to demonstrate compliance with the TRAMPAC. The Hanford site must demonstrate compliance with TRAMPAC transportation requirements before TRU wastes can be shipped from the Hanford site in the TRUPACT-II, a Type B package certified for transporting CH TRU wastes.

This section is organized to correlate with the organization of the TRAMPAC, which defines payload requirements under the following categories:

- Container and physical properties
- Nuclear properties
- Chemical properties
- Gas generation
- Payload assembly
- Quality assurance.

Each TRAMPAC requirement is summarized, followed by descriptions of the Hanford site methods of compliance and verification. Each generator or storage site shall select and implement a single method, or a combination of methods, to ensure the payload is compliant with each requirement and is qualified for shipment. Because many of the TRAMPAC requirements overlap CH-WAC requirements, this section will refer to applicable sections and tables in section 3.0, where appropriate. QA is addressed in section 5.0 of this certification plan. Appendix A (consistent with the QAPjP) lists the CH-WAC and TRAMPAC requirements and identifies applicable Hanford site documents and procedures that implement each requirement. Appendix A (consistent with the QAPjP) is organized to correlate with section numbering for CH-WAC requirements. Therefore, the equivalent compliance and verification subsections of section 4.0 are cross-referenced in column two of appendix A (consistent with the QAPjP) to the applicable CH-WAC requirement(s) listed in column one of appendix A. Radiography requirements are addressed in the QAPjP.

Only wastes from a properly characterized and approved waste stream can be certified as meeting the requirements and associated criteria in this certification plan. Any payload containers with unresolved discrepancies associated with hazardous waste characterization will not be managed or disposed at WIPP until the discrepancies are resolved in accordance with requirements established in the WIPP-WAP. Corrective action reports applicable to WIPP-WAP requirements shall be resolved before waste shipment. Throughout this section and the discussion of compliance and verification methods, unless otherwise noted, if a requirement is not met, project personnel segregate the noncompliant item and initiate an NCR or CAR in accordance with WMP-400, Section 1.3.2, or Section 1.3.3. Corrective action will be taken in accordance with WMP-400, Section 1.3.1, to resolve nonconformances. (See subsection 5.3 of this document for more information about the NCR/CAR process.)

Hanford will ensure compliance with each waste container and payload before shipment. Compliance will be consistent with one or more methods described below.

1. Visual Examination. Visual examination (VE) at the time of waste generation (i.e., VE technique) may be used to qualify waste for transport. The operator(s) of a waste-generating area shall visually examine the physical form of the waste according to site/equipment-specific procedures and remove all prohibited waste forms before its placement in the payload container. Observation of the waste-generation process by an independent operator may be used as an independent verification of compliance before closure of the payload container. VE under a sampling program may be used to verify the absence of prohibited items.

2. Visual Inspection. Visual inspection may be used to evaluate compliance with specific restrictions (e.g., visual inspection of payload container type, marking, number of filters, etc.). Visual inspection by a second operator may be considered independent verification.

3. Real-Time Radiography (RTR). RTR may be used as an independent verification to qualify waste for transport. RTR shall be used to nondestructively examine the physical form of the waste and to verify the absence of prohibited waste forms, after the payload container is closed. The requirements for RTR are described in HNF-2599.

4. Records and Database Information. Information obtained from existing site records and/or databases or AK of the process may be used as a basis for reporting the absence of prohibited waste forms within waste containers. This information may be verified using RTR and/or a waste sampling program (as applicable).

5. Administrative and Procurement Controls. Site-specific administrative and procurement controls may be used to show the payload container contents are monitored and controlled and to demonstrate the absence of prohibited items.

6. Sampling Programs. Sampling programs may be used as an independent verification of compliance. A site-specific sampling program designed to address all payload requirements needing verification is recommended.

7. Measurement. Direct measurement or evaluation based on analysis using the direct measurement may be used to qualify waste (e.g., direct measurement of the weight or analysis of assay data to determine decay heat).

4.01 TRUCON Document

The TRUPACT-II Content Codes (TRUCON) document is a catalog of TRUPACT-II authorized contents and a description of the methods used to demonstrate compliance with the TRAMPAC. All containers must have an approved TRUCON code to be eligible for shipment in the TRUPACT-II. Each content code within the TRUCON document must contain the following elements, as described below:

- Content Description. Identifies the physical form of the waste (e.g., describing whether it is inorganic or organic, solidified, or solid). This is similar to the waste material type descriptions in the TRAMPAC.

- Storage Site. Provides the location of the waste, if the location is different than the generating site.

- Generating Site. Provides the location of waste generation.

- Waste Description. Provides basic information regarding the nature and main components of the waste.

- Generating Source(s). Lists processes and/or buildings at each site that generates the waste in each content code.

- Waste Form. Provides more detailed information on the waste contents, how the waste is processed, and specific information about the chemistry of constituents.

- Waste Packaging. Describes in detail techniques necessary for waste packaging in a given content code. This includes a description of the waste confinement layers, the number of layers of confinement used in packaging waste, and the mechanism for bag, can, or container closure.

- Assay. Describes the types of radioactive materials measurement techniques used to obtain fissile material content and decay heat values for a particular content code.

- Free Liquids. Describes the authorized procedures used by sites to ensure the limits imposed on free liquids (<1 percent by volume) are met for each content code.

- Explosives/Compressed Gases. Identifies the methods used to preclude the presence of explosives or compressed gases and the method for secondary verification of this requirement.

- Pyrophorics. Describes the controls in place at each site to ensure nonradionuclide pyrophoric materials in TRU waste are excluded, reacted to render nonpyrophoric, or are immobilized before placement in certifiable waste containers.

- Corrosives. Describes the controls in place to ensure that corrosive materials in TRU waste are either not present or are neutralized or immobilized before placement in a payload container.

- Chemical Compatibility. Describes the controls in place to ensure chemical compatibility for the waste contents and the TRUPACT-II. All chemicals/materials in the waste for a specific content code are restricted either to the allowable chemical lists or to the limits specified in the TRAMPAC.

- Payload Container Venting and Aspiration. Details how payload containers that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) are aspirated using one of three options to ensure equilibration of any gases that may have accumulated in the closed container. This procedure is required only for unvented waste.

- Additional Criteria. Provides details on how the waste qualifies for shipment by meeting additional transport requirements (e.g., filtering payload containers and puncturing liners).

- Shipping Category. Provides the numeric or alphanumeric notation summarizing waste and waste packaging description information whereby the payload container wattage and gas generation rate limits can be derived.

- Maximum Allowable Wattage. Provides a limit that may be used for evaluating payload container compliance with hydrogen gas concentration limits.

Any site requiring the transportation of TRU waste in the TRUPACT-II that is not described in an approved content code must request the revision or addition of a TRUCON code by submitting a request in writing to the TRUPACT-II cognizant engineer.

The TRUPACT-II cognizant engineer has the authority to review and approve any TRUCON code request only if compliance with the transportation requirements of the TRAMPAC document can be demonstrated. Any submittal not meeting the requirements of the TRAMPAC shall not be approved for inclusion in the TRUCON document or be used as the basis for a shipment in the TRUPACT-II. The TRUPACT-II cognizant engineer does not have the authority to change the transportation requirements for the TRUPACT-II or the TRAMPAC document without approval from the NRC.

The use, operation, and maintenance of the TRUPACT-II and its associated payload are operated under a QA program approved by CBFO.

Requests for revisions to content codes shall be submitted to the TRUPACT-II cognizant engineer and may include the following:

- Minor revisions to the content descriptions (e.g., changes to buildings or sources generating the waste)

- Changes to method(s) used to characterize the waste (e.g., the use of an alternate approved assay method)

- Changes to the packaging descriptions (e.g., the use of a different number of bag layers)

- Addition of a new authorized waste form from a given site (e.g., shipment of filter waste)

- Minor revisions to the chemical list for a specific content code.

TRUCON Document Process

The process for requesting a content code addition or revision is as follows:

1. The site prepares a draft content code containing sufficient information to satisfy all of the necessary elements of a code, previously identified. If the request is for a content code revision, only the revised elements require preparation and documentation. The site shall ensure that the information submitted in the form of a content code addition or revision accurately describes the waste and waste generating processes to the best of its knowledge.

2. The site submits the draft TRUCON code or TRUCON code elements in writing to the TRUPACT-II cognizant engineer for review.

3. Under the direction of the TRUPACT-II cognizant engineer, the submittal shall be reviewed for completeness and satisfactory demonstration of compliance with all the transportation requirements of the TRAMPAC. This review may include a review to ensure each of the previously identified elements is complete, the calculation or verification of new payload shipping categories to accommodate changes in packaging configurations using the Numeric Payload Shipping Category Worksheet (tables 5.4-1 through 5.4-3 in appendix 5.4 of the TRAMPAC), and the analysis of compliance with the list of allowable materials (for new waste forms or changes in chemical composition). Any submittal that does not demonstrate compliance with every transportation requirement for the TRUPACT-II shall not be approved by the TRUPACT-II cognizant engineer.

4. Upon completion of the review, the TRUPACT-II cognizant engineer shall send formal written notification to the site indicating the status of the request. If the request is denied, the TRUPACT-II cognizant engineer shall indicate in the notification the reason why the request was not accepted and shall identify which elements of the submittal are incomplete or out of compliance.

5. If the request is approved, a site may begin using the new or revised content code once official notification is received from the TRUPACT-II cognizant engineer. Sites may not use proposed content code additions or revisions to make shipments in the TRUPACT-II before receipt of written notification from the TRUPACT-II cognizant engineer.

6. All content code additions or revisions shall be recorded in the TRUCON document. The current revision of the TRUCON document shall be available to sites.

4.02 Compliance Program

Transportation Certification Official

The site transportation certification official (TCO) is responsible for administratively verifying the compliance of payload containers and the payload assembly with transportation requirements (TRAMPAC and DOT). The site TCO shall approve by signature on the transportation certification documents every payload for transport. In accordance with the WIPP waste acceptance criteria (CH-WAC), a similar position (WCO) is responsible for verifying all waste prepared for shipment to the WIPP meets the specified CH-WAC. The functions of the two positions may be performed by the same or different official(s).

CBFO

The CBFO is responsible for the performance of compliance verification audits, which are conducted for each program before the first shipment and periodically thereafter to evaluate TRUPACT-II payload compliance and specific areas of CH-WAC compliance. Compliance verification audits are not required at sites that document compliance by preparing waste-specific data packages that are reviewed and approved by the CBFO. Audit activities include document review and interview of site operators on a job-function basis relative to meeting the applicable criteria. Where specific technical ability is required (e.g., chemical compatibility, isotopic inventory, and assay), technical experts are included on the audit team. The audit team will grant or deny waste certification and waste transportation authorization based on objective findings.

The use, operation, and maintenance of the TRUPACT-II at the Hanford site is conducted under the QA program contained in section 5.0 of this document.

4.1 CONTAINER AND PHYSICAL PROPERTIES REQUIREMENTS

4.1.1 Container Descriptions

4.1.1.1 Requirements

Only the following payload containers, which must comply with the specifications in section 2.0 and appendix 2.1 of the TRAMPAC, are authorized for shipment in the TRUPACT-II:

- 55-gallon drum (including standard, S100, and S200 pipe overpacks)
- Standard waste box (SWB)
- Ten-drum overpack (TDOP).

The maximum number of containers per TRUPACT-II and authorized packaging configurations are shown in subsection 3.2.1.1, table 3-2, of this document.

4.1.1.2 Compliance and Verification

The Hanford site procures payload containers (e.g., 55-gallon drums, SWBs, and TDOPs) that meet the following requirements:

- SWBs and TDOPs are procured to the same standards and specifications as the containers used in Type 7A testing.

- New 55-gallon drums are procured as UN1A2, in accordance with applicable requirements of 49 CFR 173. Drums must be procured to the same standards and specifications used in DOT 7A, Type A, testing.

- Pipe overpacks (standard, S100 and S200) are procured in accordance with specifications identified in the TRAMPAC (section 2.1 and appendix 2.1).

Containers are inspected to ensure that they are DOT Specification 17C or 17H or meet UN1A2 (DOT 7A, Type A) requirements. Permanent markings embossed on the bottom of the drums are used to verify the drum type if procurement records are not available. Alternatively, if the markings are not visible (e.g., drums that are galvanized through a dipping process, which obscures the embossing), the drums are visually inspected and inspection results compared to requirements for 17C, 17H, or UN1A2 (DOT 7A, Type A) drums. Project personnel examine retrievably stored containers for compliance with the applicable requirements and verify the containers are in good and unimpaired condition. The TCO verifies the container meets the specific DOT 7A, Type A, criteria and documents it on a container integrity checklist (consistent with appendix D of the CH-WAC), in accordance with WMP-400, Section 7.1.8. Project personnel document their procurement acceptance and/or visual inspections. If packages cannot be shown to meet the above requirements by procurement records and/or physical examination, the TCO or project personnel take corrective action (e.g., accept as is or repackage the waste into a certifiable container) to resolve the nonconformance. The TCO verifies that the packaging meets applicable requirements and that the TRUPACT-II is assembled in an authorized packaging configuration, in accordance with WRP1-OP-0521 and WMP-400, Section 7.1.8.

Refer to appendix A, column “CH-WAC and Certification Plan Section,” row 3.2.1, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.1.2 Dunnage

4.1.2.1 Requirements

A shipper shall use empty drums or SWBs as dunnage to complete a 14-drum or 2-SWB payload configuration if too few payload containers are available that meet transportation requirements. Dunnage containers shall meet the specifications of section 2.2 and appendix 2.1 of the TRAMPAC except that dunnage containers shall have open vent ports (i.e., not filtered or plugged). Dunnage containers shall be marked in accordance with 4.1.4 of this subsection.

4.1.2.2 Compliance and Verification

Empty 55-gallon drums or SWBs that meet DOT Type A requirements may be used as dunnage. Dunnage drums may be assembled into a seven-pack of only dunnage drums or may be assembled into a seven-pack with drums of waste that meet all applicable requirements. Refer to subsection 4.1.4 for requirements for labeling dunnage containers. Loading personnel ensure that dunnage containers have open vent ports (e.g., vent ports shall not be plugged or filtered), in accordance with WMP-400, Section 7.1.8. Shoring, including empty drums, is provided as necessary inside a TDOP. The TCO ensures that dunnage drums meet all applicable requirements (e.g., through visual inspection and documentation before shipment) following the procedures WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.2.6, which contains the titles of applicable procedures that implement the requirements of this section.

4.1.3 Contain/Assembly Weight and Center of Gravity

4.1.3.1 Requirements

Section 2.3 of the TRAMPAC restricts the weight of individual payload containers, the payload assembly, loaded TRUPACT-IIs, and the center of gravity of each payload assembly. The weight limits are as follows:

- 1,000 pounds (453 kgs.) per 55-gallon drum (these drums must also meet restrictions in DOT 7A, Type A)
- 4,000 pounds (1,815 kgs.) per SWB
- 6,700 pounds (3,040 kgs.) per TDOP
- 328 pounds (149 kgs.) per standard pipe overpack with 6-inch pipe component
- 547 pounds (248 kgs.) per standard pipe overpack with 12-inch pipe component
- 650 pounds (294 kgs) per S100 pipe overpack
- 547 pounds (248 kgs) per S200 pipe overpack
- 7,265 pounds (3,296 kgs.) per payload assembly of fourteen 55-gallon drums (including pallet, guide tubes, slip-sheets [optional], reinforcing plates, and banding material)
- 7,265 pounds (3,296 kgs.) per payload assembly of two SWBs, including adjustable sling (optional)
- 19,250 pounds (8,734 kgs.) per loaded TRUPACT-II.

NOTE - Actual payload assembly weights are limited by "as-built" TRUPACT-II weights and DOT requirements for a loaded tractor/trailer.

The center of gravity requirements are as follows:

- The total weight of the top seven drums or SWB must be less than or equal to the total weight of the bottom seven drums or SWB.

- The total weight of the top five 55-gallon or three 85-gallon drums in a TDOP must be less than or equal to the total weight of the bottom five 55-gallon or three 85-gallon drums.

Each payload container (or dunnage) shall be weighed on a calibrated scale. Scale calibrations shall be in accordance with the *National Institute for Standards and Testing (NIST) Handbook 44* or an equivalent standard. The weight of each payload container and measurement error must be recorded on the PCTCD or OPCTCD. The weight and error of the total TRUPACT-II payload is reported on the PATCD.

4.1.3.2 Compliance and Verification

Loading personnel weigh individual payload containers in accordance with WRP1-OP-0503, "Move Waste Drums Throughout the WRAP Facility," to ensure that payload containers do not exceed maximum allowable weights determined from DOT 7A, Type A, testing and evaluation, those shown above, or table 3-1, whichever is less. Loading personnel calibrate and maintain the scale in accordance with *NIST Handbook 44*, calculate the error, and record the calibration results. If the waste container meets applicable weight limits, loading personnel record the weight of the container for each payload container. The TCO enters this weight information on the PCTCD (see appendix B-1) or OPCTCD (appendix B-2). The TCO reviews loading data and the PCTCD or OPCTCD to verify compliance with the individual payload container weight requirement and signs the PCTCD or OPCTCD, in accordance with WMP-400, Section 7.1.8. If the measured weight of the payload container (including the error) exceeds applicable weight limits, the containers are repackaged and reweighed.

The TRUPACT-II payload weight limit of 7,265 pounds includes a payload of 14 drums and the payload pallet, optional slip-sheets, reinforcing plates, guide tubes, and banding material; or a payload of two SWBs and optional nylon strap assemblies; or one TDOP. The total payload weight is obtained either from the weights and associated errors of the individual components or by weighing the complete assembly. If total payload weight is obtained by summing the weights of individual payload containers or dunnage (plus the weight of pallets, reinforcing plates, slip-sheets, guide tubes, and banding material), the measurement includes the square root of the sum of the squares of the individual measurement errors, as indicated on the PATCD. If total payload is weighed as an assembly, the measurement includes the error. The TCO plans the load using the PATCD (appendix D). The load is planned to ensure compliance with the center-of-gravity requirements by placing the heavier seven pack of drums or the heavier SWB at the bottom of the TRUPACT-II. The TCO also takes the actual as-built weight of the TRUPACT-II and the weight of the payload pallet, optional slip-sheets, reinforcing plates, guide tubes, and banding material into account as necessary during load planning. The loading personnel load the TRUPACT-II in accordance with the requirements of the PATCD, the *Contact-Handled Program Guidance* (DOE/WIPP-02-3183), and the *Contact-Handled Packaging Operations Manual* (DOE/WIPP-02-3184).

The TCO reviews the data and information, approves the weight of the total payload, verifies compliance with the TRUPACT-II payload weight and center-of-gravity requirements, and signs the PATCD. The TCO also verifies that TRUPACT-II trailer loads meet all DOT weight restrictions, in accordance with WMP-400, Section 7.1.8. All container weights are entered into WWIS before container and/or shipment approval. Approval is done by CBFO.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.2.2, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.1.4 Container Marking

4.1.4.1 Requirements

Each payload and dunnage container shall be labeled with the unique container identification number (CIN) and WIPP bar code (see subsection 3.2.5.1).

The CIN and WIPP bar code may be on the same label. If an empty 55-gallon drum or SWB is used as dunnage to complete a 14-drum or 2-SWB payload configuration, the dunnage container shall be labeled with the following information:

- Unique CIN
- "EMPTY" or "DUNNAGE."

If a seven-pack of only dunnage drums or three-pack of 85-gallon drums or a dunnage SWB is used in the TRUPACT-II, the container(s) shall be labeled "EMPTY" or "DUNNAGE." The unique CIN labels are not required for a seven-pack of dunnage drums or a dunnage SWB.

4.1.4.2 Compliance and Verification

In accordance with WRP1-OP-0521, loading facility personnel load the TRUPACT-II in one of the configurations identified in table 3-2. If dunnage containers are used, loading personnel mark each dunnage container with a unique identification number, label the containers "EMPTY" or "DUNNAGE," and document this action. Dunnage drums in a seven-pack assembly are reported by CIN and reported in the WWIS, consistent with WMP-400, Section 7.1.5. If a seven-pack of empty drums is shipped as dunnage, each dunnage container is labeled "EMPTY" or "DUNNAGE," but the containers are not marked with an identification number and not reported in the WWIS. Payload containers will be marked "Caution Radioactive Material" with a yellow and magenta label consistent with 10 CFR 835. Those payload containers that are RCRA regulated will have hazardous waste labels affixed. The TCO performs a visual inspection to verify whether dunnage containers are used, whether the containers are marked and labeled as required, and documents the information on the PCTCD or OPCTCD and PATCD, waste inspection checklist, and/or the waste dunnage certification statement (see WMP-400, Section 7.1.8).

4.1.5 Filter Vents

4.1.5.1 Requirements

Each payload container (except dunnage containers) to be transported in the TRUPACT-II must have one or more filter vents as specified below (including overpacked containers, as applicable). Appendix 2.5 and table 2.5-1 of the TRAMPAC specify the flow and hydrogen diffusion requirements for these filters. Filters to be installed on each waste container (at a minimum) are:

- 1 per 55-gallon drum
- 1 per 85-gallon drum
- 1 per pipe component overpacked in a drum
- 1 per filtered metal can (not applicable to waste Type II.2)
- 2 per SWB
- 2 per bin overpacked in a SWB
- 9 per TDOP
- 1 per sealed bag.

4.1.5.2 Compliance and Verification

The Hanford site procures filters for use on TRU waste containers. Filters must meet the specifications described in appendix 2.5 of the TRAMPAC and table 2.5-1 and the CH-WAC (section 3.2.7) and are procured in accordance with the Hanford site's procurement process identified in subsection 5.7 of this document.

Project personnel visually verify that filter vents, if present, have been installed properly as shown in DO-080-009, “Obtain Headspace Gas Samples of TRU Waste Containers”; ZO-160-080, “Pipe-N-Go Processing”; WRP1-OP-0503, “Move Drums Throughout the WRAP Facility”; or WRP1-OP-0522, “Assemble and Stretch Wrap TRUPACT-II Payload.” If filter vents are not installed, project personnel procure filter vents that meet specifications and install the correct number of filter vents. The TCO verifies and records this information on the PCTCD or OPCTCD, in accordance with WMP-400, Section 7.1.8. When a payload container does not meet the payload container filter requirements, an NCR is initiated. Nonconforming filters are replaced as necessary.

Previously unvented containers shall meet the aspiration requirements described in section 3.2.7 of the CH-WAC, appendix 5.6 of the TRAMPAC, and be consistent with WMP-400, Sections 7.1.8 and 7.1.7. The TCO verifies and records the aspiration methods as appropriate in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column “CH-WAC and Certification Plan Section,” row 3.2.7, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.1.6 Liquids

4.1.6.1 Requirements

Liquid waste is prohibited in the payload containers, except for residual amounts in well-drained containers. The total volume of residual liquid in a payload container shall be less than 1 percent (volume) of the payload container, consistent with section 2.6 of the TRAMPAC.

4.1.6.2 Compliance and Verification

Generators ensure TRU waste is not in free-liquid form, minor residual liquids remaining in internal containers (e.g., bottles, cans) do not exceed 1 inch (2.5 cm) in the bottom of any container, and the total liquid in the waste package does not exceed 1 volume percent. Very small amounts of liquid identified in items other than internal containers (e.g., vials, ampules, levels, etc.) may be considered residual and, therefore, are acceptable consistent with 40 CFR 264.314(a).

Initially, AK is used to determine container contents. AK is confirmed through radiography and/or VE for retrievably stored waste. AK is verified through the VE technique at the time of packaging for newly generated waste. Waste generators ensure that the contents of newly generated waste containers comply with the free liquids restriction. For retrievably stored waste, project personnel estimate liquid volume by radiography and/or VE, in accordance WMP-400, Section 7.1.3, “TRU Waste Repackaging, Visual Examination and Sampling,” WRP1-OP-0908, “Operation of the Drum Nondestructive Examination System,” and applicable procedures listed in appendix A, and record the location of any liquid detected in a CH TRU waste container. NDE and/or VE personnel reject payload containers found to have greater than 1 volume percent liquid or greater than 1 inch of liquid in the bottom of an internal container and segregate them. If necessary, personnel repackage noncompliant waste containers in accordance with WMP-400, Section 7.1.3. The TCO verifies compliance on the PCTCD or OPCTCD, in accordance with WMP-400, Sections 7.1.7 and 7.1.8.

Refer to appendix A, column “CH-WAC and Certification Plan Section,” row 3.4.1, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.1.7 Sharp or Heavy Objects

4.1.7.1 Requirements

Sharp or heavy objects in the waste shall be blocked, braced, or suitably packaged as necessary to provide puncture protection for the payload containers packaging these objects, consistent with section 2.7 of the TRAMPAC.

4.1.7.2 Compliance and Verification

For retrievably stored waste, AK initially is used to determine container contents. AK is confirmed by radiography and/or VE of the payload container contents before certification. These activities are consistent with section 2.7 of the TRAMPAC and WMP-400, Section 7.1.8.

As appropriate, noncompliant items are removed or repackaging of sharp or heavy objects is conducted in a manner to preclude puncturing the payload container.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.4.1, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.1.8 Sealed Containers

4.1.8.1 Requirements

Sealed containers greater than 4 liters are prohibited, except for waste material type II.2 packaged in metal containers. Waste material type II.2 in metal containers does not generate any flammable gas (see subsection 3.4.2 of this document and section 2.8 of the TRAMPAC).

