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Mr. James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 E. Rodeo Park Drive, Bldg. 1
Santa Fe, NM 87505-6110

Subject: Transmittal of Current Revisions of the AMWTP Quality Assurance Project Plan and CCP Transuranic Waste Characterization Quality Assurance Project Plan

Dear Mr. Bearzi:

Enclosed are two paper copies of the Advanced Mixed Waste Treatment Project Quality Assurance Project Plan (QAPjP) and the CCP Transuranic Waste Characterization Quality Assurance Project Plan (QAPjP) that has been revised. These documents are being submitted to you in accordance with the *Hazardous Waste Facility Permit,* Attachment C5, Section C5-2.

The following documents are enclosed:

- MP-TRUW-8.2, Revision 14, *Quality Assurance Project Plan*
- CCP-PO-001, Revision 19, *CCP Transuranic Waste Characterization Quality Assurance Project Plan.*

If you have any questions regarding this transmittal, please contact me at (575) 234-7313.

Sincerely,

J. R. Stroble

J. R. Stroble, Director
Office of the National TRU Program

Enclosure(s)

cc: w/enclosures
WIPP Operating Record
CBFO M&RC

110124

CBFO:NTP:GS:11-0117:UFC 5900.00

cc: w/o enclosure

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AMWTP
Advanced Mixed Waste Treatment Project

MP-TRUW-8.2, Rev. 14

Quality Assurance Project Plan

Advanced Mixed Waste Treatment Project

(Signature on file. See DCR-9605.)
T. F. Fallon
Quality Assurance Manager

12/17/10
Date

DOCUMENT APPROVAL SHEET

Document Type: Compliance Plan **Document Number:** MP-TRUW-8.2

Title: Quality Assurance Project Plan

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REVISION LOG

Revision Number	Date Approved	Pages Affected	Description of Revision
0	08/29/02	All	Initial issue. DCR-2002-1171. Document issue date was 08/29/02. DOE/WIPP approval was received 09/09/02 thus the change in effective date to 09/12/02.
1	02/26/03	Various	DCR-1821. Correct procedure titles and numbers. Added DOE-ID to the Document Approval Sheet in accordance with MP-DOCS-18.4. Document issue date was 12/19/02. DOE/WIPP approval was received 02/25/03 thus the change in effective date to 02/26/03.
2	03/10/03	12, 153	DCR-2094. Added changes to the training sections A-7 & B3-14. Document issue date was 03/10/03. DOE/WIPP approval was received 03/17/03. The change in effective date is 03/31/03.
3	08/19/04	Various	DCR-2895: Revised to reflect the addition of new headspace gas sampling system, references to facility procedures and updates to NMED's WAP. Incorporation of CBFO review comments
4	04/18/05	P69	DCR-3280. Add text to P.69, B1-1a(5): "This Section is applicable to the AMWTP such that sampling and analysis may be performed by other contractors. Level I validation will be performed by a subcontractor. Level II validation will be performed by the AMWTP PLV&V group."
5	06/09/05	54, 55	DCR-4365 Incorporation of Class 1 Permit Modification Notification to Revise Language for Compacted 55-Gallon Drums With Rigid Liners, April 27, 2005 and WIPP Memorandum CBFO:OCT:KWW:VW:05-1164-UFC:5822. Incorporated the procedure to implement the UFGTP long-term objective
6	02/03/06	All	DCR-4640. Periodic Review. Added carbon disulfide to the target analyte list in Table B3-2. Various editorial changes.
7	06/01/06	Various	DCR-5039. Change reference to reflect change in contractor. Editorial. BBWI address change. Optional headspace system configuration.

Revision Number	Date Approved	Pages Affected	Description of Revision
8	01/04/2007	All	DCR-5381. Implementation of the NMED 311 Permit modification. Incorporate CBFO DRR comments, AMWTP organization, OI-34 title change (global), and effective date to 1/24/07
9	08/09/07	Various	DCR-6104. Incorporate WIPP Class 1 Permit modifications, update procedural titles and references, and editorial changes.
10	10/24/07	Various	DCR-6307. Incorporate August 2007 WIPP Class 1 permit modifications.
11	08/29/08	Various	DCR-6887. Incorporate the Class 1 Permit Notifications, July, 2008. Add references to INST-OI-75, INST-OI-81, and CCP procedures. Update organization chart in Figure B5-1.
12	12/22/09	Various	DCR-8769. Annual review: updated the overview, description of the site, project description, and AMWTP organizations and responsibilities, WDS implementation; added characterization and AK of off-site waste, and update analytical lab name and location. Editorial changes consistent with MP-DOCS-18.3.
13	05/27/10	Various	DCR-9164. Incorporate Class 2 PMR change for liquid, VE, and NCRs.
14	12/17/10	Various	DCR-9605. Incorporate the new WIPP Hazardous Waste Permit Renewal structure (attachments and sections from B to C and modules to parts/subparts), revise the definitions of *waste stream* and *ITR*, delete (cis)1, 2-dichloroethylene, clarify the RTR training drum VEE training, RTR independent replicate scan and oversight functions, and AK.

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A. INTRODUCTION

The Advanced Mixed Waste Treatment Project (AMWTP) characterizes and certifies contact-handled (CH) transuranic (TRU) waste for disposal at the Waste Isolation Pilot Plant (WIPP). The AMWTP has developed this Quality Assurance Project Plan (QAPjP) to comply with the *WIPP Hazardous Waste Facility Permit, Attachment C, Waste Analysis Plan* (WIPP-WAP).The format of this document parallels that of the WIPP-WAP.

A-0 Scope

This QAPjP describes how the characterization and certification requirements of the WIPP-WAP are met at the AMWTP. The Site Project Manager (SPM) will ensure any conflicts between this QAPjP and any existing WIPP-WAP requirements are resolved.

This QAPjP implements the applicable requirements of United States (U.S.) Department of Energy (DOE)/Carlsbad Field Office (CBFO)-94-1012, Quality Assurance Program Document, which identifies the quality of data necessary to maintain quality.

A-1 Overview

The AMWTP is operated under a non-commercial contract with the DOE and is located at the Idaho National Laboratory's (INL) Radioactive Waste Management Complex (RWMC).

The AMWTP plans to dispose of approximately 65,000 m^3 of contact-handled transuranic (CH-TRU) waste at the WIPP. These wastes are byproducts of nuclear weapons production and are identified in terms of waste streams based on the processes that produced them. Each waste stream is assigned to a waste category summary to facilitate Resource Conservation and Recovery Act (RCRA) waste characterization and reflect the final waste forms acceptable for WIPP disposal. TRU mixed waste processed at the AMWTP is currently stored in drums, boxes, and bins in the Transuranic Storage Area (TSA) Retrieval Enclosure (RE) and in Type II storage modules at the RWMC.

The AMWTP has the capability of treating specific waste streams to be retrieved from the TSA-RE and may treat other applicable INL and DOE national waste streams. The majority of TRU mixed waste within the TSA-RE is CH-TRU. Although some remote-handled (RH) TRU waste will be encountered during the retrieval operations, the RH-TRU waste will be segregated from the CH-TRU and will not be shipped to the WIPP for disposal.

Approximately 95% of the TRU waste stored at the RWMC contains hazardous waste regulated under the RCRA. Mixed waste refers to waste that is both radioactive and contaminated by hazardous constituents, and is regulated by both the Atomic Energy Act and RCRA. Some of the waste stored at the RWMC may also contain Toxic Substance Control Act (TSCA)-regulated material such as polychlorinated biphenyls (PCBs) and asbestos.

Capabilities established to support the TRU waste management mission include: storage; characterization (nondestructive examination [NDE], nondestructive assay [NDA], headspace gas sampling and analysis, and solid sampling); and treatment, as appropriate. Transportation and chemical analysis of homogeneous solids are performed by the Central Characterization Project (CCP).

A-2 Description of the Site

The AMWTP is located in the southwest corner of the INL. The INL, located approximately 30 miles west of Idaho Falls, encompasses 900 square miles. Facilities supporting characterization, treatment, certification, and transportation activities are located within the INL at the RWMC.

B. PROJECT DESCRIPTION

Consistent with requirements in the WIPP-WAP, AMWTP uses acceptable knowledge (AK) to initially characterize TRU waste which provides the basis for identifying TRU waste streams eligible for WIPP disposal. A waste stream is defined as waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity.

Once a waste stream has been identified, characterization information must be collected in order to complete and submit the WIPP Waste Stream Profile Form (WSPF) to the CBFO for approval. Waste characterization activities include the following, although not all of these techniques are used on each container: AK, headspace gas sampling (HSGS) and analysis, homogeneous solids waste sampling and analysis, radioassay (RA), real-time radiography (RTR), and visual examination (VE). RA characterization is covered in MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*. Data generated by these methods are assessed on a waste stream basis or lot. For each waste stream characterized, the SPM determines if sufficient data have been collected to determine the waste parameters required for completion of the WSPF. After a WSPF has been submitted to and approved by CBFO, characterization activities continue on subsequent lots of the waste stream to verify consistency with the WSPF.

B-0 AMWTP Organization and Responsibilities

The AMWTP organization and responsibilities for implementation of the requirements of this QAPjP are described in the following sections. Figure B-1 provides the organization structure.

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

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

TRU Programs Manager is responsible for the management and direction of activities related to the characterization, certification, transportation, and disposal of TRU waste destined for WIPP. The TRU Programs Manager's responsibilities include the following:

- Providing the necessary planning, organization, direction, control, resources, and support to achieve the defined objectives
- Ensuring compliance with all applicable regulations, DOE orders and requirements, and applicable Federal, state, and local laws
- Developing, implementing, and maintaining plans, policies, and procedures that implement WIPP requirements
- Ensuring that adequate technical and QA training are provided for personnel performing WIPP activities.
- Ensuring that personnel adhere to procedures for the generation, identification, control, and protection of QA records
- Identifying, investigating, reporting, and correcting quality problems.

Site Project Manager (SPM) has overall responsibility for TRU waste characterization and certification activities and is responsible for the following:

- Development, maintenance, review, and implementation of procedures and reports
- Review and approval of the QAPjP and subsequent revisions
- Waste selection and tracking
- Validation/verification of data
- Reconciliation of data with data quality objectives (DQOs)
- Assignment of EPA hazardous waste numbers (HWNs)
- Preparation and submission of SPM Data Validation Summaries, WSPFs, Characterization Information Summaries, and Waste Stream Characterization Packages (if requested by CBFO)
- Review of the QA/semiannual report, commenting if appropriate, and forwarding a copy of the report with comments to DOE-ID.

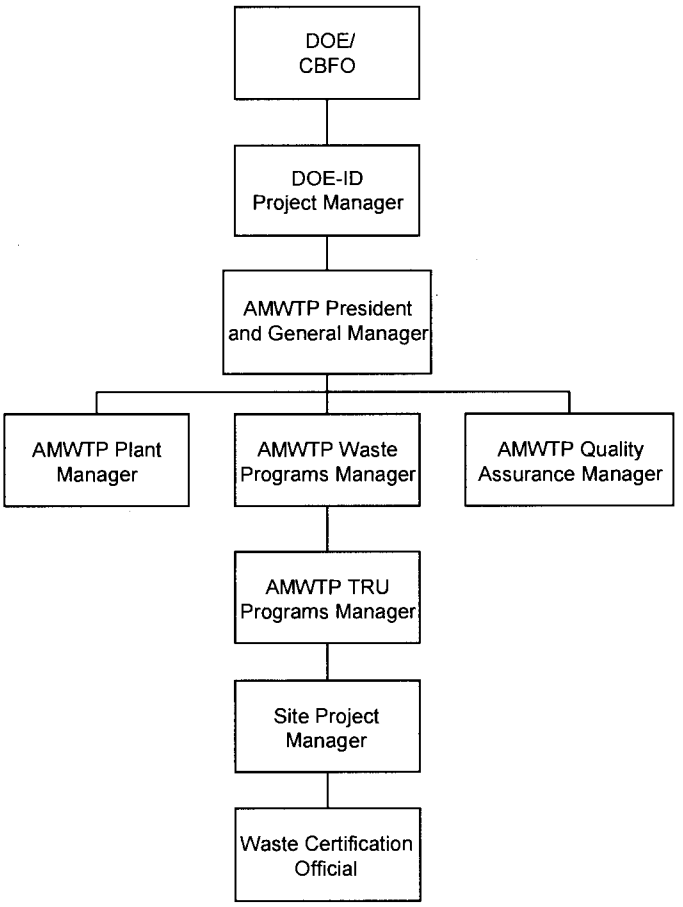


Figure B-1. AMWTP Organization.

C. WASTE ANALYSIS PLAN

C-0 Introduction and Highlights

This QAPjP has been prepared for the management, storage, or disposal activities to be conducted at the WIPP facility to meet the requirements set forth in 20.4.1.500 New Mexico Administrative Code (NMAC; incorporating 40 Code of Federal Regulations [CFR] §264.13). Guidance in the most recent U.S. Environmental Protection Agency (EPA) manual on waste analysis has been incorporated into the preparation of the WIPP-WAP (EPA 1994). This QAPjP includes test methods, details of planned waste sampling and analysis for complying with the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.13), a description of the waste shipment screening and verification process, and a description of the quality assurance/quality control (QA/QC) program. The AMWTP will implement the requirements of the WIPP-WAP prior to offering waste for shipment and disposal at WIPP.

TRU mixed wastes stored at the AMWTP were generated by DOE generator/storage sites by various specific processes and activities. Examples of the major types of operations that generated these wastes include:

- Production of Nuclear Products – Production of nuclear products includes reactor operation, radionuclide separation/finishing, and weapons fabrication and radionuclide separation/finishing processes. More specifically, wastes consist of residues from chemical processes, air and liquid filtration, casting, machining, cleaning, product quality sampling, analytical activities, and maintenance and refurbishment of equipment and facilities.

- Plutonium Recovery – Plutonium recovery wastes are residues from the recovery of plutonium-contaminated molds, metals, glass, plastic, rags, salts used in electrorefining, precipitates, firebrick, soot, and filters.

- Research and Development (R&D) – R&D projects include a variety of hot cell or glovebox activities that often simulate full-scale operations described above, producing similar TRU mixed wastes. Other types of R&D projects include metallurgical research, actinide separations, process demonstrations, and chemical and physical properties determinations.

- Decontamination and Decommissioning – Facilities and equipment that are no longer needed or usable are decontaminated and decommissioned, resulting in TRU mixed wastes consisting of scrap materials, cleaning agents, tools, piping, filters, Plexiglas, gloveboxes, concrete rubble, asphalt, cinder blocks, and other building materials.

TRU mixed waste contains both TRU radioactive and hazardous components, as described in 20.4.1.800 NMAC (incorporating 40 CFR §268.35[d]), and in the Federal Facility Compliance Act, Public Law 102-386 Title 1, §3021(d). TRU and TRU mixed waste are designated and separately packaging as either CH or RH based on the radiological dose rate at the surface of the waste container.

The hazardous components of the TRU mixed waste to be managed at the WIPP are designated in Table C-9. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at WIPP as long as the WIPP Hazardous Waste Permit Treatment, Storage, and Disposal Facility (TSDF) Waste Acceptance Criteria (WAC) in Part 2 are met. This QAPjP describes the measures that will be taken to ensure that the TRU mixed wastes received at the WIPP facility are within the scope of Table C-9 as established by 20.4.1.500 NMAC (incorporating 40 CFR §264), and that they comply with unit-specific requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.600), Miscellaneous Units.

Some TRU waste is retrievably stored at the AMWTP. Additional TRU waste is generated and packaged into containers. Retrievably stored waste is defined as TRU mixed waste generated after 1970 and before the New Mexico Environment Department (NMED) notifies the CBFO, by approval of the final audit report, that the characterization requirements of the WAP have been implemented. Newly generated waste is defined as TRU mixed waste generated after NMED approves the final audit report. Acceptable Knowledge (AK) information is assembled for both retrievably stored and newly generated waste. Waste characterization of retrievably stored TRU mixed waste will be performed on an ongoing basis, as the waste is retrieved. Waste characterization of newly-generated TRU mixed waste is typically performed as it is generated, although some characterization occurs post-generation. Waste characterization requirements for retrievably store and newly-generated TRU mixed waste differ, as discussed in Sections C-3d(1) and C-3d(2).

Waste characterization is defined in Part 1 of the WIPP RCRA Permit as the activities performed by the waste generator to satisfy the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §240.13[a]) before waste containers have been certified for disposal at WIPP. The characterization process for WIPP waste is presented in Figure C-2. AMWTP's waste characterization program was first audited by CBFO in August 2003, with NMED approving the final audit report. After this, AMWTP determines whether AK alone is sufficient for characterization, or whether a Sampling and Analysis Program in conjunction with AK is necessary to adequately characterize wastes. If an AK Sufficiency Determination is sought, information is provided to the CBFO for their review and provisional approval. NMED determination of adequacy of the AK information is required before final approval by the CBFO. If the sampling and analysis route is chosen, AMWTP proceeds to sample and analyze waste in conjunction with AK and in accordance with this QAPjP. Once an AK Sufficiency Determination is obtained, or when required sampling and analysis data are obtained, AMWTP would then prepare and submit the Waste Stream Profile Form (WSPF) for CBFO approval. Once the WSPF is approved, AMWTP may ship waste to WIPP. AMWTP will provide sufficient

data to allow CBFO to perform waste confirmation prior to shipment of the waste from AMWTP to WIPP pursuant to Section C7 by performing RTR or VE of a representative subpopulation of certified waste containers, to ensure that the wastes meet the applicable requirements of the TSDF-WAC.

C-0a Waste Characterization

Characterization requirements for individual containers of TRU mixed waste are specified on a waste stream basis. A waste stream is defined as waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity. Waste streams are grouped by Waste Matrix Code Groups that relate to the physical and chemical properties of the waste. The AMWTP uses the characterization techniques described in the WIPP-WAP to assign appropriate Waste Matrix Code Groups to waste streams for WIPP disposal. The Waste Matrix Code Groups are solidified inorganics, solidified organics, salt waste, soils, lead/cadmium metal, inorganic nonmetal waste, combustible waste, graphite, filters, heterogeneous debris waste, and uncategorized metal. Waste Matrix Code Groups can be grouped into three Summary Category Groups: Homogeneous Solids (Summary Category S3000), Soil/Gravel (Summary Category S4000), and Debris Waste (Summary Category S5000).

TRU mixed waste are initially categorized into the three broad Summary Category Groups that are related to the final physical form of the waste. Waste characterization requirements for these Summary Category Groups are specified separately in Section C-2 of this document. Each of the three broad groups is described below.

- S3000 – Homogeneous Solids

  Homogeneous solids are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20 NMAC 4.1.800 (incorporating 40 CFR §268.2[g] and [h]). Included in the series of homogeneous solids are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this Summary Category Group based on the specific waste stream types and final waste form. This Summary Category Group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50 percent by volume homogeneous solids.

- S4000 – Soils/Gravel

  This Summary Category Group includes S4000 waste streams that are at least 50 percent by volume soil/gravel. This Summary Category Group is expected to contain toxic metals.

- S5000 – Debris Wastes

  This Summary Category Group includes heterogeneous waste that is at least 50 percent by volume materials that meet the criteria specified in 20 NMAC 4.1.800 [incorporating 40 CFR §268.2 (g)]. Debris means solid material exceeding a 2.36-inch (60 millimeter [mm]) particle size that is intended for disposal and that is:

  1. A manufactured object, or
  2. Plant or animal matter, or
  3. Natural geologic material.

  Particles smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material.

If a waste does not include at least 50% of any given Summary Category Group by volume, characterization shall be performed using the waste characterization process required for the category constituting the greatest volume of waste for that waste stream (see Section C-3d).

The AMWTP characterizes waste in accordance with this QAPjP and ensures that waste proposed for storage and disposal at WIPP meets the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC. The AMWTP assembles the AK information into an auditable record[a] for the waste stream as described in Attachment C4. For those waste streams with an approved AK Sufficiency Determination, sampling and analysis per the methods described in Attachments C1 and C2 are not required.

All waste characterization activities specified in this QAPjP are carried out at the AMWTP and, as applicable, at the WIPP approved laboratories in accordance with the WIPP-WAP. CBFO will audit generator/storage site waste characterization programs and activities as described in Section C-3. Waste characterization activities at the AMWTP include the following, although not all these techniques will be used on each container, as discussed in Section C-3:

- Real-time radiography (RTR), which is an x-ray technique to determine physical contents of containers
- Visual examination (VE) of opened containers as an alternative way to determine their physical contents

a. "Auditable Records" are those records which allow the CBFO to conduct a systematic assessment, analysis, and evaluation of the site's compliance with the QAPjP and the WIPP RCRA Permit.

- Headspace-Gas Sampling (HSGS) to determine volatile organic compound (VOC) content of gases in the void volume of the containers

- Sampling and Analysis of waste forms that are homogeneous and can be representatively sampled to determine concentrations of hazardous waste constituents and toxicity characteristic (TC) contaminants of waste in containers

- Compilation of AK documentation into an auditable record.

C-0b AK Sufficiency Determination

AMWTP may submit a request to the CBFO for an AK Sufficiency Determination (Determination Request) to meet all or part of the waste characterization requirements. The contents of the Determination Request are specified in Attachment C4, Section C4-3d. The Determination Request may take one of the following forms:

Scenario 1 Radiography or VE of the waste stream is not required, and Chemical Sampling and Analysis is not required;

Scenario 2 Radiography or VE of the waste stream is not required, but Chemical Sampling and Analysis of a representative sample of the waste stream is required; or

Scenario 3 Chemical Sampling and Analysis is not required, but RTR or VE of 100% of the containers in the waste stream is required.

The CBFO shall evaluate the Determination Request for completeness and technical adequacy. This evaluation shall include, but be limited to whether the Determination Request is technically sufficient for the following:

- The Determination Request must include all information specified in Attachment C4, Section C4-3d.

- The AK Summary must identify relevant hazardous constituents and must correctly identify all TC and listed EPA HWNs.

- All EPA HWN assignments must be substantiated by supporting data and, if not, whether this lack of substantiation compromises the interpretation.

- Resolution of data discrepancies between different AK sources must be technically correct and documented.

- The AK Summary must include all the identification of waste material parameter weights by percentage of the material in the waste stream and determinations must be technically correct.

- All prohibited items specified in the WIPP Hazardous Waste Permit TSDF-WAC should be addressed and conclusion drawn must be technically adequate and substantiated by supporting information.

- If the AK record includes process control information specified in Attachment C4, Section C4-3b, the information should include procedures, waste manifests, or other documentation demonstrating that the controls were adequate and sufficient.

- The AMWTP must provide the supporting information necessary to substantiate technical conclusions within the Determination Request and this information must be correctly interpreted.

The CBFO will review the Determination Request for technical adequacy and compliance with the requirements of the WIPP-WAP, using trained and qualified individuals in accordance with the standard operating procedures that, at a minimum, address all of the technical and procedural requirements listed above. CBFO shall resolve comments with AMWTP and the CBFO may change the scope of the Determination Request to one of the three scenarios.

If CBFO determines that the AK is sufficient, they will inform the public of the Determination Request, the CBFO evaluation of it, and the date and time of a public meeting to provide information to and solicit comments from interested members of the public hearing regarding the Determination Request. Notice of the meeting and comment period shall be provided by the following:

1. Written notice to all individuals on the facility mailing list

2. Public notice in area newspapers, including the Carlsbad *Current-Argus*, Albuquerque *Journal*, and Sante Fe *New Mexican*

3. Notice on the WIPP home page

4. E-mail notification as specified in Permit Section 1.11.

CBFO will take written comment of the Determination Request for at least 30 days following the public meeting. CBFO will compile all comments, including any disagreement between the CBFO and commenters.

If CBFO provisionally approves the Determination Request, they may forward it along with all relevant information submitted with the Determination Request to NMED for an evaluation that the provisional approval made by the CBFO is adequate. CBFO will also provide NMED with a

separate appendix to the Determination Request, the compilation of all comments, and CBFO's response to each comment. After submitting a Determination Request to NMED, the CBFO will post a link to the transmittal letter to NMED on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11. Based on the results of NMED's evaluation, the CBFO will notify the AMWTP whether the AK information is sufficient and the Determination Request is approved. The CBFO will not approve a Determination Request that NMED has determined to be inadequate unless the AMWTP resolves the inadequacies and provides the resolution to NMED for evaluation of adequacy. Should the inadequacies not be resolved to NMED's satisfaction, the CBFO shall not submit a Determination Request for the same waste stream at a later date. CBFO shall not submit a Determination Request if a previous Determination Request is pending evaluation by NMED.

In the event CBFO disagrees, in whole or in part, with an evaluation performed by NMED resulting in a determination by NMED that CBFO's provisional approval for a particular waste stream is inadequate, CBFO may seek dispute resolution. The dispute resolution process is specified in Part 1. The Secretary's final decision under Permit Section 1.16.4 shall constitute a final agency action.

By July 1 of each year, the CBFO will submit to NMED a list of waste streams that CBFO may submit for an AK Sufficiency Determination during the upcoming federal fiscal year. The CBFO will post a link to the transmittal letter to NMED and announce a public meeting to discuss the list with interested members of the public on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11.

If AMWTP does not submit a Determination Request, or if the CBFO does not approve a Determination Request, or if NMED finds that the CBFO's provisional approval of a Determination Request is inadequate, the AMWTP shall perform RTR or VE on 100% of the containers in a waste stream and chemical sampling and analysis on a representative sample of the waste stream using HSGS and analysis (for debris wastes) or solids sampling and analysis (for homogeneous solid or soil/gravel waste) as specified in Attachments C1 and C2.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 1, and NMED finds that the CBFO's provisional approval is adequate, neither RTR or VE nor chemical sampling and analysis of the waste stream is required.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 2, and NMED finds that the CBFO's provisional approval is adequate, chemical sampling and analysis of a representative sample of the waste stream is required, but RTR or VE is not required.

If AMWTP submits a Determination Request, the CBFO provisionally approves the Determination Request as Scenario 3, and NMED finds that the CBFO's provisional approval is

adequate, RTR or VE of 100% of the containers in the waste stream is required, but chemical sampling and analysis is not required.

C-0c Waste Stream Profile Form Completion

After a complete AK record has been compiled and either a Determination Request has been approved by the CBFO or the AMWTP has completed the applicable representative sampling and analysis requirements specified in Attachments C1 and C2, AMWTP will complete a WSPF and Characterization Information Summary (CIS). The requirements for the completion of a WSPF and a CIS are specified in Attachment C3, Sections C3-12b(1) and C3-12b(2), respectively.

The WSPF and CIS for the waste stream resulting from waste characterization activities are transmitted to the CBFO, who reviews them for completeness and screens them for acceptance prior to loading any TRU mixed waste into the CH or RH Packaging, as described in Section C-4. The review and approval process will ensure the submitted waste analysis information is sufficient to meet the Data Quality Objectives (DQOs) for AK in Section C-4a(1) and allow the CBFO to demonstrate compliance with the requirements of this QAPjP. Only TRU mixed waste and TRU waste that has been characterized in accordance with the WIPP-WAP and that meets the WIPP Hazardous Waste Permit TSDF-WAC will be accepted at the WIPP facility for disposal. Upon notification of approval of the WSPF by the CBFO, the AMWTP may be authorized to ship waste to WIPP.

In the event CBFO requests detailed information on a waste stream, the AMWTP will provide a Waste Stream Characterization Package (Section C3-12b[2]). For each waste stream, this package will include the WSPF, the CIS, and the complete AK summary. The Waste Stream Characterization Package will also include specific Batch Data Reports (BDRs) and raw analytical data associated with waste container characterization as requested by CBFO.

C-0d Waste Confirmation

The CBFO will perform waste confirmation on a representative subpopulation of each waste stream shipment after certification and prior to shipment pursuant to Attachment C7. The CBFO will use radiography, review of radiography audio/video recordings, VE, or review of VE records (e.g., VE data sheets or packaging logs), to examine at least 7 percent of each waste stream shipment to confirm that the waste does not contain ignitable, corrosive, or reactive waste. Waste confirmation will be performed by the CBFO prior to shipment of the waste from AMWTP to WIPP.