4.1.8.2 Compliance and Verification

For newly generated waste, the waste generators use the VE technique during packaging to ensure prohibited physical waste forms are not present in waste containers. Waste generators process items such as pressurized or sealed containers to eliminate any condition that may result in rejection of the payload container. The generator verifies that the waste placed in the container meets the physical form requirements. Friction-fit or slip-lid containers are not considered to be sealed unless the lid is completely taped around its edge to the container body. A rigid 55-gallon drum liner, if present, shall be punctured with a hole with a minimum 0.3-inch diameter or fitted with a filter, consistent with Appendix 2.5 of the TRAMPAC. Twist-and-tape closure, fold-and-tape closure, and heat-seal closure (with a minimum of one filter vent) are allowable methods for closing plastic bags used for waste confinement. For retrievably stored waste, project personnel ensure compliance with the physical form requirements through AK verified by radiography and/or VE of the payload container contents. A payload container rejected for noncompliance with the physical form requirements is marked and segregated, or the noncompliant item is removed and the container is repackaged and reprocessed to verify remaining certification requirements. The TCO verifies compliance on the PCTCD or OPCTCD and the container integrity checklist, in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," rows 3.4.2 and 3.2.7, which contain the titles of applicable procedures that implement the requirements of this subsection.

4.2 NUCLEAR PROPERTIES REQUIREMENTS

4.2.1 Nuclear Criticality

4.2.1.1 Requirements

A payload container shall be acceptable for transport only if the ^{239}Pu fissile gram equivalent (FGE) plus two times the measurement error is less than 200 grams for a drum or pipe overpack, or 325 grams for an SWB or TDOP.

A TRUPACT-II shall be acceptable for transport only if the ^{239}Pu FGE plus two times the measurement error is less than 325 grams for a payload of fourteen 55-gallon, two SWBs, or one TDOP; or 2,800 grams for a payload of 14-pipe overpacks.

There are two primary methods for determining isotopic composition (3.1.2 of TRAMPAC). Mass spectrometry (MS) is a primary method for determining radioisotopic composition of plutonium product material. Gamma ray pulse height analysis is the other method used to determine isotopic composition for gamma-emitting radionuclides. When MS is used to determine isotopic composition, the analyses must be performed in accordance with American Society for Testing and Materials (ASTM) methods (e.g., ASTM C 696-80, ASTM C 697-86, ASTM C 759-79, and ASTM C 853-82 [References 8.5, 8.6, 8.7, and 8.8]), or equivalent. NDA is performed in accordance with appendix E of this document and consistent with section 3.1.2 of the TRAMPAC.

The following are the five allowed assay methods for quantifying radionuclides in TRU waste. These methods are described in attachment B of the TRAMPAC.

1. Passive gamma
2. Radiochemical
3. Passive neutron coincidence counting assay
4. Passive-active neutron assay
5. Calorimetry.

Pu-239 FGE for other fissile or fissionable isotopes, including special actinide elements, shall be obtained using the American National Standards Institute (ANSI)/American Nuclear Society (ANS) method ANSI/ANS-8.15-1981 (Reference 8.4) or an equivalent method. Table 3-1 of the TRAMPAC lists the ^{239}Pu FGE, as well as the decay heat and specific activity of many radionuclides.

The quantity of the radionuclides in each payload container shall be estimated by either a direct measurement or records of the individual payload container, summation of assay results from individual packages in a payload container, or by direct measurement on a representative sample of a waste stream. The measured quantity of radiation is used to calculate the quantity of other radionuclides and the total quantity of ^{239}Pu FGE.

The isotopic inventory for each payload container shall include the identity, total quantity, and measurement error for all radionuclides in the waste container. In addition, the total fissile loading in ^{239}Pu FGE and its measurement error must be determined for each payload container. The ^{239}Pu FGE for each payload container is summed to compute the total measured ^{239}Pu FGE for the proposed TRUPACT-II payload. The total ^{239}Pu FGE error is the square root of the sum of the squares of the individual ^{239}Pu FGE errors. The total shipment ^{239}Pu FGE (measured value plus two times the total error) is compared to the TRUPACT-II limit for ^{239}Pu FGE.

4.2.1.2 Compliance and Verification

Project personnel compile and review AK to make initial determinations about radionuclide content and concentrations. NDA personnel at WRAP confirm AK by obtaining information on the isotopic composition of the waste through radioassay of the filled payload container following WRP1-OP-0906 and, if necessary, WRP1-OP-0905, "Imaging Passive/Active Neutron Assay Operation." NDA personnel at PFP confirm AK by obtaining information on the isotopic composition of the waste through radioassay of the storage cans that are packaged into the payload container following ZA-948-385, ZA-948-392, or ZA-948-393. The NDA requirements are specified in appendix E of this certification plan.

NDA personnel compute the container ^{239}Pu FGE and container ^{239}Pu FGE error manually or using a computational algorithm. Individual radionuclide mass quantities and errors are converted to ^{239}Pu FGE by multiplying the mass values (g) by ^{239}Pu FGE conversion factors (FGE/g) listed in the TRAMPAC. The container ^{239}Pu FGE is determined by summing the ^{239}Pu FGE for each radionuclide in the container.

The TCO verifies the container FGE data and records them on the PCTCD or OPCTCD in accordance with WMP-400, Section 7.1.8. The TCO sums the container ^{239}Pu FGE and two times the container ^{239}Pu FGE error and compares the result to the limits of 200 FGE per drum and 325 FGE per SWB. If the container does not meet the criterion, project personnel at WRAP repackage it in accordance with WRP1-OP-0725, "TRU Sorting Glovebox Operation."

To assess compliance with the payload ^{239}Pu FGE requirements, the TCO computes the payload ^{239}Pu FGE and the payload ^{239}Pu FGE error. The payload ^{239}Pu FGE is computed as the sum of the container ^{239}Pu FGE values for all containers in the proposed payload. The payload ^{239}Pu FGE error is computed by taking the square root of the sum of the squares of two times the container ^{239}Pu FGE error values for all containers in the payload. Finally, the payload ^{239}Pu FGE and the payload ^{239}Pu FGE error are summed and compared to the limit of 325 ^{239}Pu FGE or 2800 ^{239}Pu FGE per 14 POCs. The ^{239}Pu FGE and its associated measurement error are reported to WWIS consistent with WMP-400, Section 7.1.5. If the payload does not meet the criterion, a different combination of payload containers is identified that meets the TRUPACT-II ^{239}Pu FGE limit. Once a compliant payload is identified, the TCO records the sum of the payload ^{239}Pu FGE and payload ^{239}Pu FGE error on the PATCD in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," rows 3.3.1 and 3.3.2, which contain the titles of applicable procedures that implement the requirements of this subsection.

4.2.2 Radiation Dose Rates

4.2.2.1 Requirements

The external radiation dose rates of individual payload containers and the loaded TRUPACT-II payloads to be shipped on a trailer must be less than or equal to 200 mrem/hr at the surface and 10 mrem/hr at a 2-meter distance for TRUPACT-II only, as specified in section 3.2 of the TRAMPAC. The radiation dose rates for the TRUPACT-II must also comply

with 10 CFR 71.47. Drums that exceed the 200-mrem/hr surface dose rate may not be transported in a TRUPACT-II. Internal payload container shielding shall not be used to meet dose rate limits (≤ 200 mrem/hr) except for the POC configurations shown in appendices 2.2, 2.3, and 2.4 of the TRAMPAC document.

In addition, S100 and S200 pipe overpacks shall meet the curie limits identified in appendices 2.3 and 2.4 of the TRAMPAC, respectively.

4.2.2.2 Compliance and Verification

A Hanford site RCT measures surface dose rates of the individual payload containers in accordance with WRP1-OP-1225 using the beta-gamma and neutron dose rates for each container at the surface, and records the results for each payload container. If the combined beta-gamma and neutron dose rate exceeds 200 mrem/hr at the surface, the container is rejected, marked, and segregated. Corrective action is taken to resolve the noncompliant condition. In addition, S100 and S200 pipe overpacks shall meet the curie limits identified in appendices 2.3 and 2.4 of the TRAMPAC, respectively. The payload container and the TRUPACT-II surface dose rate and the dose rate at 2 meters shall be measured with instruments traceable to a national standard. The dose rates shall be recorded before each shipment.

The RCT also surveys the loaded TRUPACT-II surface before shipping. Additionally, the reading from a TRUPACT-II at a 2-meter distance from any side of the TRUPACT-II (excluding the top and bottom) is recorded on the PATCD. If this reading exceeds 10 mrem/hr at 2 meters, the TCO rejects the TRUPACT-II from shipment. If the TRUPACT-II is rejected from shipment, corrective action is taken to resolve the noncompliant condition.

After the payload assemblies are loaded into the TRUPACT-II, the RCT surveys the vehicle's driver and passenger space to ensure the dose rate does not exceed 2 mrem/hr. The TCO reviews the radiation dose rates and records the results of the RCT survey of the TRUPACT-II and transport vehicle on the PATCD for the payload assembly, consistent with WMP-400, Section 7.1.8. Dose rates for payload containers and TRUPACT-II vessels are reported to WWIS consistent with WMP-400, Section 7.1.5. Project personnel submit radiation dose rate measurement reports to the project records custodian. The TCO verifies compliance with the radiation dose rate requirements by signing the PATCD in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.3.5, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.3 CHEMICAL PROPERTIES REQUIREMENTS

4.3.1 Pyrophorics

4.3.1.1 Requirements

A pyrophoric is any solid material, other than one classed as an explosive, which under normal conditions is likely to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited, burns so vigorously and persistently as to create a serious transportation handling or disposal hazard. Included are spontaneously combustible and water-reactive materials.

Pyrophoric radioactive materials shall be present only in small residual amounts (< 1 percent [weight]) in payload containers. Radioactive pyrophorics in concentrations greater than 1 percent by weight and all nonradioactive pyrophorics shall be reacted (or oxidized) and/or otherwise rendered nonreactive before placement in the payload container.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.2.5, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.3.1.2 Compliance and Verification

Nonradionuclide pyrophoric materials at the Hanford site are subject to procurement controls. In general, the Hanford site does not permit pyrophoric materials in TRU waste process areas. If a process requires the use of pyrophoric materials, the quantity of pyrophoric materials that enters the process is limited and controlled, and the waste must be treated to render it chemically safe before placement in a waste container.

Examples of pyrophoric radionuclides are metallic plutonium and americium. Examples of nonpyrophoric are organic peroxides, sodium metal, and chlorates.

For newly generated waste, waste generators use AK and the VE technique during packaging to ensure prohibited items are not present in waste containers. Waste generators process items to eliminate any condition that may result in rejection of the payload container. VE personnel verify that the waste placed in the container meets the pyrophoric restriction. For retrievably stored waste, project personnel verify compliance with the pyrophorics restriction by obtaining information (e.g., administrative, operating, and QA procedures and safety assessments) documenting that waste does not contain pyrophorics or other prohibited materials. Project personnel review and evaluate AK to verify that waste-producing processes included no pyrophorics or other prohibited materials. AK includes sampling and analysis data, documentation of waste stream descriptions, or actions to treat or stabilize the waste to eliminate specific characteristics. Project personnel verify AK through radiography and VE of randomly selected waste containers. The TCO documents compliance on the PCTCD or OPCTCD, and the WCO and TCO confirm the pyrophorics criteria in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.5.1, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.3.2 Explosives, Corrosives, and Compressed Gases

4.3.2.1 Requirements

An explosive is defined as “any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion (e.g., with substantial instantaneous release of gas and heat).” Examples of explosives are ammunition, dynamite, black powder, detonators, nitroglycerin, urea nitrate, and picric acid.

A corrosive is defined as an aqueous material that has a pH less than or equal to 2 or greater than or equal to 12.5.

Explosives, corrosives, and pressurized containers are prohibited from the payload, consistent with section 4.2.1 of the TRAMPAC.

4.3.2.2 Compliance and Verification

The Hanford site prohibits explosives, compressed gases, and corrosive liquids in payload containers. Chemicals (e.g., oxidizers) capable of forming explosive mixtures under conditions incident to transportation or storage are also prohibited from the waste. The Hanford site administratively controls and monitors the procurement, distribution, use, and disposal of explosive materials through site-specific operating and QA procedures. Additionally, waste-generating processes must be assessed for safety hazards such as potential explosion hazards and potential inadvertent production of explosive materials. Corrosives must be either excluded from the payload container or processed to neutralize the corrosive material or otherwise render it noncorrosive. Process-specific operating procedures describe the specific actions taken to ensure compliance with the corrosive material prohibition, consistent with section 4.2.1 of the TRAMPAC.

For newly generated waste, waste generators use AK and the VE technique during packaging to ensure that there is no indication of the presence of waste materials that may contain explosives, compressed gases, and corrosives in waste containers. Waste generators process items to eliminate any condition that may result in rejection of the payload container. For retrievably stored waste, project personnel verify compliance with the prohibited items requirement by obtaining information (e.g., administrative, operating, and QA procedures and safety assessments) documenting that waste does not contain explosives, corrosives, or pressurized containers. Project personnel review and evaluate AK to verify that waste-producing processes included no prohibited or restricted materials. AK includes sampling and analysis data, documentation of waste stream descriptions, or actions to treat or stabilize the waste to eliminate specific characteristics. Project personnel verify that prohibited materials are not in the waste container through radiography. Radiography is verified through VE of randomly selected waste containers. The TCO documents compliance on the PCTCD or OPCTCD, and the WCO and TCO verify this information in accordance with WMP-400, Section 7.1.8.

See also appendix A, column "CH-WAC and Certification Plan Section," row 3.5.4, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.3.3 Chemical Composition

4.3.3.1 Requirements

The chemical constituents allowed within a given waste material type are restricted so that a conservative bounding G-value can be established for the gas-generation potential in each waste material type, consistent with section 4.3 of the TRAMPAC.

Chemical constituents in a payload shall conform to the allowable chemical lists in tables 4-1 through 4-8 of the TRAMPAC. The total quantity of the trace chemicals/materials (i.e., materials that occur in the waste in quantities less than 1 percent [by weight]) in any payload container is restricted to less than 5 percent (weight).

4.3.3.2 Compliance and Verification

Waste generators and/or project personnel initially review AK information to identify chemical constituents in the waste. AK is verified based on the results of sampling and analysis activities. The TCO compares the payload container inventory with the allowable material/chemical lists in the TRAMPAC tables 4-1 through 4-8. If a TRUCON code has not been assigned to the waste in the container, project personnel assign the appropriate TRUCON code based on the waste stream characterization information as described in the TRUCON. If the waste is not listed in the correlation tables of the TRUCON or if there is no corresponding TRUCON code listed in the TRUCON, the payload container is not eligible for shipment. The TCO requests TRUCON code changes or additions from the TRU cognizant engineer as necessary. The TCO verifies the TRUCON code assignment of each payload container before certification for shipment to WIPP and documents this on the PCTCD. The TCO does this consistent with WMP-7.1.8. The OPCTCD and PATCD are completed in accordance with WMP-400, Section 7.1.8 (consistent with section 1.5 of the TRAMPAC).

See also appendix A, column “CH-WAC and Certification Plan Section,” rows 3.5.3 and 3.6.1, which contain the titles of applicable procedures that implement the requirements of this subsection.

4.3.4 Chemical Compatibility

4.3.4.1 Requirements

The allowable chemical lists in tables 4-1 through 4-8 of the TRAMPAC restrict the chemical composition of the TRUPACT-II payload. Chemical compatibility of a waste with its packaging ensures that chemical processes will not occur that might pose a threat to the safe transport of a payload in the TRUPACT-II. Chemical compatibility has been verified for the following:

- Chemical compatibility of the waste form within each individual payload container

- Chemical compatibility between contents of payload containers during hypothetical accident conditions

- Chemical compatibility of waste forms within the TRUPACT-II inner containment vessel (ICV)

- Chemical compatibility of the waste form with the TRUPACT-II O-ring seals.

4.3.4.2 Compliance and Verification

Project personnel ensure compliance with the chemical compatibility requirements based on AK and analytical data, consistent with EPA guidance (EPA-600/2-80-076, *A Method for Determining Compatibility of hazardous Wastes)*. The TCO verifies chemical compatibility by comparing payload container inventory with approved TRUCON codes using the chemical lists in the TRAMPAC tables 4-1 through 4-8. The WCO and TCO confirm chemical compatibility criteria in accordance with WMP-400, Section 7.1.8. If necessary, project personnel repackage CH TRU waste containers not meeting the chemical compatibility requirement.

Refer to appendix A, column "CH-WAC and Certification Plan Section," row 3.5.3, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.4 GAS GENERATION REQUIREMENTS

4.4.1 Payload Shipping Category

4.4.1.1 Requirements

Gas generation, concentrations, and pressures during transport of CH TRU wastes in a TRUPACT-II payload are restricted as follows:

- For any package containing water and/or organic substances that could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis of a representative package such that the following criterion is met over a period of time that is twice the expected shipment time. The hydrogen generated must be limited to no more than 5 percent by volume of the innermost layer of confinement (or equivalent limits for other inflammable gases) if present at standard temperature and pressure (STP).

- The gases generated in the payload and released into the ICV cavity shall be controlled to maintain the pressure within the TRUPACT-II ICV cavity below the acceptable design pressure of 50 pounds-per-square-inch gauge (psig).

CH TRU waste is classified into payload shipping categories to evaluate and ensure compliance with the gas-generation requirements. The thermal wattage (decay heat) allowed in each payload shipping category is restricted such that the hydrogen generated during twice the expected shipment time results in a molar quantity of not more than 5 volume percent in any

layer of confinement in the payload container or packaging. 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)
- Gas release resistance (type of payload container and type and maximum number of confinement layers used).

For any given payload container, the shipping category provides a basis to determine the gas-generation potential of the contents and the resistance to gas release of the packaging configuration. This enables evaluation of compliance with the gas-generation requirements (5 percent limit on hydrogen concentration). Two payload shipping category notations are available. A shipping site may use either notation. Descriptions of the two notations are presented below.

Numeric Shipping Category Notation

The numeric shipping category notation (initiated in the TRAMPAC) is a ten-digit code, in the form XX YYYY ZZZZ, where

XX = the waste type, which indicates the chemical composition of the waste

YYYY = the G value, or gas generation potential, of the waste material type multiplied by 10^2

ZZZZ = the resistance to hydrogen release of the packaging configuration multiplied by 10^{-4}

A description of the parameters follows.

Waste Type

Payloads for the TRUPACT-II package are subdivided into four waste types based on physical and chemical form as shown in table 4-1. Table 4-1 also shows the shipping category notation denoting each waste type.

Waste Material Type

The four waste types can be further subdivided into waste material types. The waste material types define the gas generation potential of the waste. A listing of the chemicals/materials allowed in each waste material type is presented in the TRAMPAC, tables 4-1 through 4-8. An effective G value quantifying the gas generation potential of each waste material type is assigned based on the chemicals allowed. Table 4-2 (of this certification plan and consistent with appendix 5.1 of the TRAMPAC) lists the waste material types and their respective bounding G values, along with the shipping category denoting the bounding G value.

Total Resistance

The determination of the total resistance to gas release of a payload container requires knowledge of the type and maximum number of layers of confinement used to package waste. Allowable closure methods for confinement layers are specified in appendix 5.3 of the TRAMPAC. The plastic layers of confinement in payload containers are of three types–liner bags, inner bags, and filtered bags, as described in appendices 2.5 and 2.6 of the TRAMPAC. The release rates for these types of bags have been quantified. Any other confinement layers used shall be shown to be equivalent to one of the three listed above.

The shipping category notation used to denote the total resistance to hydrogen release of the packaging configuration of a payload container is the sum of all the resistances from all confinement layers (seconds/mole) multiplied by 10^{-4}, rounded up, and reported as digits (ZZZZ). For example, the shipping category notation for a total resistance of 1,395,163 seconds/mole is "0140."

The shipping category assignment for a 55-gallon drum containing solid inorganic waste packaged within two filtered, plastic-liner-bag layers is:

20 0170 0140

where,

20 = Waste Type II

0170 = G value (x 10^{2}) of Waste Material Type II.1

0140 = Total resistance to hydrogen release (x 10^{-4}) of the two filtered bags.

Alphanumeric Shipping Category Notation

This shipping category notation (used through Rev. 16 of the TRAMPAC) was based on the same parameters as the numeric notation (initiated in revision 17), but conveyed the information through a different set of parameters.

The alpha-numeric shipping category notation was based on the waste material type, the payload containment type, and the type and number of confinement layers a payload contains.

Table 4-1. Summary of Payload Waste Types

Waste Type[a]	Waste Type[b]	Description of Examples
I	10	Solidified Aqueous or Homogenous Inorganic Solids (<1% organics – not including packaging) absorbed, adsorbed or solidified inorganic liquid soils, concreted inorganic particulate waste, solidified particulates, or sludges formed from precipitates
II	20	Solid Inorganics Glass, metals, crucibles Other solid inorganics
III	30	Solid Organics Plastics (e.g., polyethylene, polyvinyl chloride) Cellulose (e.g., paper, cloth, wood) Cemented organic solids Other solid organics
IV	40	Solidified Organics Cemented or immobilized organic liquids and solids

[a]Payload shipping category notation used through TRUPACT-II SAR, Rev. 16
[b]Payload shipping category notation used through TRUPACT-II SAR, Rev. 17

Source: TRAMPAC, table 5-1

Table 4-2 CH TRU Waste Material Types and G Values

Waste Material Type[a]	Typical Material Description	G Value	Numeric Shipping Category Notation[b] (G Value x 10^2 (YYYY)
I.1	Absorbed, adsorbed, or solidified inorganic liquid	1.6	0160
I.2	Soils, solidified particulates, or sludges formed from precipitation	1.3	0130
I.3	Concerted inorganic particulate waste	0.4	0040
II.1	Solid inorganic materials in plastic bags (watt*year ≤ 0.012)	1.7	0170
II.1	Solid inorganic materials in plastic bags (watt*year >0.012)	0.32	0032
II.2	Solid inorganic materials in metal cans	0	0000
II.3	Homogeneous solid inorganic materials with unbound absorbed ambient moisture (≤ 6 percent by weight) in metal cans	0.08	0008
III.1	Solid organic materials (watt*year ≤ 0.012)	3.4	0340
III.1	Solid organic materials (watt*year > 0.012)	1.09	0109
III.2	Homogeneous mixed organic (10 percent by weight) and inorganic (90 percent by weight) materials in metal cans (watt*year ≤ 0.012)	0.34	0034
III.2	Homogeneous mixed organic (10 percent by weight) and inorganic (90 percent by weight) materials in metal cans (watt*year > 0.012)	0.11	0011
III.3	Homogeneous mixed organic (10 percent by weight) and inorganic (90 percent by weight) materials in plastic bags (watt*year ≤ 0.012)	1.85	0185
III.3	Homogeneous mixed organic (10 percent by weight) and inorganic (90 percent by weight) materials in plastic bags (watt*year > 0.012)	0.4	0040
IV.1	Solidified organics	Unknown test	9999

[a]Payload shipping category notation used through Revision 16 of the TRUPACT-II SAR
[b]Payload shipping category notation initiated in Revision 17 of the TRUPACT-II SAR

Table 4-3
Alpha-numeric Shipping Category Notation for Payload Container Configurations

Notation	Description
A	55-gal. drums with materials in additional layers of confinement (such as rigid liners[s], bag[s], and can[s] and includes 55-gal. drums overpacked in a TDOP)
B	Overpack of four 55-gal. drums in an SWB (SWB overpack)
C	SWB with materials in additional layers of confinement (such as bag[s] and can[s])
D	Overpack of one experimental bin in an SWB
E	Overpack of one pipe component in a 55-gal. drum (pipe overpack)

Source: TRAMPAC, table 5-3

Table 4-4
Alpha-numeric Shipping Category Notation for
Layers of Confinement in Payload Containers

Notation	Description
0	No closed bags around waste
1	Up to a maximum of 1 closed bag around waste
2	Up to a maximum of 2 closed layers of bags around waste
3	Up to a maximum of 3 closed layers of bags around waste
4	Up to a maximum of 4 closed layers of bags around waste
5	Up to a maximum of 5 closed layers of bags around waste
6	Up to a maximum of 6 closed layers of bags around waste
M	Metal container(s) as the innermost layer of confinement
a	For Waste Types II and III packaged in drums, denotes a minimum of 2 liner bags
b	For all waste types packaged in SWBs, denotes a minimum of 1 SWB liner bag
f	All layers of bags around waste are vented with a minimum of 1 filter vent
T	Payload container qualified for shipment under the test category.

Source: TRAMPAC, table 5-4

The shipping category assignment for a 55-gallon drum with alpha-numeric shipping category notation is:

II.1A2af

where,

II.1 = the waste material type (solid inorganic materials in plastic bags [table 4-2 of this document])

A = the type of payload container (55-gallon drum [table 4-3 of this document])

2 = the number of confinement layers (2 bag layers [table 4-4 of this document])

af = the type of confinement layers (filtered drum liner bags [table 4-4 of this document]).

Each payload container shall be assigned to a payload shipping category that shall have the following components:

- Waste type
- Waste material type that defines the gas generation potential
- Total resistance
  - Confinement layer: The inner layers of confinement around the waste materials in a payload container shall be a plastic bag and/or metal cans that meet the specifications outlined in appendix 5.3. Any other confinement layers must be equivalent by demonstration of hydrogen release rates equal to or greater than those established in appendix 5.3 of the TRAMPAC.
  - Rigid liners: The rigid liner, if present, shall be punctured by an equal to or greater than 0.3-inch diameter hole or fitted with an equivalent filter vent (consistent with appendix 2.1 of the TRAMPAC).

4.4.1.2 Compliance and Verification

For retrievably stored waste, AK is verified by radiography and/or VE. Before the completion of waste certification and transport, the assigned shipping category must contain an approved TRUCON.

Wastes generated at the Hanford site will be categorized into several waste streams. The TRUCON generally lists Hanford site waste streams and their associated waste material types and transportation parameters (e.g., shipping categories, decay heat, total resistance, confinement layers).

Numeric or Alpha-Numeric Shipping Categories

The TCO shall verify compliance by looking up the numeric shipping category for the appropriate content code in the TRUCON document, comparing the approved TRUCON codes to assigned shipping categories, consistent with WMP-400, Section 7.1.8. If a TRUCON code is not approved, a request must be submitted to the TRUPACT-II cognizant engineer for approval. The TCO records the appropriate shipping category on the PCTCD or OPCTCD, as applicable, in accordance with WMP-400, Section 7.1.8.

For alpha-numeric shipping categories, the TCO shall compare the payload container data with allowable shipping categories from the TRUCON document. The shipping category is recorded on the PCTCD or OPCTCD, as applicable, in accordance with WMP-400, Section 7.1.8.

Equivalent Shipping Categories

Consistent with section 6.0 of the TRAMPAC, a payload can be made up of the same, equivalent, or different shipping categories. To be equivalent, they must be:

- Same waste type
- Can be different waste material types
- Decay heat or measured hydrogen gas-generation rate must be bound by lowest limit.

The TCO requests updates to the TRUCON and associated shipping categories from the TRUPACT-II cognizant engineer as necessary when additional waste types are identified. As waste is selected for processing, the shipping category is assigned based on AK and/or visual inspection, consistent with WMP-400, Section 7.1.9 or Section 7.1.3.

Total Resistance

Confinement layers shall be determined and verified through AK, RTR, VE, and/or VE technique consistent with WMP-400, Sections 7.1.9, 7.1.3, 7.1.8, and 7.1.10, respectively. If any other type of confinement and layer other than those noted in table 4-4 of this document are used, equivalency shall be established by demonstration of hydrogen release rate greater than or equal to the approved confinement layers.

The TCO verifies and documents confinement layers consistent with WMP-400, Sections 7.1.8 and 7.1.5.

Rigid liners shall be vented with a fitted filter equivalent to filters described in appendix 2.5 of the TRAMPAC or punctured with a greater than 0.3-inch diameter hole. The TCO verifies and documents the compliance consistent with WMP-400, Sections 7.1.8, 7.1.3, and 7.1.5.

Decay Heat

The TCO verifies and documents the maximum allowable decay heat plus the measurement error (one standard deviation) in accordance with WMP-400, Sections 7.1.8 and 7.1.5.

Refer to appendix A, column "TRAMPAC (& Certification Plan Section, if applicable)" row 5.1, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.4.2 Compliance with Gas/VOC Concentration Limits (Analytical/Test Category) Flammable Volatile Organic Compounds

4.4.2.1 Requirements

The primary mechanism for flammable gas generation in TRU waste is radiolysis. TRU waste transported in the TRUPACT-II is restricted so that no flammable mixtures can occur in any layer of confinement during shipping. Payload containers to be transported in the TRUPACT-II can be classified into one of two categories based on compliance with the flammable (gas/VOC) limits:

1. Analytical Category. Under the analytical category, a conservative analysis is used to impose decay heat limits on individual payload containers to ensure that flammable (gas/VOC) limits are met. Specifically, flammable VOCs are restricted to less than or equal to 500 parts per million (ppm) in the payload container headspace (to ensure their contribution to flammability is negligible), and a founding G value is used to conservatively estimate the potential for flammable gas generation due to radiolysis. This G value accounts for both hydrogen and methane gas generation potential based on the waste type. The 5 percent limit on hydrogen concentration is then met by imposing a decay heat limit that restricts the amount of radioactive material that can be present in the payload container.

2. Test Category. Payload containers that do not meet the analytical category limits are classified as test category (see appendix 5.7 or 5.8 of the TRAMPAC document). Under the test category, one of two options is used for determining compliance with flammable (gas/VOC) limits:

    a. Measurement of the headspace of payload containers for flammable (gas/VOC) concentrations and determination of the potential flammability of the (gas/VOC) mixture in the innermost layer of confinement during transportation, and

    b. Full-drum testing to determine compliance with flammable (gas/VOC) limits for individual 55-gallon drums.

VOC absorbing or adsorbing material (such as granular-activated carbon to adsorb carbon tetrachloride) may be placed in a payload container provided the following can be

demonstrated through testing, analysis, or verified through AK. Testing/measurement can be done consistent with appendix 5.6, 5.7, and/or 5.8 of the TRAMPAC document.

- The absorbent/adsorbent remains effective in retaining VOCs from the time of waste package through the end of the maximum shipping period in the TRUPACT-II, and

- A flammable mixture of gases does not exist in the innermost layer of confinement, and

- The total concentration of potentially flammable VOCs does not exceed 500 ppm in the headspace of a payload container.

Headspace-gas sampling for VOCs is required for each payload container. The VOC limit is equal to or less than 500 ppm. Before performing headspace gas, the drum age criteria (DAC) must be met for determination of 90 percent steady-state concentration in a waste container. The 90 percent steady state can be correlated to the VOC concentration in the innermost confinement layer by use of prediction factors. Appendix 5.6 of the TRAMPAC document outlines the various DAC options that can be used for compliance.

The limit on flammable VOCs will be met either by means of process controls or by suitable sampling programs. A list of flammable VOCs is presented in section 5.6, table 5.6-1, of the TRAMPAC.

4.4.2.2 Compliance and Verification

Project personnel verify that wastes are in compliance with the 500-ppm flammable VOC limit through review of documentation of the chemical inputs and outputs. Project personnel obtain headspace-gas samples from all containers, and analytical laboratory personnel analyze headspace-gas samples to verify that wastes are in compliance with the 500-ppm flammable VOC limit. Waste streams that meet the conditions specified in Sections B-3a1(i) and B-3a1(ii) of the QAPjP qualify for reduced sampling of headspace gas. These waste streams will have the headspace gas from a statistically determined number of containers sampled and analyzed. The statistical approach specified in Section B2-2 of the QAPjP will be used to specify the number of randomly selected containers from a waste requiring headspace-gas sampling and analysis. Analytical laboratory personnel determine VOCs, SVOCs, and metals in the waste matrix according to the waste type and approved procedures.

The SPM or designee reviews the analytical data to ensure that chemical constituents in the waste are allowable in accordance with the chemical lists and that flammable VOCs in the headspace of the payload containers are less than 500 ppm. If a payload container is greater than 500 ppm, it qualifies as test category wastes, and compliance is determined either by measurement or testing. Measurement or testing is consistent with the requirements of subsection 4.5.2.1 of this document and compliance verified consistent with subsection 4.5.2.2 of the document.

If a concentration of equal to or less than 500 ppm flammable VOCs cannot be established, determination can be established through several paths depending on the drum age of the container and other testing and measurement capabilities of the site. For example:

- Measurement of VOCs can be done provided the requirements for DAC for flammable VOC measurement can be met using DAC and/or prediction factors.
- If waste type is IV, full drum testing requirements must be met for a payload container to be approved for shipment.
- If decay heat is greater than the analytical limit of an analytical category, measurement of a payload container can be used to demonstrate compliance.
- If total gas concentration is equal to or greater than 500 ppm flammable VOCs, determination of shipability can be done using E-TRAMPAC in accordance with WWIS.

The TCO reviews the DAC per payload container to verify compliance, in accordance with WMP-400, Section 7.1.8. The prediction factors for DAC compliance can be verified by using E-TRAMPAC in WWIS. WWIS entries will be in accordance with WMP-400, Section 7.1.5. Decay heat limits, full-drum testing requirements for category IV wastes, and containers with greater than 500 ppm shall be verified to be compliance in accordance with subsection 4.5.2.2 of this document.

At the discretion of the SPM, additional sampling of the waste stream from which nonconforming containers originated will be performed to determine whether the container is anomalous or is representative of the entire waste stream. The TCO documents compliance on the PCTCD or OPCTCD and/or container test category data sheet, as applicable and confirms the flammable VOC criteria in accordance with WMP-400, Section 7.1.8. Project personnel identify those containers that are noncompliant, segregate, and disposition them in accordance with WMP-400, Section 1.3.1, 1.3.2, and/or 1.3.3, as applicable.

Refer to appendix A, column “CH-WAC and Certification Plan Section,” row 3.5.5, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.4.3 Venting and Aspiration

4.4.3.1 Requirements

Drums that have been stored in an unvented condition (e.g., no filter installed and/or rigid liners not punctured) shall be aspirated for a sufficient period of time to equilibrate gases that may have accumulated in the closed containers before transport. For payload containers of waste types in packaging configurations that do not generate any flammable gas, aspiration is not required (e.g., waste type II.2). Appendix 5.9 of the TRAMPAC offers three options, any one of which may be implemented.

- Option 1 - Aspiration Time Based on Date of Drum Closure. This option determines aspiration time based on the closure date of the payload container and the TRUCON code. This method does not require sampling of headspace gases.

- Option 2 - Headspace Gas Sampling at the Time of Venting. This option determines aspiration time based on the measured concentration of hydrogen in the headspace of the drum (between the drum lid and the rigid liner) at the time of venting.

- Option 3 - Headspace Gas Sampling During Aspiration. This option uses the measured headspace concentration of hydrogen two or more weeks after venting to determine aspiration time.

4.4.3.2 Compliance and Verification

Project personnel ensure that all containers are properly vented or repackage CH TRU waste into vented containers. Unvented containers will be allowed to aspirate for a period of time determined using one of the options and applicable aspiration tables presented in the TRAMPAC. If option 2 or 3 is used to determine aspiration time, project personnel follow headspace-gas sampling requirements identified in the QAPjP and the TRAMPAC appendix 5.9, and analyze the headspace-gas samples. Analytical personnel determine the concentration of hydrogen in the headspace-gas samples. The TCO enters the aspiration option used and the information required to compute the aspiration time on the PCTCD or OPCTCD in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column “TRAMPAC (& Certification Plan Section, if applicable)” row 5.3, which contains the titles of applicable procedures that implement the requirements of this subsection.

4.5 PAYLOAD ASSEMBLY REQUIREMENTS

This subsection describes the procedures that must be followed to assemble a payload approved and qualified for transport in the TRUPACT-II in accordance with the TRAMPAC.

The parameters described in previous subsections shall be evaluated for selection of a payload.

The CIN number shall uniquely identify the payload container. The content code identifies a payload shipping category per the TRUCON. Whenever applicable, the measured parameters (weight, fissile material, and the decay heat) shall be checked against the limits after addition of the measurement error, as detailed in previous subsections.

If the container does not meet any of the limits, it shall be rejected from transport, marked, and segregated. If all requirements are satisfied except for the decay heat limit or flammable VOC limits, the container can be assigned to a test category and can be qualified for transport only by the procedure outlined in subsection 4.5.2 of this document and consistent with the TRAMPAC.

Only waste with approved content codes described in the TRUCON document may be transported in the TRUPACT-II. Shipping categories impose restrictions and requirements on the manner in which a payload can be assembled as follows:

- Payload selection shall be made from only those payload containers that have been approved for shipment.

- After all the payload parameters have been quantified and verified and the transport requirements are satisfied, the shipping category must be confirmed.

- Individual containers forming a payload within each TRUPACT-II shall belong to the same shipping category or equivalent categories allowed by the TRAMPAC (see appendix 6.3). This permits the management of different waste material types, different payload containers, and different internal packaging configurations. This requirement applies to drums (including POCs), SWBs, and TDOPs.

- Payload containers qualified for transport in the analytical and test categories cannot be mixed in a TRUPACT-II.

- Payload containers with different shipping categories may be shipped when each payload container demonstrates compliance with the flammability index (FI). A payload can be qualified for shipment only if the FI of each payload container is equal to or less than 50,000. If one or more payload containers fail the FI requirements, the payload assembly shall be reconfigured until all payload packages satisfy this requirement. The FI is calculated as the ratio of the actual flammable gas generation rate to the allowable flammable has generation rate limit multiplied by 50,000.

- Transportation parameters of individual payload containers are recorded on the PCTCD or OPCTCD and/or the TRUPACT-II test category payload container data sheets. Separate PCTCD and OPCTCD forms are used for the analytical payload shipping category and the test payload shipping category. (Examples of these forms are provided in appendices B-1, B-2, and C, respectively.) Information on these forms should be available for each payload container, even if the format is not identical to that shown in appendices B-1 through B-4 and C (e.g., use of a computer-generated form is acceptable provided all required information is included). A payload container may be certified for transport only if all transportation parameters are in compliance with the TRAMPAC. The TCO verifies compliance before containers are authorized for transport.

- A TRUPACT-II shipment is authorized only if all the transportation requirements are met and verified by the TCO. The transportation parameters of every TRUPACT-II shipment are then recorded on the PATCD (shown in appendix D). The information on this form must be available for each payload assembly, even if the format is not identical to that shown in appendix D (e.g., use of a computer-generated form is acceptable provided all required information is included). The shipper shall maintain the shipping records for a minimum period of three years.

All authorized payloads must meet the requirements set forth in the TRAMPAC. Data on the parameters for specific payloads are obtained by the methods outlined in this document in accordance with the specific limits of the TRUCON. The following subsections describe methods for evaluating the payload container and shipment data against TRUPACT-II limits and restrictions. All container and shipment data are entered into WWIS and must be approved by CBFO.

4.5.1 Certification of Individual Payload Containers for Transport in the TRUPACT-II (Analytical Payload Shipping Category)

4.5.1.1 Requirements

Generating and storage sites shall qualify an individual payload container for transport in a TRUPACT-II under the analytical category by verifying that the container meets the parameter requirements/limits listed in previous subsections of this certification plan. All parameters noted on the PCTCD or OPCTCD for overpack containers shall be included in any modified version. Data on the parameters for specific payloads shall be obtained by the methods outlined in this document, be consistent with the TRAMPAC, and the TRAMPAC and shall be consistent with the information for each parameter provided in the TRUCON.

Individual payload containers must be qualified for transport in a TRUPACT-II by verifying that each container meets the requirements and limits for the parameters listed on the PCTCD or OPCTCD for overpacks for the analytical payload shipping category.

4.5.1.2 Compliance and Verification

The TCO completes a PCTCD or OPCTCD for analytical category waste in accordance with WMP-400, Section 7.1.8, to qualify an individual payload container for shipping. The TCO signs and dates the PCTCD or OPCTCD after verifying that each container meets the following transportation parameter requirements.

- Container ID and container Bar Code Numbers--identification numbers unique to each container and used to track process data and package history
- Shipping Category--assigned using the corresponding tables in the TRUCON or as approved by the TRUPACT-II cognizant engineer
- Content Code--acquired either from the data package (preassigned) or by correlating the waste description with the applicable contents code list in the TRUCON
- Container Type and Configuration (e.g., direct load or overpacked or fixed)—obtained by visual inspection, RTR, or VE
- Certification Site--the location at which transportation takes place (e.g., the generating site for newly generated waste; the generating or storage site for retrievably stored waste)

- TRAMPAC/Transportation Parameters--for each payload container, the following criteria must be met:
  - Free liquids limited to residual amounts less than 1 percent of container volume (no free liquids)
  - Nonradioactive pyrophorics are prohibited
  - Explosives are prohibited
  - Corrosives are prohibited
  - Pressurized containers are prohibited
  - Sealed containers greater than 4 liters are prohibited, except for waste material Type II.2 packaged in metal cans
  - Drum liner (if present) is punctured/filtered
  - Flammable VOCs are limited to not more than 500 ppm per payload container or be evaluated for meeting the requirements of the test category (see subsection 4.5.2.2 of this document)
  - Radiation dose rates are limited to not more than 200 mrem/hr at the surface of the payload container
  - Filter Identification—Information obtained by visual inspection includes filter vent identification of both supplier and date of installation, lot number, or unique serial number. The type and number of filters will be documented depending on container type. For fixed configurations (e.g., pipe overpacks), the filter information shall be documented for both the payload containers (e.g., inner pipe component and outer drum).

Measured Transportation Parameters

- Weight--the maximum weight limit for the appropriate payload container type shall be recorded. Loaded weight of each payload container obtained from the data package. Container weight (plus error at one standard deviation) is obtained from the data package (an error is assigned to the container weight in accordance with project methodology) and total weight plus error compared against the allowable limit for each payload container. If overpacked, the maximum allowable limit applies to the outermost payload container.

- Decay Heat (Plus Error)--obtained and recorded from the data package. Decay heat plus error (at one standard deviation) is compared against the allowable decay heat limit per payload container for applicable shipping category. For mixed category and/or taking credit for dunnage, the decay heat limit is marked N/A, and the flammability index is used and recorded.

- Fissile Mass (Plus Two Times the Error)--obtained from NDA data report (fissile mass calculated by combining isotopic inventory data and ^{239}Pu FGE for each radionuclide in the waste, plus error (at one standard deviation) is assigned to the fissile mass for the appropriate payload container. If overpacked, the allowable limit applies to the outermost payload container.

- Curie Limits—obtained and recorded from the NDA data reports, as applicable, for only S100 and S200 POCs. The measured curie value plus measurement error (one standard deviation) must meet the appropriate limit.

Unvented Waste Parameters

- Aspiration Method Option 1, 2a, 2b, or 3)--confirms that the requirements on aspiration time for containers that have been closed (e.g., not vented with an approved filter vent) for a period of time are met. Aspiration methods must be determined and recorded. Aspiration methods include:
  - Container Closed Time (Option 1)—the period of time a payload container has been unvented in storage. That time is recorded.
  - Headspace H_2 Concentration (Option 2a, 2b, or 3)—The H_2 concentration measured in the headspace of a payload container is recorded.
  - Aspiration Period/Aspiration Table—Aspiration time selected shall be limited to the value specified by appropriate aspiration table. If H_2 concentration indicates the aspiration is not needed, a zero is recorded on the PCTCD. This is not applicable for test category containers or overpacked containers.
  - Time Container Vented—Indicates the number of days the payload container has vented. The time that the container was vented must comply with the prescribed aspiration period recorded above.

Overpack Payload Container Parameters

Identification Parameters

- Overpack Container ID Number/Bar Code Number—The site-specific ID number is unique to each container of waste and provides a means for tracking process data records and package history.

- Payload Shipping Category Number—The governing shipping category for the overpack configuration shall be determined by selecting the payload shipping category of the container being overpacked with either the lowest decay heat limit or the lowest hydrogen/flammable gas generation rate limit. These values shall be determined by consulting the appropriate PCTCDs completed for the payload container(s) to be overpacked.

- Decay Heat Limit—The maximum allowable decay heat per payload container for the governing payload shipping category of the overpacked configuration.

- Hydrogen/Flammable Gas Generation Rate Limit—the governing flammable gas generation rate limit for the overpack is recorded either from an approved shipping category or from the test category container data sheet.

- Overpack/Overpacked Container Type—Select the appropriate overpack container type and overpacked container type. The payload container shall be one of the approved types in one of the following authorized configurations.
  - SWB with 55-gallon drum(s) (SWB overpack)—Waste packaged in 55-gallon drum(s) overpacked in one SWB (up to four 55-gallon drums per SWB)

- TDOP with 55-gallon drums—Waste packaged in 55-gallon drum(s) overpacked in one TDOP (up to ten 55-gallon drums per TDOP)
- TDOP with SWB—Waste packaged in one SWB overpacked in one TDOP (one SWB per TDOP)
- TDOP with SWB overpack—Waste packaged in 55-gallon drum(s) overpacked in one SWB (up to four 55-gallon drums per SWB) overpacked in one TDOP (one SWB per TTDOP).
- TDOP with 85-gallon drum overpack(s)—Waste packaged in one 55-gallon drum overpacked in one 85-gallon drum overpacked in one TDOP (up to six 85-gallon drum overpacks per TDOP)
- TDOP with bin overpack—Waste packaged in one bin overpacked in one SWB overpacked in one TDOP (one bin overpack per TDOP).

- Weight Limit—The maximum allowable weight limit for the appropriate overpacking payload container type (i.e., SWB or TDOP) shall be recorded. The limit applies only to the outermost payload container.
- Fissile Mass Limit—The maximum allowable fissile mass limit for the appropriate payload container type (i.e., SWB or TDO) shall be recorded.
- Certification Site—The certification site shall be recorded at the location at which transportation certification occurs.
- Content Code—The content code from the data package for the payload container shall be approved.

TRAMPAC Transportation Parameters

Compliance information for the TRAMPAC transportation parameters shall be obtained from the data package for the payload container. The TCO indicates compliance and documents it on the OPCTCD as appropriate. The following criteria shall be met.

- Radiation Dose Rate Equal to or Less Than 200 mrem/hr at Surface of Payload Container—The limit applies only to the outermost payload container. If an SWB overpack will be overpacked in a TDOP, the limit for radiation dose rate applies only to the TDOP.

- Filter Identification-- If a payload container will be overpacked, the limit applies to only the outermost payload container. The number of filters will be documented depending on container type. For fixed configurations (e.g., pipe overpacks), the filter information shall be documented for both the payload containers (e.g., inner pipe component and outer drum).

Overpacked Container Measured Parameters

- Overpacked Container ID Number—List the site-specific identification number for each of the overpacked payload containers.

- Measured Weight and Measurement Error—The measured weight and measurement error (one standard deviation) for each overpacked payload container or the entire overpack configuration shall be recorded and is limited to

the outermost container configuration. The measured weight and measurement error may be obtained from PCTCD(s) or OPCTCD for each overpacked payload container. The measured weight of the individual overpacked payload containers is not required if the entire overpack configuration will be weighed. If the weight of each individual overpacked payload container is recorded, enter the weight and measurement error (one standard deviation) of the empty overpack payload container on the last row. Calculate the total weight as the sum of each of the individual weights (including the weight of the empty overpack container), and record this value in the appropriate box. Calculate the root-mean square (RMS) error for the overpack configuration as the square root of the sum of the squares of the individually listed errors, and record this value in the approached box. If the entire overpack configuration is weighed, record the total weight of the overpack configuration and the measurement error (one standard deviation) in the appropriate boxes (in this case, the measurement error is the same as the RMS error).

- Measured Decay Heat and Measurement Error—The measured decay heat value and measurement error (one standard deviation) for each overpacked analytical category payload container shall be recorded. The measured decay heat value and measurement error may be obtained from the PCTCD(s) or OPCTCD for each overpacked payload container. For analytical category payload containers, the decay heat value plus the measurement error for each payload container shall be compared individually to the governing decay heat limit for the overpacked configuration.

- Decay heat Limit—For analytical category payload containers, the maximum allowable decay heat limit per overpacked payload container for the applicable payload shipping category shall be recorded from the PCTCD(s) or OPCTCD. The decay heat limits are recorded for use in determining the governing decay heat limit.

- Measured Fissile Mass (FGE) and Measurement Error—The measured fissile mass and two times the measurement error (two standard deviations) for each payload container shall be recorded as obtained from the PCTCD(s) or OPCTCD for each overpacked payload container. The subtotal fissile mass plus the total RMS error (RMS of twice each individual measurement error) or the entire overpack configuration shall be compared to the maximum allowable fissile mass limit for the outermost payload container of the overpack configuration (i.e., 325 FGE per SWB or per TDOP).

- Hydrogen/Flammable Gas Generation Rate—The hydrogen/flammable gas generation rate for each overpacked test category payload container shall be recorded. The hydrogen/flammable gas generation rate limit for each payload container (analytical or test category) shall be recorded for later use in completing the PATCD. For test category payload containers, the hydrogen/flammable gas generation rate for each payload container shall be compared individually to the governing hydrogen/flammable gas generation rate limit.

- Hydrogen/Flammable Gas Generation Rate Limit—For test category and analytical category payload containers, the hydrogen/flammable gas generation rate limit per overpacked payload container for the applicable payload shipping category shall be recorded from the PCTCD(s). The hydrogen/flammable gas generation rate limits are recorded for use in deterring the governing limit.

Approved for Transport--the TCO records and signs and dates the PCTCD or OPCTCD certifying that the requirements for the transportation parameters are met. If the requirements are not met, the payload container is rejected (nonconformance disposition) and not qualified for shipment.

Payload containers that do not comply with parameter limits are not qualified for shipment. These containers are segregated and corrective action is taken to resolve the noncompliant condition. The TCO completes the verification and certification of parameters in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column "CH-WAC and Certification Plan Section," rows 3.3.4 and 3.6.2, which contain the titles of applicable procedures that implement the requirements of this subsection.

4.5.2 Certification of Individual Payload Containers for Transport in the TRUPACT-II (Test Payload Shipping Category)

4.5.2.1 Requirements

In accordance with the TRAMPAC, section 6.1.2, payload containers assigned to the test category must meet additional criteria for certification. The generating and storage sites shall qualify an individual payload container for transport in a TRUPACT-II under the test category by verifying the container meets the parameter requirements/limits in this subsection and in section 5.2, appendices 5.7 and/or 5.8, of the TRAMPAC.

Complete the PCTCD or OPCTCD for the test payload shipping category as outlined in subsection 4.5.2.2 of this document.