C-1 Identification of TRU Mixed Waste to be Managed at the WIPP Facility

C-1a Waste Stream Identification

TRU mixed waste destined for disposal at WIPP is characterized on a waste stream basis. The AMWTP delineates waste streams using AK. Required AK is specified in Section C-3b and C4.

All of the waste within a waste stream may not be accessible for sampling and analysis at one time. Attachment C2 addresses the requirements for selecting waste containers used for characterization of waste streams as they are generated or retrieved.

C-1b Waste Summary Category Groups and Hazardous Waste Accepted at the WIPP Facility

Once a waste stream has been delineated, a Waste Matrix Code is assigned to the waste stream based on the physical form of the waste. Waste streams are then assigned to one of three broad Summary Category Groups: S3000-Homogeneous Solids, S4000-Soils/Gravel, and S5000-Debris Wastes. These Summary Category Groups are used to determine further characterization requirements.

The AMWTP ships only those TRU mixed waste streams which have EPA HWNs already listed in Table C-9. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at the WIPP as long as the WIPP Hazardous Waste Permit TSDF-WAC is met. The AMWTP will perform characterization of all waste streams as required by the WIPP-WAP. If during the characterization process, new EPA HWNs are identified; those wastes will not be shipped for disposal to the WIPP facility until the EPA HWN has been added to the WIPP Hazardous Waste permit and AMWTP WSPF.

C-1c Waste Prohibited at the WIPP Facility

The following TRU mixed wastes are prohibited at WIPP and therefore will not be shipped to the WIPP facility for disposal:

- Liquid waste is not acceptable at WIPP. Liquid in the quantities delineated below is acceptable.
  - Observable liquid shall be no more than 1 percent by volume of the outermost container at the time of RTR or VE.
  - Internal containers with more than 60 milliliters or 3 percent by volume observable liquid, whichever is greater, are prohibited.
  - Containers with EPA HWN U134 assigned shall have no observable liquid.

- Overpacking the outermost container that was examined during radiography or visual examination or redistributing untreated liquid within the container shall not be used to meet the liquid volume limits.

- Non-radionuclide pyrophoric materials, such as elemental potassium.
- Hazardous wastes not occurring as co-contaminants with TRU mixed waste (non-mixed hazardous waste).
- Wastes incompatible with backfill, seal and panel closures materials, container and packaging materials, shipping container materials, or other wastes.
- Wastes containing explosives or compressed gases.
- Wastes with PCBs not authorized under an EPA PCB waste disposal authorization.
- Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (EPA HWNs D001, D002, or D003).
- Waste that has ever been managed as high-level waste and waste from tanks specified in Table C-8, unless specifically approved through a WIPP RCRA Permit Modification.
- Any waste container from a waste stream (or waste stream lot), which has not undergone either radiographic examination or VE of a statistically representative subpopulation of the waste stream in each shipment, pursuant to Attachment C7.
- Any waste container from a waste stream, which has not been preceded by an appropriate, certified WSPF (refer to Section C-ld of this document).

Before shipping a container holding TRU mixed waste to the WIPP facility, CBFO will perform waste confirmation activities pursuant to Attachment C7 on each waste stream shipment to confirm that the waste does not contain ignitable, corrosive, or reactive waste and the assigned EPA HWNs are allowed for storage and disposal by the WIPP RCRA Permit. Section C-4 and Attachment C7 include descriptions of the waste confirmation processes that are conducted prior to shipping waste to the WIPP facility.

Containers are vented through filters allowing any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization or development of conditions within the container that would lead to the development of ignitable, corrosive, reactive, or other characteristic wastes.

To ensure the integrity of the WIPP facility, waste streams identified to contain incompatible materials or materials incompatible with waste containers are not shipped to the WIPP until after

they have been treated to remove the incompatibility. Only those waste streams that are compatible or have been treated to remove incompatibilities are shipped to the WIPP.

C-1d Control of Waste Acceptance

Every waste stream shipped to WIPP shall be preceded by a WSPF (Figure C-1) and a CIS. The required WSPF information and the CIS elements are discussed in section C3-12b(1) and section C3-12b(2).

The AMWTP provides the WSPF for each waste stream to CBFO for acceptance prior to shipping the waste (refer to MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*) to the WIPP. The WSPF and CIS will be transmitted to CBFO for each waste stream. If continued waste characterization reveals discrepancies that identify different EPA HWNs or indicates that the waste belongs to a different waste stream, the waste is redefined to a separate waste stream, and a new WSPF is submitted. The AMWTP will develop criteria to determine the specific circumstances under which a WSPF is revised, versus when a new WSPF is required. These criteria will be evaluated during site audits (Attachment C6). Any time CBFO requests additional information concerning a waste stream, the AMWTP will provide a Waste Stream Characterization Package. The option to request additional information ensures that waste being offered for disposal is adequately characterized and accurately described in the WSPF.

C-1e Waste Generating Processes at the WIPP Facility

The requirements contained in this section are specific to the WIPP facility. Therefore, these requirements have not been addressed in this document.

C-2 Waste Characterization Program Requirements and Waste Characterization Parameters

AMWTP has developed procedures which specify programmatic waste characterization requirements. CBFO evaluates the procedures during audits conducted under the CBFO Audit and Surveillance Program (Section C-5a[3]), and may also evaluate the procedures as part of the review and approval process of the WSPF. AMWTP must notify CBFO and obtain approval prior to making data-affecting modifications to procedures (Attachment C3, Section C3-15). Program procedures shall address the following minimum elements:

- Waste characterization and certification procedures for retrievably stored and newly generated wastes to be sent to the WIPP facility.
- Methods used to ensure prohibited items are documented and managed. These will include procedures for performing RTR, VE, or treatment, if these methods are used to ensure prohibited items are not present in the waste prior to shipment of the waste to WIPP.

- Procedures used to verify packaging configurations to determine the correct drum age criteria (DAC) if HSGS and analysis is used to collect waste characterization information per Section C1-1a(1) of this QAPjP.
- Identify the organizations responsible for compliance with waste characterization and certification procedures.
- Identify the oversight procedures and frequency of actions to verify compliance with waste characterization and certification procedures.
- Develop training specific to waste characterization and certification procedures.
- Ensure that personnel may stop work if noncompliance with waste characterization or certification procedures is identified.
- Develop a nonconformance process that complies with the requirements in Attachment C3 of this QAPjP to document and establish corrective actions.
- As part of the corrective action process, assess the potential time frame of the noncompliance, the potentially affected waste populations, and the reassessment and recertification of those wastes.
- A list of all approved EPA HWNs which are acceptable at WIPP is included in Table C-9.

For those waste streams or containers that are not amenable to RTR (e.g., RH TRU mixed waste, direct loaded ten-drum overpacks [TDOPs]) for waste confirmation by CBFO pursuant to Attachment C7, AMWTP VE data may be used for waste acceptance. In those cases, the CBFO will review the AMWTP VE procedures to ensure that data sufficient for the CBFO's waste acceptance activities pursuant to Attachment C7 will be obtained and the procedures meet the minimum requirements for VE specified in Attachment C1, Section C1-3.

The following waste characterization parameters are obtained at the AMWTP:

- Determination whether TRU mixed waste streams comply with the applicable provisions of the WIPP Hazardous Waste Permit TSDF-WAC
- Determination whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC incorporating 40 CFR, §261 Subpart C)
- Determination whether TRU mixed waste are listed (20.4.1.200 NMAC incorporating 40 CFR §261 Subpart D)
- Estimation of waste material parameter weights.

Tables C-1, C-2, C-3, and C-4 provide the parameters of interest for the various constituent groupings and analytical methodologies. The following sections provide a description of the acceptable methods to evaluate these parameters for each Summary Category Group.

C-3 Generator Waste Characterization Methods

The characterization techniques used by the AMWTP includes AK and may also include, as necessary, HSGS and analysis, RTR, VE, and homogeneous waste sampling and analysis. AMWTP receives off-site DOE CH-TRU waste that may require generator requested characterization (e.g., solid sampling) or characterization, profiling, and certification by AMWTP for disposal at WIPP. All characterization activities are performed in accordance with this QAPjP. Table C-5 provides a summary of the characterization requirements for TRU mixed waste.

C-3a Sampling and Analytical Methods

C-3a(1) Headspace Gas Sampling and Analysis

Representative headspace gas sampling (HSGS) and analysis is used by the AMWTP to determine the types and concentrations of VOCs in the void volume of randomly selected waste containers in order to resolve the assignment of EPA HWNs for those debris waste streams for which an AK Sufficiency Determination Request has not been approved by the CBFO. In addition, VOC constituents are compared to those assigned by AK which may include an analysis of radiolytically derived VOCs. The AMWTP may also consider radiolysis and packaging materials when assessing the presence of hazardous constituents in the headspace gas results, and whether radiolysis would generate wastes which exhibit the TC. Refer to Section C4 for additional clarification regarding EPA HWN assignment and headspace gas results. The methods for random selection of containers for HSGS and analysis are specified in Attachment C2. HSGS and analysis shall be subject to the CBFO Audit and Surveillance Program (Attachment C6).

In accordance with EPA convention, identification of hazardous constituents detected by gas chromatography/mass spectrometry (GC/MS) methods that are not on the list of target analytes shall be reported. These compounds are reported as tentatively identified compounds (TICs) in the analytical BDR and shall be added to the target analyte list if detected in a given waste stream, if they appear in the 20.4.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII, and if they are reported in 25% of the waste containers sampled from a given waste stream. The headspace gas analysis method QAOs are specified in Section C3.

C-3a(2) Homogeneous and Soil/Gravel Waste Sampling and Analysis

Representative homogeneous and soil/gravel waste sampling and analysis shall be used by AMWTP to resolve the assignment of EPA HWNs for homogeneous and soil/gravel waste streams for which an AK Sufficiency Determination Request has not been approved by the CBFO. Sampling of homogeneous and soil/gravel wastes results in the collection of a sample that is used to resolve the assignment of EPA HWNs. Sampling is accomplished through coring or other EPA approved sampling, which is described in Section C1. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes is not sampled. The waste containers for sampling and analysis are randomly selected from the population of containers for the waste stream. The random selection methodology is specified in Section C2. Homogeneous and soil/gravel sampling and analysis shall be subjected to the CBFO's Audit and Surveillance Program (Attachment C6).

Totals or Toxicity Characteristic Leaching Procedure (TCLP) analyses for VOCs, SVOCs, and RCRA-regulated metals (refer to Table C-3 and Table C-4) are used to determine waste parameters and to determine if a waste exhibits a TC for compounds specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. The results from these analyses are used to determine if a waste exhibits a TC. The mean concentration of TC contaminants is calculated for each waste stream such that it can be reported with an upper 90 percent confidence limit (UCL_{90}). The UCL_{90} values for the mean measured contaminant concentrations in a waste stream are compared to the specified regulatory levels in 20 NMAC 4.1.200 (incorporating 40 CFR §261 Subpart C), expressed as total/TCLP values, to determine if the waste stream exhibits a TC. A comparison of total analyses and TCLP analyses is presented in Appendix C3 of the WIPP RCRA Part B Permit Application, and a discussion of the UCL_{90} is included in Section C2. If TC wastes are identified, these will be compared to those determined by AK and TC waste numbers will be revised, as warranted. Refer to Section C4 for additional clarification regarding EPA HWN assignment and homogeneous solid and soil/gravel analytical results.

C-3a(3) Laboratory Qualification

Chemical analysis of AMWTP homogeneous solids/soils is performed by the ICP CCP, which is qualified through participation in the Performance Demonstration Program (PDP). Required QAOs are specified in Section C3.

Analytical methods used by CCP (1) satisfy all of the appropriate QAOs, and (2) are implemented through laboratory-documented standard operating procedures. These analytical QAOs are discussed in detail in Section C3 of this document.

C-3b Acceptable Knowledge

AK is used in TRU mixed waste characterization activities in five ways:

- To delineate TRU mixed waste streams
- To assess whether TRU mixed wastes comply with the WIPP Hazardous Waste Permit TSDF-WAC
- To assess whether TRU-mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261 Subpart C)
- To assess whether TRU mixed wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261 Subpart D)
- To estimate waste material parameter weights.

AK is discussed in detail in Section C4, which outlines the minimum set of requirements and DQOs that are met by the AMWTP in order to use AK. In addition, Section C-5a(3) of this QAPjP describes the assessment of AK through the CBFO's Audit and Surveillance Program.

C-3c Radiography and Visual Examination

Radiography and VE are nondestructive qualitative and quantitative techniques used to identify and verify waste container contents as specified in Attachment C1. AMWTP performs RTR or VE on 100 percent of CH-TRU mixed waste containers in waste streams except for those waste streams for which the CBFO approves a Scenario 1 or Scenario 2 Determination Request. No RH-TRU mixed waste will be shipped to WIPP for storage or disposal without documentation of RTR or VE of 100 percent of the containers as specified in Attachment C1.

Radiography and/or VE are used, when necessary, to examine a waste container to verify its physical form. These techniques can detect observable liquid in excess of TSDF-WAC limits and containerized gases, which are prohibited for WIPP disposal. The prohibition of liquid in excess of TSDF-WAC limits and containerized gases prevents the shipment of corrosive, ignitable, or reactive wastes.

Radiography and/or VE are also used to verify that the physical form of the waste matches its waste stream description (i.e., Homogeneous Solids, Soil/Gravel, or Debris Waste [including uncategorized metals]). If the physical form does not match the waste stream description, the waste is designated as another waste stream and assigned the preliminary EPA HWNs associated with that new waste stream assignment. That is, if RTR and/or VE indicate that the waste does not match the waste stream description arrived at by AK characterization, a nonconformance report (NCR) is completed, the inconsistency is resolved as specified in Section C4, and the

NCR will be dispositioned as specified in Section C3-13 of this document. The proper waste stream assignment is determined (including preparation of a new WSPF), the correct EPA HWNs are assigned, and the resolution is documented. Refer to Attachment C4 for a discussion of AK and its verification process.

When VE is used, the detection of any liquid in non-transparent internal containers, detected from shaking the internal container, will be handled by assuming that the internal container is filled with liquid and adding this volume to the total liquid in the container being characterized using VE. The container being characterized using VE will be rejected and/or repackaged to exclude the internal container if it is over the WIPP Hazardous Waste Permit TSDF-WAC limits. When RTR is used, or VE of transparent containers is performed, if any liquid in internal containers is detected, the volume of liquid is added to the total for the container being characterized using RTR or VE.

Radiography, or the equivalent, will be used as necessary on the existing/stored waste containers to verify the physical characteristics of the TRU mixed waste correspond with its waste stream identification/waste stream Waste Matrix Code and to identify prohibited items. Radiographic examination protocols and QA/QC methods are provided in Section C1. Radiography and VE shall be subjected to the CBFO's Audit and Surveillance Program (Attachment C6).

C-3d Characterization Techniques and Frequency for Newly Generated and Retrievably Stored Waste

The AMWTP uses AK to delineate all TRU mixed waste containers into waste streams for the purposes of grouping waste for further characterization. The analyses performed may differ based on the waste stream and the physical form of the waste (i.e., heterogeneous debris waste cannot be sampled for totals analyses). Both retrievably stored and newly generated wastes are delineated in this fashion, though the types of AK used may differ. Section C-3b discusses the use of AK, sampling, and analysis in more detail. AK is discussed more completely in Section C4. Every TRU mixed waste stream will be assigned EPA HWNs based upon AK, and the AMWTP may resolve the assignment of EPA HWNs using headspace gas (Summary Category Group S5000 only) and solid sampling and analysis (Summary Category Groups S3000 and S4000 only).

In the CIS for each waste stream, the AMWTP will document its methods, and the findings from those methods, for determining the physical form of the waste and the presence or absence of prohibited items for both retrievably stored and newly generated waste.

Radiography and/or VE may be used to verify the physical form of retrievably stored TRU mixed waste. For newly generated waste, physical form and prohibited items may either be documented during packaging using VE or verified after packaging using RTR or VE.

For debris waste streams that do not have an AK Sufficiency Determination approved by the CBFO, containers selected in accordance with Attachment C2 from those waste streams are sampled and analyzed for VOCs in the headspace gas. Likewise, a statistically selected portion of homogeneous solids and soil/gravel waste stream are sampled and analyzed for RCRA regulated total VOCs, SVOCs, and metals when those waste streams do not have an AK Sufficiency Determination approved by CBFO. Sampling and analysis methods used for waste characterization are discussed in Section C-3a.

In the process of performing organic headspace and solid sample analyses, nontarget compounds may be identified. These compounds are reported as TICs. TICs reported in 25% of the samples and listed in 20 NMAC 4.1.200 (incorporating 40 CFR §261) Appendix VIII, are compared with AK data to determine if the TIC is in a listed hazardous waste in the waste stream. TICs identified through headspace gas analyses that meet the Appendix VIII list criteria and the 25 percent reporting criteria for a waste stream are added to the headspace gas waste stream target list, regardless of the hazardous waste listing associated with the waste stream. TICs subject to inclusion on the target analyte list that are TC parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for TC and non-toxic F003 constituents, the AMWTP may take concentration into account when assessing whether to add an EPA HWN. TICs reported from the Totals VOC or semivolatile organic compound (SVOC) analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation from AK documentation.

If the TIC associated with a total VOC or SVOC analysis cannot be identified as a component of waste packaging materials or as a product of radiolysis, the AMWTP will add these TICs to the list of hazardous constituents for the waste stream (and assign additional EPA listed HWNs, if appropriate). For TC compounds and non-toxic F003 constituents, the AMWTP may consider waste concentration when determining whether to change an EPA HWN. Refer to Attachment C3 for additional requirements on TIC identification.

Waste characterization solid sampling and analysis activities may differ for retrievably stored waste and newly generated waste. The waste characterization processes used by the AMWTP for both retrievably stored and newly generated waste streams will be evaluated during the CBFO audit of the site. The typical waste characterization data collection design for each type of waste is described in the following sections. Table C-1 provides a summary of hazardous waste characterization requirements for all TRU mixed waste characterization parameters.

Table C-5 summarizes the parameters, methods, and rationales for stored and newly generated TRU mixed wastes according to their waste forms.

TRU mixed waste that has been repackaged or treated may be shipped to the WIPP facility, but it shall retain the original waste stream's listed EPA HWN designation.

C-3d(1) Newly Generated Waste

The RCRA-regulated constituents in newly generated wastes will typically be documented at the time of generation based on AK for the waste stream. Newly generated TRU mixed waste characterization typically begins with the verification that the processes generating the waste have operated within established written procedures. Waste containers are delineated into waste streams using AK. AMWTP will document the methods used to delineate waste streams in the AK Record and AK Summary Report. Determination that the physical form of the waste (Summary Category Group) corresponds to the physical form of the assigned waste stream may be accomplished either using VE during packaging or by performing RTR as specified in Section C1-3 for retrievably stored waste. Instead of using a video/audio tape and a single operator, the VE method for newly generated waste (or repackaged retrievably stored waste) may use a second operator, who is equally trained to the requirements stipulated in Attachment C1 to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. If the second operator cannot provide concurrence, correct actions[b] are taken as specified in Attachment C3. The subsequent waste characterization activities depend on the assigned Summary Category Group, since waste within the Homogeneous Solids and Soils/Gravel Summary Category Groups may be characterized using different techniques than the waste in the Debris Waste Summary Category Group. The packaging configuration, type and number of filters, and rigid liner vent hole presence and diameter necessary to determine the appropriate drum age criteria (DAC) in accordance with Attachment C1, Section C1-1, may be documented as part of the characterization information collected during the packaging of newly generated waste or repackaging of retrievably stored waste for those containers of debris waste that will undergo HSGS and analysis.

C-3d(1)(a) Sampling of Newly Generated Homogeneous Solids and Soil/Gravel

When a Determination Request has not been approved by the CBFO, sampling and analysis of newly generated homogeneous solid and soil/gravel waste streams are conducted in accordance with the requirements specified in Attachment C1, Section C1-2. The number of newly generated homogeneous solid and soil/gravel waste containers to be sampled is determined using the procedure specified in Section C2-1, wherein a statistically selected portion of the waste will be sampled.

b. "Corrective Action" as used in the QAPjP does not mean corrective action as defined under HWA, RCRA, and their implementing regulations.

C-3d(2) Retrievably Stored Waste

All retrievably stored waste containers are first delineated into waste streams using AK. The AMWTP documents the methods used to delineate waste streams in the AK record and AK Summary Report in accordance with MP-TRUW-8.13. Retrievably stored waste containers may be examined using RTR or VE to determine the physical waste form (Summary Category Group), the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, S5000).

The HSGS method provided in Attachment C1 is used, when necessary, to resolve the assignment of EPA HWNs to debris waste streams, as specified in Attachment C4.

A statistically selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed for total VOCs, SVOCs, and metals, when necessary. The sampling location selection methodology is described in Attachment C2. The sampling methods for these wastes are provided in Attachment C1.

The TC of retrievably stored homogeneous solids and soil/gravel wastes is determined using total analysis of TC parameters or TCLP. To determine if a waste exhibits a TC for compounds specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. Appendix C3 of the WIPP RCRA Part B Permit Application discusses comparability of totals analytical results to those of the TCLP method.

Representativeness of containers selected for HSGS and waste subjected to homogeneous solids and soil/gravel sampling and analysis will be validated by the AMWTP via examination of documentation that shows that random samples were collected. Because representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represent the population being studied, the random sampling of waste streams ensures representativeness. The AMWTP procedure that addresses random selection is MP-TRUW-8.25, *Random Selection of Containers for Headspace Gas and Solids Sampling and Analysis.*

C-4 Data Verification and Quality Assurance

Data validation, usability, and reporting controls are used to ensure that the TRU mixed waste shipped to the WIPP facility for disposal meets WIPP-WAP requirements. Verification steps are taken at three levels: (1) the AMWTP data generation level, (2) the AMWTP project level, and (3) the CBFO level. The validation and verification process and requirements at each level are described in Section C3-10. The verification process at the CBFO level is also described in Section C-5.

C-4a Data Generation and Project Level Verification Requirements

C-4a(1) Data Quality Objectives

The waste characterization data obtained through implementation of the QAPjP will be used to ensure that the waste meets regulatory requirements and to ensure that TRU mixed waste is properly managed during the disposal phase. To satisfy the RCRA regulatory compliance requirements, the following DQOs are established in the WIPP-WAP:

- Acceptable Knowledge
  - To delineate TRU mixed waste streams.
  - To assess whether TRU mixed wastes comply with the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC.
  - To assess whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart C).
  - To assess whether TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart D).
  - To estimate waste material parameters weights.
- Headspace Gas Sampling and Analysis
  - To identify VOCs and quantify the concentrations of VOC constituents in waste containers to resolve the assignment of EPA HWNs.
- Homogeneous Waste Sampling and Analysis
  - To compare upper 90% confidence level (UCL_{90}) values for the mean measured contaminant concentrations in a waste stream with specified TC levels in 20 NMAC 4.1.200 (incorporating 40 CFR §261), to determine if the waste is hazardous, and to resolve the assignment of EPA HWNs.
- Radiography
  - To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that maybe used based on the Summary Category Groups (i.e., S3000, S4000, and S5000).

- Visual Examination
  - To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, or S5000).

Reconciliation of these DQOs by the SPM or CBFO-approved laboratories, as applicable, is addressed in Attachment C3. Reconciliation requires determining whether sufficient type, quality, and quantity of data have been collected to ensure the DQOs cited above can be achieved (refer to MP-TRUW-8.11, *Data Reconciliation*).

C-4a(2) Quality Assurance Objectives

The AMWTP or CBFO-approved laboratories, as applicable, demonstrate compliance with each QAO associated with the various characterization methods as presented in Attachment C3. The SPM or CBFO-approved laboratories, as applicable, perform a reconciliation of the data with the DQOs established in the WIPP-WAP. The SPM or CBFO-approved laboratories, as applicable, conclude that all of the DQOs have been met for the characterization of the waste stream prior to submitting a WSPF to the WIPP facility for approval (refer to Attachment C3). The following QAO elements are considered for each technique, as a minimum:

- Precision
  - Precision is a measure of the mutual agreement among multiple measurements.
- Accuracy
  - Accuracy is the degree of agreement between a measurement result and the true or known value.
- Completeness
  - Completeness is a measure of the amount of valid data obtained from a method compared to the total amount of data obtained that is expressed as a percentage.
- Comparability
  - Comparability is the degree to which one data set can be compared to another.
- Representativeness
  - Representativeness expresses the degree to which data represent characteristics of a population.

A more detailed discussion of the QAOs, including mathematical representation, where appropriate, can be found in Attachment C3, which describes the QAOs associated with each method of sampling and analysis.

C-4a(3) Sample Control

The AMWTP and CBFO-approved laboratories, as applicable, have implemented a sample handling and control program that includes the maintenance of field documentation records, proper labeling, and a chain-of-custody (COC) record. This QAPjP and CBFO-approved laboratory QAPjPs, as applicable, or procedures referenced in the QAPjP document this program and include COC forms to control the sample from the point of origin to the final analysis result reporting. Details of the AMWTP sample control program are provided in instruction INST-OI-16, *Drum Coring Operations*; INST-OI-73, *Manual Drum Coring Operations*; INST-OI-75, *Container-in-Container Sampling;* INST-OI-43, *HGAS Sampling and Analysis Operations*; MP-TRUW-8.34, *WIPP Sample Transfers*; and Attachment C1 of this QAPjP and are summarized below to include:

- Field documentation of samples including: point of origin, date of sample, container ID, sample type, analysis requested, and COC number
- Labeling and/or tagging including: sample numbering, sample ID, sample date, sampling conditions, and analysis requested
- COC control including: name of sample relinquisher, sample receiver, and the date and time of the sample transfer
- Proper sample handling and preservation.

C-4a(4) Data Generation

Batch Data Reports, in a format approved by the CBFO, are used by the AMWTP and CBFO-approved laboratories, as applicable, for reporting waste characterization data. This format is included in the AMWTP and CBFO-approved laboratory QAPjPs, as applicable, controlled electronic databases, and MP-TRUW-8.8, *Level 1 Data Validation*, which includes all of the elements required by this QAPjP for BDRs (refer to Attachment C3).

The CBFO performs audits of the AMWTP waste characterization program, as implemented by the AMWTP QAPjP, to verify compliance with the WAP and the DQOs in this QAPjP (See Attachment C6 for a discussion of the content of the audit program). The primary functions of these audits are to review AMWTP adherence to the requirements of this QAPjP and ensure adherence to the WAP characterization program. CBFO shall provide the results of the audit to NMED. If audit results indicate that the AMWTP is not in compliance with the requirements of this QAPjP, the CBFO will take appropriate action as specified in Attachment C6.

CBFO further requires all CBFO-approved laboratories analyzing WIPP waste samples to have established, documented QA/QC programs. CBFO annually evaluate these laboratories and their QA/QC programs as part of their participation in the CBFO PDP laboratory performance program. The CBFO audits of the laboratory verify that the laboratories analyzing waste have been properly audited. The laboratory's QA/QC program includes the following:

- Facility organization
- A list of equipment/instrumentation
- Operating procedures
- Laboratory QA/QC procedures
- QA review
- Laboratory records management.

C-4a(5) Data Verification

Batch Data Reports document the testing, sampling, and analytical results from the required characterization activities, and include documentation of required QA/QC activities. Data validation and verification at both the data generation level and the project level are performed before the required data are transmitted to the WIPP facility. Attachment C3 discusses the data validation process in more detail. NMED may request, through the CBFO, copies of any BDR, and/or the raw data validated by the AMWTP, to check the CBFO audit of the validation process.

C-4a(6) Data Transmittal

Batch Data Reports include information required by Section C3-10 and are transmitted by hard copy or electronically (provided a hard copy is available on demand) from the data generation level to the project level. The AMWTP transmits waste container information electronically via the Waste Data System (WDS)/WIPP Waste Information System (WWIS) in accordance with MP-TRUW-8.5, *TRU Waste Certification*. Data is entered into the WDS/WWIS in the exact format required by the database. Refer to Section C-5a(1) for WDS/WWIS reporting requirements and DOE/WIPP-09-3427, *Waste Data System User's Manual* (DOE, 2009), for WDS/WWIS data fields and format requirements.

Once a waste stream is characterized, the SPM also submits to the WIPP facility a WSPF (Figure C-1) accompanied by the CIS for the waste stream which includes reconciliation with DQOs (refer to Sections C3-12b[1] and C3-12b[2]). The WSPF, the CIS, and information from the WDS/WWIS are used as the basis for acceptance of waste characterization information on TRU mixed waste disposed at WIPP.

C-4a(7) Records Management

Records related to waste characterization activities performed by the AMWTP are maintained in the AMWTP site project files or at the WIPP Records Archive facility.

CBFO-approved laboratories forward testing, sampling, and analytical records along with BDRs, to the AMWTP site project files and to CBFO for inclusion in the WIPP facility operating record. Raw data obtained by testing, sampling, and analyzing TRU mixed waste in support of this QAPjP is identifiable, legible, and provides documentary evidence of quality. Refer to MP-DOCS-18.2, *Records Management,* for a detailed description of records.

An electronic records system, (the equivalent of a CBFO required Records Inventory and Disposition Schedule [RIDS]) has been prepared, approved, and implemented by the AMWTP. All records relevant to an enforcement action under the WIPP Permit, regardless of disposition, are maintained at the AMWTP until NMED determines that the records are no longer needed for enforcement action. The records will then be dispositioned as specified in the approved implementing procedure. All waste characterization data and related QA/QC records for TRU mixed waste to be shipped to the WIPP facility are designated as either Lifetime Records or Non-Permanent Records. Records that are designated as Lifetime Records are maintained for the life of the AMWTP waste characterization program plus six years or transferred for permanent archival storage to the WIPP Records Archive facility.

Waste characterization records designated as Non-Permanent Records are maintained for ten years from the date of (record) generation either at AMWTP or at the WIPP Records Archive facility and then dispositioned according to the requirements defined in MP-DOCS-18.2. If the AMWTP ceases to operate, all records will be transferred before closeout for management at the WIPP Records Archive facility. Table C-6 provides a listing of records designated as Lifetime Records and Non-Permanent Records. Classified information will not be transferred to WIPP. Although the AMWTP expects no classified information, a notation will be provided to CBFO indicating the absence of classified information. The AMWTP will identify appropriate disposition of classified information. Nothing in this QAPjP is intended to, nor should it be interpreted to, require the disclosure of any DOE classified information to persons without appropriate clearance to view such information.

C-5 CBFO Level Waste Stream Screening and Verification of TRU Mixed Waste

CBFO waste screening is a two-phased process. Phase 1 occurs prior to configuring shipments of TRU mixed waste. Phase II occurs after configuration of shipments of TRU mixed waste but before it is disposed at the WIPP facility. Figure C-3 presents Phase I and a portion of Phase II of the TRU mixed waste screening process. Attachment C7 presents the TRU mixed waste confirmation portion of Phase II activities.

C-5a Phase 1 Waste Stream Screening and Verification

The first phase of the waste screening and verification process occurs before TRU mixed waste is shipped to the WIPP facility. Before CBFO begins the process of accepting TRU mixed waste from the AMWTP, an initial audit of the AMWTP is conducted as part of the CBFO Audit and Surveillance Program. The RCRA portion of the AMWTP audit provides on-site verification of characterization procedures; BDR preparation; and recordkeeping to ensure that all applicable provisions of the WAP requirements are met. Another portion of the Phase 1 verification is the WSPF approval process. At the WIPP facility, this process includes verification that all of the required elements of the WSPF and the CIS are present and that the waste characterization information meet the acceptance criteria required for compliance with this QAPjP (Section C3-12b[1]).

After the AMWTP has prepared this QAPjP, which includes applicable WAP requirements, it is submitted to CBFO for review and approval. Once approved, a copy is provided to NMED for examination. The AMWTP will implement the specific parameters of the QAPjP after it is approved. An initial audit was performed after QAPjP implementation and prior to AMWTP being certified for shipment of waste to WIPP. Additional audits, focusing on the results of waste characterization, will be performed at least annually. CBFO has the right to conduct unannounced audits and to examine any records that are related to the scope of the audit. See Section C-5a(3) and Attachment C6 for further information regarding audits.

When the required waste stream characterization data have been collected by the AMWTP and the initial AMWTP audit has been successfully completed, the SPM will verify that the waste stream characterization meets the applicable QAPjP requirements as part of the project level verification (Section C3-10b). If the waste characterization does not meet the applicable requirements of the QAPjP, the mixed waste stream cannot be shipped until those requirements are met. The SPM will then complete a WSPF and submit it to CBFO, along with the accompanying CIS for that waste stream (Section C3-12b[1]). All data necessary to check the accuracy of the WSPF will be transmitted to CBFO for verification. This provides notification that the AMWTP considers that the waste stream (identified by the waste stream identification number) has been adequately characterized for disposal prior to shipment to WIPP. The CBFO compares headspace gas, radiographic, VE, and solid sampling/analysis data obtained subsequent to submittal and approval of the WSPF (and prior to submittal) with characterization information presented on this form. If CBFO determines (through the data comparison) that the characterization information is adequate, the WSPF will be approved. Prior to the first shipment of containers from the approved waste stream, the approved WSPF and accompanying CIS is provided to the NMED. If the data comparison indicates that analyzed containers have hazardous wastes not present on the WSPF, or a different Waste Matrix Code applies, the WSPF is in error and shall be resubmitted. Ongoing WSPF examination is discussed in detail in Section C-5a(2).

Audits of AMWTP are conducted as part of the CBFO's Audit and Surveillance Program (Attachment C6). The RCRA portion of the AMWTP site audit program provides on-site

verification of waste characterization procedure; BDR preparation; and record keeping ensuring that all applicable provisions of the WIPP-WAP requirements are met. As part of the waste characterization data submittal, the AMWTP also transmits the data on a container-by-container basis via the WDS/WWIS. This data submittal can occur at any time as the data are being collected, but will be complete for each container prior to shipment of that container. The WDS/WWIS will conduct internal edit/limit checks as the data is entered and made available to CBFO as supporting information for WSPF review. The initial WSPF check performed by CBFO will include WDS/WWIS data submitted by AMWTP for each waste container submitted for the WSPF review and the CIS. The CBFO will compare ongoing sampling/analysis characterization data obtained and submitted via the WDS/WWIS to the approved WSPF. If this comparison shows that containers have hazardous wastes not reported on the WSPF, or a different Waste Matrix Code applies, the data are rejected and the waste containers are not accepted for shipment until a new or revised WSPF is submitted to and approved by the CBFO.

If discrepancies regarding EPA HWN assignment or Waste Matrix Code designation arise as a result of the Phase 1 review, the AMWTP will be contacted and required to provide the necessary additional information to resolve the discrepancy before the waste stream is approved for disposal at the WIPP facility. If the discrepancy is not resolved, the waste stream will not be approved.

C-5a(1) WDS/WWIS Description

All generator/storage sites planning to ship TRU mixed waste to WIPP will supply the required data to the WDS/WWIS. The WDS/WWIS Data Dictionary includes all of the data fields, the field format, and the limits associated with the data as established by this QAPjP. The data will be subjected to edit and limit checks that are performed automatically by the database as defined in DOE/WIPP-09-3427, *Waste Data System User's Manual (DOE, 2009).*

The CBFO will coordinate the data transmission with AMWTP. Actual data transmission will use appropriate technology to ensure the integrity of the data transmissions. The CBFO requires the AMWTP to populate a data structure provided by the CBFO that contains the required data dictionary fields that are appropriate for the waste streams at the site. The CBFO will access the data via the Internet to ensure an efficient transfer of this data.

CBFO uses the WDS/WWIS to verify that all supplied data meet the edit and limit checks prior to shipment of TRU mixed waste to WIPP. The WDS/WWIS notifies the AMWTP if any of the supplied data fails to meet the requirements of the edit and limit checks via an appropriate error message. The AMWTP corrects the discrepancy with the waste or the waste data and re-transmit the corrected data prior to acceptance of the data by the WDS/WWIS. CBFO will review data reported for each container of each shipment prior to providing notification to the AMWTP that the shipment is acceptable. Read-only access is provided to NMED. Table C-7 contains a listing of the data fields contained in the WDS/WWIS that is required as part of this QAPjP. The

WDS/WWIS generates a Waste Emplacement Report, Shipment Summary Report, Waste Container Data Report, and a Change Log Report.

Access to the WDS/WWIS is controlled by CBFO based on approval from management. All data formally accepted by CBFO is protected from indiscriminate change and can only be changed by an authorized Data Administrator (DA).

C-5a(2) Examination of the Waste Stream Profile Form and Container Data Checks

CBFO verifies the completeness and accuracy of the WSPF (Section C3-12b[1]). Figure C-2 includes the waste characterization and waste stream approval process. The assignment of the waste stream description, Waste Matrix Code Group, and Summary Category Groups; the results of waste analyses, as applicable; the AK summary documentation; the method used for characterization; CBFO certification; and appropriate designation of EPA HWN(s) will be examined by CBFO. If the WSPF is inaccurate, efforts will be made to resolve discrepancies by contacting the AMWTP in order for the waste stream to be eligible for shipment to the WIPP facility. If discrepancies in the waste stream are detected at the AMWTP, the AMWTP will implement a non-conformance program in accordance with MP-Q&SI-5.4, *Identification of Nonconforming Conditions*, to identify, document, and report discrepancies (Attachment C3).

The WSPF will pass all verification checks by CBFO in order for the waste to be approved by CBFO for shipment to the WIPP facility. The WSPF check against waste container data will occur during the initial WSPF approval process (Section C-5a).

The EPA HWNs for the waste that appear on the WSPF will be compared to those in Table C-9 to ensure that only approved wastes are accepted for management, storage, or disposal at WIPP. Some of the waste may also be identified by unique state hazardous waste codes or numbers. These wastes are acceptable at WIPP as long as the WIPP Hazardous Waste Permit TSDF-WAC is met. The CIS will be reviewed by the CBFO to verify that the waste has been classified correctly with respect to the assigned EPA HWNs. Any analytical method used will be compared to those listed in Tables C-2, C-3, and C-4 to ensure that only approved analytical methods are used for analysis of the waste. CBFO verifies that the applicable requirements of the WIPP Hazardous Waste Permit TSDF-WAC have been met.

Waste data transferred via the WDS/WWIS after WSPF approval will be compared with the approved WSPF. Any container from an approved hazardous waste stream with a description different from its WSPF will not be managed, stored, or disposed at WIPP.

CBFO will also verify that three different types of data specified below are available for every container holding TRU mixed waste before that waste is managed, stored, or disposed at WIPP.

1. An assignment of the waste stream's waste description (by Waste Matrix Codes) and Waste Matrix Code Group;
2. A determination of ignitability, reactivity, and corrosivity; and
3. A determination of compatibility.

The verification of waste stream description will be performed by reviewing the WDS/WWIS for consistency in the waste stream description and WSPF. The CIS will indicate if the waste has been checked for the characteristics of ignitability, corrosivity, and reactivity. The final verification of waste compatibility is performed using Appendix C1 of the WIPP RCRA Part B Permit Application, the compatibility study.

Any container with unresolved discrepancies associated with hazardous waste characterization will not be managed, stored, or disposed at the WIPP facility until the discrepancies are resolved. If the discrepancies cannot be resolved, the CBFO will revoke the approval status of the waste stream, suspend shipments of the waste stream, and notify NMED. Waste stream approval will not be reinstated until the AMWTP demonstrates all corrective actions have been implemented and the AMWTP program is reassessed by CBFO.

C-5a(3) CBFO's Audit and Surveillance Program

An important part of CBFO's verification process is the CBFO's Audit and Surveillance Program. The focus of this audit program is compliance with the QAPjP and the WIPP Permit. This audit program addresses all AK implementation and waste sampling and analysis activities, from waste stream classification assignment through waste container certification, and ensures compliance with standard operating procedures and the QAPjP. Audits will ensure that containers and their associated documentation are adequately tracked throughout the waste handling process. Operator qualifications will be verified, and implementation of QA/QC procedures will be surveyed. A final report that includes AMWTP or CBFO-approved laboratory audit results and applicable WIPP-WAP-related corrective action report (CAR) resolution will be provided to NMED for approval.

Audits will be performed at least annually, including the possibility of unannounced audits (i.e., not a regularly scheduled audit).

C-5b Phase II Waste Shipment Screening and Verification

As presented in Figure C-3, Phase II of the waste screening and verification process begins with confirmation of the waste pursuant to Attachment C7 after waste shipments are configured. After the waste shipment has arrived at WIPP, CBFO screens the shipments to determine the completeness and accuracy of the EPA Hazardous Waste Manifest and land disposal restriction notice completeness. CBFO will verify there are no waste shipment irregularities and the waste containers are in good condition. Only those waste containers that are from shipments that have been confirmed pursuant to Attachment C7 and that pass all Phase II waste screening and verification determinations will be emplaced at WIPP. For each container shipped, the AMWTP provides the following information:

Hazardous Waste Manifest Information

- Generator/storage site name and EPA ID
- Generator/storage site contact name and phone number
- Quantity of waste
- List of up to six state and/or EPA HWNs in each line item
- List of all container IDs (Shipping Package serial number)
- Signature of authorized generator representative.

Specific Waste Container Information

- Waste Stream Identification Number
- List of EPA HWNs per container
- Certification date
- Shipping data (Assembly numbers, ship date, shipping category, etc.).

This information is also supplied electronically to the WDS/WWIS. The container-specific information is supplied as described in Section C-5a(1), and is supplied prior to shipment.

C-5b(1) Examination of the EPA Uniform Hazardous Waste Manifest (UHWM) and Associated Waste Tracking Information

Upon receipt of a TRU mixed waste shipment, CBFO will make a determination of EPA UHWM completeness. For CH-TRU mixed waste, the CBFO will then make a determination of waste shipment completeness by checking the unique, barcode identification number found on each container holding TRU mixed waste against the WDS/WWIS database after opening the Shipping Package.

For shipments in the RH-TRU 72B cask, the identification number of the single payload container is read during cask-to-cask transfer in the Transfer Cell and then checked against the WDS/WWIS database. For shipments in the CNS 10-160B cask, CBFO will make a determination of waste shipment completeness by checking the unique identification number found on each container holding TRU mixed waste in the Hot Cell against the WDS/WWIS database after unloading the cask.

Manifest discrepancies may be identified during manifest examination and container barcode WDS/WWIS data comparison. A manifest discrepancy is a difference between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste the WIPP facility actually receives. The AMWTP technical contact (as listed on the manifest) will be contacted to resolve the discrepancy. Errors on the manifest can be corrected by the WIPP facility with a verbal (followed by a mandatory written) concurrence by the AMWTP technical contact. All discrepancies that are unresolved within fifteen days of receiving the waste at the WIPP facility will be immediately reported to the NMED in writing by CBFO. If the manifest discrepancies have not been resolved within thirty days of waste receipt, the shipment will be returned to the AMWTP.

C-5b(2) Examination of the Land Disposal Restriction (LDR) Notice

With the initial shipment of a TRU mixed waste stream, AMWTP will provide WIPP with a notice that the waste is not prohibited from land disposal (The Land Disposal Restriction Notice [LDR]). The Notice will be prepared per the requirements of 20 NMAC 4.1.800 (incorporating 40 CFR 268.7[a][4]). The LDR Notice information includes:

- EPA HWN(s) and manifest number of first shipment of a mixed waste stream
- Date the waste is subject to prohibition
- Statement that the waste is not prohibited from land disposal at WIPP.

This information is the applicable information taken from column "268.7(a)(4)" of the "Generator Paperwork Requirements Table" in 20.4.1.800 NMAC (incorporating 40 CFR 268.7[a][4]). Note that item "5" from the "Generator Paperwork Requirements Table" is not applicable since waste analysis data are provided electronically via WDS/WWIS and item "7" is not applicable, since waste designated by the Secretary of Energy for disposal at WIPP is exempted from the treatment standards.

CBFO will review the LDR notice for accuracy and completeness. The AMWTP will prepare this notice in accordance with the applicable requirements of 20.4.1.800 NMAC (incorporating 40 CFR 268.7[a][4]).

C-5b(3) Verification

This is a CBFO function.

C-6 CBFO's Waste Shipment Screening QA/QC

This is a CBFO function.

C-7 Records Management and Reporting

As part of the WIPP facility's operating record, data and documents associated with waste characterization and waste confirmation activity records are managed in accordance with MP-DOCS-18.2, *Records Management.*

The storage of the AMWTP's copy of the manifest, LDR information, waste characterization data, WSPFs, waste confirmation activity records, and other related records are identified on an electronic records system, (the equivalent of a CBFO-required Records Inventory and Disposition Schedule [RIDS]) .

C-7a General Requirements

- Records are legible
- Corrections are made with a single line through the incorrect information, and the date and initial of the person making the correction are added.
- Black ink is encouraged, unless a copy test has been conducted to ensure the other color ink will copy.
- Use of highlighters on records is discouraged
- Records are reviewed for completeness
- Records are validated by the cognizant manager or designee

C-7b Records Storage

- Active records are stored when not in use
- Quality records are kept in one-hour (certified) fire-rated container or a copy of a record is stored separately (sufficiently remote from the original) in order to prevent destruction of both copies as a result of a single event such as fire or natural disaster
- Unauthorized access to the records is controlled by locking the storage container or controlling personnel access to the storage area.

C-8 Reporting

This is a CBFO function.

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste[a]

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Physical Waste Form Summary Category Names S3000 Homogeneous Solid S4000 Soil/Gravel	**RTR/Visual Examination** Retrievably Stored Waste Radiography (RTR) Visual Examination (VE)	**RTR/Visual Examination** (Refer to Section C1-3 and Section C3-4) Retrievably Stored Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	**RTR/Visual Examination** Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Newly Generated Waste Visual Examination Radiography (RTR)	Newly Generated Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Newly Generated Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Repackaging of Retrievably Stored Waste Visual Examination	Repackaging of Retrievably Stored Waste INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations* INST-FOI-17, *Facility Visual Examination Operations*	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*

Table C-1. (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Summary Category Names S5000 Debris Waste	Retrievably Stored Waste Radiography (RTR) Visual Examination	Retrievably Stored Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
	Newly Generated Waste Radiography (RTR) Visual Examination	Newly Generated Waste INST-OI-12, *Real-Time Radiography Operations (Drum)* INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)* INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Newly Generated Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*

Table C-1. (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
	Repackaging of Retrievably Stored Waste Visual Examination	Repackaging of Retrievably Stored Waste INST-OI-34, *Non-Facility Visual Examination Operations* INST-FOI-17, *Facility Visual Examination Operations* INST-FOI-20, *Supercompactor and Post-Compaction Operations*	Repackaging of Retrievably Stored Waste MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
Headspace Gases **Volatile Organic Compounds** Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene (trans)-1,2-Dichloroethylene Ethyl benzene Ethyl ether Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Xylenes Alcohols and Ketones Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	**Gas Analysis** Gas Chromatography/Mass Spectroscopy (GC/MS), EPA TO-14A or TO-15 or modified SW-846 8260 GC/Flame Ionization Detector (FID), for alcohols and ketones, SW-846 8015	**Analysis** (refer to Section C3) INST-OI-43, *HGAS Sampling and Analysis Operations*	**Analysis** MP-TRUW-8.8, *Level I Data Validation* MP-TRUW-8.9, *Level II Data Validation*
Total Volatile Organic Compounds Acetone Benzene Bromoform Butanol Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroform 1,4-Dichlorobenzene[d] 1,2-Dichlorobenzene[d] 1,2-Dichloroethane 1,1-Dichloroethylene Ethyl benzene Ethyl ether Formaldehyde[b] Hydrazine[c] Isobutanol Methanol Methyl ethyl ketone Methylene chloride Pyridine[d] 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene trans-1,2-Dichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Trichlorofluoromethane 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichloroethylene Vinyl chloride Xylenes	**Total Volatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8260 Gas Chromatography/Flame Ionization Detection (GC/FID), SW-846 8015 HPLC, SW-846 8315A Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Sample Collection** **INST-OI-16, *Drum Coring Operations*** **INST-OI-73, *Manual Drum Coring Operations*** **INST-OI-75, *Container-in-Container Sampling*** **Analysis** (refer to Section C3) CCP-TP-184, *CCP Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GS/MS)* CCP-TP-186, *CCP Determination of Nonhalongenated Volatile Organics by Gas Chromatography*	**Analysis** CCP-TP-188, *Analytical Data Recording, Review, and Reporting* MP-TRUW-8.9, *Level II Data Validation*

Table C-1. (continued)

PARAMETER	TECHNIQUES AND PROCEDURE	SITE-SPECIFIC DATA COLLECTION PROCEDURES	SITE-SPECIFIC DATA RELEASE PROCEDURES
Total Semivolatile Organic Compounds Cresols 1,4-Dichlorobenzene [c] 1,2-Dichlorobenzene [e] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Pyridine [c]	**Total Semivolatile Organic Compound Analysis** TCLP, SW-846 1311 GC/MS, SW-846 8270 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Sample Collection** **INST-OI-16, *Drum Coring Operations*** **INST-OI-73, *Manual Drum Coring Operations*** **INST-OI-75, *Container-in-Container Sampling*** **Analysis** (refer to Section C3) CCP-TP-187, *Sample Preparation for Semi-volatile Compounds* CCP-TP-185, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*	**Analysis** CCP-TP-188, *Analytical Data Recording, Review, and Reporting* MP-TRUW-8.9, *Level II Data Validation*
Total Metals Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc	**Total Metals Analysis** TCLP, SW-846 1311 ICP- MS, SW-846 6020, ICP Emission Spectroscopy, SW-846 6010 Atomic Absorption Spectroscopy , SW-846 7000 Acceptable Knowledge for Summary Category S5000 (Debris Wastes)	**Sample Collection** **INST-OI-16, *Drum Coring Operations*** **INST-OI-73, *Manual Drum Coring Operations*** **INST-OI-75, *Container-in-Container Sampling*** **Analysis** (refer to Section C3-8) CCP-TP-183, *CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel* CCP-TP-182, *CCP Determination of Metals by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) for TRU Waste Characterization* CCP-TP-181, *CCP Determination of Mercury by CVAA for TRU Waste Characterization*	**Analysis** CCP-TP-188, *Analytical Data Recording, Review, and Reporting* MP-TRUW-8.9, *Level II Data Validation*

[a] Permit Attachment C
[b] Required only for homogeneous solids and soil/gravel waste from Savannah River Site to resolve the assignment of EPA HWNs.
[c] Required only for homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and Savannah River Site to resolve the assignment of EPA HWNs.
[d] Can also be analyzed as a semi-volatile organic compound.
[e] Can also be analyzed as a volatile organic compound
[f] Required only to resolve the assignment of EPA HWNs to debris waste streams.
[g] Required only to resolve the assignment of EPA HWNs to homogeneous sold and soil/gravel waste streams.

Table C-2. Headspace Target Analyte List and Methods[b]

PARAMETER	EPA SPECIFIED ANALYTICAL METHOD
Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform Cyclohexane [c] 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene (trans)-1, 2- Dichloroethylene Ethyl benzene Ethyl ether Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane 1,2,4-Trimethylbenzene [c] 1,3,5-Trimethylbenzene [c] Xylenes	EPA: Modified TO-14A or TO-15[a]; Modified 8260 EPA - Approved FTIRS
Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	EPA: Modified TO-14A or TO-15[a]; Modified 8260 Method 8015 EPA - Approved FTIRS

a. U.S. Environmental Protection Agency (EPA), 1999, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition (EPA/625/R-96/010b). The most current revision of the specified methods may be used.
b. Required only for debris waste when required to resolve the assignment of EPA HWNs.

Table C-3. Required Organic Analyses and Test Methods Organized by Organic Analytical Groups[e]

ORGANIC ANALYTICAL GROUP	REQUIRED ORGANIC ANALYSES	EPA SPECIFIED ANALYTICAL METHOD [a, d]
Nonhalogenated Volatile Organic Compounds (VOCs)	Acetone Isobutanol Benzene Methanol n-Butanol Methyl ethyl ketone Carbon disulfide Toluene Ethyl benzene Xylenes Ethyl ether Formaldehyde Hydrazine[b]	8015 8260 8315A
Halogenated VOCs	Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane 1,1-Dichloroethylene (trans)-1, 2- Dichloroethylene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene 1,1,2-Trichloroethane 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl Chloride	8015 8260
Semivolatile Organic Compounds (SVOCs)	Cresols (o, m, p) 1,2-Dichlorobenzene[c] 1,4-Dichlorobenzene[c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Pyridine[c]	8270

a. U.S. Environmental Protection Agency (EPA), 1996, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition.
b. Generator/Storage Sites will have to develop an analytical method for hydrazine. This method will be submitted to the CBFO for approval.
c. These compounds may also be analyzed as VOCs by SW-846 Method 8260.
d. TCLP (SW-846 Method 1311) may be used to determine if compounds in 20 NMAC 4.1.200 (incorporating 40 CFR §261, Subpart C) exhibit a TC.
e. Required only to resolve the assignment of EPA HWNs.

Table C-4. Summary of Sample Preparation and Analytical Methods for Metals

PARAMETERS	EPA SPECIFIED ANALYTICAL METHODS [a, b, c]
Sample Preparation	3051, or equivalent, as appropriate for analytical method
Total Antimony	6010, 6020, 7000, 7010, 7062
Total Arsenic	6010, 6020, 7010, 7061, 7062
Total Barium	6010, 6020, 7000, 7010
Total Beryllium	6010, 6020, 7000, 7010
Total Cadmium	6010, 6020, 7000, 7010
Total Chromium	6010, 6020, 7000, 7010
Total Lead	6010, 6020, 7000, 7010
Total Mercury	7471
Total Nickel	6010, 6020, 7000, 7010
Total Selenium	6010, 7010, 7741, 7742
Total Silver	6010, 6020, 7000, 7010
Total Thallium	6010, 6020, 7000, 7010
Total Vanadium	6010, 7000, 7010
Total Zinc	6010, 6020, 7000, 7010

a. U.S. Environmental Protection Agency (EPA), 1996. "Test Methods for Evaluating Solid Waste," Laboratory Manual Physical/Chemical Methods, SW 846, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

b. TCLP (SW-846 Method 1311) may be used to determine if compounds in 20 NMAC 4.1.200 (incorporating 40 CFR 261, Subpart C) exhibit a TC.

c. Required only for homogeneous solids and soil/gravel to resolve the assignment of EPA HWNs.

Table C-5. Summary of Parameters, Characterization Methods, and Rationale for Transuranic Waste (For Both Stored Waste and Newly Generated Waste Unless Otherwise Specified)

WASTE MATRIX CODE SUMMARY CATEGORIES	WASTE MATRIX CODE GROUPS	CHARACTERIZATION PARAMETER	METHOD	RATIONALE
S3000-Homogeneous Solids S4000-Soil/Gravel	• Solidified inorganics • Salt waste • Solidified organics •Contaminated soil/debris	Physical waste form	Acceptable Knowledge, Radiography and/or Visual Examination.	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits,, no incompatible wastes, no compressed gases)
		Hazardous constituents • Listed • Characteristic	**Retrievably Stored** Acceptable Knowledge or Statistical Sampling [a] (see Tables C-3 and C-4) **Newly Generated** Statistical Sampling [a] (see Tables C-3 and C-4)	• Determine characteristic metals and organics • Resolve the assignment of EPA HWNs
S5000–Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous debris waste • Composite filter waste	Physical waste form	Acceptable Knowledge, Radiography and/or Visual Examination.	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents • Listed • Characteristic	Statistical Gas Sampling and Analysis[a] (See Table C-2)	• Resolve the assignment of EPA HWNs
		Hazardous constituents • Characteristic	Acceptable knowledge	• Determine characteristic metals and organics

a. Applies to waste streams that require sampling.