Additional requirements for the test payload shipping category include measurement or testing of 55-gallon drums. Drum testing of 55-gallon drums shall be documented in the TRUPACT-II test category payload container data sheet (appendices B-3 and B-4 of this document).

Compliance can be achieved by measurement or drum testing. Methods must be consistent with the TRAMPAC in the following sections:

- Unified flammable gas test procedure (UFGTP) – appendix 5.7 of TRAMPAC
  - Measurement of UFGTP requirements are described in 5.7.3 of the TRAMPAC.
  - Testing of UFGTP requirements is described in 5.7.4 of the TRAMPAC.
  - Data sheets for documenting test results are identified in appendixes B-3 and B-4 of this document.

- Determination of flammable gas/VOC concentrations - appendix 5.8 of TRAMPAC
  - Compliance with calculations of drum mathematical models and methodology are described in appendix 5.8.1.
  - Compliance with flammability assessment methodology program (FAMP) is described in 5.8.2 of the TRAMPAC.

4.5.2.2 Compliance and Verification

With the exception of waste type IV (solidified organics), which currently is test category waste by definition, the Hanford site will repackage test category waste into an acceptable configuration to qualify as analytical category waste or conduct appropriate drum measurements or testing as specified in appendix 5.7 or 5.8 of the TRAMPAC. Appendix 5.7 will be implemented under the gas generation QAPP and a Hanford site-specific QAPjP for gas generation testing. Appendix 5.8 will be implemented via E-TRAMAPC in WWIS. WWIS entries will be in accordance with WMP-400, Section 7.1.5. For type IV waste or test category waste that cannot be repackaged, the Hanford site will segregate and store this waste until testing and/or repackaging can be performed.

All test category parameter requirements will be documented in accordance with appendix 6.1, section 6.1.2, of the TRAMPAC. Where applicable, overpacked containers parameter/requirements limits will be documented on the OPCTCD in accordance with appendix 6.1, sections 6.1.2 and 6.1.3, of the TRAMPAC. The TCO completes the verification and certification of the TRAMPAC requirements in accordance with WMP-400, Section 7.1.8.

Refer to appendix A, column “CH-WAC and Certification Plan Section,” rows 3.3.6 and 3.5.2, which contain the titles of applicable procedures that implement the requirements of this subsection.

4.5.3 Assembly of a TRUPACT-II Payload

4.5.3.1 Requirements

In accordance with the TRAMPAC, appendix 6.2, certified payload containers shall be assembled into acceptable TRUPACT-II payloads. Total TRUPACT-II package limits must be met by ensuring the TRUPACT-II SAR restrictions and requirements are met, and by evaluating the data from the individual PCTCDs or OPCTCDs, as applicable.

All parameters shall be met and documented on the PATCD consistent with subsection 4.5.3.2 of this document.

Weight of pallets, reinforcing plates, slip-sheets, guide tubes, banding material, etc., shall be measured for total weight (or 265 lbs) and recorded on the PATCD as required.

4.5.3.2 Compliance and Verification

The TCO combines data from appropriate data sheets and/or the individual PCTCDs or OPCTCDs and completes a PATCD upon verifying the applicable transportation parameters are met, consistent with WMP-400, Section 7.1.8. The parameters listed below correspond with data fields on the PATCD, consistent with WMP-400, Section 7.1.8. When assembling payloads with mixed shipping categories, each payload container must meet all parameters of E-TRAMPAC provided in WWIS (e.g., edit/limit checks must be satisfied before a payload container is shippable). The WWIS entries must be done in accordance with WMP-400, Section 7.1.5. The parameters listed below correspond with data fields on the PATCD as identified in WMP-400, Section 7.1.8, and shall be completed as follows.

- Shipment No.: The shipment number assigned by TCO.

- TRUPACT-II OCA Body/Lid Nos.: The identification numbers on the TRUPACT-II OCA body and lid.

- Payload Shipping Category: The governing shipping category of the payload shall be recorded only if all containers belong to the same or equivalent shipping category. Mixing shipping categories is also allowed in a TRUPACT-II, but must be consistent with E-TRAMPAC software provided in WWIS (e.g., all edit/limit checks are satisfied).

- Category Decay Heat Limit: If all containers belong to the same or equivalent shipping category, the maximum allowable decay heat per payload container for the governing payload shipping category shall be recorded from the PCTCD and OPCTCD. Mixing of shipping categories and payloads of any authorized contents, including credit for dunnage, is allowable provided all parameters in E-TRAMPAC provided in WWIS are met (e.g., all edit/limit checks are satisfied).

- Type of Payload: The payload configuration shall consist of any approved type of payload container (verified by visual inspection).

- Hydrogen/Flammable Gases Rate Limit: If all containers belong to the same or equivalent shipping category, the maximum allowable hydrogen/flammable gas generation rate per payload container for the governing payload shipping category shall be recorded from PCTCD(s). Mixing of shipping categories is also allowed in the TRUPACT-II, but must be consistent with E-TRAMPAC software provided in WWIS (e.g., all edit/limit checks are satisfied).

- Date ICV Closed: Identifies the date the inner containment vessel is closed and that information is recorded.

- Payload Composition: Identifies the following container parameters:
  - Payload container identification number (or "DUNNAGE" or "EMPTY")
  - Weight and measurement error
  - Decay heat and measurement error of one standard deviation
  - FGE and two times the measurement error (two standard deviations or one times RMS error if values are taken from an OPCTCD)
  - Measured hydrogen flammable gas generation rate
  - Calculated flammability index for mixed shipping categories in accordance with the E-TRAMPAC provided in WWIS.

Weights, decay heats, and FGEs of individual containers are summed for both top and bottom layers of the assembly, and the total error for each parameter is calculated as indicated on the PATCD.

Payload Totals

- The total weight of pallets, reinforcing plates, slip-sheets, guide tubes, banding material, etc., (or 265 pounds) shall be measured and recorded.

- Total Weight (Plus RMS Error) of Payload and Package--Indicates that the total weight of the payload and package does not exceed limits established in the TRAMPAC. The total error can be determined by weighing the entire payload assembly.

- Bottom Layer (Plus RMS Error) $\geq$Top Layer (Plus RMS Error)--The total weight of the bottom layer of seven drums, seven pipe overpacks, SWB, or five drums in a TDOP must be verified to be greater than or equal to the top layer.

- Total Weight (Plus RMS Error) $\leq$7,265 lbs--The total weight plus error must be verified to be less than or equal to 7,265 pounds.

- Total Decay Heat (Plus RMS Error) of all Containers--Indicates that the total decay heat plus error for all containers comprising the shipment does not exceed allowable limits.

- Total ^{239}Pu FGE (Plus RMS Error) of all Containers--Indicates that the calculated total fissile quantity plus two times the error for all containers comprising the shipment does not exceed allowable limits.

- TRUPACT-II Dose Rates--Indicates that dose rate measurements do not exceed allowable limits.

Payload Certification Parameters

- Decay Heat Plus Error of Each Analytical Category Payload Container Less Than or Equal to Governing Decay Heat Limit: For payload containers with the same of equivalent payload shipping category shipped under a governing payload

shipping category, all analytical category payload containers shall meet the governing decay heat limit.

- Hydrogen/Flammable Gas Generation Rate of Each Test Category Payload Container Less Than or Equal to Governing Hydrogen/Flammable Gas Generation Rate Limit: For payload containers with the same or equivalent payload shipping category shipped under a governing hydrogen/flammable gas generation rate, all payload containers shall meet the governing hydrogen/flammable gas generation rate limit.

- Flammability Index of Each Payload Container Less Than or Equal to 50,000: For shipments with dunnage, or multiple shipping categories, record the flammability index for each container. The flammability index for each container must be less than or equal to 50,000 for the payload to be eligible for shipment. Flammability index is only applicable to mixed payloads. For payloads with all containers belonging to the same or equivalent shipping category, mark "N/A" for flammability index.

- Bottom Weight Greater Than or Equal to Top Weight: The subtotal weight plus subtotal RMS weight error of the bottom layer of seven 55-gallon drums, seven pipe overpacks, one SWB, five 55-gallon drums in a TDOP, or three 85-gallon drums in a TDOP shall be greater than or equal to that of the top layer.

- Total Weight Plus RMS Error Less Than or Equal to 7,265 Pounds: The total measured payload weight plus the weight of the pallets, reinforcing plates, etc., plus the total RMS weight error shall be less than or equal to 7,265 pounds.

- Decay heat Plus RMS Error Less Than or Equal to 40 Watts: The total measured decay heat value plus the total RMS decay heat error shall be less than or equal to the design limit for the packaging. The design limit for the TRUPACT-II is 40 watts.

- Fissile Mass (Pu-239 FGE) Plus RMS Error Less Than or Equal to Payload Limit: The total measured fissile mass (Pu-239 FGE) plus the total RMS fissile mass error shall be less than or equal to the maximum allowable fissile mass limit established for the payload configuration. If the payload is composed of only pipe overpacks (standard, S100, or S200), the total Pu-239 FGE limit is 2,800 grams per TRUPACT-II. The total Pu-239 FGE limit for all other payloads is 325 grams per TRUPACT-II.

The TCO completes the PATCD, except for dose rate information, and provides the PATCD to loading personnel. Loading personnel load the TRUPACT-II in accordance with the PATCD and WRP1-OP-0521. The TCO signs and dates the PATCD upon verifying the TRUPACT-II transportation requirements, including dose rate information, are met, the TRUPACT-II vessel is loaded, and the payload is certified for transport. This is done in accordance with WMP-400, Section 7.1.8.

For test category payload containers and/or mixed shipping category payload containers that comprise a payload, the E-TRAMPAC software provided in WWIS will be used to determine payload shipability. If E-TRAMPAC edit/limit checks are satisfied, a payload assembly can be approved for shipment provided all other payload container requirements/parameters are met as well. WWIS entries for E-TRAMPAC will be done in accordance with WMP-400, Section 7.1.5.

Refer to appendix A, column "CH-WAC and Certification Plan Section," rows 3.2.1 and 3.6.2, which contain the titles of applicable procedures that implement the requirements of this subsection.

5.0 QUALITY ASSURANCE PLAN

Each site must develop and implement QA plans for TRU waste characterization, certification, and packaging. QA plans are submitted to CBFO for approval before TRU wastes are characterized, certified, and transported to WIPP. Analytical laboratories analyzing waste for characterization are required to have an established QA program. No waste may be certified unless it is a product of a waste stream evaluated and approved by CFBO. The TRUPACT-II is not used without CBFO granting authority.

The QAPD establishes QA program requirements for all programs, projects, and activities sponsored by permittee. The QA plan associated with the certification plan must apply QAPD requirements. The QA requirements for compliance with TRUPACT-II loading and usage are derived from 10 CFR 71, Subpart H, "Packaging and Transportation of Radioactive Materials"; 49 CFR 173, "Shippers–General Requirements for Shipments and Packagings"; TRUPACT-II Certificate of Compliance; DOE O 460.1 and 460.2; and the permittee TRUPACT-II *CH Packaging Program Guidance, Packaging Operations,* and *Packaging Maintenance Manual* manuals. The QA plan for packaging must address DOT and NRC requirements applicable to the use, maintenance, and control of packages used to transport TRU waste to WIPP, including the criteria addressed in 10 CFR 71, Subpart H; 10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste," Subpart G, "Quality Assurance"; and 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

This QA plan implements the combined QA requirements for certification, transportation, and packaging established in the documents identified above. The QAPjP implements the QA/QC activities and requirements specified in the WAP. All analytical labs analyzing WIPP waste characterization samples shall have an established and documented QA/QC program. Activities included in the scope of this QA plan are those related to certifying that waste containers and payload assemblies meet the criteria and requirements specified in the CH-WAC, TRUPACT-II SAR, and TRAMPAC, operation and maintenance of transport containers, waste transportation services, and the criteria specific to the packaging and transportation of radioactive materials. This QA plan ensures that all activities that are governed by the CFRs, applicable certificates of compliance, or other regulatory requirements are conducted in accordance with written, approved procedures or instructions that incorporate the applicable regulatory requirements. Activities that are important to safety are performed with specified equipment under suitable conditions, and prerequisites are satisfied before inspection, testing, or operation. This QA plan takes precedence over any other Hanford site QA plans related to characterization and certification of TRU wastes destined for WIPP, and transportation and packaging applicable to the TRUPACT-II. This plan does not apply to the procurement, inspection, or testing of payload containers except as those activities apply to verification that the payload containers meet the requirements of the TRUPACT-II SAR.

Any payload container with unresolved discrepancies (e.g., CARs, NCRs) associated with hazardous waste characterization will not be shipped to WIPP until the discrepancies are resolved consistent with applicable site-specific procedures (e.g., WMP-400, Section 1.3.2 or 1.3.3).

The organization of this QA plan is based on the QAPD elements outlined below. Table 5-1 provides a cross-reference of identical or related QA requirement elements from 10 CFR 830.120 and 10 CFR 71.

- **Organization and QA Program** 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.

Table 5-1. Cross-Reference of Quality Assurance Requirements*

QAPD and QA Plan Section	Equivalent Section in 10 CFR 830.120	Equivalent Section in 10 CFR Part 71, Subpart H
Organization and QA Program	Program	QA Organization QA Program
Personnel Qualification and Training	Personnel Training and Qualification	QA Program
Quality Improvement	Quality Improvement	Corrective Action Nonconforming Materials, Parts, or Components
Documents Records	Documents and Records	Document Control QA Records
Work Processes	Work Processes	Instructions, Procedures, and Drawings Identification and Control of Materials, Parts, and Components Control of Special Processes
Procurement	Procurement	Procurement Document Control Control of Purchased Material, Equipment, and Services
Inspection and Testing	Work Process and Acceptance Testing	Internal Inspection Test Control Control of Measuring and Test Equipment Inspection, Test, and Operating Status Handling, Storage, and Shipping
Assessment Requirements	Management Assessment Independent Assessment	Audits
Sample Control Requirements	Work Processes	Not applicable
Scientific Investigation Requirements	Work Processes Design	Identification and Control of Materials, Parts, and Components
Software Requirements	Not applicable	Not applicable

*The TRU Project applies a graded approach for managing items and activities associated with certifying waste for shipment to WIPP as defined in WMP-400, Section 1.1.2, “TRU Graded Approach.”

- **Personnel Qualification and Training** identifies the Hanford site 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 project 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.

5.1 ORGANIZATION AND QA PROGRAM

This QA program applies to items and activities affecting project quality. The QA activities are integrated into the project through reviews, assessments, inspections, and approval and control of records and documents. The Hanford site has identified the SPM, SQAO, WCO, and TCO as being responsible for ensuring QA within the project. The responsibilities of each of these positions, as well as other personnel involved with TRU waste characterization, certification, packaging, and transportation, are summarized in this certification plan (subsection 2.1).

All personnel involved with TRU waste certification, packaging, and transportation ensure the quality of their activities and products. If work is delegated, the individual making the delegation retains responsibility for the delegated work. Disputes related to QA program requirements will be resolved by the SQAO and cognizant project personnel.

TRU project management at all levels have established communication channels that provide timely and wide dissemination of information related to the TRU Project quality performance which includes:

- QA program status
- Lessons learned
- Quality improvement
- Results of trend analysis.

The program interfaces are described and defined in section 2.0 of this certification plan.

Figure 1-1 (see section 1.0 of this document) illustrates the hierarchy and interrelationships of QA documents governing the QA program. Quality management documents are audited and/or assessed to ensure they meet project requirements.

The TRU Project QA organization has the authority, access to work, and organizational freedom to identify quality problems, make recommendations for resolution, and verify implementation of corrective actions. In addition, the QA organization will ensure unsatisfactory conditions are controlled until proper corrective actions have been completed.

Project personnel plan certification activities and document the planning process. Planning documentation is subject to review by facility managers and subject matter experts (SME)s. Project planning documentation consists of this certification plan, the QAPjP, implementing procedures, QA plans, training plans, and facility and certification process designs. These documents establish performance criteria and methods to measure performance relevant to the project. All project personnel are accountable for ensuring quality within their assigned areas of responsibility. However, the SQAO is responsible for determining the effectiveness of this QA plan, which is accomplished through internal reporting procedures, audits, and assessments (see subsection 5.3 of this document).

A procedure matrix has been developed and will be maintained. The procedure matrix identifies TRU Project documents that implement QAPD requirements. When the QAPD is revised, the TRU Project will be evaluated for changes to requirements and revisions to this certification plan will be initiated and implemented as appropriate. TRU Project procedure WMP-400, Section 1.1.2, which applies a graded approach for managing items and activities associated with certifying waste for shipment to WIPP, requires CBFO approval before implementation.

5.2 PERSONNEL QUALIFICATION AND TRAINING

Personnel performing work in support of the project receive QA indoctrination and are qualified and trained to ensure that suitable proficiency is achieved and maintained in the performance of their assigned tasks. Records documenting qualifications and completed training programs are maintained and controlled as described in subsections 5.4 and 5.5 of this document.

5.2.1 Qualification

Facility managers, the SPM, and the Training manager determine qualification standards for each job category relevant to the project and ensure that qualifications of project personnel, including minimum education and experience, have been verified. Project personnel maintain minimum qualifications in accordance with WMP-400, Section 1.2.1, "TRU Training and Qualification Plan." The SPM assists facility managers in determining which positions relevant to the project require minimum qualifications. The period of effectiveness for qualification associated with special processes and operations that require special skills and the requalification criteria are specified or referenced in WMP-400, Section 1.2.1. Facility managers ensure auditable records documenting personnel qualifications are maintained as described in WMP-400, Section 1.5.1. Records of qualified personnel, their areas of qualification, and qualification periods (as appropriate) are retained in the TRU project records files.

5.2.2 Training

The SPM and facility managers ensure that all project personnel receive indoctrination and training on the scope, purpose, and objectives of the project and the specific QAOs of the tasks being performed. Facility personnel performing activities affecting quality are trained according to facility training plans to ensure they achieve and maintain proficiency. Personnel receive initial and continuing training requisite with their activities and level of responsibility, as described in WMP-400, Section 1.2.1.

Training is designed, developed, conducted, and evaluated in accordance with Hanford site requirements described in WMP-400, Section 1.2.1. 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. Facility managers (or designees) analyze job positions and determine task responsibilities for project personnel to ensure education, experience, and training is commensurate with minimum requirements specified. Facility managers are responsible for ensuring that auditable records documenting the required training and qualifications are maintained in accordance with WMP-400, Section 1.5.1.

5.3 QUALITY IMPROVEMENT

Project personnel continually evaluate and improve project activities. The SQAO ensures that quality improvement in the project is achieved by identifying and controlling conditions adverse to quality, analyzing trends, reporting and tracking nonconformances, and implementing corrective actions. These quality improvement activities detect and prevent unacceptable quality problems and thereby increase accuracy and reliability and reduce variability.

A condition adverse to quality is an all-inclusive term used in reference to failures; malfunctions; deficiencies; and nonconforming items, materials, parts, or components, and processes. Project personnel ensure that nonconforming items, materials, parts, or components, waste containers, etc., are adequately identified and segregated from acceptable items and materials to preclude their inadvertent use. The SQAO, the SPM, facility managers, and FQAOs have the authority to stop certification, packaging, and transportation activities and/or refuse to accept work products or services (e.g., procured items, documentation, packaging, and waste

shipments) that do not conform to project requirements. All Hanford site employees have the responsibility to stop work that poses a clear and imminent danger to the safety and health of employees, subcontractors, visitors, or the environment. Project personnel report conditions adverse to quality to FQAOs and/or the SQAO, who ensure that the condition adverse to quality is investigated and that corrective action is taken as described in this section.

All violations of the *WIPP Hazardous Waste Facility Permit* must be managed as a significant condition adverse to quality. Project personnel notify permittee of all conditions adverse to quality affecting waste to be shipped to WIPP and forward all CARs related to violations of the *WIPP Hazardous Waste Facility Permit* to permittee for tracking.

Deficiencies are uncontrolled and unapproved deviations from an approved plan, procedure, or expected result. Deficiencies specific to the project also include documentation or management practices that do not meet the requirements related to waste certification, packaging, and transportation, which are identified in the WAP, TRAMPAC, CH-WAC, QAPD, DOE orders, and applicable federal and state regulations. Project personnel are responsible for identifying any condition that affects the project's compliance with these requirements. Assessments may often identify systems, processes, products, or services that do not meet performance criteria established in planning documents. When deficiencies are found, project personnel take prompt action to rectify the situation.

Any individual who identifies a condition adverse to quality initiates an NCR or CAR in accordance with WMP-400, Section 1.3.2 or 1.3.3. If the safety or quality of the certification process could be compromised by continued use of a nonconforming item, the item is taken out of service and tagged or otherwise identified to prevent reuse or acceptance until the nonconformance is corrected. The facility manager of the facility where the nonconformance is identified ensures that an NCR is initiated and that corrective action is taken to resolve the nonconformance. WMP-400, Section 1.3.1, guides the corrective action process.

NCRs and CARs are forwarded to the SQAO. The SQAO is responsible for validating and tracking project-related deficiencies to ensure that corrective action is implemented and that the corrective action resolves the nonconformance. Project personnel notify permittee within five calendar days of identification of any nonadministrative nonconformance related to applicable requirements specified in the *WIPP Hazardous Waste Facility Permit* WAP, which are first identified at the SPM's signature release level. Project personnel submit the NCR to permittee within 30 calendar days of identification of the deficiency. WMP-400, Section 1.3.1, guides the corrective action process. The SQAO ensures dissemination of information that may prevent problems or help improve parallel processes in other waste generator or project activities and reevaluates system performance after corrective actions have been implemented. The facility manager provides the resources necessary to accomplish corrective actions.

The SQAO, facility managers, and FQAOs are jointly responsible for identifying the following:

- Trends in nonconformances
- Root causes of nonconformances
- Specific, measurable corrective actions to resolve current problems and prevent recurrence

- Personnel responsible for implementing corrective actions
- Schedules for completing corrective actions.

5.4 DOCUMENTS

Documents that specify quality requirements or establish activities affecting quality are controlled to ensure that accurate and current documents are used. Document control ensures that documents have gone through the designated review and approval process and are distributed to the appropriate personnel.

Project personnel prepare and control documents supporting the quality of the project in compliance with WMP-400, Section 1.4.1. Document control coordinators ensure documents are developed as prescribed by current procedures; reviewed for adequacy, correctness, and completeness; approved; revised; and distributed to the appropriate personnel. Documents developed specifically for the project are distributed through a document control process. These documents include:

- Certification plan
- QAPjP
- QAPD procedures matrix
- Plans and procedures implementing the TRU waste characterization, certification, packaging, and transportation requirements.

5.5 RECORDS

A QA record is an authenticated record that furnishes evidence of the quality of items and/or activities. The minimum lifetime and nonpermanent QA project records are identified in the QAPjP. QA records are controlled and maintained to certify compliance with requirements and to reflect completed work. QA records are indexed, classified, controlled, and maintained by records management personnel as described in WMP-400, Section 1.5.1.

5.6 WORK PROCESSES

The work processes and items supporting and affecting project quality are controlled through plans and procedures identified in this certification plan, the QAPjP, and the QAPD procedures matrix. Procedures and plans are developed, reviewed, approved, revised, and distributed in accordance with WMP-400, Section 1.4.1; WMP-400, Section 2.1.2, “TRU Operating Procedure Preparation and Approval”; WMP-400, Section 2.1.3, “TRU Administrative Procedure Preparation and Approval”; and WMP-400, Section 2.1.6, “TRU Analytical Procedure Process.” Project 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 SQAO (or designee), and cognizant facility manager in accordance with WMP-400, Section 2.1.2, Section 2.1.3, and Section 2.1.6, as appropriate. Facility managers ensure personnel perform work following established procedures.

The procedures identified in this certification plan, the QAPjP, and the QAPD procedures matrix 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)
- Prerequisites, 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 facility managers ensure that project activities are controlled and conducted in accordance with WMP-400, Section 2.1.1, "TRU Process Control," and facility-specific procedures that describe and control work processes applicable to TRU waste characterization, certification, packaging, or transportation. If equipment is designed for TRU Project activities, site personnel comply with QAPD design control. Inspection and testing is addressed in subsection 5.8.

Each individual performing the work is responsible for ensuring that:

- Work processes are controlled and comply with established criteria, and
- Reports describing work activity results are correct and free of grammatical and spelling errors.

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 (see subsection 5.4). Instructions, procedures, and drawings are readily available to project 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 shall be controlled by process procedures. Special processes controlled under this QA plan are nondestructive testing (NDA, NDE, and VE), helium leak testing, and limited maintenance of the TRUPACT-II and associated components. These processes are controlled by the following written procedures:

- WRP1-OP-0906, "Gamma Energy Assay Operation"
- WRP1-OP-0905, Imaging Passive/Active Neutron Assay Operation"
- ZA-948-385, "NDA Using GeniePC"
- ZA-948-392, "NDA Using NDA 2000"
- ZA-948-393, "NDA Using the Room 172 ANTECH Calorimeters"

- WRP1-OP-0908, "Operation of the Drum NDE"
- WRP1-OP-0729, "Visual Examination"
- WRP1-OP-0522, "Assemble and Stretch Wrap TRUPACT
- WRP1-OP-0521, "Receive and Load TRUPACT Containers"
- WRP1-OP-0524, "Helium Leak Test Operation"
- WRP1-OP-1225, "Radiological Support of TRUPACT-II Shipping and Receiving"
- WMP-400, Section 1.2.2, "Qualification of NDA, NDE, VE, and Inspection and Test Personnel"

5.7 PROCUREMENT

All Hanford site TRU Project facilities implement procedures to ensure 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 recordkeeping practices established in written procedures. The procurement criteria are implemented according to WMP-400, Section 2.3.1, "TRU Procurement Planning," and the procedures specified in the following subsections.

5.7.1 Procurement Document Control

The SPM and facility managers ensure project personnel control procurement documents in accordance with WMP-400, Section 2.3.2, "TRU Procurement Document Control." Procurement documents supporting waste management and packaging and transportation activities must include required specifications and acceptance criteria. Procurement documents are reviewed by appropriate organizations and engineering disciplines to ensure they contain adequate scope of work, technical requirements, supplier QA program requirements, and provisions for acceptance. The procurement document control system is also defined in WMP-400, Section 2.3.2.

5.7.2 Control of Purchased Items and Services

The SPM and facility managers ensure project personnel control items and services purchased (including supplier evaluations and inspections) in accordance with WMP-400, Section 2.3.3, "TRU Control of Purchased Items and Services," and WMP-400, Section 2.4.1, "TRU Inspection Control." 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 WMP-400, Section 2.3.2. Potential suppliers of goods and services to the TRU Project will have their own QA program or will comply with applicable TRU Project requirements.

Measures are established in WMP-400, Section 2.1.4, "TRU Handling and Storage," and WMP-400, Section 2.4.1, to ensure that materials, parts, and components used for repair work for maintenance purposes or packaging and transportation 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 (see subsection 5.8 of this document).

5.7.3 Control of Subcontractors

Subsection 5.7.2 of this document also applies to subcontractors who perform work that directly affects the quality of characterization and certification data. WMP-400, Section 2.3.3, describes how project personnel control subcontractor services. Subcontractors may support TRU Project activities under a "staff augmentation" role or for procurement of products and services. TRU Project staff augmentation subcontractors operate under the umbrella of the TRU Project QA program and are subject to all applicable requirements for TRU Project-related functions they perform. All subcontractors who support the TRU Project will be informed of the need to perform operations in compliance with TRU Project requirements. Subcontractors are required to establish procurement controls and a QA program to ensure that purchased materials, equipment, and services conform to the TRU Project procurement and QA program documents. 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. Subcontractor personnel must meet applicable project training and qualification requirements. Subcontractors shall submit copies of all project-related, quality-affecting documents to the SPM.

5.8 INSPECTION AND TESTING

Equipment is tested, inspected, and maintained in accordance with WMP-400, Section 2.4.1; WMP-400, Section 2.4.2, "TRU Test Control"; and WMP-400, Section 2.4.4, "TRU Control of Measuring, Testing, and Data Collection Equipment." Status tagging based on inspections and/or tests done in accordance with WMP-400, Section 2.4.5, "TRU Identification and Control of Items." Project 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 according to WMP-400, Section 2.4.1. These procedures and documents address planning, parameters for evaluation, techniques to be used, qualification of inspection and test personnel, hold points, documentation, acceptance criteria, and organizational responsibilities.

Project personnel routinely test and inspect items and processes and control, calibrate, and maintain equipment to ensure proper operation and data quality. Procedures identified above implement 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. The verification is performed in accordance with written procedures, instructions, or drawings. 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. 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 test control program is established for items and services important to safety. No testing requiring a test control program relative to waste payload containers or the TRUPACT-II will be performed under this program. All TRUPACT-II repair parts that may be replaced by the operator are supplied by the permittee or a designated contractor and are tested, inspected, accepted, and tagged in accordance with the permittee DOE/WIPP-02-3183 and DOE/WIPP-02-3184 manuals before delivery to the user. Leak testing is a special process discussed in subsection 5.6.

Specific measures to control packaging, shipping, storage, preservation, handling of components, material, and packaging to prevent damage, loss, deterioration, or substitution are established in the following procedures:

WRP1-OP-0521
WRP1-OP-0522
WRP1-OP-0524
WMP-400, Sections 2.1.5, 7.1.5, 7.1.7, and 7.1.8.

These procedures address the following requirements:

- Transport cask handling and operation shall conform to written handling and operating procedures for each licensed.

- Before shipment of a transport cask, conditions of the NRC's certificate of compliance (e.g., specifications, tests, inspections) shall be satisfied. Required shipping papers shall be prepared and shall accompany the shipment.

- Established safety restrictions concerning handling, storage, and shipping shall be included in the handling and operating procedures for transport casks.

5.9 ASSESSMENT REQUIREMENTS

The Hanford site participates in an assessments program to ensure that the project is in compliance with applicable requirements. Management assessments are conducted by Hanford site project management and independent assessments by site personnel independent of the project. Permittee and external regulatory agencies also conduct assessments of the TRU Project. The SQAO tracks deficiencies identified during assessments; identifies corrective actions to resolve deficiencies according to WMP-400, Sections 1.3.1, 1.3.2, and 1.3.3; and ensures the resolutions are reported to the SPM, RL, and permittee as described in subsection 5.3 of this document.

5.9.1 Management Assessments

Project managers periodically assess the performance of their organization to determine the effectiveness of QA program provisions that enable the organization to comply with requirements of the WAP, QAPD, CH-WAC, TRAMPAC, and applicable procedures and documents. Managers evaluate QA program effectiveness by focusing on the identification and resolution of both systemic and management issues and problems, and 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 WMP-400, Section 3.1.1, "TRU Management Assessment." Project managers are responsible for the conduct of these assessments and report at least annually on relevant findings.

5.9.2 Independent Assessments

Documented independent assessments, also referred to as audits and surveillances, are used to measure item service and quality, process adequacy and effectiveness, and to promote improvement. Independent assessments are conducted in accordance with WMP-400, Section 3.2.1, "TRU Independent Assessments." Project personnel and facilities are subject to periodic independent assessments performed by teams assembled by the SQAO. The SQAO ensures that characterization facilities and analytical laboratories are assessed and determines whether the independent assessment is an audit or process surveillance (see below). In addition, FQAOs may perform independent assessments (audits or surveillances) of project activities at their facilities. Audit teams include one or more qualified auditors, one of whom must be a certified lead auditor. Audit and surveillance personnel qualifications are addressed in WMP-400, Sections 1.2.1 and Section 1.2.3, "Certification of Audit Personnel," and are in accordance with the QAPD.

The independent assessment team is made up of a team leader appointed by the SQAO and team members and technical specialists selected by the team leader in conjunction with the SQAO. 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 a draft report for presentation at the exit conference for the assessment. Assessments are performed in accordance with WMP-400, Sections 3.2.1 and 3.2.2.

5.9.3 Audits

Facilities participating in the project are subject to permittee audits. A permittee audit of the project is conducted before waste is shipped to WIPP and annually thereafter. These audits are the responsibility of the permittee QA manager, who coordinates these audits through the SPM and SQAO.

The TRU Project also participates in an internal audits and surveillance program. The SQAO ensures that all conditions adverse to quality are resolved and that appropriate corrective

actions are implemented in a timely manner. The SQAO develops a schedule, in association with project facility managers, which details follow-up activities and final resolution of all corrective actions. The SQAO tracks corrective actions to completion and monitors the status of the corrective actions to ensure timely closure of deficient conditions.

5.9.4 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 similar to other assessment activities. Surveillances are performed in accordance with WMP-400, Section 3.2.2, "TRU Surveillance Program."

5.9.5 Reports to Management

The SQAO provides the QA interface between facilities and the SPM. The SQAO oversees the NCR/CAR process for project-related deficiencies and coordinates with facility managers to track nonconformances and verify corrective action completion according to WMP-400, Sections 1.3.2 and 1.3.3. Facility QA officers (FQAOs) report the results of their independent assessments to the SQAO, and together they track assessment results and corrective actions. The SQAO reports these independent assessment results to the SPM in accordance with WMP-400, Section 3.1.2, "Quality Assurance Reports to Management." Also, the SQAO prepares and transmits a semiannual QA report to the SPM and the DOE. The semiannual QA report includes the following information, as appropriate:

- Any QAPjP changes
- 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 PDP sample results
- Results of audits, assessments, and surveillances conducted during the period.

5.9.6 Performance Demonstration Program (PDP)

The Hanford site TRU Project facilities participate in the PDP as summarized in the QAPjP. PDP samples are processed according to the facility procedures applicable to the specific testing or analytical characterization activity being assessed. Sites using nondestructive assay (NDA) systems shall participate in any relevant measurement comparison program sponsored or approved by CBFO.

5.10 SAMPLE CONTROL REQUIREMENTS

Project personnel use 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 project

personnel are described in LO-090-450, “TRU Project Chain of Custody, Storage, Acceptance, and Disposal.” Project personnel ship samples in compliance with DOT regulations and project QA requirements.

5.11 SCIENTIFIC INVESTIGATION REQUIREMENTS

The plans and procedures developed and implemented to support the project define, control, verify, and document data collection activities related to TRU waste management.

5.12 SOFTWARE REQUIREMENTS

Computer software and hardware/software configurations used in project activities are developed, documented, verified, validated, and tested before use in compliance with requirements contained in the QAPD, QAPjP, and NQA-2a, Subpart 2.7, "Quality Assurance Requirements of Computer Software for Nuclear Facility Applications." WMP-400, Section 6.1.1, describes the processes for computer software development, validation, and verification.

6.0 REFERENCES

10 CFR Part 71, "Packaging and Transportation of Radioactive Material," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

10 CFR Part 830, "Nuclear Safety Management," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

10 CFR Part 835, "Occupational Radiation Protection," *Code of Federal Regulations,* Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 191, "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 194, "Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 'Disposal Regulations'," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 262, "Standards Applicable to Generators of Hazardous Wastes," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations,* Washington D.C., Office of the Federal Register National Archives and Records Administration.

40 CFR Part 268, "Land Disposal Restrictions," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

49 CFR Part 173, "Shippers-General Requirements for Shipments and Packagings," *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.

ANSI/AIM BC1-1995, *Uniform Symbology Specification* – Code 39. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities,* 1989 Edition, New York, New York, American Society of Mechanical Engineers.

ASME NQA-2a-1990, Part 2.7, Addenda to NQA-2, *Quality Assurance Program Requirements of Computer Software for Nuclear Facility Applications,* New York, New York, American Society of Mechanical Engineers.

ASTM C 1030-95, "Determination of Plutonium Isotopic Composition by Gamma-Ray Spectrometry," American Society for Testing and Materials, Washington D.C.

DOE/CAO-2056, 40 CFR 191, *Compliance Certification Application*, Carlsbad Field Office, Carlsbad, New Mexico, U.S. Department of Energy.

DOE/WIPP 89-004, *TRUPACT-II Content Codes* (TRUCON), Current Revision, Waste Isolation Pilot Plant, Carlsbad, New Mexico, U.S. Department of Energy.

WHC-EP-0558, *Test and Evaluation Document for the U.S. Department of Transportation Specification 7A, Type A Packaging*, U.S. Department of Energy.

Carlsbad Area Office Interim Guidance on Ensuring that Waste Qualifies for Disposal at the Waste Isolation Pilot Plant, Current Revision, Carlsbad Field Office, Carlsbad, New Mexico, U.S. Department of Energy.

DOE/WIPP-02-3183, *Contact-Handled Packaging Program Guidance*

DOE/WIPP-02-3184, *Contact-Handled Packaging Operations Manual*

DOE/WIPP-02-3185, *Contact-Handled Maintenance Manual*

DOE-CBFO-94-1012, *U.S. Department of Energy-Carlsbad Area Office Quality Assurance Program Document*, Current Revision, Carlsbad Field Office, Carlsbad, New Mexico, U.S. Department of Energy.

DOE/WIPP-02-3122, *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant.*

DOE O 435.1, 1999, *Radioactive Waste Management*, Washington, D.C., U.S. Department of Energy.

EPA-600/2-80-076, *A Method for Determining the Compatibility of Hazardous Wastes*, Washington D.C., U.S. Environmental Protection Agency.

SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Final Update I and Final Update II and III, Office Solid Waste and Emergency Response, Washington, D.C., U.S. Environmental Protection Agency.

HNF-2599, *Hanford Site Transuranic Waste Characterization Quality Assurance Project Plan.*

HNF-2601, *Hanford Site Transuranic Waste Project Quality Assurance Program Document Procedures Matrix.*

Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, Handbook 44, Boulder, Colorado, U.S. Department of Commerce, National Institute of Standards and Technology.

Safety Analysis Report for the TRUPACT-II Shipping Package, Docket No. 9218, Current Revision, Washington, D.C., U.S. Nuclear Regulatory Commission.

Waste Isolation Pilot Plant Land Withdrawal Act, Public Law 102-579.

Waste Isolation Pilot Plant Hazardous Waste Facility Permit, 4890139088-TSDF, Attachment B, including B1 through B6, Santa Fe, New Mexico, New Mexico Environment Department.

DOE/WIPP-95-2065, *Waste Isolation Pilot Plant Safety Analysis Report*, Carlsbad, New Mexico, Westinghouse Electric Corporation.

TRUPACT-II Authorized Methods for Payload Control (TRAMPAC), Westinghouse TRU Solutions, LLC, Carlsbad, New Mexico.

APPENDIX A

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION DOCUMENTS AND PROCEDURES

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
Container Properties Criteria and Requirements				
3.2.1	2.1 (4.1.1)	Payload Container description	• DOT 7A Type A 55-gal. drums, pipe overpacks, SWBs, and TDOPs (including dunnage) • Maximum number of containers and authorized packaging configurations shown in Table 3-2	TRU Control of Purchased Items and Services (WMP-400, Section 2.3.3) TRU Procurement Document Control (WMP-400, Section 2.3.2) Transuranic Waste Sample and Waste Container Management Activities (WMP-400, Section 7.1.7) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Receive and Load TRUPACT Containers (WRP1-OP-0521)
3.2.2	2.3 (4.1.3)	Weight limits and center of gravity	• ≤1000 lbs/55-gal. drum • ≤certified weight. Limits for Type A equivalent drums • ≤4000 lbs/SWB • ≤6,700 lbs/TDOP • ≤TRUPACT-II configuration limits shown in Table 3-1	Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.2.3	2.3 (4.1.3)	Container assembly	• Fourteen 55-gal. drums • 14 POCs (std., S100 & S200 • 2 SWBs (including one bin) • 2 SWBs (including four 55-gal. drums) • 1 TDOP all configurations	Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.2.4	NA	Removable surface contamination	• ≤20 disintegrations per minute (dpm)/100 cm^2 alpha • ≤200 dpm/100 cm^2 beta/gamma	Radiological Support of TRUPACT-II Shipping and Receiving (WRP1-OP-1225) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.2.5	2.4 (4.1.4)	Container identification / labeling/ marking	• Bar code with unique CIN and site identification • Empty • Dunnage	Transuranic Waste Container Management Activities (WMP-400, Section 7.1.7) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.2.6	2.2 (4.1.2)	Dunnage	• Empty 55-gal. drums • Empty SWBs •	Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Assemble and Stretch Wrap TRUPACT Payload (WRP1-OP-0522) Receive and Load TRUPACT Containers (WRP1-OP-0521)
	2.5 (4.1.5)	Filter vents	• Payload containers vented with filters that meet WAP and TRAMPAC specifications CH-WAC	TRU Control of Purchased Items and Services (WMP-400, Section 2.3.3) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Obtain Headspace Gas Samples of TRU Waste Containers (DO-080-009) Assemble and Stretch Wrap TRUPACT Payload (WRP1-OP-0522)
Physical Properties Criteria and Requirements				
3.4.1	2.6 (4.1.6)	Liquids	• <1 in. (2.5 cm) in the bottom of any container • <1 volume percent in any payload container	AK Documentation Management (WMP-400, Section 7.1.9) Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Transuranic Waste (WMP-400, Section 7.1.4) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Operation of the Drum Nondestructive Examination System (WRP1-OP-0908) TRU Sorting Glovebox Operation (WRP1-OP-0725) TRU Loadout Glovebox Operation (WRP1-OP-0726) TRU RWM Glovebox Automatic Mode Operations (WRP1-OP-0722) TRU Waste Visual Exam Technique (WMP-400, Section 7.1.10) Pipe-and-Go Operations (ZO-160-080) Pu/Al Alloys Operations (ZO-160-081) (inactive)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.4.2	2.8 (4.1.8)	Sealed containers	• Sealed containers >4 L prohibited (except for waste material Type II.2 packaged in a metal container)	AK Documentation Management (WMP-400, Section 7.1.9) Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Transuranic Waste (WMP-400, Section 7.1.4) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Operation of the Drum Nondestructive Examination System (WRP1-OP-0908) TRU Sorting Glovebox Operation (WRP1-OP-0725) Pipe-and-Go Operations (ZO-160-080) Pu/Al Alloys Operations (ZO-160-081) (inactive) TRU Loadout Glovebox Operation (WRP1-OP-0726) TRU RWM Glovebox Automatic Mode Operations (WRP1-OP-0722) TRU Waste Visual Exam Technique (WMP-400, Section 7.1.10)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
Radiological Properties Criteria and Requirements				
3.3.1	3.1 (4.2.1)	Radionuclide Composition / Nuclear criticality	• Assay measurements • Quantification of : ^{241}Am, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, ^{233}U, ^{234}U, ^{238}U, ^{90}Sr, and ^{137}Cs	Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Imaging Passive/Active Neutron Assay Operation (WRP1-OP-0905) Gamma Energy Assay Operations (WRP1-OP-0906) Calculation of Assay Results (WMP 350, Section 2.2) Data Management (WMP-350, Section 2.3) QC Criteria for Residues Project NDA Instruments (FSP-PFP-5-8, Section 16.3) Calibration Confirmation for Residues Project NDA Instruments (FSP-PFP-5-8, Section 16.4) GEA Energy and Efficiency Setup and Baseline Establishment (WMP-350, Section 2.5) NDA Using GeniePC (ZA-948-385) Energy and Efficiency Setup and Baseline Determination Using GeniePC (ZA-400-301) Energy and Efficiency Setup and Baseline Determination Using NDA 2000 (ZA-400-303) ANTECH Calorimeter Calibration (ZA-400-304) Calculation of Assay Results (ZA-400-302) WRAP NDA Measurement Control Program (WMP-350, Section 2.8) Performing Calibration Verifications and Confirmations for NDA at WRAP (WMP-350, Section 2.9) Data Management (FSP-PFP-5-8, Section 16.2) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.3.2	3.1 (4.2.1)	Fissile material quantity (Plutonium-239 fissile gram equivalent [FGE])	• ≤200 g/55-gal. drum (including pipe overpacks) • ≤325 g/SWB or TDOP • ≤325 g/TRUPACT-II • ≤2,800 g/TRUPACT-II (14 pipe overpacks)	Imaging Passive/Active Neutron Assay Operation (WRP1-OP-0905) Gamma Energy Assay Operations (WRP1-OP-0906) Calculation of Assay Results (WMP-350, Section 2.2) Data Management (WMP-350, Section 2.3) WRAP NDA Measurement Control Program (WMP-350, Section 2.8) Performing Calibration Verifications and Confirmations for NDA at WRAP (WMP-350, Section 2.9) GEA Energy and Efficiency Setup and Baseline Establishment (WMP-350, Section 2.5) NDA Using GeniePC (ZA-948-385) NDA Using NDA 2000 (ZA-948-392) NDA Using the Room 172 ANTECH Calorimeters (ZA-948-393) Energy and Efficiency Setup and Baseline Determination Using GeniePC (ZA-400-301) Energy and Efficiency Setup and Baseline Determination Using NDA 2000 (ZA-400-303) ANTECH Calorimeter Calibration (ZA-400-304) Calculation of Assay Results (ZA-400-302) QC Criteria for Residues Project NDA Instruments (FSP-PFP-5-8, Section 16.3) Calibration Confirmation for Residues Project NDA Instruments (FSP-PFP-5-8, Section 16.4) Pipe-N-Go Operations (ZO-160-080) Pu/Al Alloys Operations (ZO-160-081) (inactive) Data Management (FSP-PFP-5-8, Section 16.2) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.3.3	NA	TRU alpha activity	• >100 nCi of alpha-emitting TRU isotopes with half-lives greater than 20 years per gram of waste matrix	Imaging Passive/Active Neutron Assay Operation (WRP1-OP-0905) Gamma Energy Assay Operations (WRP1-OP-0906) Calculation of Assay Results (WMP-350, Section 2.2) Data Management (WMP-350, Section 2.3) NDA Using GeniePC (ZA-948-385) NDA Using NDA 2000 (ZA-948-392) NDA Using the Room 172 ANTECH Calorimeters (ZA-948-393) Energy and Efficiency Setup and Baseline Determination Using GeniePC (ZA-400-301) Energy and Efficiency Setup and Baseline Determination Using NDA 2000 (ZA-400-303) ANTECH Calorimeter Calibration (ZA-400-304) Calculation of Assay Results (ZA-400-302) Data Management (FSP-PFP-5-8, Section 16.2) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.3.4	NA	^{239}Pu equivalent activity (^{239}Pu equivalent-curies [PE-Ci])	Untreated Waste • ≤80 PE-Ci/55-gal. Drum • ≤130 PE-Ci/SWB • ≤130 PE-Ci/drum overpacked in TDOP • ≤1800 std. POC • ≤1100 PE-Ci/55-gal. drum overpacked in SWB or TDOP or 85-gal. drum Solidified/Vitrified Waste • ≤1800 PE-Ci/55-gal. drum (including a drum containing a pipe component) (see PE-Ci table in subsection 3.3.4.1 of this document)	Imaging Passive/Active Neutron Assay Operation (WRP1-OP-0905) Gamma Energy Assay Operations (WRP1-OP-0906) Calculation of Assay Results (WMP-350, Section 2.2) Data Management (WMP-350, Section 2.3) NDA Using GeniePC (ZA-948-385) NDA Using NDA 2000 (ZA-948-392) NDA Using the Room 172 ANTECH Calorimeters (ZA-948-393) Energy and Efficiency Setup and Baseline Determination Using GeniePC (ZA-400-301) Energy and Efficiency Setup and Baseline Determination Using NDA 2000 (ZA-400-303) ANTECH Calorimeter Calibration (ZA-400-304) Calculation of Assay Results (ZA-400-302) Data Management (FSP-PFP-5-8, Section 16.2) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.3.5	3.2 (4.2.2)	Radiation dose rate	• ≤200 mrem/hr (at surface for payload containers and TRUPACT-II) • ≤10 mrem/hr at 2 meters (TRUPACT-II only)	Radiological Support of TRUPACT-II Shipping and Receiving (WRP1-OP-1225) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Receive and Load TRUPACT Containers (WRP1-OP-0521) Transuranic Waste Repackaging Visual Examination and Sampling (WMP-400, Section 7.1.3)
Chemical Properties Criteria and Requirements				
3.5.1	4.1 (4.3.1)	Pyrophoric materials	• <1 weight percent radionuclide pyrophorics • No nonradionuclide pyrophorics	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.5.2	NA	Hazardous wastes	• Characterization per QAPjP (as defined in WAP) • Limited to EPA hazardous waste numbers approved by WIPP-WAP	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Transuranic Waste (WMP-400, Section 7.1.4) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) TRU Transportation Logistics (WMP-400, Section 2.1.5) Determination of Volatile Organic Compounds in TRU/Mixed Waste Container Headspace (LA-523-410) Determination of Total Nonmethane Organic Compounds in TRU Waste Container Headspace (LA-523-425) Volatile Sample Analysis by SSW-846 (LA-523-455) Semivolatile Sample Analysis by SW-846, Method 8270B1 (LA-523-456) Mercury Analysis by Cold Vapor Atomic Absorption (LA-325-104) Acid Digestion of Solid and Liquid Samples for Graphite Furnace Atomic Absorption Analysis (GFAA) (LA-505-100) Metal Analysis by Graphite Furnace Atomic Absorption (GFAA) using the Perkin-Elmer 5100 PC (LA-505-102) Acid Digestion/Dilution of Aqueous Samples and Extracts (LA-505-158) Acid Digestion of Sediments, Sludges, and Soils for Inductively Coupled Plasma (ICP) and Atomic Absorption (AA) Analysis (LA-505-159) Inductively Coupled Plasma (ICP) Emission Spectrometric Method for the Applied Research Laboratories (LA-505-151) Inductively Coupled Plasma (ICP) Emission Spectrometric Method for Jarrel Ash Type 61E (LA-505-161) Determination of Trace Elements and Radionuclides by Inductively Coupled Plasma-Mass Spectrometry using TJA Poems (LA-506-101) ACE Program Implementation and Operation of Spreadsheet Interface (WMP-310, Section 9.1) Polychlorinated Biphenyls (PCBs) by Gas Chromatography (LA-523-427) WIPP Waste Information System Data Entry and Reporting (WMP-400, Section 7.1.5) Data Management for Headspace Gas Sampling and Analytical Results (WMP-400, Section 8.1.8) Transuranic Waste Characterization Data Quality Objectives Reconciliation and Reporting (WMP-400, Section 7.1.1) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
3.5.3	4.4 (4.3.4)	Chemical compatibility	All chemicals must be allowable per the TRAMPAC	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.5.4	4.2 (4.3.2)	Explosives, corrosives, and compressed gases	• No explosives, compressed gases, or pressurized containers • No ignitable, reactive, or corrosive wastes	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) TRU Waste Certification - Operation of the Drum NDE System (WRP1-OP-0908) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) TRU Sorting Glovebox Operation (WRP1-OP-0725) Pipe-and-Go Operations (ZO-160-080) Pu/Al Alloys Operations (ZO-160-081) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) TRU Loadout Glovebox Operation (WRP1-OP-0726) TRU RWM Glovebox Automatic Mode Operations (WRP1-OP-0722) TRU Waste Visual Exam Technique (WMP-400, Section 7.1.10)
3.5.6	NA	PCB concentration	• <50 ppm	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Polychlorinated Biphenyls (PCBs) by Gas Chromatography (LA-523-427)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
Gas Generation Properties Criteria and Requirements				
3.3.6	5.0 (4.4.1)	Decay heat Test category waste	• ≤Decay heat limit for the authorized shipping category • ≤40 W per TRUPACT-II	Imaging Passive/Active Neutron Assay Operation (WRP1-OP-0905) Gamma Energy Assay Operations (WRP1-OP-0906) Calculation of Assay Results (WMP-350, Section 2.2) Data Management (WMP-350, Section 2.3) NDA Using GeniePC (ZA-948-385) NDA Using NDA 2000 (ZA-948-392) NDA Using the Room 172 ANTECH Calorimeters (ZA-948-393) Energy and Efficiency Setup and Baseline Determination Using GeniePC (ZA-400-301) Energy and Efficiency Setup and Baseline Determination Using NDA 2000 (ZA-400-303) ANTECH Calorimeter Calibration (ZA-400-304) Calculation of Assay Results (ZA-400-302) Data Management (FSP-PFP-5-8, Section 16.2) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8)
3.5.5	5.0 (4.4.2)	Headspace gas VOC concentration	• Every container or randomly selected containers from waste streams that meet the conditions for reduced headspace gas sampling will be headspace gas sampled per the QAPjP as defined in the WAP • ≤ 500 ppm VOC for analytical category • ≥ 500 ppm VOC for test category	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Transuranic Waste (WMP-400, Section 7.1.4) Obtain Headspace Gas Samples of TRU Waste Containers (DO-080-009) Determination of Volatile Organic Compounds in TRU/Mixed Waste Container Headspace (LA-523-410) Volatile Organics by Gas Chromatography/Mass Spectrometry Using SW-846 (LA-523-134) Mercury Analysis by Cold Vapor Atomic Absorption (LA-325-104) WIPP Waste Information System and Reporting (WMP-400, Section 7.1.5) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Data Management for Headspace Gas Sampling and Analytical Results (WMP-400, Section 8.1.8)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
N/A	5.3 (4.4.3)	Venting and aspiration	• ≥Times shown in TRUCON tables • Options for determining aspiration time based on date of drum closure	Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Transuranic Waste (WMP-400, Section 7.1.4) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) TRU Waste Container Management Activities (WMP-400, Section 7.1.7)
N/A	5.1 (4.4.1)	Payload shipping category	• Approved content codes listed in TRUCON tables • Assigned shipping category per TRUPACT-II cognizant engineer • Derived shipping category decay heat limits for TRUPACT-II	Acceptable Knowledge Documentation Management (WMP-400, Section 7.1.9) Operation of the Drum Nondestructive Examination System (WRP1-OP-0908) Transuranic Waste Repackaging, Visual Examination, and Sampling (WMP-400, Section 7.1.3) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) TRU Sorting Glovebox Operation (WRP1-OP-0725) Pipe-and-Go Operations (ZO-160-080) Pu/Al Alloys Operations (ZO-160-081) Receive and Load TRUPACT Containers (WRP1-OP-0521) TRU Loadout Glovebox Operation (WRP1-OP-0726) TRU RWM Glovebox Automatic Mode Operations (WRP1-OP-0722) TRU Waste Visual Exam Technique (WMP-400, Section 7.1.10)