Table C-6. Required Program Records Maintained in AMWTP Project Files

LIFETIME RECORDS
· Field sampling data forms · Field and laboratory COC forms · Test facility and laboratory batch data reports · Waste Stream Characterization Package · Sampling Plans · Data reduction, validation, and reporting documentation · AK documentation · Waste Stream Profile Form and Characterization Information Summary
NON-PERMANENT RECORDS
· Nonconformance documentation · Variance documentation · Assessment documentation · Gas canister tags · Methods performance documentation · PDP documentation · Sampling equipment certifications · Calculations and related software documentation · Training/qualification documentation · QAPjPs (generator/storage sites) documentation (all revisions) · Calibration documentation · Analytical raw data · Procurement documentation · QA procedures (all revisions) · Technical implementing procedures (all revisions) · Audio/video recording (radiography, visual, etc.)

Table C-7. Waste Data System/WIPP Waste Information System Data Fields [a]

CHARACTERIZATION MODULE DATA FIELDS b	
Container ID [c]	Total VOC Sample Date
Generator EPA ID	Total VOC Analysis Date
Generator Address	Total VOC Analyte Name [d]
Generator Name	Total VOC Analyte Concentration [d]
Generator Contact	Total Metal Sample Date
Hazardous Code	Total Metal Analysis Date
Headspace Gas Sample Date	Total Metal Analyte Name [d]
Headspace Gas Analysis Date	Total Metal Analyte Concentration [d]
Layers of Packaging	Semi-VOC Sample Date
Liner Exists	Semi-VOC Analysis Date
Liner Hole Size	Semi-VOC Analyte Name [d]
Filter Model	Semi-VOC Concentration [d]
Number of Filters Installed	Transporter EPA ID
Headspace Gas Analyte [d]	Transporter Name
Headspace Gas Concentration [d]	Visual Exam Container [e]
Headspace Gas Char. Method [d]	Waste Material Parameter [d]
Total VOC Char. Method [d]	Waste Material Weight [d]
Total Metals Char. Method [d]	Waste Matrix Code
Total Semi-VOC Char. Method [d]	Waste Matrix Code Group
Item Description Code	Waste Stream Profile Number
Haz. Manifest Number	
NDE Complete [e]	
CERTIFICATION MODULE DATA FIELDS	
Container ID [c]	Handling Code
Container type	
Container Weight	
Contact Dose Rate	
Container Certification date	
Container Closure Date	
TRANSPORTATION MODULE DATA	
Contact Handled Package Number	Ship Date
Assembly Number [f]	Receive Date
Container IDs [c, d]	
Inner Containment Vessel (ICV) Closure Date	
DISPOSAL MODULE DATA	
Container ID [c]	
Disposal Date	
Disposal Location	

a. This is not a complete list of the WDS/WWIS data fields.
b. Some of the fields required for characterization are also required for certification and/or transportation.
c. Container ID is the main relational field in the WDS/WWIS Database.
d. This is a multiple occurring field for each analyte, nuclide, etc.
e. These are logical fields requiring only a yes/no.
f. Required for 7 packs of 55-gal. drums, 4-packs of 85-gal drums, or 3-packs of 100-gal drums to tie all of the drums in that assembly together. This facilitates the identification of waste containers in a shipment without need to breakup the assembly.

Table C-8. Waste Tanks Subject to Exclusion.

Hanford Site – 177 Tanks	
A-101 through A-106	C-201 through C-204
AN-101 through AN-107	S-101 through S-112
AP-101 through AP-108	SX-101 through SX-115
AW-101 through AW-106	SY-101 through SY-103
AX-101 through AX-104	T-101 through T-112
AY-101 through AY-102	T-201 through T-204
B-101 through B-112	TX-101 through TX-118
B-201 through B-204	TY-101 through TY-106
BX-101 through BX-112	U-101 through U-112
BY-101 through BY-112	U-201 through U-204
C-101 through C-112	
Savannah River Site – 51 Tanks	
Tank 1 through 51	
Idaho National Laboratory – 15 Tanks	
WM-103 through WM-106	WM-180 through 190

Table C-9. Listing of Permitted EPA Hazardous Waste Numbers.

EPA Hazardous Waste Numbers			
F001	D019	D043	U079
F002	D021	P015	U103
F003	D022	P030	U105
F004	D026	P098	U108
F005	D027	P099	U122
F006	D028	P106	U133*
F007	D029	P120	U134*
F009	D030	U002*	U151
D004	D032	U003*	U154*
D005	D033	U019*	U159*
D006	D034	U037	U196
D007	D035	U043	U209
D008	D036	U044	U210
D009	D037	U052	U220
D010	D038	U070	U226
D011	D039	U072	U228
D018	D040	U078	U239*

* Acceptance of U-numbered wastes listed for reactivity, ignitability, or corrosivity characteristics is contingent upon a demonstration that the wastes no longer exhibit the characteristic of reactivity, ignitability, or corrosivity.

WASTE STREAM PROFILE FORM

Waste Stream Profile Number: _____
Generator Site Name: _____ Technical Contract: _____
Generator Site EPA ID: _____ Technical Contact Phone Number: _____
Date of audit report approval by NMED: _____
Title, version number and date of documents used for WAP Certification: _____

Did your facility generate this waste? ☐Yes ☐No
If no, provide the name and EPA ID of the original generator: _____

WIPP ID: _____ Summary Category Group: _____
Waste Stream Name: _____
Description from the WTWBIR: _____

Defense Waste: ☐Yes ☐No Check one: ☐CH ☐RH
Number of SWBs _____ Number of Drums _____ Number of Canisters _____
Batch Data Report numbers supporting this waste stream characterization: _____
List applicable EPA Hazardous Waste Numbers [2] _____
Applicable TRUCON Content Numbers: _____
Acceptable Knowledge Information[1]
(For the following, enter supporting documentation used (i.e., references and dates))

Required Program Information

- Map of site: _____
- Facility mission description: _____
- Description of operations that generate waste: _____
- Waste identification/categorization schemes: _____
- Types and quantities of waste generated: _____
- Correlation of waste streams generated from the same building and process, as applicable: _____
- Waste certification procedures: _____

Required Waste Stream Information

- Area(s) and building(s) from which waste stream was generated: _____
- Waste stream volume and time period of generation: _____
- Waste generating process description for each building: _____
- Waste process flow diagrams: _____
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: _____
- Waste material parameter estimates per unit of waste: _____
- Which Defense Activity generated the waste: (check one)

☐ Weapons activities including defense inertial confinement fusion
☐ Naval reactors development
☐ Verification and control technology
☐ Defense research and development
☐ Defense nuclear waste and material by products management
☐ Defense nuclear material production
☐ Defense nuclear waste and materials security and safeguards and security investigations

EXAMPLE

Figure B-1 (Example Only)
WASTE STREAM PROFILE FORM

Figure C-1.WIPP waste stream profile form (example only).

WASTE STREAM PROFILE FORM

Supplemental Documentation

Process design documents: _____
Standard operating procedures: _____
Safety Analysis Reports: _____
Waste packaging logs: _____
Test plans/research project reports: _____
Site data bases: _____
Information from site personnel: _____
Standard industry documents: _____
Previous analytical data: _____
Material safety data sheets: _____
Sampling and analysis data from comparable/surrogate waste: _____
Laboratory notebooks: _____

Confirmation Information[2]
[For the following, when applicable, enter procedure title(s), number(s), and date(s)]

Radiography: _____

Visual Examination: _____

EXAMPLE

Waste Stream Profile Form Certification

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

_____	_____	_____
Signature of Site Project Manager	Printed Name and Title	Date

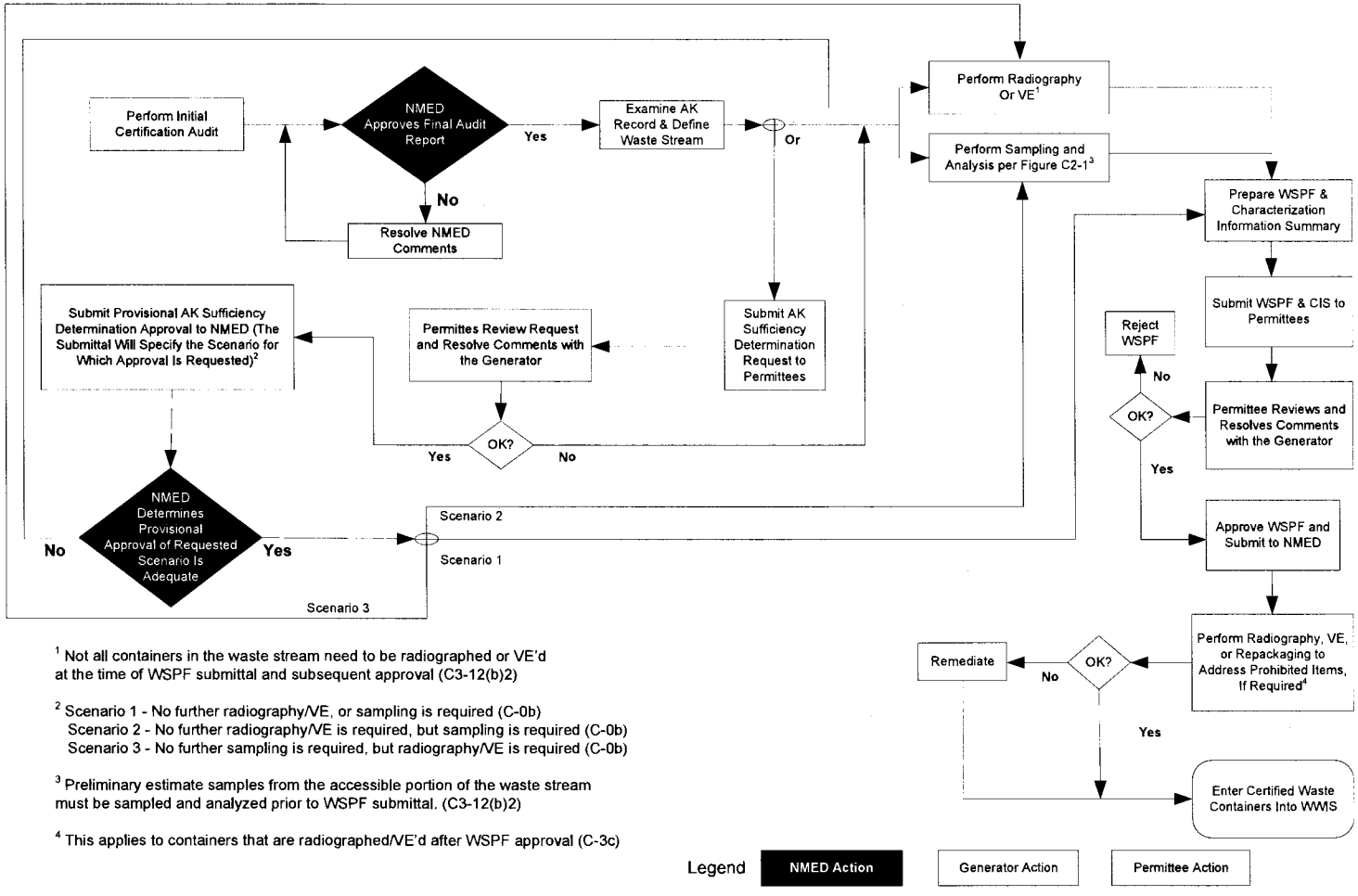
NOTE:

(1) Use back of sheet or continuation sheets, if required.

(2) If, radiography, visual examination were used to confirm EPA Hazardous Waste Numbers, attach signed Characterization Information Summary documenting this determination.

Figure B-1 (Example Only) (Continued)
WASTE STREAM PROFILE FORM

Figure C-1. (continued)



[1] Not all containers in the waste stream need to be radiographed or VE'd at the time of WSPF submittal and subsequent approval (C3-12(b)2)

[2] Scenario 1 - No further radiography/VE, or sampling is required (C-0b)
Scenario 2 - No further radiography/VE is required, but sampling is required (C-0b)
Scenario 3 - No further sampling is required, but radiography/VE is required (C-0b)

[3] Preliminary estimate samples from the accessible portion of the waste stream must be sampled and analyzed prior to WSPF submittal. (C3-12(b)2)

[4] This applies to containers that are radiographed/VE'd after WSPF approval (C-3c)

Figure C-2. Waste characterization process.

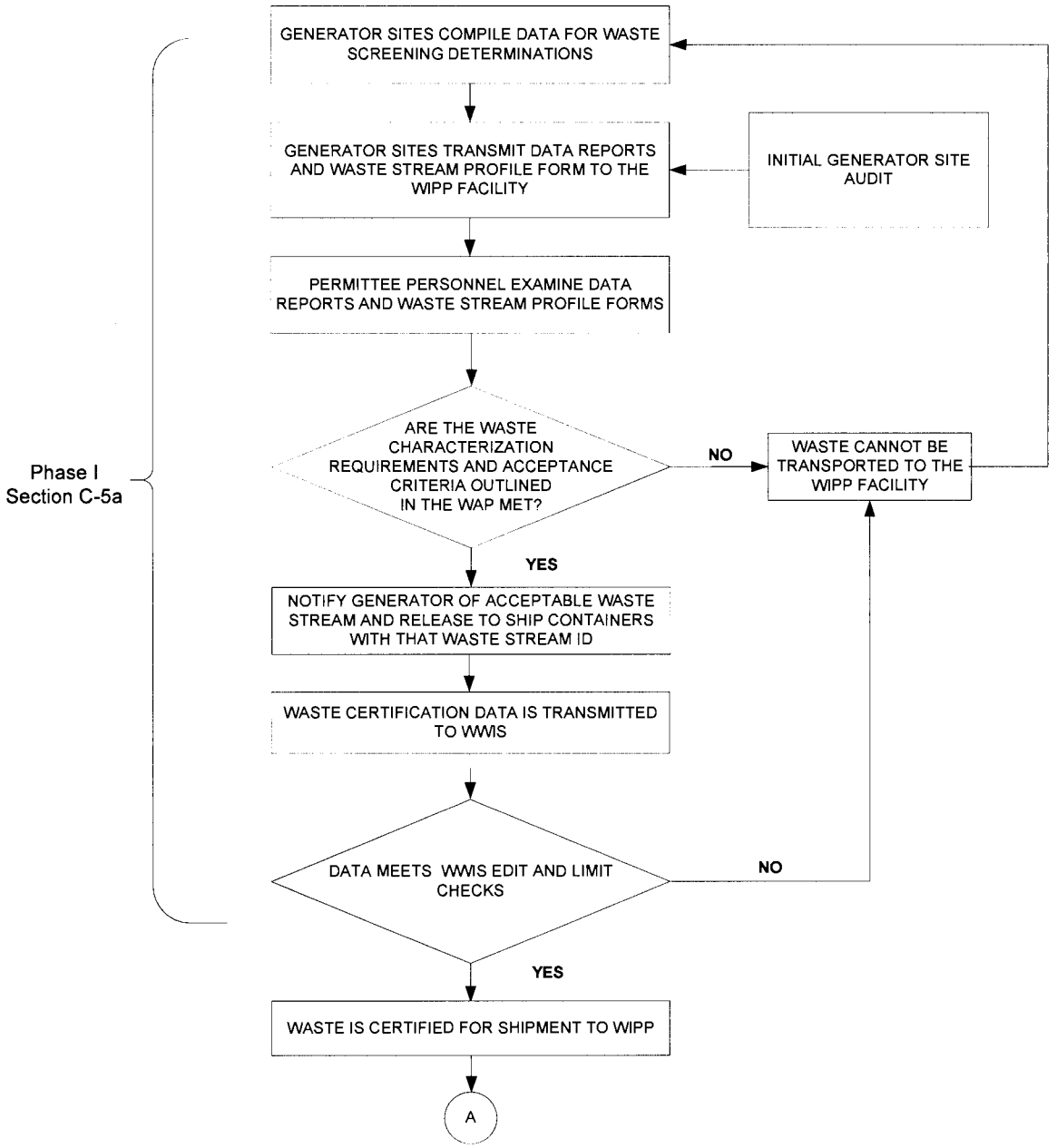


Figure C-3. TRU mixed waste screening and verification flow diagram.

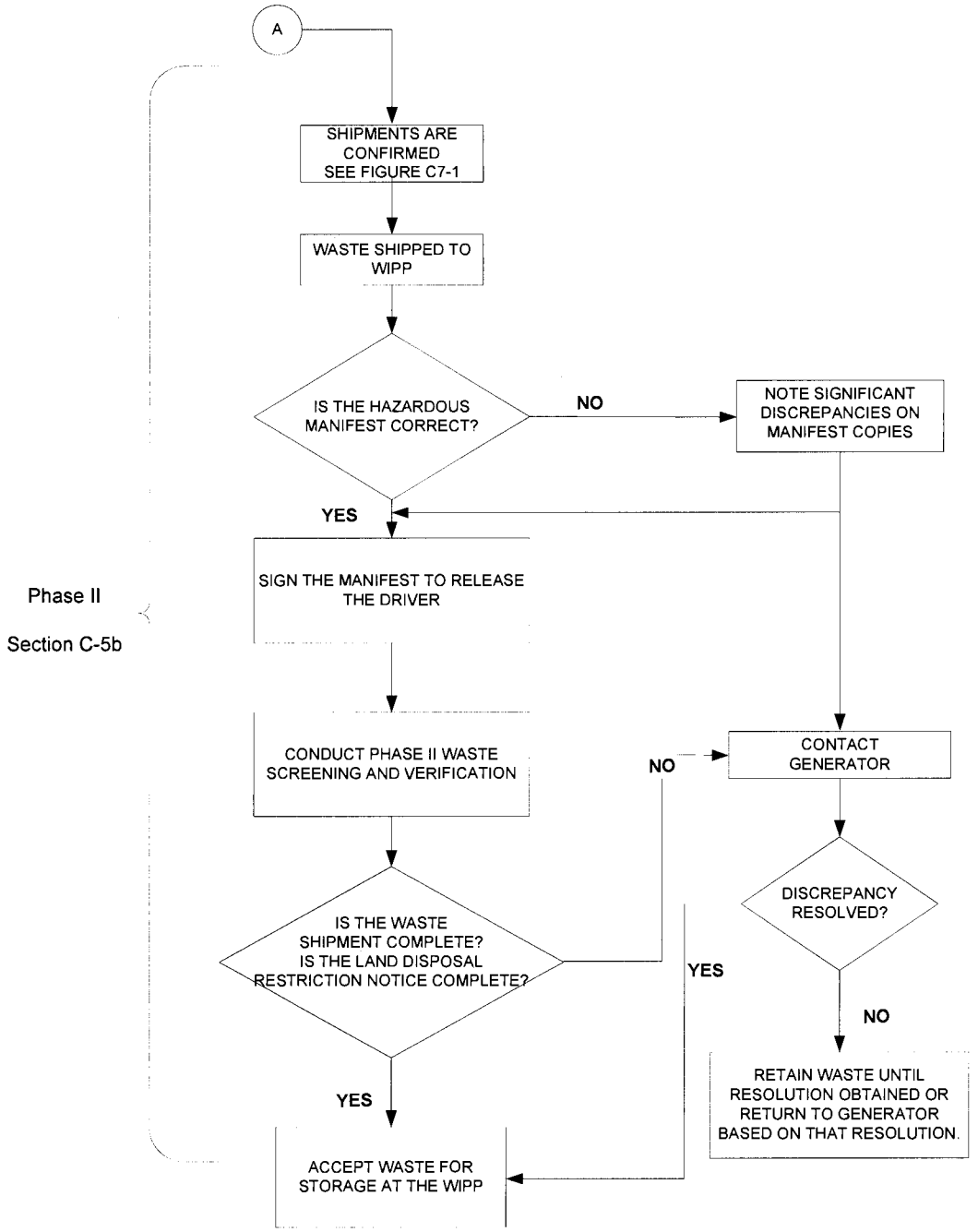


Figure C-3. (continued)

Attachment C1.
Waste Characterization Sampling Methods

The AMWTP uses the following methods as applicable for characterization of TRU mixed waste to be disposed of at the WIPP facility. These methods include requirements for HSGS , sampling of homogeneous solids and soil/gravel, and RTR or VE. Additionally, this section provides quality control (QC), sample custody, and sample packing and shipping requirements.

C1-1 Sampling of Debris Waste (Summary Category S5000)

Headspace gas sampling and analysis is used to resolve the assignment of EPA HWNs to debris waste streams.

The AMWTP on-line integrated HSGS operations are described in INST-OI-43which list the specific activities and requirements necessary to prepare and test the sampling equipment to ensure sampling readiness and for obtaining the required field blank, field reference standard, and headspace samples. These activities and requirements assure that the sampling and analytical QA objectives are met.

C1-1a Method Requirements

Headspace gas sampling is performed in an appropriate radiation containment area on waste containers that are in compliance with the container equilibrium requirement (i.e., 72 hours at 18° C or higher).

For those waste streams without an AK Sufficiency Determination approved by the CBFO, containers are randomly selected from waste streams designated as summary category S5000 (debris waste) and are categorized under one of the sampling scenarios shown in Table C1-5 and depicted in Figure C1-1. If the container is categorized under Scenario 1, the applicable drum age criteria (DAC) from Table C1-6 must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table C1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table C1-7 must be met after venting the container. The DAC for Scenario 2 containers that contain filters or rigid liner vent holes other than those listed in Table C1-7 shall be determined using footnotes "a" and "b" in Table C1-7. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. Containers categorized under Scenario 3 must be placed into one of the Packaging Configuration Groups listed in Table C1-8. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment C, Section C-3d[1]), a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for SWBs and TDOPs, and 8 for 85-gallon and 100-gallon drums must be assigned, provided the drums do not contain pipe component packaging. If a container is designated as Packaging Configuration Group 4 (i.e., a pipe component), the headspace gas sample must be taken from the pipe component headspace.

Drums, TDOPs, or SWBs that contain compacted 55-gallon drums containing a rigid liner may not be disposed of under any packaging configuration unless headspace gas sampling was performed before compaction in accordance with this QAPjP. The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) shall be determined using the default conditions in footnote "b" in Table C1-9. The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table C1-9 shall be determined using footnote "a" in Table C1-9. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table C1-9 based on its packaging configuration (Note: Packaging Configuration Groups 4, 5, 6, 7, and 8 are not summary category group dependent, and 85-gallon drum, 100-gallon drum, SWB, and TDOP requirements apply when the 85-gallon drum, 100-gallon drum, SWB, or TDOP is used for the direct loading of waste).

C1-1a(1) General Requirements

The determination of packaging configuration consists of identifying the number of confinement layers and the identification of rigid poly liners when present. AMWTP shall use either the default conditions specified in Tables C1-7 through C1-9 for retrievably stored waste or the data documented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) for determining the appropriate DAC for each container from which a headspace gas sample is collected. These drum age criteria are to ensure that the container contents have reached 90 percent of steady state concentration within each layer of confinement (Lockheed 1995, BWXT 2000). The following information must be reported in the headspace gas sampling documents for each container from which a headspace gas sample is collected:

- Sampling scenario from Table C1-5 and associated information from Tables C1-6 and/or TableC1-7;
- The packaging configuration from Table C1-8 and associated information from Table C1-9 including the diameter of the rigid liner vent hole, the number of inner bags, the number of liner bags, the presence/absence of drum liner, and the filter hydrogen diffusivity;
- The permit–required equilibrium time; and
- The drum age.
- For supercompacted waste, both:
  - The absence of rigid liners in the compacted 55-gallon drums which have not been headspace gas sampled in accordance with this QAPjP prior to compaction, and
  - The absence of layers of confinement must be documented in the WDS/WWIS if Packaging Configuration Group 7 is used.

For all retrievably stored waste containers, the rigid liner vent hole diameter must be assumed to be 0.3 inches unless a different size is documented during drum venting or repackaging. For all retrievably stored waste containers, the filter hydrogen diffusivity must be assumed to be the most restrictive unless container-specific information clearly identifies a filter model and/or filter diffusivity characteristic that is less restrictive. For all retrievably stored waste containers that have not been repackaged, AK shall not be used to justify any packaging configuration less conservative than the default (i.e., Packaging Configuration Group 3 for 55-gallon drums, 6 for SWBs and TDOPs, and 8 for 85-gallon and 100-gallon drums). For information reporting purposes listed above, AMWTP may report the default packaging configuration for retrievably stored waste without further verification.

All waste containers with unvented rigid containers greater than 4 liters (exclusive of rigid poly liners) are subject to innermost layer of containment sampling or are vented prior to initiating drum age and equilibrium criteria. When sampling the rigid poly liner under Scenario 1, the sampling device must form an airtight seal with the rigid poly liner to ensure that a representative sample is collected (using a sampling needle connected to the sampling head to pierce the rigid poly liner, and that allows for the collection of a representative sample, satisfies this requirement). The configuration of the containment area and remote-handling equipment at each sampling facility are expected to differ. Headspace-gas samples will be analyzed for analytes listed in Table C3-2 of Attachment C3. If additional packaging configurations are identified, an appropriate Permit Modification will be submitted to incorporate the DAC using the methodology BWXT (2000). Consistent with the footnote "a" in Table C1-8, any waste container selected for headspace gas sampling that cannot be assigned a packaging configuration specified in Table C1-8, shall be assigned a conservative default packaging configuration.

Drum age criteria apply only to 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, and TDOPs. Drum age criteria for all other container types must be established through permit modification prior to performing headspace gas sampling.

AMWTP collects samples in SUMMA® or equivalent canisters using standard headspace gas sampling methods that meet the general guidelines established by the EPA in the Compendium Method TO-14A or TO-15, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA 1999) or by using on-line integrated sampling/analysis systems. Samples will be directed to an analytical instrument instead of being collected in SUMMA® or equivalent canisters if a single-sample on-line integrated sampling/analysis system is used. If a multi-sample on-line integrated sampling/analysis system is used, samples will be directed to an integrated holding area that meets the cleaning requirements of C1-1c(1). The leak proof and inert nature of the integrated holding area interior surface has been demonstrated and documented. Since samples will not be transported to another location when using on-line integrated sampling/analysis systems, the sample custody requirements of Section C1-4 and C1-5 do not apply. The same sampling manifold and sampling heads are used with on-line integrated sampling/analysis systems and all of the requirements associated with sampling manifolds and sampling heads will be met. When using an on-line integrated system, the sampling batch and

analytical batch QC samples are combined as on-line batch QC samples as outlined in Section C1-1b.

Headspace gas sampling of waste drums at the AMWTP is conducted per INST-OI-43.

C1-1a(2) Manifold Headspace Gas Sampling

The headspace gas sampling protocol employs a multiport manifold capable of collecting multiple simultaneous headspace samples for analysis and QC purposes in accordance with INST-OI-43. The manifold can be used to collect samples in SUMMA® or equivalent canisters or as part of an on-line integrated sampling/analysis system. The sampling equipment is leak checked and cleaned prior to first use and as needed thereafter. The manifold and sample canisters will be evacuated to 0.0039 inches (in) (0.10 mm mercury (Hg) prior to sample collection. Cleaned and evacuated sample canisters will be attached to the evacuated manifold before the manifold inlet valve is opened. The manifold inlet valve is attached to a changeable filter connected to either a side port needle sampling head capable of forming an airtight seal (for penetrating a filter or rigid poly liner when necessary), a drum punch sampling head capable of forming an airtight seal (capable of punching through the metal lid of a drum for sampling through the drum lid), or a sampling head with an airtight fitting for sampling through a pipe overpack container filter vent hole. Refer to Section C1-1a(4) for descriptions of these sampling heads.

The manifold is equipped with a purge assembly that allows applicable QC samples to be collected through all sampling components that may affect compliance with the QAOs. AMWTP will demonstrate and document the effectiveness of the sampling equipment design in meeting the QAOs. Field blanks are samples of room air collected in the sampling area in the immediate vicinity of the waste container to be sampled. If using SUMMA® or equivalent canisters, field blanks will be collected directly into the canister without using the manifold.

The manifold, the associated sampling heads, and headspace gas sample volume requirements are designed to ensure that a representative sample is collected. The manifold internal volumes must be calculated and documented in field logbooks dedicated to headspace-gas sampling collection. The total volume of headspace gases collected during each sampling operation is determined by adding the combined volume of the canisters attached to the manifold and the internal volume of the manifold. The sample volume should remain small in comparison to the volume of the waste container. When an estimate of the available headspace gas volume in the drum can be made, less than 10 percent of that volume should be withdrawn. The manifold must consist of a sample side and a standard side. The sample side must be connected to the standard side for cleaning and collecting equipment blanks and field reference standards. The sample side of the sampling manifold consists of the following major components:

- An applicable sampling head that forms a leak-tight connection with the headspace sampling manifold.

- A flexible hose that allows the movement of the sampling head from the purge assembly (standard side) to the waste container.

- A pressure sensor(s) pneumatically connected to the manifold. This manifold pressure sensor(s) is capable of measuring absolute pressure in the range from 0.05 millimeters mercury (mm Hg) to 1,000 mm Hg. Resolution for the manifold pressure sensors must be ± 0.01 mm Hg at 0.05 mm Hg. The manifold pressure sensor(s) must have an operating range from approximately 15° C to 40° C.

- Ports available for attaching sample canisters. If using canister-based sampling methods, a sufficient number of ports shall be available to allow simultaneous collection of headspace-gas samples and duplicates for VOC analyses. If using on-line integrated sampling/analysis system, only one port is necessary for the collection of comparison samples. Ports not occupied with sample canisters during cleaning or headspace-gas sampling activities require a plug to prevent ambient air from entering the system. In place of using plugs, the AMWTP may choose to install valves that can be closed to prevent intrusion of ambient air into the manifold. Ports have VCR® fittings for connection to the sample canister(s) to prevent degradation of the fittings on the canisters and manifold.

- Sample canisters are leak-free, stainless steel pressure vessels, with a chromium-nickel oxide (Cr-NiO) SUMMA®-passivated interior surface, bellows valve, and a pressure/vacuum gauge. Equivalent designs, such as Silco Steel canisters, may be used so long as the leak proof and inert nature of the canister interior surface is demonstrated and documented. All sample canisters must have VCR fittings for connection to sampling and analytical equipment. The pressure/vacuum gauge must be mounted on each manifold. The canister must be helium-leak tested to 1.5×10^{-7} standard cubic centimeters per second (cc/s), have all stainless steel construction, and be capable of tolerating temperatures to 125° C. The gauge range is capable of operating in the leak test range as well as the sample collection range.

- A dry vacuum pump with the ability to reduce the pressure in the manifold to 0.05 mm Hg. A vacuum pump that required oil may be used, but precaution must be taken to prevent diffusion of oil vapors back to the manifold. Precautions may include the use of a molecular sieve and a cryogenic trap in series between the headspace sampling ports and the pump. The AMWTP systems use either an oil-free scroll vacuum pump or an oil vacuum pump to reduce the pressure in the headspace sampling manifold to 0.05 mm Hg. Precautions have been taken to prevent diffusion of oil vapors back to the manifold including the use of a non-interfering silicone-based lubricant, continuous pump operation and piping dimensioning from the pump to the manifold. Compliance is demonstrated by several months of operation and equipment blank analyses without indication of contamination due to oil diffusion.

- A minimum distance, based on the design of the manifold system, between the tip of the needle and the valve that isolates the pump from the manifold in order to minimize the dead volume in the manifold.

- If real-time equipment blanks are not available, the manifold must be equipped with an organic vapor analyzer (OVA) that is capable of detecting all analytes listed in Table C3-2. The OVA shall be capable of measuring total VOC concentrations below the lowest headspace program required quantitation limit (PRQL). Detection of 1,1,2-trichloro-1,2,2-trifluoroethane may not be possible if a photoionization detector is used. The OVA measurement shall be verified by the collection of equipment blanks at the frequency specified in Section C1-1 to check for manifold cleanliness.

- At the AMWTP, the manifold is equipped with GC/MS that is capable of measuring all analytes listed in Table C3-2. The GC/MS is capable of measuring total VOC concentration below the lowest headspace gas PRQL. The GC/MS measurement is confirmed by the collection of equipment blanks and as specified in C1-1 to check for manifold cleanliness.

The standard side of the sampling manifold consists of the following major components:

- A cylinder of compressed zero air, helium, argon, or nitrogen gas that is used to clean the manifold between samples and provide gas for the collection of equipment blanks or on-line blanks. The high-purity gas is certified by the manufacturer to contain less than one parts per million (ppm) total VOCs. The gases are metered into the standard side of the manifold using devices (solenoid controlled valves), that are corrosion proof and that do not allow for the introduction of manifold gas into the purge gas cylinders or generator. Alternatively, a zero air or nitrogen generator may be used, provided a sample of the zero air or nitrogen is collected and demonstrated to contain less than one ppm total VOCs. Zero air or nitrogen from a generator will be humidified. Gas quality is of ultra-high purity grade and metered by a two-stage stainless steel regulator.

- Cylinders of field reference standard gases or on-line control sample (OLCS) gases. These cylinders provide gases for evaluating the accuracy of the headspace sampling process. Each cylinder of field reference gas or OLCS gas has a flow regulating device. The field reference standard gas or OLCS gas is certified by the manufacturer to contain analytes from, Table C3-2 at known concentrations.

- A humidifier filled with American Society for Testing and Materials (ASTM) Type I or Type II water is connected and opened to the standard side of the manifold between the compressed gas cylinder and the purge assembly. Dry gases flowing to the purge assembly pick up moisture from the humidifier. Moisture is added to the dry gases to condition the equipment blanks and field reference standards and to assist with system cleaning between headspace gas sample collection or pre-humidified certified nitrogen cylinders are used.

NOTE: *Caution should be exercised to isolate the humidifier during the evacuation of the system to prevent flooding the manifold. In lieu of the humidifier, the compressed gas cylinders (e.g., zero air and field reference standard gas), may contain water vapor in the concentration range of 1,000 to 10,000 parts per million by volume (ppmv).*

- A purge assembly allows the sampling head (sample side) to be connected to the standard side of the manifold. The ability to make this connection is required to transfer gases from the compressed gas cylinders to the canisters or on-line analytical instrument. This connection is required for system cleaning.

- A flow indicating device or a pressure regulator connected to the purge assembly monitors the gas flow rate through the purge assembly. The flow rate or pressure through the purge assembly is monitored to assure excess flow during cleaning activities and during QC sample collection. Maintaining excess flow prevents ambient air from contaminating QC samples and allows samples of gas from the compressed gas cylinders to be collected near ambient pressures.

In addition to a manifold consisting of a sample side and a standard side, the area in which the manifold is operated contains sensors for measuring ambient pressure and ambient temperature as follows:

- An ambient-pressure sensor with a sufficient measurement range for the ambient barometric pressures expected at the sampling location. It must be kept in the sampling area during sampling operations. Resolution is 1.0 mm Hg or less and calibration performed by the manufacturer is based on National Institute of Standards and Technology (NIST), or equivalent, standards.

- The temperature sensor must have a sufficient measurement range for the ambient temperatures expected at the sampling location. The measurement range of the temperature sensor must be 18° C to 50° C. The temperature sensor calibration is traceable to NIST, or equivalent, standards.

C1-1a(3) Direct Canister Headspace Gas Sampling

This section is applicable to the AMWTP such that sampling and analysis may be performed by other contractors. Data generation level validation will be performed by a subcontractor. Project level validation will be performed by the AMWTP PLV&V groups.

This headspace-gas sampling protocol employs a canister-sampling system to collect headspace gas samples for analysis and QC purposes without the use of the manifold described above. Rather than attaching sampling heads to a manifold, in this method the sampling heads are attached directly to an evacuated sample canister.

Canisters shall be evacuated to 0.0039 in. (0.10 mm) Hg prior to use and attached to a changeable filter connected to the appropriate sampling head. The sampling head(s) must be capable of either punching through the metal lid of the drums (and/or the rigid poly liner when necessary) while maintaining an airtight seal when sampling through the drum lid, penetrating a filter or the septum in the orifice of the self-tapping screw, or maintaining an airtight seal for sampling through a pipe overpack container filter vent hole to obtain the drum headspace samples. Field duplicates must be collected at the same time, in the same manner, and using the same type of sampling apparatus as used for headspace-gas sample collection. Field blanks shall be samples of room air collected in the immediate vicinity of the waste-drum sampling area prior to removal of the drum lid. Equipment blanks and field reference standards must be collected using a purge assembly equivalent to the standard side of the manifold described above. These samples shall be collected from the needle tip through the same components (e.g., needle and filter) that the headspace-gas samples pass through.

The sample canisters, associated sampling heads, and the headspace-sample volume requirements ensure that a representative sample is collected. When an estimate of the available headspace-gas volume of the waste container can be made, less than 10 percent of that volume should be withdrawn. A determination of the sampling head internal volume shall be made and documented. The total volume of headspace gases collected during each headspace gas sampling operation can be determined by adding the volume of the sample canister(s) attached to the sampling head to the internal volume of the sampling head. Every effort shall be made to minimize the internal volume of sampling heads.

Each sample canister used with the direct canister method shall have a pressure/vacuum gauge capable of indicating leaks and sample collection volumes. Canister gauges are intended to be gross leak-detection devices, not vacuum certification devices. If a canister pressure/vacuum gauge indicates an unexpected pressure change, determination of whether the change is a result of ambient temperature and pressure differences or a canister leak shall be made. This gauge shall be helium-leak tested to 1.5×10^{-7} standard cc/s, have all stainless steel construction, and be capable of tolerating temperatures to 125°C.

The SUMMA® or equivalent sample canisters as specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) shall be used when sampling each drum. These heads shall form a leak-tight connection with the canister and allow sampling through the drum-lid filter, through the drum lid itself and/or rigid poly liner when necessary (by use of a punch or self-tapping screw), using an airtight fitting to collect the sample through the filter vent hole of a pipe overpack container, or using a hollow side port needle. Figure C1-4 illustrates the direct canister-sampling equipment.

C1-1a(4) Sampling Heads

A sample of the headspace gas directly under the container lid, pipe overpack filter vent hole, or rigid poly liner shall be collected. Several methods have been developed for collecting a representative sample: sampling through the filter, sampling through the drum lid by drum punching, sampling through a pipe overpack container filter vent hole, and sampling through the rigid poly liner. The chosen sampling method shall preserve the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, replace set screw in filter housing, and seal the punched drum lid). The AMWTP samples through the filter and preserves the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, replace set screw in filter housing, and seal the punched drum lid).

C1-1a(4)(i) Sampling Through the Filter

To sample the drum-headspace gas through the drum's filter, the AMWTP uses, a side-port needle (e.g., a hollow needle sealed at the tip with a small opening on its side close to the tip) pressed through the filter and into the headspace beneath the drum lid in accordance with INST-OI-43. This permits the gas to be drawn into the manifold or directly into the canister(s). All of the general method requirements, sampling apparatus requirements, and QC requirements described in this section are met in addition to the following requirements that are pertinent to drum headspace-gas sampling through the filter:

- The lid of the drum's 90-mil poly rigid liner shall contain a hole for venting to the drum headspace. A representative sample cannot be collected from the drum headspace until the 90-mil poly-liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If the sample is collected by removing the drum lid, the sampling device shall form an airtight seal with the rigid poly liner to prevent the intrusion of outside air into the sample (using a sampling needle connected to the sampling head to pierce the rigid poly liner satisfies this requirement). If headspace-gas samples are collected from the drum headspace prior to venting the 90-mil rigid poly liner, the sample is not acceptable and an NCR shall be prepared, submitted, and resolved. Nonconformance procedures are outlined in Attachment C3.

- For sample collection, the drum's filter shall be sealed to prevent outside air from entering the drum and diluting and/or contaminating the sample.

The sampling head for collecting drum headspace by penetrating the filter consists of a side- port needle, a filter to prevent particles from contaminating the gas sample, and an adapter to connect the side-port needle to the filter. To prevent cross contamination, the sampling head is cleaned or replaced after sample collection, after field-reference standard collection, and after field-blank collection. The following requirements shall also be met:

The housing of the filter shall allow insertion of the sampling needle through the:

- Filter element or a sampling port with septum that bypasses the filter element into the drum headspace.
- The side-port needle shall be used to reduce the potential for plugging.
- The purge assembly shall be modified for compatibility with the side-port needle.

C1-1a(4)(ii) Sampling Through the Drum Lid by Drum Lid Punching

Sampling through the drum lid at the time of drum punching or thereafter may be performed as an alternative to sampling through the drum's filter if an airtight seal can be maintained. To sample the drum headspace gas through the drum lid at the time of punching or thereafter, the lid is breached using an appropriate punch (sparkless drill/filter assembly). The punch forms an airtight seal between the drum lid and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method requirement, sampling apparatus requirements, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) as appropriate, are met in addition to the following requirements:

- The seal between the drum lid and sampling head minimizes the intrusion of ambient air.
- All components of the sampling system that come into contact with sample gases are purged with humidified zero air, nitrogen, or helium prior to sample collection.
- Equipment blanks and field reference standards are collected through all the components of the punch that contact the headspace gas sample.
- Pressure is applied to the punch until the drum lid has been breached.
- Provisions are made to relieve excessive drum pressure increases during the drum-punch operations; potential pressure increases may occur during sealing of the drum punch to the drum lid.
- The lid of the drum's 90-mil rigid poly liner shall contain a hole for venting to the drum headspace. The drill filter assembly design ensures penetration of drum poly liners. A representative sample cannot be collected from the drum headspace until the 90-mil rigid poly liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If headspace gas samples are collected from the drum headspace prior to venting the poly liner, the sample is not acceptable and an NCR is prepared, submitted, and resolved. Nonconformance procedures are outlined in Section C3-13.

- During sampling, the drums filter, if present, is sealed to prevent outside air from entering the drum.

- While sampling through the drum lid using manifold sampling a flow indicating device or pressure regulator to verify flow of gases is pneumatically connected to the drum punch and operated in the same manner as the flow indicating device described in C1-1a(2).

- Equipment shall be used to adequately secure the drum-punch sampling system to the drum lid.

- If the headspace gas sample is not taken at the time of drum punching, the presence and diameter of the rigid liner vent hole shall be documented during the punching operation for use in determining an appropriate Scenario 2 DAC.

C1-1a(4)(iii) Sampling Through a Pipe Overpack Container Filter Vent Hole

This section is not applicable to the AMWTP.

Sampling through an existing filter vent hole in a pipe overpack container (POC) may be performed as an alternative to sampling through the POC's filter if an airtight seal can be maintained. To sample the container headspace-gas through a POC filter vent hole, an appropriate airtight seal shall be used. The sampling apparatus shall form an airtight seal between the POC surface and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method, sampling apparatus, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) as appropriate, shall be met in addition to the following requirements:

- The seal between the POC surface and sampling apparatus shall be designed to minimize intrusion of ambient air.

- The filter shall be replaced as quickly as is practicable with the airtight sampling apparatus to ensure that a representative sample can be taken. Sites must provide documentation demonstrating that the time between removing the filter and installing the airtight sampling device has been established by testing to assure a representative sample.

- All components of the sampling system that come into contact with sample gases shall be cleaned according to requirements for direct canister sampling or manifold sampling, whichever is appropriate, prior to sample collection.

- Equipment blanks and field reference standards shall be collected through all the components of the sampling system that contact the headspace-gas sample.

- During sampling, openings in the POC shall be sealed to prevent outside air from entering the container.

- A flow-indicating device shall be connected to sampling system and operated according to the direct canister or manifold sampling requirements, as appropriate.

C1-1b Quality Control

For the manifold and direct canister sampling systems, field QC samples are collected on a per sampling basis. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding QC samples), all of which shall be collected within 14 days of the first sample in the batch. For the on-line integrated sampling/analysis systems, QC samples shall be collected and analyzed on an on-line batch basis. Holding temperatures and container requirements for gas sample containers are provided in Table C1-1. An on-line batch is the number of headspace-gas samples collected within a 12-hour period using the same on-line integrated analysis system as described in INST-OI-43. The analytical batch requirements are specified by the analytical method being used in the on-line system. Table C1-2 provides a summary of field QC sample collection requirements, and Table C1-3 provides a summary of QC sample acceptance criteria.

For the on-line integrated sampling/analysis systems, the on-line batch QC samples serve as combined sampling batch/analytical batch QC samples as follows:

- The on-line blank replaces the equipment blank and laboratory blank.

- The OLCS replaces the field reference standard and laboratory control sample (LCS).

- The on-line duplicate replaces the field duplicate and laboratory duplicate.

The acceptance criteria for on-line batch QC samples are the same as for the sampling batch and analytical batch QC samples they replace. Acceptance criteria are shown in Table C1-3. A separate field blank is collected and analyzed for each on-line batch. If the results of a field blank collected through the sampling manifold meets the acceptance criterion, a separate on-line blank need not be collected and analyzed for AMWTP systems that deliver samples directly to the GC/MS for analysis. For systems that collect samples temporarily in on-line passivated canisters, a separate on-line blank will be collected and analyzed to demonstrate canister cleanliness.

The SPM monitors and documents field QC sample results and fills out an NCR if acceptance or frequency criteria are not met. The SPM also ensures appropriate corrective action is taken if acceptance criteria are not met.

C1-1b(1) Field Blanks

Field blanks are collected to evaluate background levels of program-required analytes. Field blanks are collected prior to sample collection, and at a frequency of one per sampling batch. The SPM uses the field blank data to assess impacts of ambient contamination, if any, on the sample results. Field blank results determined by gas GC/MS or gas chromatography/flame ionization detection (GC/FID) are acceptable if the concentration of each VOC analyte is less than or equal to three times the method detection limit (MDL) listed in Table C3-2. An NCR is initiated and resolved if the final reported QC sample results do not meet the acceptance criteria.

C1-1b(2) Equipment Blanks

Equipment blanks shall be collected to assess cleanliness prior to first use after cleaning of all sampling equipment. On-line blanks are used to assess equipment cleanliness as well as analytical contamination. After the initial cleanliness check, equipment blanks collected through the manifold shall be collected at a frequency of one per sampling batch for VOC analysis or one per day, whichever is more frequent. If the direct canister method is used, field blanks may be used in lieu of equipment blanks. The SPM uses equipment blank data to assess impacts of potentially contaminated sampling equipment on the sample results. Equipment blank results determined by GC/MS or GC/FID are acceptable if the concentration of each VOC analyte is less than or equal to three times the MDL listed in Table C3-2.

C1-1b(3) Field Reference Standards

Field reference standards are used to assess the accuracy with which the sampling equipment collects VOCs samples into SUMMA® or equivalent canisters prior to first use of the sampling equipment. The OLCS is used to assess the accuracy with which the sampling equipment collects VOC samples as well as an indicator of analytical accuracy for the on-line sampling system. Field reference standards contain a minimum of six of the analytes listed in Table C3-2 at concentrations within a range of 10 to 100 ppmv and greater than the MDL for each compound.

Field reference standards have a known valid relationship to a nationally recognized standard (e.g., NIST), if available. If NIST traceable standards are not available and commercial gases are used, a Certificate of Analysis from the manufacturer documenting traceability is required. Commercial stock gases are not used beyond their manufacturer-specified shelf life.

After the initial accuracy check, field reference standards collected through the manifold are collected at a frequency of one per sampling batch and submitted blind to the analytical laboratory. For the direct canister method, field reference standards collection may be discontinued if the field reference standard results demonstrate the QAO for accuracy specified in Attachment C3. Field reference standard results are acceptable if the accuracy for each tested compound has a recovery of 70 to 130 percent.

C1-1b(4) Field Duplicates

Field duplicates are collected sequentially and in accordance with Table C1-1 to assess the precision with which the sampling procedure collects samples into SUMMA® equivalent canisters. Field duplicates also serve as a measure of analytical precision for the on-line sampling system. Field duplicate results are acceptable if the relative percent difference (RPD) is less than or equal to 25 for each tested compound found in concentrations greater than the PRQL in both duplicates.

C1-1c Equipment Testing, Inspections, and Maintenance

All sampling equipment components that come into contact with headspace sample gas are constructed of relatively inert materials such as stainless steel or Teflon®. A passivated interior surface on the stainless steel components is recommended.

To minimize the potential for cross-contamination of samples, the headspace gas sampling manifold and sample canisters are properly cleaned and leak-checked prior to each headspace gas sampling event. Procedures used for cleaning and preparing the manifold and sample canisters are equivalent to those provided in EPA's Compendium Method TO-14A or TO-15 (EPA 1999). Cleaning requirements are presented below.

C1-1c(1) Headspace Gas Sample Canister Cleaning

SUMMA® or equivalent canisters used in these methods are subject to a rigorous cleaning and certification procedures prior to use in the collection of any samples. Guidance for the development of this procedure has been derived from Method TO-14A or TO-15 (EPA 1999). Specific detailed instructions are provided in INST-OI-43 for cleaning and certification of canisters.

Canisters are cleaned and certified on an equipment cleaning batch basis. An equipment cleaning batch is any number of canisters cleaned together at one time using the same cleaning method. A cleaning system, capable of processing multiple canisters at a time, composed of an oven (optional) and a vacuum manifold which uses a dry vacuum pump or cryogenic trap backed by an oil sealed pump used to clean SUMMA® or equivalent canisters. Prior to cleaning, a positive or negative pressure leak test is performed on all canisters. The duration of the leak test must be greater than or equal to the time it takes to collect a sample, but no greater than 24 hours. For a leak test, a canister passes if the pressure does not change by a rate greater then ±2 pounds per square inch gauge (psig) per 24 hours. Any canister that fails will be checked for leaks, repaired, and reprocessed. One canister per equipment cleaning batch will be filled with humid zero air or humid high purity nitrogen and analyzed for VOCs. The equipment cleaning batch of canisters is considered clean if there are no VOCs above three times the MDLs listed in Table C3-2. After the canisters have been certified for leak-tightness and found to be free of background contamination, they are evacuated to 0.0039 in. (0.10 mm) Hg or less for storage prior to shipment. The AMWTP is responsible for canister cleaning and certification to maintain canister certification documentation and initiate the canister tags as required in Attachment C3.

C1-lc(2) Sampling Equipment Initial Cleaning and Leak-Check

The surfaces of all headspace-gas sampling equipment components that will come into contact with headspace gas is thoroughly inspected and cleaned prior to assembly. The manifold and associated sampling heads are purged with humidified zero air, nitrogen, or helium, and leak checked after assembly. This cleaning is repeated if the manifold and/or associated sampling heads are contaminated to the extent that the routine system cleaning is inadequate.

C1-1c(3) Sampling Equipment Routine Cleaning and Leak-Check

The manifold and associated sampling heads which are reused are cleaned and checked for leaks in accordance with the cleaning and leak check procedures described in EPA's Compendium Method TO-14A or TO-15 (EPA 1999). The procedure is conducted after headspace gas and field duplicate collection; after field blank collection, after field blanks are collected through the manifold; and after the additional cleaning required for field reference standard collection has been completed. The protocol for routine manifold cleaning and leak check requires that sample canisters be attached to the canister ports, or that ports be capped or closed by valves, and requires that the sampling head be attached to the purge assembly.

VOCs are removed from the internal surfaces of the headspace sampling manifold to levels that are less than or equal to three times the MDLs of the analytes listed in Table C3-2, as determined by analysis of an equipment blank or through use of an OVA. It is recommended that the headspace sampling manifold be heated to 150° Centigrade and periodically evacuated and flushed with humidified zero air, nitrogen, or helium. When not in use, the manifold shall be demonstrated clean before storage with a positive pressure of high purity gas (i.e., zero air, nitrogen, or helium) in both the standard and sample sides.

Sampling is suspended and corrective actions are taken when the analysis of an equipment blank indicates that the VOC limits have been exceeded or if a leak test fails. The SPM ensures that corrective action has been taken prior to resumption of sampling.

C1-1c(4) Manifold Cleaning After Field Reference Standard Collection

The sampling systems are specially cleaned after a field reference standard has been collected because the field reference standard gases contaminate the standard side of the headspace gas sampling manifold when they are regulated through the purge assembly. This cleaning requires the installation of a gas-tight connector in place of a sampling head, between the flexible hose and the purge assembly. This configuration allows both the sample and standard sides of the sampling system to be flushed (evacuated and pressurized) with humidified zero air, nitrogen, or helium which, combined with heating the pneumatic lines, should sweep and adequately clean the system's internal surfaces. After this protocol has been completed and prior to collecting another sample, the routine system cleaning and leak check (see previous section) shall also be performed in accordance with INST-OI-43.

C1-1c(5) Sample Head Cleaning

To prevent cross-contamination, the needle, airtight fitting or airtight seal, adapters, and filter of the sampling heads are cleaned in accordance with the cleaning procedures, INST-OI-43 which use the cleaning procedures described in EPA in the Compendium Method TO-14 (EPA 1988). After sample collection, a sampling head will be disposed of or cleaned in accordance with EPA's Compendium Method TO-14A or TO-15 (EPA 1999), prior to reuse. As a further QC measure, the needle, airtight fitting or airtight seal, and filter, after cleaning, should be purged with zero air, nitrogen, or helium and capped for storage to prevent sample contamination by VOCs potentially in the ambient air.

C1-1d Equipment Calibration and Frequency

The manifold pressure sensors are certified prior to initial use, then annually as described in MP-CMNT-10.5, *Calibration and Control of Measuring and Test Equipment Program*, using NIST traceable, or equivalent, standards. If necessary, the pressure indicated by the sensor is temperature compensated. The ambient air temperature sensor, if present, is certified prior to initial use, then annually, to NIST traceable, or equivalent, temperature standards.

The OVA shall be calibrated once per day, prior to first use, or as necessary according to the manufacturer's specifications Calibration gases are certified to contain known analytes from Table C3-2 at known concentrations. The balance of the OVA calibration gas is consistent with the manifold purge gas when the OVA is used (i.e., zero air, nitrogen, or helium).

The AMWTP HGAS units from Consonant Technology, Inc., do not employ an OVA, rather an automatic manifold capable of collecting samples from a single sampling probe, or from in-line QC sample gas cylinders, routes the sample to a manifold of canisters or directly to the GC/MS, for analysis of VOCs, hydrogen, and methane. Calibration and standardization are performed in accordance with INST-OI-43.

C1-2 Sampling of Homogeneous Solids and Soil/Gravel (Summary Categories S3000/S4000)

For those waste streams without an AK Sufficiency Determination approved by the CBFO, randomly selected containers of homogeneous solid and/or soil/gravel waste streams (S3000/S4000) shall be sampled and analyzed to resolve the assignment of EPA HWNs. For example, analytical results may be useful to resolve uncertainty regarding hazardous constituents used in a process that generated the waste stream when the hazardous constituents are not documented in the AK information for the waste.

This section describes the requirements for collecting samples of TRU mixed waste classified as homogeneous solids and soils/gravels. Sampling protocols are based upon methods similar to

those approved by EPA methods and ASTM and are implemented in INST-OI-16, INST-OI-73, or INST-OI-75.

C1-2a Method Requirements

The methods used to collect samples of TRU mixed waste classified as homogeneous solids and soil/gravel from waste containers is such that the samples are representative of the waste from which they are taken. To minimize the quantity of investigation-derived waste, the laboratories conducting the analytical work will receive no more than is required for analysis, based on the analytical methods.

A sufficient number of samples are collected to adequately represent the waste being sampled. For those waste streams defined as Summary Category Groups S3000 and S4000, debris that may be present within these wastes is not sampled.

Samples of retrievably stored waste containers will be collected using appropriate coring equipment or other EPA approved methods to collect a representative sample. Newly generated wastes that are sampled from a process as it is generated may be sampled using EPA approved methods, including scoops and ladles that are capable of collecting a representative sample. All sampling and core sampling will comply with the QC requirements specified in C1-2b.

C1-2a(1) Core Collection

Coring tools are used to collect cores of homogenous solids and soil/gravel from waste containers, when possible, in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, to cut, lift the waste cuttings, and collect a core from the bore hole, is used to collect sample cores from waste containers. For homogenous solids and soil/gravel that are relatively soft, non-rotational coring tools may be used in lieu of a rotational coring tool.