SUMMARY OF CH TRU WASTE ACCEPTANCE CRITERIA, REQUIREMENTS, AND COMPLIANCE AND VERIFICATION PROCEDURES				
CH-WAC & Cert. Plan Sect.	**TRAMPAC (& Cert. Plan Sect., if app)**	**Criteria**	**Requirements**	**Compliance and Verification Procedures**
Data Packages Criteria and Requirements				
3.6.2	6.0 (4.5)	Shipping data	• Payload Container Transportation Certification Document • Overpack PCTCD • Payload Assembly Transportation Certification Document (analytical/test) • TRUPACT-II test category payload container data sheet, as applicable • Bill of lading[b] • Land disposal restriction notification [a] • UHWM[a]	TRU Transportation Logistics (WMP-400, Section 2.1.5) Receive and Load TRUPACT Containers (WRP1-OP-0521) Transuranic Waste Transportation and Disposal Certification (WMP-400, Section 7.1.8) Radiological Support of TRUPACT II Shipping and Receiving (WRP1-OP-1225)

[a] Applies to mixed wastes only (a one-time notice per waste stream)
[b] A Uniform Hazardous Waste Manifest may be substituted

APPENDIX B-1

PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT: ANALYTICAL PAYLOAD SHIPPING CATEGORY

TRUPACT-II PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (PCTCD)
(Analytical Payload Shipping Category)

IDENTIFICATION PARAMETERS

Container/Barcode ID#_____ **Certification Site**_____

Shipping Category_____ **Content Code**_____

Direct Load Configurations O 55-gal. drum O 100-gal. drum O SWB O TDOP

Fixed Configurations O Standard Pipe Overpack O S100 Pipe Overpack O S200 Pipe Overpack
O Bin Overpack O S100 85-gal. Drum Overpack

Overpacked Configurations O SWB with 55-gal. Drum(s) (SWB Overpack) O TDOP with SWB
O TDOP with 55-gal. Drum(s) O TDOP with SWB Overpack
O TDOP with 85-gal. Drum Overpack(s) O TDOP with Bin Overpack

TRAMPAC TRANSPORTATION PARAMETERS		
Parameter	**Initials**	**Filter(s) Identification**
Free liquids are < 1% of payload container volume		1._____ 2._____
Nonradioactive pyrophorics are not present		3._____ 4._____
Radioactive pyrophorics are < 1% (weight)		5._____ 6._____
Explosives are not present		7._____ 8._____
Corrosives are not present		9._____ 10._____
Pressurized containers are not present		
Sealed container > 4 liters are not present		
Rigid drum liner (if present) is punctured/vented		
Flammable VOCs are ≤ 500 ppm		
Radiation dose rate is ≤ 200 mrem/hour		

MEASURED PARAMETERS					
Container Parameter	**Value**	**Error**	**Value + 1x Error**	**Value + 2x Error**	**Limit**
Weight (lbs)					
Decay heat (watts)					
Fissile mass (FGE)					
Curie limits (Ci) *S100* *Pipe overpack or S200* *Pipe overpack only*	Value + error meets limits for radionuclides listed in Appendix 2.3 (S100) or Appendix 2.4 (S200) Yes/No_____				

UNVENTED WASTE PARAMETERS ONLY	
Aspiration Method O Option 1 O Option 2a O Option 2b O Option 3	Aspiration period (if applicable) _____ days
Option 1 Container closed time _____ months	Aspiration table no. (if applicable) _____
Options 2a, 2b, or 3 Headspace H_2 concentration _____ mol%	Time container vented _____ days

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The container is approved for shipment or overpacking.

_____/_____ _____
Transportation Certification Official (print/sign) Date

APPENDIX B-2
OVERPACK PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (OPCTCD)

OVERPACK PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (OPCTCD)

IDENTIFICATION PARAMETERS

Overpack Container ID# _____ Overpack Container Bar Code #_____

Governing Payload Shipping Category Number _____

Governing Decay Heat Limit _____

Governing Hydrogen/Flammable Gas Generation Rate Limit _____

Overpack Container Type ☐ SWB ☐ TDOP

Overpacked Contained Type(s) ☐ 55-gal. Drum ☐ SWB ☐ SWB Overpack

☐ 85-gal. Drum Overpack ☐ Bin Overpack

Weight Limit_____ (lbs) Fissile Mass Limit_____FGE

Certification Site _____ Content Code _____

TRAMPAC TRANSPORTATION PARAMETERS

Radiation Dose Rate ≤ 200 mrem/hour Initials _____

Filter Identification 1._____ 2._____ 3._____ 4._____ 5._____

6._____ 7._____ 8._____ 9._____ 10._____

OVERPACKED CONTAINER MEASURED PARAMETERS

Overpacked Container ID Number	Weight (lbs)	Error (lbs)	Decay Heat (watts)	Error (watts)	Decay Heat Limits (watts)	Fissile Mass (FGE)	2x Error (FGE)	Hydrogen/ Flammable Gas Generation Rate (mol/s)	Hydrogen/ Flammable Gas Generation Rate Limit (mol/s)
			← Weight and error of empty overpack payload container (if applicable)						
Total (A)									
Total RMS Error									
Total + RMS Error									

CERTIFICATION OF COMPLIANCE

	Initials
Total weight + weight error ≤ limit	
Total fissile mass + 2x fissile mass error ≤ limit	
Decay heat + decay heat error ≤ decay heat limit of governing payload shipping category for each analytical category payload container	
Hydrogen/flammable gas generation rate ≤ hydrogen/flammable gas generation rate limit of governing payload shipping category for each test category payload container	

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The overpack is approved for shipment or overpacking.

_____/_____ _____

Transportation Certification Official (print/sign) Date

APPENDIX B-3
TRUPACT-II TEST CATEGORY PAYLAOD CONTAINER DATA SHEET

TRUPACT-II TEST CATEGORY PAYLAOD CONTAINER DATA SHEET (Example)

SECTION 1. Identification Parameters

Container ID No._____ Container Bar Code No._____
Shipping Category_____ Content Code_____
Container Type ☐ 55-gal. drum ☐ SWB ☐ TDOP ☐ 100-gal. drum
Filter Type_____
Certification Site_____

Test Category Classification

Measurement (Waste Types I, II, or III) (Complete Sections 2, 3, 4, and 6)	55-Gal. Drum Testing (Complete Sections 2, 3, 5, and 6)
☐ Decay Heat > Analytical Limit	☐ Decay Heat > Analytical Limit
☐ Flammable VOC Concentration > 500 ppm	☐ Fail Measurement
	☐ Waste Type III > 7 watts and < 20 watts
	☐ Waste Type IV

SECTION 2. Methane Concentration

Location of methane measurement Container headspace/inside liner

Date of methane measurement _____

Measured methane concentration (ppm) _____

Measured methane concentration ≤ 1,250 ppm YES/NO

SECTION 3. Flammable VOC Concentration

☐ No flammable VOCs present

☐ Maximum concentration of flammable VOCs in payload container headspace ≤ 500 ppm (from process knowledge)

Flammable VOC	Headspace Measured Concentration (ppm)	Predicted Innermost Confinement Layer Concentration (ppm)
Acetone		
Benzene		
1-Butanol		
Chlorobenzene		
Cyclohexane		
1,1-Dichloroethane		
1,2-Dichloroethane		
1,1-Dichloroethene		
cis-1,2-Dichloroethene		
Ethyl benzene		
Ethyl ether		
Methanol		
Methyl ethyl ketone		
Methyl isobutyl ketone		
Toluene		
1,2,4-Trimethylbenzene		
1,3,5-Trimethylbenzene		
m-Xylene		
o-Xylene		
p-Xylene		
Sum of flammable VOCs		

SECTION 4. Measurement

1. Decay heat plus error (W) _____

   Wattage limit for TRUPACT-II design pressure limit _____

   Decay heat plus error ≤ wattage limit for TRUPACT-II Design pressure limit _____ YES/NO

2. Calculated flammable gas generation rate (FGGR))mol/sec) _____

3a. Maximum allowable hydrogen gas generation rate of container or controlling shipping category (mol/sec) _____

   Calculated FGGR ≤ maximum allowable hydrogen gas generation rate of container or controlling shipping category _____ YES/NO

3b. Calculated innermost confinement layer flammable gas concentration (vol%) _____

   Mixture lower explosive limit (MLEL) (vol%) _____

   Calculated innermost confinement layer flammable gas concentration plus sum of flammable VOCs (innermost confinement layer concentration) (vol%) _____

   Calculated innermost confinement layer flammable gas plus flammable VOCs ≤ MLEL _____ YES/NO

3c. Allowable flammable gas concentration (vol%) _____

   Maximum allowable flammable gas generation rate (AFGGR) of container or controlling shipping category (mol/sec) _____

   Calculated FGGR ≤ AFGGR _____

SECTION 5. 55-Gallon Drum Testing

1.	Decay heat plus error (W)	_____
2.	Maximum decay heat per drum and per TRUPACT-II (W)	_____
3a.	May gas generation testing be performed at room temperature?	_____ YES/NO
3b.	Total measured gas release rate (mol/sec)	_____
	Maximum allowable total gas release rate (mol/sec)	_____
	Total measured gas release rate ≤ maximum allowable gas release rate limit	_____ YES/NO
4.	Measured flammable gas generation rate (FGGR) (mol/sec)	_____
5a.	Maximum allowable hydrogen gas generation rate (mol/sec)	_____
	Measured FGGR ≤ maximum allowable hydrogen gas generation rate	_____ YES/NO
5b.	Calculated innermost confinement layer flammable gas concentration (vol%)	_____
	Mixture lower explosive limit (MLEL) (vol%)	_____
	Calculated innermost confinement layer flammable gas concentration plus sum of flammable VOCs (innermost confinement layer concentration) (vol%)	_____
	Calculated innermost confinement layer flammable gas plus flammable VOCs ≤ MLEL	_____ YES/NO
5c.	Allowable flammable gas concentration (vol%)	_____
	Maximum allowable flammable gas generation rate (AFGGR) of container or controlling shipping category (mol/sec)	_____
	Measured FFGR < maximum AFGGR	_____ YES/NO

SECTION 6. Measurement/55-Gallon-Drum Testing Certification

Does payload container meet test category criteria? YES/NO

Transportation Certification Official Date

APPENDIX B-4
METHANE SCREENING LIMIT

A methane-screening limit or concentration of 1.250 parts-per-million volume (ppmv) methane in the container headspace is used in flammability evaluations. If the container headspace methane concentration is below this screening limit, the concentration of methane is added to the hydrogen concentration, and the flammable gas generation rate is determined. If the concentration is above the screening limit, the container is not eligible for shipment, and the container shall be either repackaged or mitigation measures shall be adopted.

Although the term “flammable gases” includes both hydrogen and methane, drum gas measurement data suggest methane is either not present or is present in very low concentrations. Laboratory analysis of methane concentration in the drum headspace to date has been performed on approximately 14,000 CH-TRU waste containers representing a broad spectrum of TRU waste content codes. In only two cases has methane been detected at concentrations greater than 1,000 ppmv. Methods currently used by the Rocky Flats Environmental Technology Site and proposed for use for determining methane concentration in the headspace have minimum detection limits that range from 25 to 500 ppmv. Other instruments (e.g., gas chromatograph with flame ionization detector or with thermal conductivity detector) have minimum detection limits ranging from 5 to 100 ppmv. All of these instruments will provide data of adequate accuracy and precision to determine if the 1,250-ppmv methane screening limit has been met.

The 1,250 methane screening limit concentration is equivalent to:

- 2.5 percent of the methane lower explosive limit of 5 percent by volume.
- Fraction of the methane contribution to the flammable gas G value for polyethylene (i.e., [0.1 molecules methane/100 eV] / [4.1 molecules flammable gas/100 eV] or 2.4 percent.

APPENDIX C

PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT: TEST PAYLOAD SHIPPING CATEGORY

TRUPACT-II PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (PCTCD)
(Test Payload Shipping Category)

IDENTIFICATION PARAMETERS

Container/Container Barcode ID#_____ **Certification Site**_____

Shipping Category_____ **Content Code**_____

Direct Load Configurations O 55-gal. Drum O100-gal. Drum O SWB OTDOP

Fixed Configurations O Standard Pipe Overpack O S100 Pipe Overpack O S200 Pipe Overpack
O Bin Overpack O 85-gal. Drum Overpack

Overpacked Configurations O SWB with 55-gal. Drum(s) (SWB overpack) O TDOP with SWB
O TDOP with 55-gal. Drum(s) O TDOP with SWB Overpack
O TDOP with 85-gal. Drum Overpack(s) O TDOP with Bin Overpack

TRAMPAC TRANSPORTATION PARAMETERS

Parameter	Initials	Filter(s) Identification
Free liquids are < 1% of payload container volume		1._____ 2._____
Nonradioactive pyrophorics are not present		3._____ 4._____
Radioactive pyrophorics are < 1% (weight)		5._____ 6._____
Explosives are not present		7._____ 8._____
Corrosives are not present		9._____ 10._____
Pressurized containers are not present		
Sealed container > 4 liters are not present		
55-gallon drum liner (if present) is punctured/vented		
Flammable VOCs are ≥ 500 ppm		
Radiation dose rate is ≤ 200 mrem/hour		

MEASURED PARAMETERS

Container Parameter	Value	Error	Value + 1x Error	Value + 2x Error	Limit
Weight (lbs)					
Fissile mass (FGE)					
Curie limits (Ci) *S100 Pipe overpack or S200 Pipe overpack only*	Value + error meets limits for radionuclides listed in Appendix 2.3 (S100) or Appendix 2.4 (S200) Yes/No_____				

TEST CRITERIA

UFGTP requirements met as documented in Attachment A of Appendix 5.7 _____Yes/No

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The container is approved for shipment or overpacking.

_____/_____ _____
Transportation Certification Official (print/sign) Date

APPENDIX D
PAYLOAD ASSEMBLY TRANSPORTATION CERTIFICATION DOCUMENT

PAYLOAD ASSEMBLY TRANSPORTATION CERTIFICATION DOCUMENT (PATCD)

IDENTIFICATION PARAMETERS

Shipment No._____ Packaging OCA Body/Lid No._____

Governing Payload Shipping Category_____

Governing Payload Shipping Category Decay Heat Limit_____

Governing Hydrogen/Flammable Gas Generation Rate Limit_____

Type of Payload ☐ 55-gal. Drums ☐ Standard Pipe Overpacks ☐ S100 Pipe Overpacks
☐ S200 Pipe Overpacks ☐ 100-gal. Drums ☐ SWBs
☐ SWB Overpacks ☐ Bin Overpacks ☐ TDOP

Date ICV Closed_____

BOTTOM PAYLOAD ASSEMBLY COMPOSITION

Container ID	Weight (lbs)	Error (lbs)	Decay Heat (watts)	Error (watts)	Fissile Mass (FGE)	2.Error (FGE)	Hydrogen/Flammable Gas Generation Rate	Flammability Index
Subtotal (A)								
Subtotal RMS Error (C)								

TOP PAYLOAD ASSEMBLY COMPOSITION

Container ID	Weight (lbs)	Error (lbs)	Decay Heat (watts)	Error (watts)	Fissile Mass (FGE)	2.Error (FGE)	Hydrogen/Flammable Gas Generation Rate	Flammability Index
Subtotal (B)								
Subtotal RMS Error (D)								

PAYLOAD TOTALS

Weight of Pallets, Reinforcing Plats, Slip Sheets, Guide Tubes, Adjustable Slings, etc. (E)_____

Total (A+B+E) Weight_____lbs Total RMS Weight Error_____lbs

Total (A+B) Decay Heat_____Watts Total RMS Decay heat Error_____Watts

Total (A+B) Fissile Mass_____FGE Total RMS Fissile Mass Error_____FGE

Bottom Assembly Weight plus Subtotal RMS Error (A+C)_____lbs

Top Assembly Weight plus Subtotal RMS Error (B+D)_____lbs

Total Weight plus Total RMS Error_____lbs

Total Fissile Mass plus Total RMS Error_____FGE

Total Decay Heat plus Total RMS Error_____Watts

PAYLOAD CERTIFICATION PARAMETERS

	Initials
Decay Heat + Error of Each Analytical Category Payload Container ≤ Governing Limit	_____
Hydrogen/Flammable Gas Generation Rate of Each Test Category Payload Container ≤ Governing Limit	_____
Flammability Index of Each Payload Container ≤ 50,000	_____
Bottom Weight ≥ Top Weight	_____
Total Weight plus RMS Error ≤ 7265 lbs	_____
Decay Heat plus RMS Error ≤ 40 Watts	_____
Fissile Mass (Pu-239 FGE) plus RMS Error ≤ _____FGE	_____

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The overpack is approved for shipment or overpacking.

_____/_____ _____

Transportation Certification Official (print/sign) Date

APPENDIX E

NONDESTRUCTIVE ASSAY

E.1 INTRODUCTION

At the Hanford site, only nondestructive assay (NDA) techniques are used in the radiological characterization and certification of TRU waste for shipment to WIPP. This appendix describes the Hanford TRU Project requirements to meet the requirements specified in the WIPP contact-handled waste acceptance criteria (CH-WAC) for NDA. Radiochemistry requirements are not addressed in this appendix.

Radiological characterization is used to:

- Identify and quantify the activity of the ten WIPP-tracked isotopes (i.e., Am-241, Pu-238, Pu-239, Pu-240, Pu-242, U-233, U-234, U-238, Sr-90 and Cs-137),

- Identify and quantify the activity for other isotopes to ensure U.S. Department of Transportation (DOT) and certificate of compliance (C of C) requirements to identify and quantify the isotopes contributing to at least 95 percent of the total radiological hazard. Identification and quantification of U-235 without regard to total package activity is necessary to meet DOT requirements for fissile gram equivalent (FGE) determination,

- Ensure applicable requirements for decay heat, Pu-239 FGE, and Pu-239 equivalent activity (PE-Ci) are met, and

- Demonstrate that the waste being disposed of at WIPP meets the radiological definition of TRU waste.

Acceptable knowledge (AK) may be used to supplement NDA for hard-to-detect radionuclides (e.g., Sr-90 and U-234), when poor counting statistics exist, etc. The requisite data on isotopic ratios and quantities will be derived from AK (see subsection E.2), NDA, or both, using CBFO-approved NDA.

The SPO must technically justify the AK, and each facility must technically justify that the NDA techniques, instruments, and procedures used:

- Are appropriate for the specific waste stream and waste content code descriptions being assayed,

- Will result in unbiased values for the cumulative activity and mass of the WIPP radionuclide inventory, and

- Are initiated, revised, reviewed, maintained, controlled in accordance with Hanford TRU Project procedures.

E.2 RADIONUCLIDE ISOTOPIC RATIOS

Direct measurement using WIPP-certified NDA equipment of all containers in a waste stream has been selected as the methodology to perform radiological characterization of TRU waste at the Hanford site. It is recognized that certain nuclides (e.g., Sr-90 and U-234) cannot be quantified using NDA and that technical reasons may cause the NDA for certain waste to be invalid (e.g., poor counting statistics). Under these circumstances, AK will be used to complete radiological characterization.

E.2.1 Methods for Confirmation of Isotopic Ratio Acceptable Knowledge

The Hanford site requires that all containers of TRU waste be assayed to perform radiological characterization of that waste. The batch data reports shall contain results of isotopic measurements. The SPO shall correlate the results of actual measurements to AK. Reference E22 shall describe the documentation and discrepancy resolution requirements for this correlation.

Because U-234 and Sr-90 cannot be detected using the NDA systems currently in use at the Hanford site, the means and methodology to quantify these isotopes from other measured isotopes shall be technically justified in the AK documentation described below. If measured isotopic results are not used, the use of AK must be either included with or referenced in NDA batch data reports. Examples of this quantification include using isotopic ratios to calculate U-234 from the measured U-235 (and possibly U-238) and Sr-90 from the measured Cs-137. When the activity of an isotope is scaled or correlated from the measured value of another isotope (e.g., Sr-90 calculated from measured Cs-137 or U-234 from U-235 or U-238), the NDA batch data report shall contain sufficient information to independently perform or repeat that calculation.

The acceptance or rejection of identified isotopes or unidentified peaks is usually part of routine analytical procedures and is not normally subject to AK requirements. Examples of this include using confirmatory peaks or correlation to demonstrate the absence or presence of certain isotopes or elimination of a nuclide or peak based upon high counting error. Facility procedures shall specify the means to document such rejection, acceptance, or correlation.

If any of the ten WIPP-tracked isotopes are determined not to be present in a waste stream on the basis of AK, this shall be technically justified in the AK.

E.2.2 Acceptable Knowledge (AK) Documentation

E.2.2.1 Required Elements

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 SPM. 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. The following information shall be included as part of the written AK record, as described in WMP-400, Section 7.1.9:

- Map of the Hanford 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 and development, and experimental processes),

- Description of the specific facility 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 Am-241 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 ten WIPP-tracked radionuclides (Am-241, Pu-238, Pu-239, Pu-240, Pu-242, U-233, U-234, U-238, Sr-90, and Cs-137) and, if applicable, other radionuclides such that at least 95 percent of the total radiological hazard in a waste stream, waste stream subpopulation, and container basis is reported. Additionally, the isotopic ratios for radionuclides that are neither one of the ten WIPP-tracked isotopes nor otherwise contribute to 95 percent of the total radiological hazard must be established and technically justified in the AK documentation if either of the below conditions are met:
  - The radionuclide contributes to FGE (e.g., Np-237 or U-235)
  - The radionuclide is used to scale one of the ten WIPP-tracked 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.

E.2.2.2 Supplemental Acceptable Knowledge Information

The SPO shall obtain supplemental AK information, dependent on availability. The amount and type of this information cannot be mandated, but the SPO shall collect information as appropriate to support documentation of the waste's isotopic distribution. This information

will be used to compile the waste's AK written record, in accordance with WMP-400, Section 7.1.9. 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 (NMMA) logs or inventory records, and available 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 facility personnel (e.g., documented interviews), and
- Historical analytical data relevant to the isotopic distribution of the waste stream.