The following requirements apply to the use of coring tools:

- Each coring tool shall contain a removable tube (liner) that is constructed of fairly rigid material unlikely to affect the composition and/or concentrations of target analytes in the sample core. Materials that are acceptable for use for coring device sleeves and end caps are polycarbonate, Teflon, or glass for most samples, and stainless steel or brass if samples are not to be analyzed for metals. The AMWTP uses polycarbonate sleeves and Teflon lined end caps that are cleaned in accordance with C1-2b prior to use. An equipment blank is taken prior to first use to ensure the absence of target analytes. Liner outer diameter is no more than 2 in. and no less than one in. Liner wall thickness is recommended to be no greater than 1/16 in. Before use, the liner is cleaned in accordance with the requirements in Section C1-2b. The liner fits flush with the inner wall of the coring tool and shall be of sufficient length to hold a core that is representative of the waste along the entire depth of the

waste. The depth of the waste is calculated as the distance from the top of the sludge to the bottom of the drum (based on the thickness of the liner and the rim at the bottom of the drum).

- The liner material is sufficiently transparent to allow VE of the core after sampling. If sub-sampling is not conducted immediately after core collection and liner extrusion, then end caps constructed of material unlikely to affect the composition and/or concentrations of target analytes in the core (e.g., Teflon®) is placed over the ends of the liner. End caps shall fit tightly to the ends of the liner.

- A spring retainer is used with each coring tool when the physical properties of the waste are such that the waste may fall out of the coring tool's liner during sampling activities. The spring retainer is constructed of relatively inert material (e.g., stainless steel or Teflon®) and its inner diameter shall not be less than the inner diameter of the liner. Before use, spring retainers are cleaned in accordance with the requirements given in Section C1-2b.

- Coring tools may have an air-lock mechanism that opens to allow air inside the liners to escape as the tool is pressed into the waste (e.g., ball check valve). If used, this air-lock mechanism shall also close when the core is removed from the waste container.

- After disassembling the coring tool, a device (extruder) to forcefully extrude the liner from the coring tool is used if the liner does not slide freely. All surfaces of the extruder that may come into contact with the core will be cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- Coring tools are of sufficient length to hold the liner and have been constructed to allow placement of the liner leading edge as close as possible to the coring tools leading edge.

- All surfaces of the coring tool that have the potential to contact the sample core or sample media are cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- The leading edge of the coring tools may be sharpened and tapered to a diameter equivalent to, or slightly smaller than, the inner diameter of the liner to reduce the drag of the homogenous solids and soil/gravel against the internal surfaces of the liner, thereby enhancing sample recovery.

- Rotational coring tools have a mechanism to minimize the rotation of the liner inside the coring tool during coring activities, thereby minimizing physical disturbance to the core.

- Rotational coring is conducted in a manner that minimizes transfer of frictional heat to the core, thereby minimizing potential loss of VOCs.

- Non-rotational coring tools shall be designed such that the tool's kerf width is minimized. Kerf width is defined as one-half of the difference between the outer diameter of one tool and the inner diameter of the tool's inlet.

C1-2a(2) Sample Collection

Sampling of cores is conducted in accordance with the following requirements:

- Sampling is conducted as soon as possible after core collection. If a substantial delay (i.e., more than 60 minutes) is expected between core collection and sampling, the core shall remain in the liner and the liner shall be capped at each end. If the liner containing the core is not extruded from the coring tool and capped, then two alternatives are permissible: (1) the liner shall be left in the coring tool and the coring tool shall be capped at each end, or (2) the coring tool shall remain in the waste container with the air-lock mechanism attached.

- Samples of homogenous solids and soil/gravel for VOC analyses are collected prior to extruding the core from the liner. These samples may be collected by collecting a single sample from the representative subsection of the core, or three sub-samples may be collected from the vertical core to form a single 15-gram (g) composite sample. Smaller sample sizes may be used if method PRQL requirements are met for all analytes. The sampling locations shall be randomly selected. If a single sample is used, the representative subsection is chosen by randomly selecting a location along the portion of the core (i.e. core length). If the three sub-sample method is used, the sampling locations shall be randomly selected within three equal-length subsections of the core along the long axis of the liner and access to the waste shall be gained by making a perpendicular cut through the liner and the core. The procedures to select, and record the selection, of random sampling locations is given in INST-OI-16, INST-OI-73, and INST-OI-75. True random sampling involves the proper use of random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the CBFO. A sampling device such as the metal coring cylinder described in EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Manual (1996), or equivalent, is immediately used to collect the sample once the core has been exposed to air. Immediately after sample collection, the sample shall be extruded into 40-ml volatile organics analysis (VOA) vials (or other containers specified in appropriate SW-846 methods), the top rim of the vial visually inspected and wiped clean of any waste residue, and the vial cap secured. Sample handling requirements are outlined in Table C1-4. Additional guidance for this type of sampling can be found in SW-846.

- Samples of the homogenous solids and soil/gravel for semi-volatile organic compound and metals analyses are collected. These samples may be collected from the same sub-sample locations and in the same manner as the sample collected for VOC analysis, or they may be collected by splitting or compositing the representative subsection of the core. The representative subsection is chosen by randomly selecting a location along the portion of the core (i.e. core length). The procedures to select, and record the selection, of random sampling locations is given in INST-OI-16, INST-OI-73, and INST-OI-75. True random sampling involves the proper use of random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the CBFO. Guidance for splitting and compositing solid materials can be found in SW-846. All surfaces of the sampling tools that have the potential to come into contact with the sample shall be constructed of materials unlikely to affect the composition or concentrations of target analytes in the waste (e.g., Teflon®). In addition, all surfaces that have the potential to come into contact with core sample media shall either be disposed or decontaminated according to the procedures found in Section C1-2(b). Sample sizes and handling requirements are outlined in Table C1-4.

Newly generated waste samples may be collected using methods other than coring, as discussed in Section C1-2a. Newly generated wastes samples will be collected as soon as possible after sampling, but the spatial and temporal homogeneity of the waste stream dictate whether a representative grab sample or composite sample shall be collected. As part of the site audit, CBFO will assess waste sampling to ensure collection of representative samples.

C1-2b Quality Control Requirements

QC requirements for sampling of homogeneous solids and soil/gravel include collecting co-located samples from cores or other sample types to determine precision; collection of equipment blanks to verify cleanliness of the sampling and coring tools and sampling equipment; and analysis of reagent blanks to ensure reagents, such as deionized and high pressure liquid chromatography (HPLC) water, are of sufficient quality. Coring and sampling of homogeneous solids and soil/gravel comply, at a minimum, with the QC requirements.

C1-2b(1) Co-located Samples

In accordance with the requirement to collect field duplicates required by the EPA methods found in SW-846, samples are collected to determine the combined precision of the coring and sampling procedures in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. The co-located core methodology is a duplicate sample collection methodology intended to collect samples from a second core placed at approximately the same location within the drum when samples are collected by coring. Waste may not be amenable to coring in some instances. In this case, a co-located sample may be collected from a sample (e.g. scoop) collected from approximately the same location in the waste stream. A sample from each co-located core or waste sample collected by other means is collected side by side as close as feasible to one another, handled in the same manner, visually inspected through the transparent liner (if cored),

and sampled in the same manner at the same randomly selected sample location(s). If the VE detects inconsistencies such as color, texture, or waste type in the waste at the sample location, another sampling location may be randomly selected, or the samples may be invalidated and co-located samples or cores may again be collected. Co-located samples, from either core or other sample type, shall be collected at a frequency of one per sampling batch or once per week, whichever is more frequent. A sampling batch is a suite of homogenous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which shall be collected within 14 days of the first sample in the batch.

C1-2b(2) Equipment Blanks

In accordance with SW-846 equipment blanks are collected from fully assembled sampling and coring tools (i.e., at least those portions of the sampling equipment that contact the sample) prior to first use after cleaning at a frequency of one per "equipment cleaning batch" in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. An equipment cleaning batch is the number of sampling equipment items cleaned together at one time using the same cleaning method. The equipment blank shall be collected from the fully assembled sampling or coring tool in the area where the sampling or coring tools are cleaned, prior to covering with protective wrapping and storage. The equipment blank is collected by pouring clean water (e.g., deionized water, HPLC water) down the inside of the assembled sampling or coring tool. The water is collected in a clean sample container placed at the leading edge of the sampling or coring tool and analyzed for the analytes listed in Tables C3-4, C3-6 and C3-8. The results of the equipment blank will be considered acceptable if the analysis indicates no analyte at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 or in the Program Required Detection Limits (PRDLs) in Table C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling or coring tools shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

Equipment blanks for coring tools are collected from liners that are cleaned separately from the coring tools. These equipment blanks shall be collected at a frequency of one per equipment cleaning batch. The equipment blanks shall be collected by randomly selecting a liner from the equipment cleaning batch, pouring clean water (e.g., deionized water or HPLC water) across its internal surface, collecting the water in a clean sample container, and analyzing the water for the analytes listed in Tables C3-4, C3-6, and the analytes in Table C3-8. The results of the equipment blank analysis will be considered acceptable if the results indicate no analyte at a concentration greater than three times the MDLs listed in Tables C3-4, C3-6, or the PRDLs in Table C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of liners shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

Sampling equipment (e.g., bowls, spoons, chisel, and VOC sub-sampler) is also to be cleaned. Equipment blanks are collected for the sampling equipment at a frequency of one per equipment cleaning batch. After the sampling equipment has been cleaned, one item from the equipment cleaning batch is randomly selected, and water (e.g., deionized water, HPLC water) is passed over its surface, collected in a clean container, and analyzed for the analytes listed in Tables C3-4, C3-6, and C3-8. The results of the equipment blank will be considered acceptable if the results indicate no analyte present at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 and in the PRDLs in C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank. The above equipment blanks may be performed on a purchased batch basis for sampling equipment purchased sterile and sealed in protective packaging. Equipment blanks need not be performed for equipment purchased in sealed protective packaging accompanied by a certificate certifying cleanliness.

The results of equipment blanks are traceable to the items in the equipment cleaning batch that the equipment blank represents. All sampling items should be identified, and the associated equipment cleaning batch should be documented. The method of documenting the connection between equipment and equipment cleaning batches shall be documented. Equipment blank results for the coring tools, liners, and sampling equipment shall be reviewed prior to use. A sufficient quantity of these items should be maintained in storage to prevent disruption of sampling operations.

The AMWTP may use certified clean disposable sampling equipment and discard liners and sampling tools after one use. As a result, cleaning and equipment blank collection is not required.

C1-2b(3) Coring Tool and Sampling Equipment Cleaning

Coring tools and sampling equipment must be cleaned in accordance with the following requirements:

- All surfaces of coring tools and sampling equipment that will come into contact with the samples are cleaned prior to use in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. All sampling equipment is cleaned in the same manner. Immediately following cleaning, sampling equipment and coring tools are assembled and sealed inside clean protective wrapping.

- Each reusable sampling or coring tool (e.g., drill heads, ball mills, sample splitters, etc.) have a unique identification number. Each number is referenced to the waste container on which it is used. This information is recorded in the field records. One sampling or coring tool from each cleaning batch is tested for cleanliness in accordance with the requirements specified above. The identification number of the sampling or coring tool from which the equipment blank is collected is recorded in the field records. The results of the equipment blank analysis for the equipment cleaning batch in which each sampling or coring tool was cleaned are submitted to the sampling facility with the identification numbers of all sampling or coring tools in the equipment cleaning batch. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment shall be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch may not be used until analytical results have been received verifying an adequately low level of contamination in the equipment blank.

- Sample containers should be purchased pre-cleaned per EPA cleaning protocols. If sampling containers are not purchased pre-cleaned, they are cleaned in accordance with SW-846 criteria.

C1-2c Equipment Testing, Inspection, and Maintenance

Prior to initiation of sampling or coring activities, sampling and coring tools are tested in accordance with manufacturer specifications to ensure operation within manufacturer's tolerance limits. Other specifications specific to the sampling operations (e.g., operation of containment structure and safety systems) are also tested and verified as operating properly prior to initiating sampling activities. Coring tools shall be assembled, including liners, and tested. Air lock mechanism and rotation mechanism shall be inspected for free movement of critical parts. Sampling and coring tools found to be malfunctioning are repaired or replaced prior to use.

Coring tools and sample collection equipment shall be maintained in accordance with manufacturer's specifications. Clean sampling and coring tools and sampling equipment shall be sealed inside clean protective wrapping and maintained in a clean storage area prior to use. Sampling equipment shall be properly maintained to avoid contamination. A sufficient supply of spare parts should be maintained to prevent delays in sampling activities due to equipment down time. Records of equipment maintenance and repair are maintained in the field records.

Inspection of sampling equipment and work areas shall include the following:

- Sample collection equipment in the immediate area of sample collection is inspected daily for cleanliness. Visible contamination on any equipment (e.g., waste on floor of sampling area, hydraulic fluid from hoses) that has the potential to contaminate a waste core or waste sample is thoroughly cleaned upon its discovery.

- The waste coring and sampling work areas are maintained in a clean condition to minimize the potential for cross contamination between waste (including cores) and samples.

- Expendable equipment (e.g., plastic sheeting, plastic gloves, and pans) are visually inspected for cleanliness prior to use and properly discarded after each sample.

- Prior to removal of the protective wrapping from a coring tool designated for use, the condition of the protective wrapping is visually assessed. Coring tools with torn protective wrapping are returned for cleaning. Coring tools visibly contaminated after the protective wrapping has been removed shall not be used and shall be returned for cleaning or properly discarded.

- Sampling equipment is visually inspected prior to use. All sampling equipment that comes into contact with waste samples must be stored in a protective wrapping until use. Prior to removal of the protective wrappings from sampling equipment, the condition of the protective wrappings is visually assessed. Sampling equipment with torn protective wrapping should be discarded or returned for cleaning. Sampling equipment visibly contaminated after the protective wrapping has been removed shall not be used and shall be returned for cleaning or properly discarded.

- Cleaned sampling and coring equipment will be physically segregated from all equipment that has been used for a sampling event and has not been decontaminated.

C1-2d Equipment Calibration and Frequency

The scales used for weighing sub samples are calibrated as necessary to maintain scale operation within manufacture's specifications, and after repairs and routine maintenance. Weights used for calibration are traceable to nationally recognized standards. Calibration records are maintained in the field records.

C1-3 Radiography

Radiography has been developed to aid in the examination and identification of containerized waste. INST-OI-12, *Real-Time Radiography Operations (Drum)*, and INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)*, describe all activities required to achieve the radiography objectives in this QAPjP. INST-OI-12 and INST-OI-81 provide instructions specific to the radiography systems used at the site. For example, to detect liquids, some systems require the container to be rotated back and forth while other systems require the container to be tilted.

A radiography system (e.g., real-time radiography digital, digital radiography/computed tomography) normally consists of an X-ray producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and

an operator control and data acquisition station. Although these six components are required, it is expected there will be some variation within a given component between sites. The RTR system has controls or an equivalent process, which allow the operator to control image quality. On some radiography systems, it should be possible to vary the voltage, typically between 150 and 400 kilovolts to provide an optimum degree of penetration through the waste. The imaging system typically uses either a fluorescent screen or a low-light television camera or x-ray detectors to generate the image.

To perform RTR, the waste container is scanned while the operator views the television screen. A video and audio recording is made of the waste container scan and is maintained as a non-permanent record. A radiography data form is also used to document the Waste Matrix Code, to ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK summary. Containers whose contents prevent full examination of the remaining contents shall be subject to VE unless the AMWTP certifies that VE would provide no additional relevant information for that container based on the AK information for the waste stream. Such certification will be documented in the AMWTP record.

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

The RTR system involves qualitative and semiquantitive evaluations of visual displays. Operator training and experience are the most important considerations for ensuring QCs in regard to the operation of the RTR system and for interpretation and disposition of radiography results. Only trained personnel are allowed to operate RTR equipment.

Standardized training requirements for RTR operators are based upon existing industry standard training requirements as detailed in the RTR qualification package in accordance with MP-RTQP-14.4, *Personnel Qualification and Certification.*

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

Radiography training programs are subject to the CBFO Audit and Surveillance Program.

One or more training containers with items (including prohibited items) common to the waste streams to be characterized and internal containers of various sizes are scanned semiannually by each operator. The audio and video media is then reviewed by a supervisor to ensure that operator's interpretations remain consistent and accurate. Imaging system characteristic are verified on a routine basis.

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

Oversight functions include periodic audio/video media reviews of accepted waste containers and shall be performed by qualified RTR operators that were not involved in the original scan of the waste containers. The results of this independent verification are available to the RTR operators who performed the original scans. The AMWTP SPM is responsible for monitoring the quality of the RTR data and calling for corrective action, when necessary.

C1-4 Visual Examination

The waste container contents may be verified directly by performing VE on the waste container contents. VE may be performed by physically examining the contents of waste containers to verify the Waste Matrix Code and to verify that the container is properly included in the appropriate waste stream.

VE is conducted on a waste container to identify and describe all waste items, packaging materials, and waste material parameters in the waste container.

VE activities are documented on video/audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting as specified in INST-OI-34, *Non-Facility Visual Examination Operations*, and INST-FOI-17, *Facility Visual Examination*. When VE is performed using a second operator, each operator performing the VE will observe for themselves the waste being placed in the waste container or the contents within the examined waste container when waste is not removed. The results of all VE are documented on manual VE data forms or electronically in WTS which are used to document the Waste Matrix Code, ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK summary.

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

- The video/audio media shall record the waste packaging event for the container such that all waste items placed into the container are recorded in sufficient detail and contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.
- The video/audio media shall capture the waste container identification number.
- The personnel loading the waste container shall be identified on the video/audio media or on packaging records traceable to the loading of the waste container.
- The date of loading of the waste container will be recorded on the video/audio media or on packaging records traceable to the loading of the waste container.

VE performed using two generator site personnel shall meet the following minimum requirements:

- At least two generator site personnel who witnessed the packaging of the waste shall approve the data forms or packaging records attesting to the contents of the waste container.
- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.
- The waste container identification number shall be recorded on the data forms or packaging records.

Although the AMWTP does not expect classified materials, VE video/audio media of containers which contain classified shapes are considered classified information. VE data forms or packaging records will not contain classified information.

Waste container packaging records may be used to meet the VE DQOs in Section C-4a(1). These records must meet the minimum requirements listed above for either VE recorded on video/audio media or VE performed by two operators, and shall be reviewed by operators trained and qualified to the requirements listed below. The operators will prepare data forms based on the VE records. VE batch data reports will be prepared, reviewed, and approved as described in Section C-4, and Attachment C-3.

Standardized training for VE has been developed. Personnel performing VE are instructed in the specific waste generating processes, typical packaging configurations, and the waste material parameters expected to be found in each Waste Matrix Code at the AMWTP. The training is site specific to include the various waste configurations at the AMWTP. For example, the particular physical forms and packaging configurations vary so operators are trained to examine the types of waste that are generated, stored, and characterized at the site. Training will include the following regardless of Summary Category Group:

- Identifying and describing the contents of a waste container by examining all items in waste containers of previously packaged waste
- Identifying when VE cannot be used to meet the DQOs.

VE personnel are requalified once every two years in accordance with MP-RTQP-14.4, *Personnel Qualification and Certification.*

The AMWTP designates visual examination experts (VEE). The VEE will be familiar with the waste generating processes that have taken place at the AMWTP and will also be familiar with all types of waste being characterized at the AMWTP. The VEE is responsible for the overall direction and implementation of the VE at the AMWTP. The VEE is selected based on experience and training in the types of waste being characterized. The VEE will receive training in the same elements as the VE personnel with both formal training and OJT. Qualification of a VEE is based on familiarity with waste generating processes, familiarity with the types of waste being characterized, and meeting the training requirements discussed above. The SPM evaluates personnel, using the above criteria, and designates VEEs accordingly. Consistent with other VE personnel, the VEE will be requalified once every two years. VEE training requirements are detailed in the VEE qualification package in accordance with MP-RTQP-14.4.

C1-5 Custody of Samples

Chain of Custody (COC) on field samples (including field QC samples) is initiated immediately after sample collection or preparation (refer to INST-OI-16, INST-OI-73, and INST-OI-75). Sample custody is maintained by ensuring that samples are custody sealed during shipment to the laboratory. After samples are accepted by the analytical laboratory, custody is maintained by assuring the samples are in the possession of an authorized individual, in that individual's view, in sealed or locked container controlled by that individual, or in a secure controlled access location.

Sample custody is maintained until the sample is released by the SPM or until the sample is expended. The AMWTP COC includes provisions for each of the following:

- Signature of individual initiating custody control, along with date and time

- Documentation of sample numbers for each sample under custody. Sample numbers will be referenced to a specific sampling event description that will identify the sampler(s) through signature, the date and time of sample collection, type/number containers for each sample, sample matrix, preservatives (if applicable), requested methods of analysis, place/address of sample collection and the waste container number

- For off-site shipping, method of shipping transfer, responsible shipping organization or corporation, and associated air bill or lading number

- Signatures of custodians relinquishing and receiving custody, along with date and time of the transfer

- Description of final sample container disposition, along with signature of individual removing sample container from custody

- Comment section

- Documentation of discrepancies, breakage or tampering.

All samples and sampling equipment are identified with unique identification numbers. Sampling Coring tools and equipment are identified with unique equipment numbers to ensure that all sampling equipment, coring tools, and sampling canisters are traceable to equipment cleaning batches.

All samples are uniquely identified to ensure the integrity of the sample and can be used to identify the AMWTP and date of collection. Sample tags and labels identify at a minimum the following:

- Sample ID number
- Sampler initials and organization
- Ambient temperature and pressure (for gas samples only)
- Sample description
- Requested analyses
- Date and time of collection
- QC designation (if applicable).

C1-6 Sample Packing and Shipping

Samples are packaged at the AMWTP and transferred to the CCP/ICP Analytical Laboratory. In the event that analytical facilities are not at the site, the samples will be packaged and shipped to an off-site laboratory. Sample containers are packed to prevent damage to the sampling container and to maintain the preservation temperature, if necessary. Department of Transportation (DOT) regulations are adhered to for shipment of the package.

When preparing SUMMA® or equivalent canisters for shipment, special care is taken with the pressure gauge and the associated connections. Metal boxes which have separate compartments or cardboard boxes with foam inserts are standard shipping containers. The chosen shipping container shall meet selected DOT regulations. Cold packs are added to the approved shipping container when it is necessary to maintain the preservation temperatures in the package.

Glass jars are wrapped in bubble wrap or similarly protected. The wrapped jars are placed in plastic bags inside of the shipping container so that the inside of the shipping container and the other samples in the shipping container are not contaminated in the event that one of the jars breaks. The plastic bag enables the receiving laboratory to prevent contamination of their shipping and receiving area. Plastic jars do not present a shipping problem.

Shipping containers contain appropriate blank samples to detect VOC cross-contamination. A DOT-approved cooler, or similar package, is used as a shipping container. When sample preservation temperatures must be maintained, an adequate number of cold packs are placed in the shipping container. If fill material is needed, the compatibility between the sample containers and the fill material is evaluated prior to use.

Sample containers are affixed with signed tamper proof seals or devices so that it is apparent if the sample integrity has been compromised and to ensure that the seal or device is traceable to the individual who affixed the seal. A seal is also placed outside the shipping container for the same reason. Sample custody documentation, with the signature of the current custodian showing sample custody release, is placed inside the shipping container. A seal is then placed on the outside of the shipping container, or the shipping container is locked, so that the integrity of the custody of the sample inside the shipping container is evident. Transfer of sample custody is complete when the receiving custodian opens the shipping container and signs the sample custody documentation. The sample custody documentation serves to track the physical transfer of samples between the two custodians.

A UHWM is not required, since samples are exempted from the definition of hazardous waste under RCRA. All other shipping documentation specified in MP-TRUW-8.34 (i.e., bill of lading, site specific shipping documentation) is required.

Table C1-1. Gas Sample Requirements

PARAMETER	Container [a]	HEADSPACE SAMPLE[b] MINIMUM VOLUME (ML)	HOLDING TEMPERATURES
VOCs	Summa ®Canister	250 mil	0-40 ° C

a. Alternatively, canisters that meet QAOs may be used.
b. Alternatively, if available headspace is limited, a single 100 milliliter (mL) sample may be collected for determination of VOCs.

Table C1-2. Headspace Gas: Summary of Field Quality Control Sample Frequencies

QC SAMPLES	MANIFOLD	DIRECT CANISTER	ON-LINE SYSTEMS
Field Blanks[a]	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]
Equipment Blanks[b]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Reference Standards[c]	1 per sampling batch[d]	Once[e]	1 per on-line batch[f]
Field Duplicates	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]

a. Analysis of field blanks for VOCs (Table C3-2), only, is required. For on-line integrated sampling/analytical systems, if field blank results meet the acceptance criterion, a separate on-line blank is not required.

b. One equipment blank or on-line equipment blank must be collected, analyzed for VOCs (Table C3-2), and demonstrated clean prior to first use of the headspace sampling equipment with each of the sampling heads, then at the specified frequency, for VOCs, only thereafter. Daily, prior to work, the sampling manifold, if in use, must be verified as clean.

c. One field reference standard or OLCS must be collected, analyzed, and demonstrated to meet the QAOs specified in Attachment C3 prior to first use, then at the specified frequency thereafter.

d. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which must be collected within 14 days of the first sample in the batch.

e. One equipment blank and field reference standard must be collected after equipment purchase, cleaning, and assembly.

f. An on-line batch is the number of samples collected within a 12-hour period using the same on-line integrated sampling/analysis system. The analytical batch requirements are specified by the analytical method being used in the on-line system.

Table C1-3. Summary of Sampling Quality Control Sample Acceptance Criteria

QC SAMPLES	ACCEPTANCE CRITERIA	CORRECTIVE ACTION [a]
Field Blanks	VOC amounts ≤ 3 × MDLs in Table C3-2 for GC/MS or GC/FID; ≤ PRQLs in Table C3-2 for FTIRS	Nonconformance if any VOC amount > 3 × MDLs in Table C3-2 for GC/MS or GC/FID; > PRQLs in Table C3-2 for FTIRS
Equipment Blanks	VOC amounts ≤ 3 × MDLs in Table C3-2 for GC/MS or GC/FID; ≤ PRQLs in Table C3-2 for FTIRS	Nonconformance if any analyte amount > 3 × MDLs in Table C3-2 for GC/MS or GC/FID; > PRQLs in Table C3-2 for FTIRS
Field Reference Standards Or On-Line Control Samples	70 - 130 percent recovery (%R)	Nonconformance if %R <70 or > 130
Field Duplicates Or On-Line Duplicates	RPD ≤ 25 %	Nonconformance if RPD > 25 %

a. Corrective action is only required if the final reported QC sample results do not meet the acceptance criteria.

MDL = Method detection limit
%R = Percent recovery
RPD = Relative percent difference

Table C1-4. Sample Handling Requirements for Homogeneous Solids and Soil/Gravel

PARAMETER	SUGGESTED QUANTITY[a]	REQUIRED PRESERVATIVE	SUGGESTED CONTAINER	MAXIMUM HOLDING TIME[b]
VOCs	15 grams	Cool to 4 ° C	Glass Vial[c]	14 Days Prep/ 40 Days Analyze[d]
SVOCs	50 grams	Cool to 4 ° C	Glass Jar[e]	14 Days Prep/ 40 Days Analyze[d]
Metals	10 grams	Cool to 4 ° C	Plastic Jar[f]	180 Days[g]

a. Quantity may be increased or decreased according to the requirements of the analytical laboratory, as long as the QAOs are met.
b. Holding time begins at sample collection (holding times are consistent with SW 846 requirements).
c. 40-mL VOA vial or other appropriate containers shall have an airtight cap.
d. 40 day holding time allowable only for methanol extract - 14 day holding time for non extracted VOCs.
e. Appropriate containers should be used and should have Teflon® lined caps.
f. Polyethylene or polypropylene is preferred, glass jar is allowable.
g. Holding time for mercury analysis is 28 days.

NOTE: *Preservation requirements in the most recent version of SW-846 may be used if appropriate.*

Table C1-5. Headspace Gas Drum Age Criteria Sampling Scenarios

Scenario	Description
1	A. Unvented 55-gallon drums without rigid poly liners are sampled through the drum lid at the time of venting. B1. Unvented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. B2. Vented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. C. Unvented 55-gallondrums with vented rigid poly liners are sampled through the drum lid at the time of venting.
2	55-gallon drums that have met the criteria for Scenario 1 and then are vented, but not sampled at the time of venting. [a]
3	Containers (i.e., 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, TDOPs, and pipe components) that are initially packaged in a vented condition and sampled in the container headspace and containers that are not sampled under Scenario 1 or 2.

a. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. This requires the additional information required of each container in Scenario 3 (i.e., determination of packaging configuration), and such containers can only be sampled after meeting the appropriate Scenario 3 DAC.

Table C1-6. Scenario 1 Drum Age Criteria (In Days) Matrix

Summary Category Group	DAC (days)
S5000	53

NOTE: *Containers that are sampled using the Scenario 1 DAC do not require information on the packaging configuration because the Scenario 1 DAC are based on a bounding packaging configuration. In addition, information on the rigid liner vent hole presence and diameter do not apply to containers that are sampled using the Scenario 1 DAC because they are unvented prior to sampling.*

Table C1-7. Scenario 2 Drum Age Criteria (In Days) Matrix

	Summary Category Group S5000			
Filter H_2 Diffusivity [a]	**Rigid Liner Vent Hole Diameter (in) [b]**			
(mol/s/mod fraction)	0.30	0.375	0.75	1.0
1.9×10^{-6}	29	22	13	12
3.7×10^{-6}	25	20	12	11
3.7×10^{-5}	7	6	6	4

a. The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with a 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9 × 10-6 filter H2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

b. The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging (Attachment C, Section C-3d[1]), repackaging (Attachment C, Section C-3d[1]), and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

NOTE: *Containers that are sampled using the Scenario 2 DAC do not require information on the packaging configuration because the Scenario 2 DAC is based on a bounding packaging configuration.*

Table C1-8. Scenario 3 Packaging Configuration Groups

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 1, 55-gal. drums [a]	• No layers of confinement, filtered inner lid [b] • No inner bags, no liner bags (bounding case)
Packaging Configuration Group 2, 55-gal. drums [a]	• 1 inner bag • 1 filtered inner bag • 1 liner bag • 1 filtered liner bag • 1 inner bag, 1 liner bag • 1 filtered inner bag, 1 filtered liner bag • 2 inner bags • 2 filtered inner bags • 2 inner bags, 1 liner bag • 2 filtered inner bags, 1 filtered liner bag • 3 inner bags • 3 filtered inner bags • 3 filtered inner bags, 1 filtered liner bag • 3 inner bags, 1 liner bag (bounding case)
Packaging Configuration Group 3, 55- gal. drums [a]	• 2 liner bags • 2 filtered liner bags • 1 inner bag, 2 liner bags • 1 filtered inner bag, 2 filtered liner bags • 2 inner bags, 2 liner bags • 2 filtered inner bags, 2 filtered liner bags • 3 filtered inner bags, 2 filtered liner bags • 4 inner bags • 3 inner bags, 2 liner bags • 4 inner bags, 2 liner bags (bounding case)
Packaging Configuration Group 4, pipe components	• No layers of confinement inside a pipe component • 1 filtered inner bag, 1 filtered metal can inside a pipe component • 2 inner bags inside a pipe component • 2 filtered inner bags inside a pipe component • 2 filtered inner bags, 1 filtered metal can inside a pipe component • 2 inner bags, 1 filtered metal can inside a pipe component (bounding case)

Table C1-8. (continued)

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 5, Standard Waste Box or Ten-Drum Overpack [a]	• No layers of confinement • 1 SWB liner bag (bounding case)
Packaging Configuration Group 6, Standard Waste Box or Ten-Drum Overpack [a]	• Any combination of inner and/or liner bags that is less than or equal to 6 • 5 inner bags, 1 SWB liner bag (bounding case)
Packaging Configuration Group 7, 85-gallon drums and 100-gallon drums[a]	• No inner bags, no liner bags, no rigid liner, filtered inner lid (bounding case)b • No inner bags, no liner bags, no rigid liner
Packaging Configuration Group 8, 85-gallon drums and 100-gallon drums[a]	• 4 inner bags and 2 liner bags, no rigid liner, filtered inner lid (bounding case)b

a. If a specific Packaging Configuration Groups cannot be determined based on the data collected during packaging and/or repackaging, a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for SWBs and TDOPs, and 8 for 85-gallon and 100-gallon drums must be assigned provided the drums do not contain pipe component packaging. If pipe components are present as packaging in the drums, the pipe components must be sampled following the requirements for Packaging Configuration Group 4.

b. A "filtered inner lid" is the inner lid on a double lid drum that contains a filter.

Definitions:

Liner Bags. One or more optional plastic bags that are used to control radiological contamination. Liner bags for drums have a thickness of approximately 11 mils. Liner bags are typically similar in size to the container. SWB liner bags have a thickness of approximately 14 mils. TDOPs use SWB liner bags.

Inner Bags. One or more optional plastic bags that are used to control radiological contamination. Inner bags have a thickness of approximately 5 mils and are typically smaller than liner bags.

Table C1-9. Scenario 3 Drum Age Criteria (In Days) Matrix for S5000 Waste by Packaging Configuration Group

Packaging Configuration Group 1

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	131	95	37	24	4	4
3.7×10^{-6}	111	85	36	24	4	4
3.7×10^{-5}	28	28	23	19	4	4

Packaging Configuration Group 2

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	175	138	75	60	30	11
3.7×10^{-6}	152	126	73	59	30	11
3.7×10^{-5}	58	57	52	47	28	8

Packaging Configuration Group 3

Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Rigid Liner Vent Hole Diameter [b]				No Liner Lid	No Liner
	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole		
1.9×10^{-6}	199	161	96	80	46	16
3.7×10^{-6}	175	148	93	79	46	16
3.7×10^{-5}	72	72	67	62	42	10

Table C1-9. (continued)

Packaging Configuration Group 4	
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	**Headspace Sample Taken Inside Pipe Component**
$> 1.9 \times 10^{-6}$	152

Packaging Configuration Group 5	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB/TDOP**
$> 7.4 \times 10^{-6}$ (SWB)	15
3.33×10^{-5} (TDOP)	15

Packaging Configuration Group 6	
Filter H_2 Diffusivity [a, c] (mol/s/mol fraction)	**Headspace Sample Taken Inside SWB/TDOP**
$> 7.4 \times 10^{-6}$ (SWB)	56
3.33×10^{-5} (TDOP)	56

Packaging Configuration Group 7			
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	**Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol fraction)**		
	7.4×10^{-6}	**1.85×10^{-5}**	**9.25×10^{-5} [e]**
3.7×10^{-6}	13	7	2
7.4×10^{-6}	10	6	2
1.85×10^{-5}	6	4	2

Table C1-9. (continued)

Packaging Configuration Group 8	
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	**Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol/fraction)**
	7.4×10^{-6}
3.7×10^{-6}	21

a. The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9×10^{-6} filter H_2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

b. The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

c. The filter H_2 diffusivity for SWBs or TDOPS is the sum of the diffusivities for all of the filters on the container because SWBs and TDOPs have more than 1 filter.

d. Headspace sample taken between inner and outer drums lids. If headspace sample is taken inside the filtered inner drum lid prior to placement of the outer drum lid, then a DAC value of 2 days may be used. Footnote e is also applicable. Packaging Configuration Group 7 DAC values apply to drums with up to two lids.

e. While a DAC value of 2 days may be determined, containers must comply with the equilibrium requirements specified in Section C1-1a (i.e., 72 hours at 18°C or higher). The equilibrium requirement for headspace gas sampling shall be met separately.

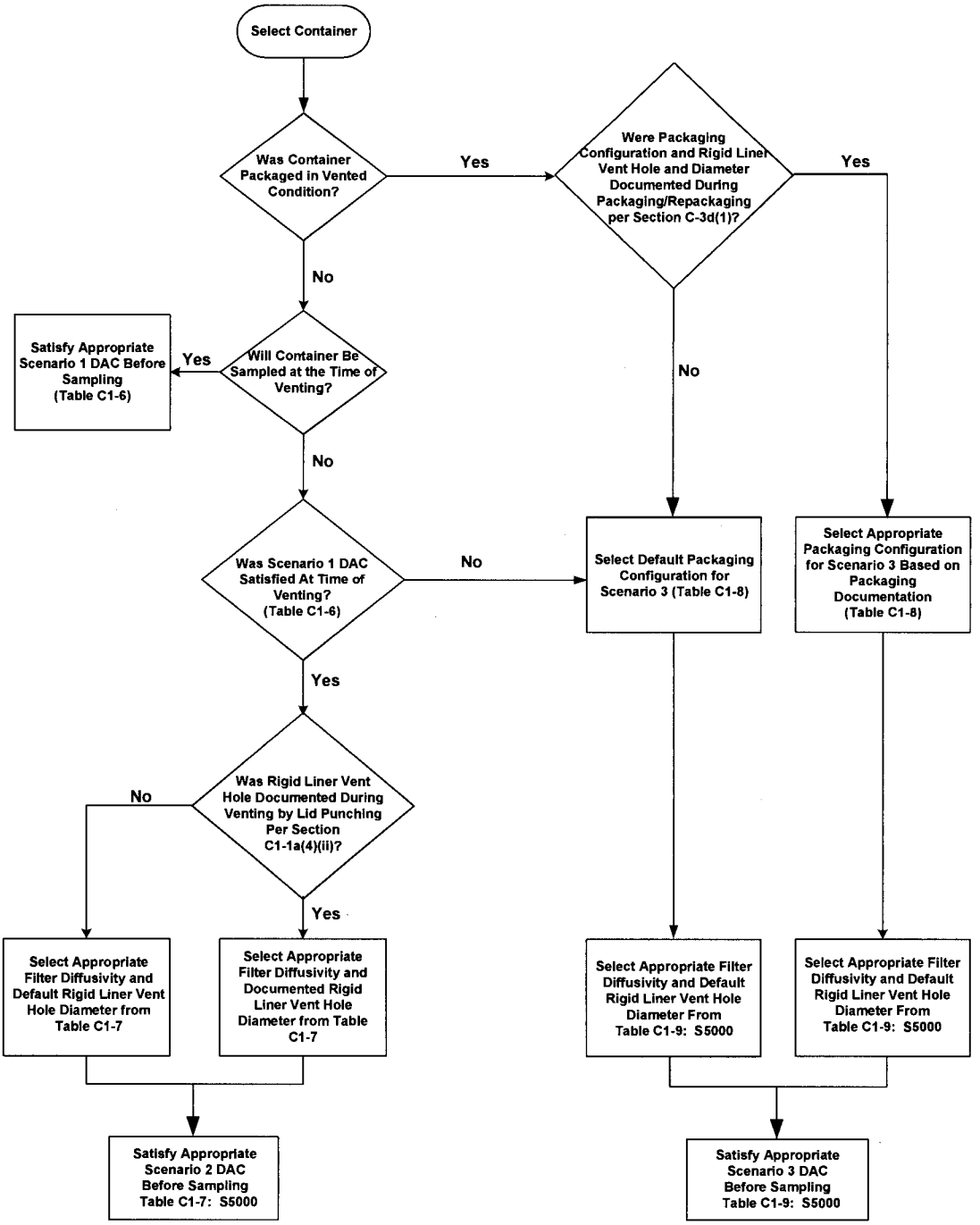


Figure C1-1. Headspace Gas Drum Age Criteria Sampling Scenario Selection Process.

Attachment C2.
Statistical Methods Used In Sampling and Analysis

The AMWTP uses the following statistical methods for sampling and analysis of TRU mixed waste, unless determined unnecessary by the CBFO as a result of an AK Sufficiency Determination. These statistical methods include methods for selecting waste containers for totals analysis, selecting waste containers for headspace gas sampling and analysis, and setting the upper confidence limit.

C2-1 Approach for Selecting Waste Containers for Statistical Sampling

C2-1a Statistical Selection of Containers for Totals Analysis

The statistical approach for characterizing retrievably stored and newly generated homogeneous solids and soil/gravel waste and repackaged or treated S3000 waste relies on using AK to segregate waste containers into relatively homogeneous waste streams. Using AK, the entire waste stream is classified as hazardous or nonhazardous rather than individual waste containers. Individual waste containers serve as convenient units for characterizing the combined mass of waste from the waste stream of interest. Once segregated by waste stream, random selection and sampling of the waste containers followed by analysis of the waste samples is performed to ensure that the resulting mean contaminant concentration provides an unbiased representation of the true mean contaminant concentration for each waste stream. The SPM verifies that the samples collected from within a waste stream were selected randomly in accordance with MP-TRUW-8.25.

An end use of analytical results for retrievably stored homogeneous solids and soil/gravel is for assigning the EPA HWNs associated with TCs (D-numbers) that apply to each mixed waste stream. The D-numbers are indicators that the waste exhibits the TC for specific contaminants under RCRA. The RCRA-toxicity determination is made on the basis of sampling and analysis of waste streams and on whether or not the waste stream includes F-number wastes. If a waste stream includes one or more RCRA F-numbers identified via AK, TC contaminants associated with the F-number waste(s) are not included in the RCRA-TC determination. That is, the F-numbers take precedence over RCRA-toxicity D-code, and the waste stream is assumed hazardous regardless of the concentration. Therefore, TCs contaminants associated with F-numbers for a waste stream is omitted from all calculations for determining the number of containers to sample because these wastes streams are assumed to be hazardous. In addition, each TC contaminant associated with the F-numbers is excluded from evaluation of analytical results to determine D-numbers. Contaminants of interest for the sampling, analysis, and RCRA-toxicity determination of a waste stream, then, exclude contaminants associated with F-numbers that have been assigned to the waste stream.

The sampling and analysis strategy is illustrated in Figure C2-1. Preliminary estimates of the mean concentration and variance of each RCRA regulated contaminant in the waste is used to determine the number of waste containers to select for sampling and analysis. Preliminary estimates are based on a minimum of five samples randomly from the waste stream. If the entire waste stream is not accessible for sampling, then a minimum of five preliminary samples will be selected randomly from the accessible population. As the rest of the waste stream is retrieved or generated, additional selected containers will be sampled as provided below and the analytical results will be reported to the CBFO. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed using a CBFO-approved laboratory in accordance with applicable provisions of the WIPP-WAP may be used as part of the required number of samples to be collected. The applicability of the preliminary estimates to the waste stream to be sampled is justified and documented. The preliminary estimates are calculated in accordance with the following equations:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{(C2-1)}$$

$$s^2 = \frac{1}{n-1}\sum_{i-1}^{n}\left(x_i - \bar{x}\right)^2 \qquad \text{(C2-2)}$$

Where:

$\bar{x}$ = the calculated mean and

s^2 = the calculated concentration variance

n = the number of samples analyzed,

x_i = the concentration determined in the ith sample

i = an index from I to n.

Based upon the preliminary estimates of $\bar{x}$ and s^2 for each chemical contaminant of concern, AMWTP estimates the appropriate minimum number of samples (n) to be collected for each contaminant using the following formula from SW-846 (EPA 1996):

$$n = \frac{t^2_{\alpha,n_0-1}\, s^2}{(RT - \bar{x})^2} \qquad \text{(C2-3)}$$

Where:

n_0 = the initial number of samples used to calculate the preliminary estimates

n = the calculated minimum number of required samples

$t_{\alpha,n-1}$ = the 90th percentile for the t distribution with n_0 -1 degrees of freedom

RT = the Regulatory Threshold of the contaminant (TC limit for toxicity characteristic wastes, PRQL for listed wastes).

The number of samples collected is based upon the largest n calculated for each of the contaminants of concern. The actual number of samples collected is adjusted as necessary to ensure that an adequate number of samples are collected to allow for acceptable levels of completeness.

Non-integer results of calculations for required sample size should be rounded up to the next integer. A minimum of five containers are sampled and analyzed in each waste stream. If there are fewer containers than the minimum or required number of samples in a waste stream, one or more randomly selected containers is sampled more than once to obtain the number of needed samples of the waste. Otherwise any one container may be selected for sampling only once.

The calculated total number of required waste containers will then be randomly sampled and analyzed using a CBFO-approved laboratory. Waste containers from the preliminary mean and variance estimates may be counted as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples.
- There is documented evidence that the method of sample analysis in the preliminary estimate samples were identical to the analytical methodology employed for the required samples.

- There is documented evidence that the validation of the sample analyses in the preliminary estimate samples were comparable to the validation employed for the required samples. In addition, the validated samples results shall indicate that all sample results were valid according to the analytical methodology.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage at the generator/storage site, or only a portion of the waste stream has been repackaged, treated, or generated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. A minimum of five randomly selected samples will be obtained and analyzed from the accessible portion of the waste stream. The CBFO may approve the WSPF and authorize the AMWTP to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream have been obtained.

The AMWTP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of five randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste streams from ongoing processes), or to facilitate waste processing, the AMWTP may divide the waste stream into lots. In this case, a minimum of five randomly selected sample locations will be selected from within each subsequent lot. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the AMWTP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The AMWTP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2a and assign EPA HWNs as appropriate. The AMWTP will submit the analytical data from subsequent sampling to the CBFO for inclusion in the WIPP facility operating record. If changes to EPA HWNs are required as a result of subsequent sampling, the AMWTP will notify the CBFO and shipments of the affected waste stream shall be suspended until the CBFO approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the AMWTP may assign EPA HWNs to a waste stream even if the calculated number of required samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the AMWTP shall collect the required number of samples if the AMWTP intends to establish that the constituent is below the regulatory threshold.

C2-1b Statistical Selection of Containers for Headspace Gas Analysis

Headspace gas sampling of a waste stream may be done on a randomly selected portion of containers in the waste stream in accordance with MP-TRUW-8.25. The minimum number of containers, *n*, that must be sampled is determined by taking an initial VOC sample from ten randomly selected containers. These samples are analyzed for all the target analytes using INST-OI-43. The standard deviation, *s*, is calculated for each of the nine VOCs in Part 4, Table 4.4.1. The value of *n* is determined as the largest number of samples (not to exceed the number of containers in the waste stream or waste stream lot) calculated using the following equation:

$$n_{VOC_i} = \frac{t^2_{\alpha,n-1} s^2_{eVOC_i}}{E^2_{VOC_i}} \qquad \text{(C2-4)}$$

Where:

n_{VOC_i} = the number of samples needed to representatively sample the waste stream for the VOC_i from Table 4.4.1,

$t_{\alpha,n-1}$ = the 90th percentile for the *t* distribution with *n-1* degrees of freedom,

s_{eVOCi} = the estimated standard deviation, based on the initial *n*-samples for VOC_i from Table 4.4.1,

E_{VOCi} = the allowable error determined as 1 percent of the limiting concentration for VOC_i. from Table 4.4.1

Non-integer results of calculations for the required sample size should be rounded up to the next integer. A minimum of ten containers will be sampled and analyzed in each waste stream. If there is fewer than the minimum or required number of containers in a waste stream, then each container should be sampled once. The calculated total number of required waste containers will then be randomly sampled and analyzed. Waste container samples from the preliminary mean and variance estimates may be counted as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples.
- There is documented evidence that the method of sample analysis in the preliminary estimate samples were identical to the analytical methodology employed for the required samples.

- There is documented evidence that the validation of the sample analyses in the preliminary estimate samples were comparable to the validation employed for the required samples. In addition, the validated samples results shall indicate that all sample results were valid according to the analytical methodology.

The mean and standard deviation calculated after sampling *n* containers can be used to calculate a UCL_{90} for each of the headspace gas VOCs using the methodology presented in Section C2-2b.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage or only a portion of the waste stream has been repackaged or treated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. A minimum of ten randomly selected samples will be obtained and analyzed from the accessible portion of the waste stream. The CBFO may approve the WSPF and authorize the AMWTP site to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream has been obtained.

The AMWTP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of ten randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers), become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste streams from ongoing processes), or to facilitate waste processing, the AMWTP may divide the waste stream into lots. In this case, a minimum of ten randomly selected containers will be selected from within each subsequent lot. As those randomly selected containers (e.g., buried or newly generated waste containers) become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the AMWTP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The AMWTP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2b and assign EPA HWNs as appropriate. The AMWTP will submit the analytical data from subsequent sampling to the CBFO for inclusion in the WIPP facility operating record upon completion of project level data validation in Section C3-10b. If changes to EPA HWNs are required as a result of subsequent sampling, the AMWTP will notify the CBFO and shipments of the affected waste stream shall be suspended until the CBFO approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the AMWTP may presumptively assign EPA HWNs to a waste stream even if the calculated number of required samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the AMWTP will collect the required number of samples if the site intends to establish that the constituent is below the regulatory threshold.

C2-2 Upper Confidence Limit for Statistical Sampling

C2-2a Upper Confidence Limit for Statistical Solid Sampling

Upon completion of the required sampling, final mean and variance estimates and the UCL_{90} for the mean concentration for each contaminant is determined. The observed sample n^* is checked against the preliminary estimate for the number of samples (n) to be collected before proceeding using the following equation:

$$n^* = \frac{t^2_{\alpha,n-1}\, s^2}{(RT - x)^2} \qquad \text{(C2-5)}$$

and the right-side terms in the equation are as defined in Section C2-1a.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and continues until the difference between n^* and the previous sample size determination is less than 20 percent.

Once sufficient sampling and analysis has occurred, the waste characterization will proceed. The assessment is made at the 90-percent confidence level. The UCL_{90} for the mean concentration of each contaminant will be calculated using the following equation from OSWER 9285.6-10 (EPA 2002):

$$UCL_{90} = \bar{x} + \frac{(t_{\alpha,n-1}\, s)}{\sqrt{n}} \qquad \text{(C2-6)}$$

If the UCL_{90} for the mean concentration is less than the regulatory threshold limit (RTL), the waste stream is not required to be assigned the EPA HWN for the associated contaminant. If the UCL_{90} is greater than or equal to the RTL, the waste stream is assigned the EPA HWN for the associated contaminant.

Compliance with the requirements for comparison of the UCL_{90} to regulatory thresholds is achieved through the execution of procedure MP-TRUW-8.11.

C2-2b Upper Confidence Limit for Statistical Headspace Gas Sampling

A UCL_{90} concentration for each of the headspace gas VOCs is calculated from the sample data collected. The observed sample n^* is checked against the estimate for the number of samples (n) to be collected before proceeding, where: n* is:

$$n^* = \frac{t^2_{\alpha,n-1}\, s^2}{E^2} \qquad \text{(C2-7)}$$

where E is as defined in Section C2-1b and the remaining right-side terms in the equation are as defined in Section C2-1a. When composite headspace gas sample results are used, the mean, standard deviation, and t-statistic are based on the number of composite samples analyzed, rather than on the number of drums sampled.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and continues until the difference between n^* and the previous sample size determination is less than 20 percent.

The UCL_{90} is then calculated using the UCL_{90} equation C2-6. In this case, the UCL_{90} is the 90 percent upper confidence limit for the mean VOC concentration, $\bar{x}$ is the calculated sample mean VOC concentration, and s is the calculated sample standard deviation. The value of $t_{(\alpha,\, n-1)}$ is found in Table 9-2 of Chapter 9 of SW-846.

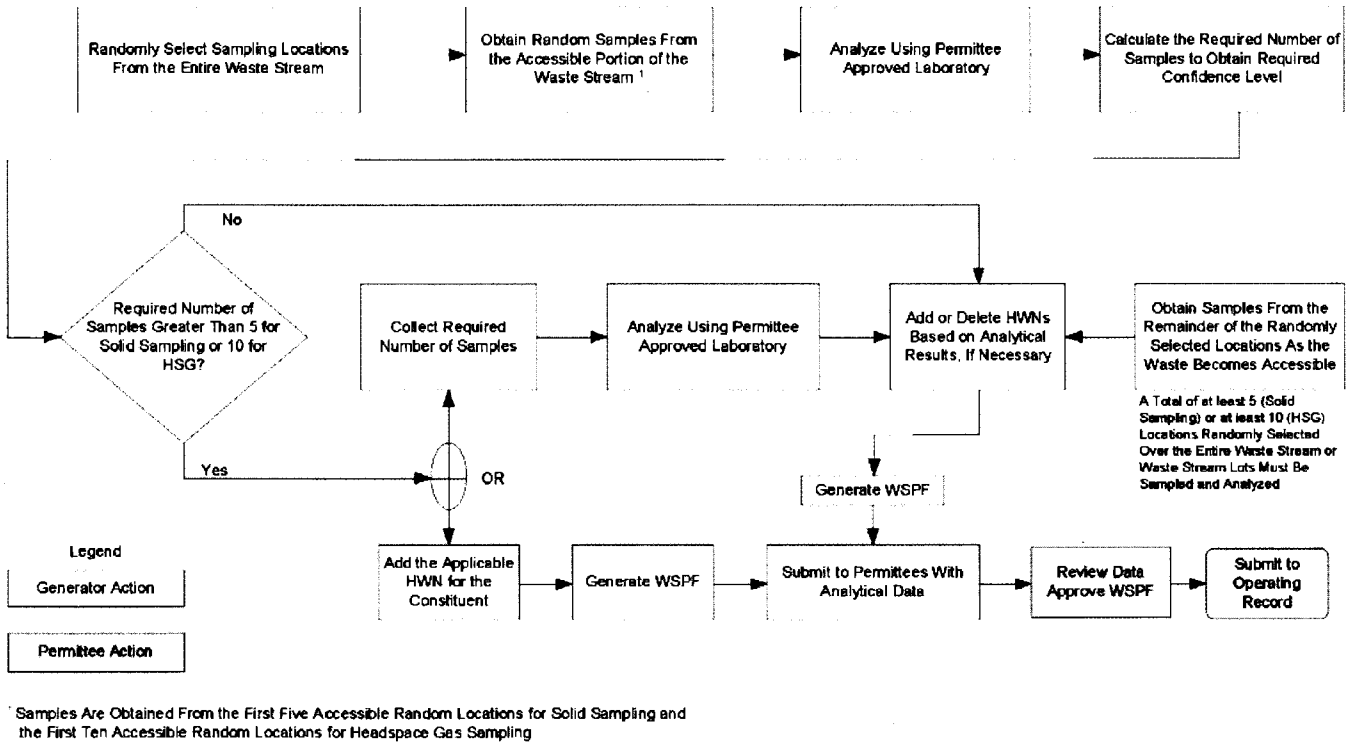


Figure C2-1. Approach for Solid and Headspace Gas Sampling and Analysis to Obtain Additional Waste Characterization Information.

Attachment C3.
Quality Assurance Objectives and Data Validation Techniques for Waste Characterization Sampling and Analytical Methods

C3-1 Validation Methods

Validation of all data (qualitative as well as quantitative) is performed so that data used for WIPP compliance activities are of known and acceptable quality. Validation includes a quantitative determination of precision, accuracy, completeness, and MDL (as appropriate) for analytical data (headspace gas VOCs, total VOCs, SVOC, and metals data). Quantitative data validations are performed according to the conventional methods outlined below (equations in C3-1 through C3-8). These quantitative determinations are compared with the QAOs specified in Sections C3-2 through C3-9. Qualitative determination of comparability and representativeness is also performed.

The qualitative data or descriptive information generated by RTR and VE is not amenable to statistical data quality analysis. However, RTR and VE are complementary techniques yielding similar data to determine the waste matrix code. The waste matrix code is determined to ensure the container is properly included in the appropriate waste stream.

Data validation will be used to assess the quality of waste characterization data collected based upon project precision, accuracy, completeness, comparability, and representativeness objectives described below:

Precision

Precision is a measure of the mutual agreement among multiple measurements of a single analyte, either by the same method or by different methods. Precision is either expressed as the relative percent difference (RPD) for duplicate measurements or as the percent relative standard deviation (%RSD) for three or more replicate measurements. For duplicate measurements, the precision expressed as the RPD is calculated as follows:

$$RPD = \frac{(C_1 - C_2)}{\frac{(C_1 + C_2)}{2}} \times 100 \qquad \text{(C3-1)}$$

where C_1 and C_2 are the two values obtained by analyzing the duplicate samples. C_1 is the larger of the two observed values.