E.2.2.3 Discrepancy Resolution

If there is a discrepancy between AK information related to isotopic ratios or composition, the SPO 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. Limitations concerning the information will be documented in the AK record and summarized in the AK report. If discrepancies result in a change to the original determinations, the AK summary will be updated. Discrepancy reporting and resolution shall be documented in accordance with reference E22.

Positive identification and quantification of any isotope previously identified in AK as not being present shall be treated as a discrepancy and documented in accordance with reference E22.

If a discrepancy cannot be resolved, the site will perform direct measurements for the impacted population of containers.

E.3 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) for WIPP-certifiable radiological characterization data are established in section 3.3 and summarized in section A.3 of the CH-WAC. They are summarized below in Table E-1 as they apply to individual payload containers.

Table E-1, Data Quality Objectives for NDA

Requirement	DQO	Confidence [a]
TRU á-activity concentration > 100 nCi/g	activity > LLD	N/A
Fissile mass for 55-gal drums ≤ 200 FGE	FGE + $2\sigma_{TMU\ (FGE)} \leq$ 200 FGE	97.5%
Fissile mass for SWB and TDOP ≤ 325 FGE	FGE + $2\sigma_{TMU\ (FGE)} \leq$ 325 FGE	97.5%
Decay Heat (DH) ≤ TRAMPAC limit	DH + $\sigma_{TMU\ (DH)} \leq L_{TRAMPAC}$	84%

[a] Confidence means the statistical level of confidence that the limit is exceeded or not exceeded depending on the requirements of the individual DQOs. The confidence is derived from the specified DQO, which assumes contributions to total measurement uncertainty (TMU) are normally distributed.

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

- The ten radionuclides identified in subsection 3.3.1 for tracking of the WIPP radionuclide inventory (see subsection E.2.1 above for discussion of hard-to-detect nuclides),
- U-235, in order to calculate FGE, as required in subsection 3.3.2 for compliance with transportation requirements,
- Other radionuclides that contribute to at least 95 percent of total radiological hazard, as specified in subsection 3.3.1, for compliance with transportation requirements, and
- Other radionuclides that contribute to FGE or decay heat (e.g., Pu-241 or Np-237 if AK indicates the presence of such contributors) or any radionuclide used to scale one of the otherwise reportable radionuclides (e.g., U-235 for U-234).

In support of the above requirements, each facility must evaluate, document, and technically justify the following determinations.

1. *Lower Limit of Detection:* The lower limit of detection (LLD) for each NDA system must be determined. Instruments performing TRU waste/low-level waste discrimination measurements must have an LLD of 100 nCi/g or less. Facility-specific environmental background and container-specific interferences must be factored into LLD determinations. LLD is that level of radioactivity which, if present, yields a measured value greater than the critical level with a 95 percent probability, where the critical level is defined as that value which measurements of the background will exceed with 5 percent probability. Because LLD is a measurement-based parameter, it is not feasible to calculate LLD for radionuclides that are not determined primarily by measurement (e.g., Sr-90 and U-234). In such cases, the facility shall derive the equivalent of an LLD (i.e., a reporting threshold for a radionuclide(s), when it is technically justified). This value may be based on decay kinetics, scaling factors, or other scientifically based relationships and must be adequately documented. For purposes of reporting

radionuclide data in the WWIS, this value will be the equivalent of an LLD. References E3 and E4 provide information in developing the LLD. The method(s) for determining LLD shall be documented in a report to the SPO and approved by the SQAO.

2. *Total Measurement Uncertainty (TMU):* The method used to calculate the TMU for the quantities in table E-1 must be documented and technically justified for each CBFO-certified NDA system. It is permissible to combine reports for like or similar systems if the TMU is justified to be identical or if any differences are clearly identified and do not otherwise affect other portions of TMU. The likeness or similarity of the systems must be technically justified in the TMU report. Compliance with this requirement will be evaluated in reviews of the TMU documentation package for each assay system by CBFO. General guidance for determining the TMU is provided in references E5 and E6. TMU shall be properly justified and calculated and documented in a report to the SPO and approved by the SQAO.

3. *Calibration.* Each NDA system shall be calibrated before initial use. During calibration (or recalibration), system correction factors shall be established and algorithms adjusted such that the value of %R (percent recovery) is set equal to 100 percent (i.e., the system is calibrated to 100% R). When calibrating NDA instruments, a calibration curve is usually fitted to a number of data points obtained with calibration sources.

   The range of applicability of system calibrations must be specified in facility procedures. The matrix/source surrogate waste combination(s) used for calibration shall be representative of the activity range(s) or gram loading(s), and relevant waste matrix characteristics (e.g., densities, moderator content, container size) planned for measurement by the system.

   Calibration and recalibration shall be documented in a report to the SPO and approved by the SQAO. Individual components or functions (e.g., separate detectors or reference peak) may require individual calibration. Calibration of supporting systems (e.g., gamma system used solely for isotopic measurements to support calorimetry or neutron measurements) may be limited to applicable portions of the calibration for that instrument (e.g., just energy).

   Calibration(s) shall be performed in accordance with consensus standards (see NDA quality control [QC] requirements below) when such standards exist. For calorimetry, calibration shall be performed in accordance with reference E17. If consensus standards are not used, full documentation of the calibration technique must be provided to and approved by CBFO before performing WIPP-related assays.

4. *Calibration Standards (and Sources):* Use of calibration standards and sources is governed by both references E20 and E2. Until reference E2 is revised, calibration standards and sources used in calibration, recalibration, calibration

conformation, and calibration verification must meet the requirements of item a. below. When permitted by revision to reference E2, these sources may utilize the less restrictive requirements as provided in item b. below. Sources used for instrument performance measurements are not subject to these requirements but shall be well-characterized.

a. Until reference E2 permits otherwise, primary calibration standards (or sources) shall be obtained from NIST, the New Brunswick Laboratory (NBL), or suppliers maintaining measurement systems and standards traceable to NIST. When primary standards are not available, the standards used shall be cross-calibrated with primary standards obtained from the above sources. Performance demonstration program (PDP) standards and surrogate waste containers may not be used for calibrations, since the calibration sources must be independent from sources used for verification measurements (i.e., the PDP). Standards used for cross-calibration cannot be the same ones used for calibration of the equipment used to establish the cross-calibration. Cross-calibration must be documented in a report to the SPO and approved by the SQAO. Sources used in the calibration, recalibration, calibration confirmation or calibration verification of calorimeters are subject to the requirements of E.3.4.b below.

b. When traceability to NIST/NBL is no longer required by reference E2 or for calorimeters, primary calibration standards (or sources) may be obtained from suppliers maintaining a nationally accredited measurement program. When primary standards are not available, the standards used shall be correlated with primary standards obtained from a nationally accredited measurement program. The Hanford TRU Project defines "nationally accredited measurement program" as associated with NDA and radioactive sources to include, but not be limited to, programs associated with or qualified by and in descending priority:

- National Institute of Standards and Technology (NIST)
- New Brunswick Laboratory (NBL)
- Sandia National Laboratory (SNL)
- Los Alamos National Laboratory (LANL)

Primary calibration standards cannot exceed the authorization or approval for that organization as identified in the applicable measurement program (e.g., relative to isotopes, matrix, form, DC voltage, etc.). Correlation to a primary standard must also be within the authorization or approval limitations for the primary standard(s) being used.

Correlation of standards must be documented, approved by the SQAO, and transmitted to the SPO. Equipment critical to the correlation of a standard to primary standards obtained from a nationally accredited measurement program must have been calibrated and maintained using

standards that meet the same criteria. Standards used for correlation cannot be the same ones used for calibration of the equipment used to establish the correlation. The sources or standards must be at the same or higher level to which the correlation is being established.

5. *Calibration Verification:* Notwithstanding the need to calibrate individual components after replacement, changes, or adjustments (e.g., energy calibration of a detector), verification of the NDA system's calibration shall be performed after any one of the following occurs:

   a. Replacement of the measurement system's major components (e.g., detector, neutron generator, or supporting electronic components that have the capacity to affect data),

   b. Major system repairs and/or modifications (e.g., detector reconditioning or replacement of key mechanical components that have the capacity to affect data),

   c. Significant changes to the system's software, or

   d. Relocation of the system.

   Calibration verification shall consist of demonstrating that the system is within the range of acceptable operation. Calibration verification is an overall performance check of the ability of the system as a whole to produce consistent results (e.g., combined overall check of a gamma system's calibrations for energy, efficiency, etc.). Secondary standards can be used for the calibration verification if their performance has been correlated with the calibration standard (see item 4, above). If a verification of the measurement system's calibration or other test demonstrates that the system's response has significantly changed, a recalibration of the system shall be performed. A system calibration may be performed in lieu of calibration verification. Calibration verification shall be documented in a report to the SPO and approved by the SQAO.

6. *Calibration Confirmation:* To confirm that the calibration of the NDA system was correctly established, the accuracy and precision of the system are determined after each calibration (or recalibration) by performing replicate measurements of a non-interfering matrix. Calibration confirmation replicate measurements shall be performed on containers of the same nominal size as those in which actual waste is assayed and according to approved waste assay procedures. The number of replicate measurements to be performed shall be documented and technically justified. The replicate measurements shall be performed using calibration standards or sources (see above) that span the range of use. The calibration standards used for calibration confirmation shall not be the same as those used for the system calibration.

Accuracy is reported as percent recovery (%R). The acceptance criteria for accuracy shall be within ± 30 percent of nominal source strength in a non-interfering matrix. Normally, a minimum of two source strengths is required--one from the lower one- third of the range, and one from the upper one-third of the range. A single-source strength may be used only if the operating range is restricted to either small mass loadings (i.e., a range of 0-20 g WG Pu) or the calibration range is small (i.e., the range spans less than 20 g WG Pu). Precision is reported as percent relative standard deviation (%RSD). The %RSD shall not exceed the values listed in table E-2 for the corresponding number of replicate measurements in a non-interfering matrix. Calibration confirmation shall be documented in a report to the SPO and approved by the SQAO.

Table E-2, Upper Limits for %RSD vs. Number of Replicates [a]

Number of Replicates	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Max %RSD	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 the formula:

$$\frac{s}{m} \bullet 100\% < \sqrt{\frac{(0.292) \bullet c^{2}_{0.05,n-1}}{n-1}} \bullet 100\%$$ 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%. This formula may be used to calculate the maximum %RSD if more than 15 replicate analyses are performed. A minimum of 2 replicates must be analyzed and documented.

Use of alternate limits for accuracy and precision must be technically justified and approved by CBFO before certification of the waste.

E.4 QUALITY CONTROL

This appendix documents, defines, and describes the additional QA requirements for NDA that must be implemented by and in facility calibration and operating procedures. Each NDA technique used for NDA of TRU waste must be performed in accordance with calibration and operating procedures that have been written, approved, and controlled by the facility and the SPO. Procedures shall contain applicable quality controls as described below and must specify the qualitative and quantitative acceptance criteria and corrective action to take if these criteria are not met. In accordance with references E27 through E29, NDA personnel initiate a nonconformance report (NCR) and/or corrective action report (CAR), as appropriate, if final reported background measurements, instrument performance measurements, interfering matrix checks, or trending analyses do not meet acceptance criteria. All background and instrument performance measurements shall be documented.

E.4.1 General Requirements

1. *NDA Training*: Only appropriately trained and qualified personnel shall be allowed to perform NDA and data validation/review. Standardized training requirements for NDA personnel shall be based upon existing industry standardized training requirements (e.g., references E8 and E9) and shall meet the specifications in the reference E2. Qualification of NDA personnel shall be completed in accordance with references E23 and E24. Requalification shall be based upon evidence of continued satisfactory performance and must be performed at least every two years in accordance with references E23 and E24.

2. *Software QC Requirements:* Reference E25 describes the Hanford TRU Project's software QA program and incorporates requirements from references E2 (QAPD, section 6.0) and E30.

3. *Comparison Programs:* Sites using NDA systems shall participate 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 (PDP) (references E7 and E10) or through other third parties. Participation in a measurement comparison program is not required if CBFO has not sponsored or approved such a program for that waste matrix or configuration. Participation in the Calorimetry Exchange Program administered by NBL is not required from a WIPP perspective. However, if WIPP-certified calorimeters participate in this program (e.g., to meet safeguards or other business practice requirements), the results shall also be transmitted to TRU Project records to document participation in a measurement comparison program.

4. *Control Limits:* As recognized by reference E15, initial establishment of statistical control limits may have to be based upon a limited population of measurement results. Control limits should be updated as conditions warrant or change (e.g., increase in sample population, changes over time, etc.).

5. *Definitions:* The Hanford TRU Project uses the following definitions relative to performance of periodic QC related measurements:

   Operational Day (also "when in operation"): A 24-hour period in which the system is to be used to perform measurements for TRU wastes.

   Operational Week: Seven consecutive days starting at 7 a.m. on Monday in which the system performed WIPP-related measurements on one or more days in that week.

   Six-month period (as used in interfering matrix checks): The six calendar months, through the last day of the sixth month, during which the system is used. This period starts the day of the first instrument performance measurement performed on or after May 17, 2002, the completion of the previous six-month period, or placing the system in service, as appropriate. Once started, the six-month period

cannot be extended due to periods of the system being out of service or inactive, although the facility may end the period earlier (e.g., if a new system calibration is required, suspension of operations, etc.).

E.4.2 NDA Quality Control Requirements for GEA Systems

E.4.2.1 Recommended Consensus Standards

The assay procedures related requirements and guidance cited in certain American Society for Testing and Materials (ASTM) and American National Standards Institute (ANSI) standards (references E8, E11, E13 and E15) and NRC standard practices and guidelines (reference E16) as referenced in this appendix are recommended for use at all Hanford facilities. Since these consensus standards address a multitude of operating systems, environments, regulatory requirements, etc., it is not practical to accept any of these standards in their entirety.

E.4.2.2 Quality Control Requirements

The information below summarizes the minimum QC requirements related to GEA systems:

1. *Background Measurements:* Must be performed and recorded at least once per operational day unless specific approval for a less frequent period is obtained from CBFO. Contributions to background due to radiation from nearby radiation-producing equipment, standards, or wastes must be carefully controlled. More frequent background measurements must be performed if the background will vary significantly within a single day or shift. Background measurements are not required when the system is out of service or for systems used solely for isotopic measurements.

   Background measurements are normally performed before the first use of the system for WIPP-related measurements on a given day. However, for measurements made during off-hours, the period of validity of the background measurement may carry over into the next calendar day, but only if the time elapsed from the last background measurement is less than 24 hours.

   Individual (i.e., daily or more frequent) background measurements shall be evaluated against acceptance limits established in facility procedures. Facility procedures shall also define the actions to take if background measurements result in data that are outside the acceptable range.

2. *Instrument Performance Measurements:* Instrument performance measurements on operable instruments or systems must be performed and recorded at least once per operational day. Instrument performance measurements for systems used for quantitative measurements shall include, but are not limited to, efficiency checks, peak position, and resolution checks, as applicable. Instrument performance measurements are not required when the system is out of service. Both

radioactive sources and surrogate waste matrix containers (both non-interfering and interfering) may be used.

Instrument performance measurements are normally performed before the first use of the system for WIPP-related measurements on a given day. However, for measurements made during off-hours, the period of validity of the instrument performance measurements may carry over into the next calendar day, but only if the time elapsed from the last set of instrument performance measurements is less than 24 hours.

Individual (i.e., daily or more frequent) instrument performance measurements, regardless of whether or not an interfering matrix is used for these measurements, shall be verified to be within acceptance limits in accordance with table E-3, below, before permitting any routine operations (e.g., measurements for actual waste characterization). If instrument performance measurements result in data that are outside the acceptable range, the required responses in Table E-3 shall be followed.

Instrument performance measurements for gamma systems used solely for isotopic measurements (e.g., to support calorimetry or neutron measurements) may consist of separate instrument performance measurements (e.g., energy and resolution) or may be part of an overall combined system instrument performance measurement for the combined gamma-calorimeter/neutron system. Independent instrument performance measures are subject to the requirements and acceptance criteria of Table E-3, and combined instrument performance measurements are subject to the requirements from the applicable section (e.g., section E.3 or E.4).

Table E-3, Control Limits (Range of Applicability) for Instrument Performance Measurements of Gamma and Neutron Systems

Range	Acceptability Range [a]	Required Actions [d]
Acceptable	$\| \text{Result} \|^{c} \leq 2\sigma^{b}$	No action required.
Warning	$2\sigma^{b} < \| \text{Result} \|^{c} \leq 3\sigma^{b}$	The instrument performance measurement may be rerun no more than twice (i.e., maximum of three total measurements). If a repeat instrument performance measurement results in data within ± 2σ, the additional instrument performance measurement shall be documented and work may continue. If the system does not fall within ± 2σ after a maximum of two reruns instrument performance measurements, then the required response for the Action Range shall be followed.
Action	$\| \text{Result} \|^{c} > 3\sigma^{b}$	Work shall stop, and the occurrence shall be documented as an NCR or CAR and appropriately dispositioned. The NDA system shall be removed from service pending successful resolution of all necessary actions, and all assays performed since the last acceptable instrument performance measurements are suspect, pending satisfactory resolution. If the corrective action includes the adjustment, maintenance, repair or replacement of any system component, recalibration or calibration verification is required before returning the system back to service.

[a] Reference E15. Alternative control limits may be used only with prior approval by CBFO.

[b] The standard deviation (σ) is only based on the reproducibility of the data check measurements themselves. This is not TMU. The standard deviation may be periodically updated to account for changes in system response over time. The initial acceptability range and any subsequent changes shall be documented and transmitted to the SPO. If the standard deviation is not calculated as the square root of the variance as calculated from ANSI N15.36-1994 (Annex A, Equation A.1), the reference for the equation that is used must be provided to and approved by CBFO. When control limits are calculated using alternative methodologies, ± 2σ corresponds to the calculated upper and lower warning limits and ± 3σ corresponds to the calculated upper and lower action limits. Only the positive range for the warning and action are applicable for resolution control limits.

[c] Absolute Value

[d] If failure of an instrument performance check is due to a procedural noncompliance (e.g., incorrect or no source used), a CAR will be issued. Additional instrument performance measurement(s) shall be performed in accordance with procedural requirements. If these additional instrument performance measurements meet the acceptance criteria, NDA operations may continue while the CAR is processed.

3. *Interfering Matrix Checks:* In addition to the daily instrument performance measurements, at least once during the 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, ash) currently being assayed. Radioactivity standards and interfering matrices 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. Interfering matrix checks are not required for gamma systems used solely for isotopic measurements to support calorimetry or neutron measurements.

   An applicable surrogate waste matrix and activity range are defined to be that by the end of the six-month period, the ranges of the matrices and activities that were

measured during that period were addressed in the interfering matrix checks performed in the same period and are relative to the range spanned in the calibration of the system. It is not required to have performed an interfering matrix check for an activity range or matrix that was not analyzed during that six-month period. The operating ranges for systems currently in use at Hanford span activity from 0-200 g WG Pu with densities from 0-2.5 g/cc.

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

Facility procedures shall define the means to ensure the interfering matrix checks satisfy the requirement to test the range of activity and matrices over a six-month period.

The applicable combinations of matrices and activity ranges shall be technically justified and documented in a report to the SPO and approved by the SQAO. New waste matrices shall be evaluated as they arise. Minimum requirements are:

- The uppermost range of activity must be within the upper one-third (1/3) of the applicable activity range for the system,
- The lowermost range of activity must be within the lower one-third (1/3) of the applicable activity range for the system,
- The matrix is defined based upon density and the uppermost range shall be within the upper one-third (1/3) of the applicable density range for the system, and
- The lowermost range of density must be within the lower one-third (1/3) of the applicable density range for the system.
- If the range of activity and/or density is relatively constant within the applicable six-month period (i.e., stays within the same third of the range), only a single range is required to be tested. For example, if all measurements performed during the applicable period fall in the lower one-third of the calibration range, the activity used in the interfering matrix checks may be limited to the lower one-third of the calibration range.

The interfering matrix checks shall be reviewed and evaluated at least weekly by the cognizant engineer or an NDA scientist to determine continued acceptability of the assay system and to monitor for adverse trends. Facility procedures shall define trend acceptance criteria and acceptance criteria for interfering matrix checks. At a minimum, the following conditions require initiation of an NCR or CAR and investigation:

- Any individual measurement with accuracy (%R) not within ± 60 percent of stated source activity at time of measurement,

- Six consecutive measurements with the accuracy (%R) increasing or decreasing, or

- Indication of other abnormal trends or conditions.

4. *Alternative Control Limits:* With CBFO approval, alternative methodologies may be used to establish control limits. The student t-distribution may be used to establish control limits for efficiency. Nonstatistical control limits may be used for other parameters such as energy and resolution provided they are technically justified. Facility procedures shall specify the methodology to establish these control limits.

E.4.2.3 Evaluation Criteria for Trend Analysis

1. Successful performance of the daily background measurements (i.e., results are within acceptance limits) satisfies weekly review requirements for background measurements.

2. *Trending Criteria for Instrument Performance Measurements:* Instrument performance measurements shall be reviewed and evaluated at least weekly by the cognizant engineer or an NDA scientist to determine continued acceptability of the assay system and to monitor for adverse trends. Facility procedures shall define trend acceptance criteria. At a minimum, if any of the conditions below occur, the facility shall notify the SQAO. An investigation shall be performed, documented, and approved by the SQAO before resuming routine operations. This investigation shall be discussed in or attached to affected NDA batch reports.

    - For efficiency, six consecutive measurements all increasing or decreasing,

    - A detailed review of the results indicates other abnormal trends or conditions.

E.4.2.4 Documenting Trend Analysis and Weekly Interfering Matrix Checks

Unless specifically approved by the SPM, within one month of the close of the six-month period, the facility shall document the results of the interfering matrix checks in a report to the SPM. This report shall include the applicable ranges and matrices of wastes measured during that period, both for measurement of wastes and for the weekly interfering matrix checks that were performed.

E.4.3 NDA Quality Control Requirements for Calorimetry Systems

E.4.3.1 Recommended Consensus Standards

The assay procedures and related requirements and guidance cited in certain ASTM and ANSI standards (references E9, E14, E15 and E17) and NRC standard practices and guidelines

(reference E16) as referenced in this appendix are recommended for use at all Hanford facilities. Since these consensus standards address a multitude of operating systems, environments, regulatory requirements, etc., it is not practical to accept any of these standards in their entirety.

E.4.3.2 Quality Control Requirements

The information below summarizes the minimum QC requirements related to NDA using calorimetry:

1. *Baseline Measurements:* Basepower or baseline measurements shall be conducted at a frequency specified in facility operating procedures and approved by CBFO. Table E-4 contains acceptance criteria for baseline or base power measurements.

2. *Instrument Performance Measurements:* Instrument performance measurements for calorimetry shall be performed with electrical and/or heat standards traceable to a nationally accredited measurement program at a frequency determined by each facility, consistent with reference E17. These requirements shall be specified in facility operating procedures and must be approved by CBFO.

3. *Acceptance Criteria:* Individual basepower or baseline and instrument performance measurements shall be verified to be within acceptance limits before permitting any routine operations. Table E-4 contains acceptance criteria for instrument performance measurements. If the NDA system fails to meet acceptance criteria, the NDA system shall be removed from service pending successful resolution of all necessary actions, and all assays performed since the last acceptable instrument performance measurements are suspect, pending satisfactory resolution.

Table E-4, Control Limits (Range of Applicability) for Base Power and Instrument Performance Measurements on Calorimeters

Range	Acceptability Range	Required Actions [c]
Acceptable	$\lvert \text{Result} \rvert^{b} \leq 2\sigma^{a}$	No action required.
Warning	$2\sigma^{a} < \lvert \text{Result} \rvert^{b} \leq 3\sigma^{a}$	The instrument performance measurement may be rerun no more than twice (i.e., maximum of three total measurements). If a repeat instrument performance measurement results in data within $\pm 2\sigma$, the additional instrument performance measurement shall be documented and work may continue. If the system does not fall within $\pm 2\sigma$ after a maximum of two reruns instrument performance measurements, then the required response for the Action Range shall be followed.
Action	$\lvert \text{Result} \rvert^{b} > 3\sigma^{a}$	As recommended by reference E17 section 8.4.2, if an instrument performance measurement for wattage exceeds 3σ, a single confirmatory measurement shall be performed. • If the result of this confirmatory measurement is $\leq 2\sigma$, no further action is required except to document both measurements. • If the result of this confirmatory instrument performance measurement is $> 2\sigma$ but $\leq 3\sigma$, the actions for exceeding the Warning Range shall continue with the initial and confirmatory instrument performance measurements being treated as two results within the Warning Range. • Otherwise, work shall stop, and the occurrence shall be documented as an NCR or CAR and appropriately dispositioned. The calorimeter shall be removed from service pending successful resolution of all necessary actions, and all assays performed since the last acceptable instrument performance measurements are suspect, pending satisfactory resolution. If the corrective action includes the adjustment, maintenance, repair, or replacement of any system component, recalibration or calibration verification is required before returning the calorimeter to service.

[a] The standard deviation (σ) is only based on the reproducibility of the data check measurements themselves. This is not TMU. The standard deviation may be periodically updated to account for changes in system response over time. The initial acceptability range and any subsequent changes shall be documented and transmitted to the SPO. If the standard deviation is not calculated as the square root of the variance as calculated from ANSI N15.36-1994 (Annex A, Equation A.1), the reference for the equation that is used must be provided to and approved by CBFO.
[b] Absolute Value
[c] If failure of an instrument performance check is due to a procedural noncompliance (e.g., incorrect or no source used), a CAR will be issued. Additional instrument performance measurement(s) shall be performed in accordance with procedural requirements. If these additional instrument performance measurements meet the acceptance criteria, NDA operations may continue while the CAR is processed.

Basepower or baseline and instrument performance measurements shall be reviewed and evaluated at least weekly by the cognizant engineer or an NDA scientist to determine continued acceptability of the calorimetry system and to

monitor performance trends. Facility procedures shall define trend acceptance criteria.

4. *Isotopic Systems:* Isotopic systems used solely in conjunction with calorimetry shall meet the applicable QC requirements from subsection E.4.2 above. Facility operating procedures shall incorporate the applicable instrument performance measurement requirements. These instrument performance measurements may be performed independently of or in conjunction with the instrument performance measurements for calorimeters.

E.4.4 NDA Quality Control Requirements for IPAN Systems

E.4.4.1 Recommended Consensus Standards

The assay procedures related requirements and guidance cited in certain ASTM and ANSI standards (references E12 and E15) and NRC standard practices and guidelines (reference E16) as referenced in this appendix are recommended for use at all Hanford facilities. Since these consensus standards address a multitude of operating systems, environments, regulatory requirements, etc., it is not practical to accept any of these standards in their entirety.

E.4.4.2 Quality Control Requirements

The information below summarizes the minimum QC requirements related to IPAN systems:

1. *Background Measurements:* Must be performed and recorded at least once per operational day unless specific approval for a less frequent period is obtained from CBFO. Contributions to background due to radiation from nearby radiation producing equipment, standards, or wastes must be carefully controlled. More frequent background measurements must be performed if the background will vary significantly within a single day or shift. Background measurements are not required when the system is out of service.

   Background measurements are normally performed before the first use of the system for WIPP-related measurements on a given day. However, for measurements made during off-hours, the period of validity of the background measurement may carry over into the next calendar day, but only if the time elapsed from the last background measurement is less than 24 hours.

   Individual (i.e., daily or more frequent) background measurements shall be evaluated against acceptance limits established in facility procedures. Facility procedures shall also define the actions to take if background measurements result in data that are outside the acceptable range.

2. *Instrument Performance Measurements:* Instrument performance measurements on operable systems must be performed and recorded at least once per operational day. Instrument performance measurements shall include, but are not limited to,

efficiency checks and matrix correction checks (if applicable). Instrument performance measurements are not required when the system is out of service. Both radioactive sources and surrogate waste matrix containers (both non-interfering and interfering) may be used.

Instrument performance measurements are normally performed before the first use of the system for WIPP-related measurements on a given day. However, for measurements made during off-hours, the period of validity of the instrument performance measurements may carry over into the next calendar day, but only if the time elapsed from the last background and instrument performance measurement is less than 24 hours.

Individual (i.e., daily or more frequent) instrument performance measurements, regardless of whether or not an interfering matrix is used for these measurements, shall be verified to be within acceptance limits per table E-3 above before permitting any routine operations (e.g., for actual waste characterization). If instrument performance measurements result in data that are outside the acceptable range, the required responses in table E-3 shall be followed.

3. *Interfering Matrix Checks:* In addition to the daily instrument performance measurements, at least once during the operational week, an interfering matrix must be used to assess the long-term stability of the system's operation and matrix correction. Surrogate waste containers must reflect the type of waste (e.g., debris, sludge) currently being assayed. Radioactive standards and interfering matrices 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.

An applicable activity range is defined to be that by the end of the six-month period, the ranges and activities that were measured during that period were addressed in the interfering matrix checks performed in the same period and are relative to the range spanned in the calibration of the system. It is not required to have performed an interfering matrix check for an activity range or matrix that was not analyzed during that six-month period. The operating ranges for systems currently in use at Hanford span activity from 0-200 g WG Pu with densities from 0-2.5 g/cc.

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

Facility procedures shall define the means to ensure the interfering matrix checks satisfy the requirement to test the range of activity and matrices over a six-month period.

The applicable combinations of matrices and activity ranges shall be technically justified and documented in a report to the SPO and approved by the SQAO. Minimum requirements are:

- The uppermost range of activity must be within the upper one-third (1/3) of the applicable activity range for the system,

- The lowermost range of activity must be within the lower one-third (1/3) of the applicable activity range for the system, and

- If the range of activity is relatively constant within the applicable six-month period (i.e., stays within the same third of the range), only a single range is required to be tested. For example, if all measurements performed during the applicable period fall in the lower one-third of the calibration range, the activity used in the interfering matrix checks may be limited to the lower one-third of the calibration range.

The interfering matrix checks shall be reviewed and evaluated at least weekly by the cognizant engineer or an NDA scientist to determine continued acceptability of the assay system and to monitor for adverse trends. Facility procedures shall define trend acceptance criteria and acceptance criteria for interfering matrix checks. At a minimum, the following conditions require initiation of an NCR or CAR and investigation:

- Any individual measurement with accuracy (%R) not within ± 60 percent of stated source activity at time of measurement,

- Six consecutive measurements with the accuracy (%R) increasing or decreasing, or

- A detailed review of the results indicates other abnormal trends or conditions.

E.4.4.3 Evaluation Criteria for Trend Analysis

1. Successful performance of the daily background measurements (i.e., results are within acceptance limits) satisfies weekly review requirements for background measurements.

2. *Trending Criteria for Instrument Performance Measurements:* Instrument performance measurements shall be reviewed and evaluated at least weekly by the cognizant engineer or an NDA scientist to determine continued acceptability of the assay system and to monitor for adverse trends. Facility procedures shall define trend acceptance criteria. At a minimum, if any of the conditions below occur, the facility shall notify the SQAO. An investigation shall be performed, documented, and approved by SQAO before resuming routine operations. This investigation shall be discussed in or attached to affected NDA batch reports.

   - Six consecutive measurements all increasing or decreasing, or

   - A detailed review of the results indicates other abnormal trends or conditions.

E.4.4.4 Documenting Trend Analysis

Unless specifically approved by the SPM, within one month of the close of the six-month period, the facility shall document the results of the interfering matrix checks in a report to the SPM. This report shall include the applicable ranges and matrices of wastes measured during that period, both for measurement of wastes and for the weekly interfering matrix checks that were performed.

E.5 DATA MANAGEMENT

E.5.1 Data Review and Validation

All NDA data must be reviewed and approved by qualified personnel before being reported. At a minimum, the data must be reviewed by an independent technical reviewer, SQAO, and approved by the SPM. The validation process includes verification that the applicable quality controls specified in subsection E.4 have been met.

Facility procedures shall specify the exact requirements for data validation, verification and review by an independent technical reviewer (ITR).

In general, the requirements of section B3-10 of reference E21 shall be incorporated into the review requirements and combines the requirements for data-generation level, independent technical review (ITR), and technical supervisor review. Key issues to be reviewed include, but are not limited to:

- ITR review shall be documented in a checklist format,
- Data generation and reduction have been performed in accordance with procedural requirements,
- Verification of calculations or data entry as appropriate,
- Instrument performance and background measurements for the affected period have been performed, documented, and meet acceptance criteria and have been evaluated for adverse trends. Appropriate corrective actions have been documented and successfully completed,
- Batch data report is otherwise assembled and complete in accordance with facility procedures,
- Data is technically correct and justified. All anomalies, error messages, warning flags, etc., have been corrected or justified in the report,
- Analytical measurements are performed within any limits for activity, waste matrix, calibration range, etc.,
- Report is complete (through ITR) and data properly reported.

The ITR of NDA data for use in batch data reports is defined to be a person qualified to perform the work as NDA scientist (analyst) who has not acted in the capacity of data analyst for any of the waste analyses contained in the affected NDA batch data report.

SPO procedures shall specify the review requirements for review, validation, and verification by SQAO.

In general, the requirements of section B3-10 of reference E21 shall be incorporated into the procedural requirements and combine the requirements for QA officer review and SQAO review. Key issues to be reviewed or incorporated include, but are not limited to:

- SQAO review shall be documented in a checklist format,
- ITR review complete with any open issues satisfactorily resolved,
- Background and instrument performance measurements for the applicable period are attached and meet acceptance criteria, including any trends,
- Analytical measurements are performed within any limits for activity, waste matrix, calibration range, etc.,
- Copies of any CAR or NCR affecting the data within the batch are attached,
- Report is complete and data properly reported, and,
- Any person qualified as SQAO may perform the SQAO review of an NDA batch data report.

SPM Approval:

- Any person qualified as SPM may perform the SPM approval of an NDA batch data report,
- SPM approval demonstrates the ITR and SQAO reviews have been successfully completed with any and all problems or issues satisfactorily resolved and the associated checklists are complete,
- Verifies the data is now acceptable to permit shipment to WIPP, and
- A checklist is not required, although SPM signature and date is required, when approved.

E.5.2 Data Reporting

E.5.2.1 NDA Batch Data Reports

NDA data must be reported to the SPO on a batch basis. For the purpose of the Hanford TRU Project, batches are defined as a suite of waste containers undergoing NDA using the same system or equipment. A single batch report is limited to 20 waste containers excepting that the SPM may authorize a greater number on a case-by-case basis for batches assayed on or after May 17, 2002.

Each facility is required to submit batch data reports for each batch to the SPO on standard forms (either hard copy or electronic equivalent), as provided in approved facility procedures. NDA batch data reports shall consist of the following:

- Facility name, batch number, container numbers included in that batch
- Table of contents
- Narrative or executive summary, including any explanation of issues or problems associated with the batch
- Background and instrument performance measurement data or control charts for the relevant time period (i.e., at least the duration over which the containers in that batch were assayed)
- Any NCR or CAR directly associated with NDA for that batch
- For all NDA batch data reports with data collected before May 17, 2002, a statement that the data was collected before May 17, 2002 (or effective date of CH-WAC, reference E20) and the replicate analysis are substituted for the weekly interfering matrix checks
- Identification of or reference to applicable calibration, TMU, and QAO reports (QAO report applies to measurements performed but not validated before May 17, 2002)
- Signed ITR and SQAO data validation checklists in accordance with reference E2 (QAPD, section 5.3.2), applicable facility procedures, and reference E26
- Separate report sheet(s) for each container in the batch that include, but are not limited to:
    - Title of "Radioassay Data Sheet"
    - Method used for NDA (i.e., procedure identification)
    - Date of NDA

- For batches with measurements obtained before May 17, 2002:
  - Positive identification of each replicate analysis
  - Positive indication of whether or not the replicate analysis met the acceptance criteria

- Activities and/or masses of individual radioisotopes present, the associated TMUs and the confidence level for which the TMU was calculated (curies and/or grams). Results less than LLD shall be reported as "<LLD" (zero shall be used if, and only if, the isotope is documented in AK as not being present in the waste stream)

- Signature/date of both analyst and reviewer

- Other information or radiological properties shall be documented on the radioassay data sheet including, but not limited to:
  - Decay heat expressed in watts (W) and its associated TMU
  - Total Pu-239 FGE expressed in grams (g) and its associated TMU
  - TRU alpha activity concentration expressed in curies/gram (Ci/g) and associated TMU -; further TRU alpha activity is defined to be the sum of the activities of TRU isotopes that decay by alpha emission and have half-lives greater than 20 years
  - Total Pu-239 equivalent activity expressed in curies (PE-Ci)

- Reported analytical results or summaries including signatures/dates of operator and analyst/reviewer

- Sufficient information to permit the independent calculation of the activity of radionuclides that are scaled or correlated from the measured values for other radionuclides (e.g., Sr-90 calculated from measured Cs-137 or U-234 from U-235 or U-238)

- Radionuclides that are neither one of the ten WIPP-tracked isotopes nor otherwise contribute to 95 percent of the total radiological hazard must have their activity/mass reported if either of the below conditions are met. Reporting may be either on the radioassay data sheet or elsewhere within the report:
  - The radionuclide contributes to FGE or decay heat (e.g., Pu-241, Np-237 or U-235)
  - The radionuclide is used to scale one of the ten WIPP-tracked isotopes.

- Signature approval and release by SPM.

E.5.2.2 Calibration Reports

Calibration and recalibration reports prepared on or after May 17, 2002, shall include, but are not limited to, the following:

- System description, including modifications, major repairs, replacement of major components, etc., since last report
- Range of operation for which the calibration is valid (both activity and matrices)
- Description of calibration methodology
- Period for which calibration is applicable
- Summary and description of the calibration confirmation
- Results of calibration confirmation
- Reports of all calibration parameters, components, functions calibrated
- Supporting analytical results
- System settings, operating parameters, etc.
- Must be reviewed and approved by the SQAO.

E.5.2.3 Total Measurement Uncertainty Reports

TMU reports prepared on or after May 17, 2002, shall include, but are not limited to, the following requirements:

- Description of system(s), including modifications, major repairs, replacement of major components, etc., since last report
- Identification of and technical justification for like or similar systems
- Assumptions, limits, range, matrices, etc., to which the TMU is applicable
- Evaluation of the individual contributing components to TMU
- Total measurement uncertainty and equations for individual isotopes and parameters in accordance with reference E6
- Must be reviewed and approved by the SQAO.

E.5.2.4 Calibration Verification Reports

Calibration verification reports prepared on or after May 17, 2002, shall include, but are not limited to, the following:

- System description, including modifications, major repairs, replacement of major components, etc., since last calibration or calibration verification report
- Range of operation for which the calibration is valid (both activity and matrices)
- Period for which calibration is applicable
- Summary and description of the calibration verification
- Results of calibration verification
- Supporting analytical results
- Must be reviewed and approved by the SQAO.

E.5.3 Data and Records Retention

The following records shall be forwarded to the SPO and shall be documented and retrievable by NDA batch number, in accordance with reference E2 (QAPD):

- NDA batch reports
- All raw data, including instrument readouts, calculation records, and NDA QC results (both background or power baseline and instrument performance measurements). Raw data includes, but is not limited to, the original data collected for subsequent analysis
- All instrument calibration reports, including the analysis of the associated standards and any confirmatory measurements performed to satisfy the calibration confirmation requirements. "Calibration reports" include the original analytical results collected to perform any and all portions of the calibration (e.g., energy calibration, efficiency determination, system correction factor determination, calibration confirmation, etc.).

E.5.4 Required Reports

Table E-5 summarizes routinely generated reports required by this appendix. This list cannot be all inclusive and does not address special occurrences.

Table E-5, Summary of Required Reports

Report Subject	Frequency	Comments	Reference Section
NDA Batch Data Reports	As generated		
AK Summary Report	As generated, updated as necessary	As related to radionuclides present and their fractional abundances	E.2.2.1 E.2.2.2
Acceptable Knowledge Source Document Deficiency	As generated		E.2.2.3
Method to Quantify U-234 and Sr-90	As generated	May need to update this on a waste stream basis	E.2.1
Calibration Report	Following initial calibration	Calibration confirmation also required	E.3 E.5.2.2
Recalibration Report	After each recalibration	Calibration confirmation also required	E.3 E.5.2.2
Calibration Confirmation	Concurrent with each calibration or recalibration	May be documented separately or included in calibration report	E.3
Calibration Verification	As performed (following system repair, modification, etc.)		E.3 E.5.2.4
LLD Methodology	As generated, updated as necessary	Must include equivalent LLD for isotopes that cannot be measured (e.g., Sr-90 and U-234)	E.3
TMU Report	As generated, updated as necessary	Must be submitted to CBFO	E.3 E.5.2.3
Methodology for Alternate Control Limits	As needed	Must be approved by CBFO before implementation of methodology	E.4.2.2 E.4.4.2
CAR/NCR	As generated		Various
Interfering Matrix Checks and Trend Analysis	1 month after end of 6-month period		E.4.2.2 E.4.3.2 E.4.4.2
Correlation of Sources to Primary Standards	When performed		E.3
Calibration Technique	If not performed in accordance with consensus standards	Requires pre-approval by CBFO	E.3
Alternate Calibration Confirmation Accuracy and Precision Limits	As needed	Requires pre-approval by CBFO	E.3
Calorimetry Baseline and Instrument Performance Measurement Frequency	Prior to use and whenever updated	Requires pre-approval by CBFO and must include equivalent trending-	E.4.3.2
Definition of applicable operating ranges for weekly interfering matrix checks	Prior to use and whenever updated		E.4.2.2 E.4.3.2 E.4.4.2

E.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.

E.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 NDA methods, this quality characteristic is met and maintained as described in subsection E.3.

E.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 NDA methods, this quality characteristic is met and maintained as described in subsection E.3.

E.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 this quality characteristic for the waste stream is met and maintained through 100 percent measurement confirmation on a payload container basis.

E.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 percent valid results. Any result indicating the NDA measurement was invalid requires re-measurement.

E.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 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 subsection E.4.1. 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 NDA systems shall participate in measurement comparison programs as specified in subsection E.4.1.

E.7 PU-239 EQUIVALENT ACTIVITY

Pu-239 equivalent activity (PE-Ci) is calculated and reported for each container of TRU waste. This calculation normalizes the activity for each TRU isotope to that of Pu-239. PE-Ci is calculated for each and every TRU isotope regardless of half-life ($t_{1/2}$) or method of decay and for U-233 using the following formula:

$$PE - Ci = \sum_{i=1}^{k} \frac{A_i}{WF_i}$$

where: $k \equiv$ the number of TRU isotopes including U-233 (without regard to method of decay or $t_{1/2}$)
$A_i \equiv$ the activity (in Curies) of TRU radionuclide *i*
$WF_i \equiv$ the weight factor (WF) for TRU radionuclide *i*

WF is defined to be the ratio of the 50-year effective whole-body dose commitment due to the inhalation of Pu-239 particulates with a 1.0 µm activity median aerodynamic diameter (AMAD) and a weekly pulmonary clearance class ($CEDE_{Pu\text{-}239}$) to the 50-year effective whole-body dose commitment due to the inhalation of radionuclide *i* particulates, with a 1.0 µm activity median aerodynamic diameter and the pulmonary clearance class resulting in the highest 50-year effective whole-body dose commitment ($CEDE_i$). The values of $CEDE_{Pu\text{-}239}$ and $CEDE_i$ are taken from DOE/EH-0071 (reference E18). Mathematically, this is expressed as:

$$WF_i = \frac{CEDE_{Pu-239}}{CEDE_i}$$

Table E-6 contains the weighting factors for TRU isotopes listed in reference E18, section 1.3.7, that have a 50-year committed dose equivalent factor (E_i as used in reference E20, CEDE as used on reference E19) identified in reference E19.

Table E-6, PE-Ci Weighting Factors

Isotope	Atomic No.	Class	CEDE	WF	1 / WF	Comment
U-233	92	Y	1.30E+02	3.9	0.3	
Np-237	93	W	4.90E+02	1.0	1.0	
Pu-236	94	W	1.60E+02	3.2	0.3	
Pu-238	94	W	4.60E+02	1.1	0.9	
Pu-239	94	W	5.10E+02	1.0	1.0	
Pu-240	94	W	5.10E+02	1.0	1.0	
Pu-241	94	W	1.00E+01	51.0	0.0	
Pu-242	94	W	4.80E+02	1.1	0.9	
Pu-244	94	W	4.80E+02	1.1	0.9	
Am-241	95	W	5.20E+02	1.0	1.0	
Am-242m	95	W	5.10E+02	1.0	1.0	
Am-243	95	W	5.20E+02	1.0	1.0	
Cm-242	96	W	1.70E+01	30.0	0.0	
Cm-243	96	W	3.50E+02	1.5	0.7	
Cm-244	96	W	2.70E+02	1.9	0.5	
Cm-245	96	W	5.40E+02	0.9	1.1	
Cm-246	96	W	5.40E+02	0.9	1.1	
Cm-247	96	W	4.90E+02	1.0	1.0	
Cm-248	96	W	1.90E+03	0.3	3.7	
Cm-250	96	N/A	N/A	N/A	N/A	Not Listed in DOE/EH-0071
Bk-250	97	W	6.90E-03	73913.0	0.0	Use with caution: may be a typo in DOE/EH-0071
Cf-249	98	W	5.50E+02	0.9	1.1	
Cf-250	98	W	2.20E+02	2.3	0.4	
Cf-251	98	W	5.60E+02	0.9	1.1	
Cf-252	98	Y	1.30E+02	3.9	0.3	
Es-254	99	W	3.60E+01	14.2	0.1	

E.8 NDA-RELATED PROCEDURES

Table E-7 identifies procedures used specifically for or in the performance or documentation of NDA in the Hanford TRU Project. These procedures may also contain requirements for other aspects of the Hanford TRU Project.

Table E-7, NDA Implementing Procedures in the Hanford TRU Project

Document number	Title
WMP-400, Section 1.2.1	TRU Training and Qualification Plan
WMP-400, Section 1.2.2	Qualification of NDA, NDE, Visual Examination, and Inspection and Test Personnel
WMP-400, Section 1.3.2	TRU Nonconforming Item Reporting and Control
WMP-400, Section 1.3.3	TRU Corrective Action Reporting and Control
WMP-400, Section 1.5.1	TRU Records Management
WMP-400, Section 3.1.2	Quality Assurance Reports to Management
WMP-400, Section 6.1.1	TRU Software Quality Assurance
WMP-350, Section 2.2	Calculation of Assay Results
WMP-350, Section 2.3	Data Management
WMP-350, Section 2.5	GEA Energy and Efficiency Setup and Baseline Establishment
WMP-350, Section 2.8	WRAP NDA Measurement Control Program
WMP-350, Section 2.9	Performing Calibration Verifications and Confirmations for NDA at WRAP
WRP1-OP-0905	Imaging Passive/Active Neutron Assay Operation
WRP1-OP-0906	Gamma Energy Assay Operations
ZA-948-385	NDA Using GeniePC
ZA-948-392	NDA Using NDA 2000
ZA-948-393	NDA Using the Room 172 ANTECH Calorimeters
ZA-400-301	Energy and Efficiency Setup and Baseline Determination Using GeniePC
ZA-400-303	Energy and Efficiency Setup and Baseline Determination Using NDA 2000
ZA-400-304	ANTECH Calorimeter Calibration
ZA-400-302	Calculation of Assay Results
FSP-PFP-5-8, Section 16.2	Data Management
FSP-PFP-5-8, Section 16.3	QC Criteria for Residues Project NDA Instruments
FSP-PFP-5-8, Section 16.4	Calibration Confirmation for Residues Project NDA Instruments

E.9 NDA-SPECIFIC REFERENCES

Hanford TRU Project NDA programs were developed using the following references.

E1 NUREG-1297, *Peer Review for High-Level Nuclear Waste Repositories,* Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington D.C.

E2 DOE-CBFO-94-1012, *Quality Assurance Program Document,* Carlsbad Field Office, U.S. Department of Energy, Carlsbad, New Mexico.

E3 Currie, Lloyd A., 1968, "Limits for Qualitative Detection and Quantitative Determination." Anal. Chem. 40: 586-93.

E4 EPA 520/1-80-012, *Upgrading Environmental Radiation Data*, Office of Radiation Programs, U. S. Environmental Protection Agency, Washington D.C., 1980

E5 "Total Measurement Uncertainty Assessment for Transuranic Waste Shipments to the Waste Isolation Pilot Plant," K. C. Smith, R. A. Stroud, K. L. Coop, and J. F. Bresson, Proceedings of the 6th Nondestructive Assay Waste Characterization Conference, Salt Lake City, Utah, Nov. 17-19, 1998, pp.21-37.

E6 "Standardized Total Measurement Uncertainty Reporting for WIPP," K. L. Coop, J. F. Bresson, M. E. Doherty, B. M. Gillespie, and D. R. Davidson, Nondestructive Assay Interface Working Group, Salt Lake City, Utah, May 22, 2000.

E7 DOE/CBFO-01-1006, *Performance Demonstration Program Plan for Nondestructive Assay of Boxed Wastes for the TRU Waste Characterization Program*, Carlsbad Field Office, U.S. Department of Energy Carlsbad, New Mexico.

E8 ASTM C1490, "Standard Guide for Selection, Training and Qualification of Nondestructive Assay (NDA) Personnel, American Society for Testing and Materials," Philadelphia, Pennsylvania.

E9 ANSI N15.54, "Radiometric Calorimeters – Measurement Control Program," American National Standards Institute, Inc., New York, NY.

E10 DOE/CBFO-01-1005, *Performance Demonstration Program Plan for Nondestructive Assay of Drummed Wastes for the TRU Waste Characterization Program*, Carlsbad Area Office, U.S. Department of Energy, Carlsbad, New Mexico.

E11 ASTM C1030-95, "Standard Test Method for Determination of Plutonium Isotopic Composition by Gamma-Ray Spectrometry," American Society for Testing and Materials, Philadelphia, Pennsylvania.

E12 ASTM C1316-95, "Standard Test Method for Nondestructive Assay of Nuclear Material in Scrap and Waste by Passive-Active Neutron Counting Using a 252Cf Shuffler," American Society for Testing and Materials, Philadelphia, Pennsylvania.

E13 ASTM C1133-96, "Standard Test Method for Nondestructive Assay of Special Nuclear Material in Low Density Scrap and Waste by Segmented Passive Gamma-Ray Scanning," American Society for Testing and Materials, Philadelphia, Pennsylvania.

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