For three or more replicate measurements, the precision expressed as the %RSD is calculated as follows:

$$\%RSD = \frac{s}{\bar{y}} \times 100 \qquad \text{(C3-2)}$$

where s is the standard deviation and $\bar{y}$ is the mean of the replicate sample analyses.

The standard deviation, s, is calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n-1}} \qquad \text{(C3-3)}$$

where y_i is the measured value of the ith replicate sample analysis measurement, and n equals the number of replicate analyses.

Precision, associated with analytical equipment calibration, is also measured as the percent difference (%D) between multiple measurements of an equipment calibration standard is calculated as follows:

$$\%D = \frac{|C_1 - C_2|}{C_1} \times 100 \qquad \text{(C3-4)}$$

where C_1 is the initial measurement and C_2 is the second or other additional measurement.

Accuracy

Accuracy is the degree of agreement between a measured analyte concentration (or the average of replicate measurements of a single analyte concentration) and the true or known concentration. Accuracy is determined as the percent recovery (%R).

For situations where a standard reference material is used, the %R is calculated as follows:

$$\%R = \frac{C_m}{C_{srm}} \times 100 \qquad \text{(C3-5)}$$

where C_m is the measured concentration value obtained by analyzing the sample and C_{srm} is the "true" or certified concentration of the analyte in the sample.

For measurements where matrix spikes are used, the %R is calculated as follows:

$$\% R = \frac{S\text{-}U}{C_{sc}} \; x\ 100 \qquad \text{(C3-6)}$$

where S is the measured concentration in the spiked aliquot, U is the measured concentration in the unspiked aliquot, and C_{sc} is the actual concentration of the spike added.

Method Detection Limit (MDL)

The MDL is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDL for all quantitative measurements (except for those using Fourier Transform Infrared Spectroscopy [FTIR]) is defined as follows:

$$MDL = t_{(n-1,1-\alpha=0.99)} \times s \qquad \text{(C3-7)}$$

where $t_{(n\text{-}1,\ 1\text{-},=\ .99)}$ is the t-distribution value corresponding to a 99% confidence level with $n\text{-}1$ degrees of freedom, n is the number of observations, and s is the standard deviation of replicate measurements.

Currently, the AMWTP has no plans to use FTIR; however, should FTIR be used for headspace-gas analysis, the MDL is defined as follows:

$$\text{MDL} = 3\text{s} \qquad \text{(C3-8)}$$

where s is the standard deviation. Initially, a minimum of seven samples spiked at a level of three to five times the estimated MDL and analyzed on non-consecutive days must be used to establish the MDLs. MDLs should be updated using the results of the LCS or OLCSs.

Completeness

Completeness is a measure of the amount of valid data obtained from the overall measurement system compared to the amount of data collected and submitted for analysis. Completeness must be expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Completeness, expressed as the percent complete (%C), is calculated as follows:

$$\%C = \frac{V}{n} \times 100 \qquad \text{(C3-9)}$$

where V is the number of valid sampling or analytical results obtained and n is the number of samples submitted for analysis.

Comparability

Comparability is the degree to which one data set can be compared to another. Comparability of data generated at different sites is ensured through the use of standardized, approved testing, sampling, preservation, and analytical techniques and by meeting the QAOs specified in Sections C3-2 through C3-9.

The comparability of waste characterization data shall be ensured through the use of data usability criteria (based on guidance provided by CBFO), which address, as appropriate, the following:

- Definition or reference of criteria used to define and assign data qualifier flags based on QAO results
- Criteria for assessing the usability of data impacted by matrix interferences
- Criteria for assessing the usability of data based upon positive and negative bias as indicated by QC data, of data qualifiers, and qualifier flags
- Criteria for assessing the usability of data due to:
    1. Severe matrix effects
    2. Misidentification of compounds
    3. Gross exceedance of holding times
    4. Failure to meet calibration or tune criteria
- Criteria for assessing the usability of data that does not meet minimum detection limit requirements.

Representativeness

Representativeness is the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that concerns the proper design of the sampling program.

The representativeness of waste containers from waste streams subjected to headspace gas and homogeneous solids and soil/gravel sampling and analysis is validated through documentation, that a true random sample with an adequate population was identified and collected consistent with Section C2-1. Since representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represents the population being studied, the random selection of waste containers ensures representativeness at a Program level. The SPM documents that the selected waste containers from within a waste stream are randomly selected. Sampling personnel verify that proper procedures are followed to ensure that samples are representative of the waste contained in a particular waste container or a waste stream.

Identification of Tentatively Identified Compounds (TICs)

In accordance with EPA SW-846 convention, identification of compounds detected by GC/MS methods that are not on the list of target analytes shall be reported. Both composited and individual container headspace gas, volatile analysis (TLCP/Totals), and semi-volatile (TLCP/Totals) analysis are subject to TIC reporting.

AMWTP and CCP procedures for identifying and reporting TICs when using GC/MS methods are based on guidance provided in EPA SW-846 Method 8260B and SW-846 Method 8270C. TIC evaluation for headspace gas is addressed in INST-OI-43. TIC evaluation for total VOC and SVOC analysis is addressed in CCP-TP-184, *CCP Volatile Organic Compounds by Gas Chromatography Mass Spectrometry (GC/MS)*, and CCP-TP-185, *CCP Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry*. These procedures assign tentative identifications in accordance with the following SW-846 criteria:

- Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.
- The relative intensities of the major ions should agree within ± 20%.
- Molecular ions present in the reference spectrum should be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.

- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks.

- The reference spectra used for identifying TICs shall include, at minimum, all of the available spectra for compounds that appear in the 20.4.1.200 NMAC (incorporating 40 CFR Part 261) Appendix VIII list. The reference spectra may be limited to VOCs when analyzing headspace gas samples.

- TICs for headspace gas analysis that are performed through FTIR analyses shall be identified in accordance with the specifications of SW-846 method 8410.

TICs shall be reported as part of the analytical batch data reports for GC/MS Methods in accordance with the following minimum criteria:

- A TIC in an individual container headspace gas or solids sample shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria above and is present with a minimum of 10% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 2 to 5 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 2% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 6 to10 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 1% of the area of the nearest internal standard.

- A TIC in a composited headspace gas sample that contains 11 to 20 individual container samples shall be reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 0.5% of the area of the nearest internal standard.

TICs that meet the SW-846 identification criteria, are reported in 25% of all waste containers sampled from a given waste stream and that appear in the 20.4.1.200 NMAC (incorporating 40 CFR Part 261) Appendix VIII list will be compared to AK to determine if the TIC is a listed waste in the waste stream. TICs identified through headspace gas analyses that meet the Appendix VIII list criteria and the 25% reporting criteria for a waste stream will be added to the headspace gas waste stream target list regardless of the hazardous waste listing associated with the waste stream. TICs reported from the Totals VOC or SVOC analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials, or radiolytic degradation from AK

documentation. If a listed waste constituent TIC cannot be attributed to waste packaging materials, radiolysis, or other origins, the constituent will be added to the target analyte list and new EPA HWNs will be assigned, if appropriate. TICs subject to inclusion on the target analyte list that are TC parameters shall be added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for TC and nontoxic F003 constituents, the site may take concentration into account when assessing whether to add an EPA HWN. If a target analyte list for a waste stream is expanded due to the presence of TICs, all subsequent samples collected from that waste stream will be analyzed for constituents on the expanded list. The comparison to AK and the determination of whether or not to add the TIC to the target analyte list will be done in accordance with MP-TRUW-8.11and MP-TRUW-8.13.

C3-2 Headspace Gas Sampling

Quality Assurance Objectives

Headspace gas samples are collected in accordance with INST-OI-43. The precision and accuracy of container headspace gas sampling operations are assessed by analyzing field QC headspace gas samples. These samples must include equipment blanks, field reference standards, field blanks, and field duplicates. If the QAOs in this section are not met, then an NCR must be prepared, submitted, and resolved (see Section C3-13).

Precision

The precision of the headspace gas sampling and analysis operations is assessed by sequential collection of field duplicates for manifold sampling operations or simultaneous collection of field duplicates for direct canister sampling operations for VOC determination. Corrective actions must be taken if the RPD exceeds 25% for any analyte found greater than the PRQL in both of the duplicate samples.

Accuracy

A field reference standard is collected using headspace-gas sampling equipment to assess the accuracy of the headspace-gas sampling operation at a frequency of one field reference standard for every 20 containers sampled or per sampling batch. Corrective action must be taken if the %R of the field reference standard is less than 70 or greater than 130.

Field blanks are collected at a frequency of 1 field blank for every 20 containers or sampling batch sampled to assess possible contamination in the headspace gas sampling method. Equipment blanks must also be collected at a frequency of one equipment blank for each equipment cleaning batch to assess possible contamination in the equipment cleaning method. Corrective actions must be taken if the blank exceeds three times the MDLs listed for any of the compounds listed in Table C3-2.

Field reference standard and blanks are collected in accordance with INST-OI-43.

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total number of samples collected for each waste stream. A valid sample is defined as a sample collected in accordance with approved sampling methods and the container was properly prepared for sampling (e.g., the poly liner was vented to the container headspace). The AMWTP shall achieve a minimum 90% completeness. The amount and type of data that may be lost during the headspace gas sampling operation cannot be predicted in advance. The AMWTP SPM or designee evaluates the importance of any lost or contaminated headspace gas samples and takes corrective action, as appropriate.

Comparability

Consistent use and application of uniform procedures and equipment, as specified in Attachment C1 and application of data usability criteria, should ensure that headspace gas sampling operations are comparable when sampling headspace at the different sampling facilities. The AMWTP takes corrective actions if uniform procedures, equipment, or operations are not followed without approved and justified deviations. In addition, the AMWTP sampling and analysis systems successfully participate in the PDP. INST-OI-43 describes the headspace sampling process at the AMWTP.

Representativeness

Specific headspace gas sampling steps to ensure samples are representative include:

- Selection of the correct DAC Scenario and waste packaging configuration and meeting DAC equilibrium times
- Sample canister cleaning and leak-check after assembly
- Sampling equipment cleaning or disposal after use
- Sampling equipment leak-check after sample collection
- Use of sample canisters with passivated internal surfaces
- Use of low-internal-volume sampling equipment
- Collection of samples with a low-sample volume to available headspace volume ratio (less than 10% of the headspace when the headspace can be determined)
- Careful and documented pressure regulation of sampling activities specified in Section C1-1

- Performance audits
- Collection of equipment blanks, field reference standard, field blanks, and field duplicates at the specified frequencies
- Manifold pressure sensors and temperature sensors calibrated before initial use and annually using NIST, or equivalent standards.

Failure to perform the checks at the prescribed frequencies results in corrective actions.

C3-3 Sampling of Homogeneous Solids and Soils/Gravel

Quality Assurance Objectives

This section presents QAOs to ensure sampling is conducted in a representative manner on a waste stream basis for containers containing homogeneous solids or soil/gravel. Samples are randomly collected in both the horizontal and vertical planes of each container's waste as described in INST-OI-16 and INST-OI-73. For waste containers that contain homogeneous solids or soils/gravel in smaller containers (for example, 1 gal poly bottles) within a waste container, one randomly chosen smaller container must be sampled from each drum in accordance with INST-OI-75.

Precision

Sampling precision is determined by collecting and sampling field duplicates (e.g., co-located cores or co-located samples as described in Section C1-2b[1]), once per sampling batch or once per week during the sampling operations, whichever is more frequent. A sampling batch is a suite of homogeneous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QA samples), all of which must be collected within 14 calendar days of the first sample in the batch. The RPD between collocated core samples is calculated and reported by the SPM or designee per MP-TRUW-8.17, *Co-Located Core Sampling Control Charts.*

The recommended method for establishing acceptance criteria for co-located cores and co-located samples is the F-Test method because the F-Test: (1) does not require potentially arbitrary groupings into batches, (2) is based on exact distributions, and (3) is more likely to detect a change in the process. When a sufficient number of samples are collected (25 to 30 pairs of collocated cores or samples), control charts of the RPD will be developed for each constituent and for each waste matrix or waste type (e.g. pyrochemical salts or organic sludges). The limits for the control chart will be three standard deviations above or below the average RPD. Once constructed, RPDs for additional co-located pairs will be compared with the control chart to determine whether or not the co-located cores are acceptable. Periodically, the control charts will be updated using all available data.

The statistical test will involve calculating the variance for co-located cores and samples by pooling the variances computed for each pair of duplicate results. The variance for the waste stream will be computed excluding any data from containers with co-located cores, because the test requires the variance estimate to be independent. All data must be transformed to normality prior to computing variances and performing the test. The test hypothesis is evaluated using the F distribution and the method for testing the difference in variances.

Accuracy

Sampling accuracy through the use of standard reference materials is not measured. Because waste containers containing homogeneous solids and soil/gravel with known quantities of analytes are not available, sampling accuracy cannot be determined. However, sampling methods and requirements described are designed to minimize sample degradation and hence maximize sampling accuracy.

Sampling accuracy as a function of sampling cross-contamination will be measured. Equipment blanks will be collected at a frequency of once per equipment cleaning batch. Corrective actions must be must be taken if the blank exceeds three times the MDLs (PRDLs for metals) listed for any of the compounds or analytes listed in Tables C3-4, C3-6, and C3-8. Equipment blanks will be collected from the following equipment types:

- Fully assembled coring tools
- Liners cleaned separately from coring tools
- Miscellaneous sampling equipment that is reused (bowls, spoons, chisels)

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total samples collected for each waste stream. A valid sample is any sample collected from a randomly selected container using randomly selected horizontal and vertical planes in accordance with INST-OI-16, INST-OI-73, and INST-OI-75. The AMWTP must achieve a minimum 90% completeness.

Comparability

Consistent use and application of uniform procedures, sampling equipment, and measurement units must ensure that sampling operations are comparable. Consistent application of data usability criteria will also ensure comparability. In addition, laboratories analyzing samples successfully participate in the PDP.

Representativeness

Specific steps to ensure representativeness of samples include the following for both waste containers and smaller containers:

- Coring tools and sampling equipment used are clean before sampling
- The entire depth of waste minus a defined approved safety factor is cored, and the core collected must have a length greater than or equal to 50% of the waste depth. This is called core recovery and is calculated as follows:

$$Core\ recovery(\%) = \frac{y}{x} \times 100 \qquad \text{(C3-10)}$$

  Where:

  x = waste depth in the container

  y = the length of the core collected from the waste

- Coring operations and tool selection should be designed to minimize alteration of the in-place waste characteristics. Minimal waste disturbance must be verified by visually examining the core and describing the observation (e.g., undisturbed, cracked, or pulverized) in the field logbook.

If core recovery is less than 50% of the depth of the waste, a second coring location is randomly selected. The core with the best core recovery is used for sample collection.

One randomly selected container within a container will be chosen if the drum contains individual containers.

C3-4 Non-Destructive Examination Methods

Quality Assurance Objectives

The QAOs for non-destructive examination (NDE) are detailed in this section. NDE can be either RTR or VE. In the event QAOs are not met, then corrective action is taken in accordance with MP-Q&SI-5.4, *Identification of Nonconforming Conditions.* It should be noted that NDE does not have a specific MDL because it is primarily a qualitative determination. The objective of NDE is to determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on Summary Category Groups (i.e., S3000, S4000, S5000). All activities required to achieve these objectives are described in INST-OI-12 and INST-OI-81.

C3-4a Radiography

Data to meet these objectives are obtained from a video and audio recorded scan provided by trained and qualified RTR operators. Results are also recorded on a radiography data form. The precision, accuracy, completeness, and comparability objectives for RTR data are presented below.

Precision

Precision is maintained by reconciling any discrepancies between two RTR operators with regard to identification of the waste matrix code, liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits, and compressed gases through independent replicate scans and independent observations.

Additionally, the precision of RTR is verified prior to use by tuning precisely enough to demonstrate compliance with QAOs through viewing an image test pattern.

Accuracy

Accuracy is obtained by using a target to tune the image for maximum sharpness and by requiring operators to successfully identify 100 percent of the items required to meet the DQOs for radiography specified in Section C-4a(1) in a training container during their initial qualifications and subsequent requalification.

Completeness

A video and audio media recording of the RTR examination and a validated radiography data form is obtained for 100 percent of the waste containers subject to RTR. All video and audio recording and radiography data forms are subject to validation as indicated in Sections C3-10.

Comparability

The comparability of RTR data from different operators is enhanced by using standardized RTR procedures and operator qualification. Operator training requirements are detailed in the RTR qualification package in accordance with MP-RTQP-14.4.

C3-4b Visual Examination

Results are recorded on a VE data form. The precision, accuracy, completeness, and comparability objectives for VE data are presented below.

Precision

Precision is maintained by reconciling any discrepancies between the operator and the independent technical reviewer with regard to identification of the waste matrix code, liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits, and compressed gases.

Accuracy

Accuracy is maintained by requiring operators to pass a comprehensive examination and demonstrate satisfactory performance in the presence of the VEE during their initial qualification. VE operators shall be requalified every two years.

Completeness

A validated VE data form is obtained for 100 percent of the waste containers subject to VE.

Comparability

The comparability of VE data from different operators is enhanced by using standardized VE procedures and operator qualification. Operator training requirements are detailed in the VE qualification package in accordance with MP-RTQP-14.4.

C3-5 Gas Volatile Organic Compounds Analysis

Quality Assurance Objectives

The specified QAOs in Table C3-2 represent the required quality of data necessary to draw valid conclusions regarding program objectives. WIPP-WAP required limits, such as the PRQL associated with VOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of the data users. A summary of required QC samples and the associated acceptance criteria is included in Table C3-3. Key data quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed by analyzing duplicates, and replicate analyses of control samples, and PDP blind audit samples. The results from measurements on these QC samples are compared with the acceptance criteria in Tables C3-2. These QC measurements are used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Precision is initially assessed using analytical methods described in INST-OI-43.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing PDP blind-audit samples and LCSs. The results from these measurements are compared with the acceptance criteria in Table C3-2. These QC measurements are used to demonstrate acceptable method performance and trigger corrective action when control limits are exceeded.

Accuracy is initially assessed using INST-OI-43 by analyzing a minimum of seven replicate method performance samples.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations are performed and evaluated using the criteria specified in Table C3-3 as implemented in INST-OI-43. These criteria will be used to demonstrate acceptable calibration and trigger corrective action when control limits are exceeded.

Method Detection Limits (MDLs)

MDLs are expressed in units of nanograms (ng) for VOCs and must be less than or equal to those listed in Table C3-2. MDLs are determined based on the method described in Section C3-1 and in accordance with INST-OI-43, as applicable.

Program Required Quantitation Limit

The AMWTP demonstrates the capability to quantitate analytes at or below the PRQL given in Table C3-2. The AMWTP sets the concentration of at least one calibration standard below the PRQL. INST-OI-43 details the procedures for PRQL demonstration.

Completeness

Laboratory completeness shall be expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. A composited sample is treated as one sample for the purposes of completeness because only one sample is run through the analytical instrument. Valid results are defined as results that meet the data usability criteria based on application of the QC Criteria specified in Tables C3-2 and C3-3; and meet the detection limit, calibration, representativeness, and comparability criteria within this section and in Table C3-2.

Comparability

For VOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is achieved by using standardized methods and traceable standards and successful participation in the PDP.

Representativeness

Representativeness for VOC analysis is achieved by collection of sufficient numbers of samples using clean sampling equipment that does not introduce sample bias. Samples must be collected as specified in Attachment C1.

C3-6 Total Volatile Organic Compound Analysis

Total VOC analysis is performed at the CCP/ICP Analytical Laboratory and is not performed by the AMWTP.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-4. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQL associated with VOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or matrix spike duplicates (MSDs), replicate analyses of LCSs, and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-4. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing LCSs, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for matrix spike samples are compared to the %R criteria listed in Table C3-4. Surrogates and internal standards are evaluated as specified in SW-846 method (EPA 1996) or Table C3-5. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-5. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS Tunes, initial calibrations, and continuing calibrations are performed and evaluated using criteria specified in Table C3-5 and the SW-846 method (EPA 1996). These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are expressed in milligrams per kilogram (mg/kg) for VOCs and must be less than or equal to those listed in Table C3-4. The detailed procedures for MDL determination are included in the laboratory procedures.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs given in Table C3-4. Laboratories set the concentration of at least one calibration standard below the PRQL. The detailed procedures for MDL determination are included in the laboratory procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-4 and C3-5 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-4.

Comparability

For VOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 (EPA) sample preparation and methods that meet the QAOs specified in Tables C3-4 and C3-5, traceable standards, and by successful participation in the PDP. AMWTP may use the most recent version of SW-846. Any changes to SW 846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for VOC analysis is achieved by collecting unbiased samples as addressed in Attachment C1.

C3-7 Total Semivolatile Organic Compound Analysis

Total SVOC analysis is performed at the CCP/ICP Analytical Laboratory and is not performed by the AMWTP.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-6. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQL associated with SVOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of Quality Control samples and associated acceptance criteria for this analysis is included in Table C3-7. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or MSDs, replicate analyses of LCSs and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-6. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy as %R is assessed for the laboratory operations by analyzing LCSs, matrix spikes, surrogate compounds, and PDP blind-audit samples. The results from these measurements for matrix spike samples are compared to the %R criteria listed in Table C3-6. Surrogates and internal standards are evaluated as specified in SW-846 method (EPA 1996) or Table C3-7. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-7. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations are performed and evaluated using criteria specified in Table C3-7 and the SW-846 method (EPA 1996). These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Method Detection Limit

MDLs are expressed in mg/kg for SVOCs and must be less than or equal to those listed in Table C3-6. The detailed procedures for MDL determination are included in the laboratory procedures.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs given in Table C3-6. Laboratories set the concentration of at least one calibration standard below the PRQL. The detailed procedures for MDL determination will be included in the site procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-6 and C3-7 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-6.

Comparability

For SVOC analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 (EPA) sample preparation and methods that meet the QAOs specified in Tables C3-6 and C3-7, traceable standards, and by successful participation in the PDP. AMWTP may use the most recent version of SW-846. Any changes to SW 846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for SVOC analysis is achieved by collecting unbiased samples as addressed in Attachment C1.

C3-8 Total Metal Analysis

Total metal analysis is performed at the CCP/ICP Analytical Laboratory and is not performed by the AMWTP.

Quality Assurance Objectives

The development of DQOs has resulted in the QAOs listed in Table C3-8. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQL associated with metals analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of Quality Control samples and the associated acceptance criteria for this analysis is provided in Table C3-9. Key data-quality indicators for laboratory measurements are defined below.

Precision

Precision is assessed through the analysis of laboratory duplicates or laboratory MSDs, replicate analyses of LCSs, and PDP blind audit samples. The results of these QC samples are compared with the acceptance criteria in Table C3-8. These QC measurements will be used to demonstrate acceptable method performance and to trigger corrective action when control limits are exceeded.

Accuracy

Accuracy is assessed through the analysis of laboratory matrix spikes, PDP blind-audit samples, serial dilutions, interference check samples, and LCSs. The results from these measurements for matrix spike samples are compared to the criteria listed in Tables C3-8 and C3-9. The QC measurements will be used to demonstrate acceptable method performance and to trigger corrective actions when control limits are exceeded.

Laboratory blanks and calibration blanks are assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-9. These QC measurements will be used to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

Mass Tunes (for ICP MS only), Standards Calibrations, Initial Calibration Verifications (ICVs), and continuing calibrations are performed and evaluated using the procedures and criteria specified in Table C3-9 and the SW-846 method (EPA 1996). These criteria will be used to demonstrate acceptable calibration and to trigger corrective action when control limits are exceeded.

Program Required Detection Limits

PRDLs, expressed in units of micrograms per liter (µg/L), are the maximum values for instrument detection limits (IDLs) permitted by the QAPjP. IDLs will be less than, or equal to, the PRDL for the method used to quantitate a specific analyte. The methods listed in Table C-5

will be used if the instrument detection limit (IDL) meets this criterion. For high concentration samples, an exception to the above requirements will be made in cases where the sample concentration exceeds five times the IDL of the instrument being used. In this case, the analyte concentration may be reported even though the IDL may exceed the PRDL. IDLs will be determined semiannually (i.e., every six months). Detailed procedures for IDL determinationare included in the laboratory procedure.

Program Required Quantitation Limit

Laboratories will quantitate analytes in samples at or below the PRQLs in units of mg/kg wet weight given in Table C3-8. The PRDLs are set an order of magnitude less than the PRQLs (assuming 100 percent solid sample diluted by a factor of 100 during preparation). Laboratories set the concentration of at least one QC or calibration standard at or below the solution equivalent of the PRQL. The detailed procedures for MDL determination are included in the laboratory procedures.

Completeness

Laboratory completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results are defined as results that meet the data usability criteria based upon an application of the QC criteria specified in Tables C3-8 and C3-9 and meet the calibration, detection limit, representativeness, and comparability criteria within this section. Participating laboratories must meet the completeness criteria specified in Table C3-8.

Comparability

For metals analysis, data generated through analysis of samples from different sites shall be comparable. Comparability of analytical data is ensured by consistent use of standardized SW-846 sample preparation and methods that meet the QAOs specified in Tables C3-8 and C3-9, demonstrating successful participation in the PDP, and use of traceable standards. AMWTP may use the most recent version of SW-846. Any changes to SW 846 methodology that results in the elimination of sample preparation or analytical methods must be addressed as a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for metals analysis is achieved by collecting unbiased samples and the preparation of samples in the laboratory using representative and unbiased methods as addressed in Attachment C1.

C3-9 Acceptable Knowledge

AK documentation provides primarily qualitative information that cannot be assessed according to specific data quality goals used for analytical techniques. QAOs for analytical results are described in terms of precision, accuracy, completeness, comparability, and representativeness. Appropriate analytical and testing results may be used to augment the characterization of wastes based on AK (refer to Section C 4 and MP-TRUW-8.13). To ensure the AK process is consistently applied, the AMWTP complies with the following data quality requirements for AK documentation:

- *Precision* - Precision is the agreement among a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. However, the AK information is addressed by the independent review of AK information during internal and external audits.

- *Accuracy* - Accuracy is the degree of agreement between an observed sample result and the true value. The percentage of waste containers that require reassignment to a new waste matrix code and/or designation of different EPA HWNs based on sampling and analysis data and discrepancies identified by the CBFO during waste confirmation are reported as a measure of AK accuracy.

- *Completeness* - Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be usable through the data validation process. The AK record must contain 100 percent of the required information (Section C4-3). The usability of AK information is assessed for completeness during audits.

- *Comparability* - Data are considered comparable when one set of data can be compared with another set of data. Comparability is ensured through sites meeting the training requirements and complying with the minimum standards outlined for procedures that are used to implement the AK process. Assignment of EPA HWNs will be made in accordance with Section C3-3b. This information will be provided to other sites that store or generate a similar waste stream.

- *Representativeness* - Representativeness expresses the degree to which sample data accurately and precisely represent characteristics of a population. Representativeness is a qualitative parameter that will be satisfied by ensuring the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Attachment C4. The AMWTP also assesses and documents the limitations of the AK information used to assign EPA HWNs (for example, purpose and scope of information, date of publication, type and extent to which waste parameters are addressed).

The AMWTP complies with the nonconformance notification and reporting requirements of Section C3-13 if the results of sampling and analysis specified in Attachment C are inconsistent with AK documentation.

The AMWTP addresses QC by tracking its performance with regard to the use of AK by: (1) assessing the frequency of inconsistencies among information, and (2) documenting AK inconsistencies identified through RTR, VE, headspace gas analyses, and solidified waste analyses. In addition, the AK process and waste stream documentation are evaluated through internal assessments by QA organizations and assessments by auditors external to the organization.

C3-10 Data Review, Validation, and Verification Requirements

Procedures have been developed for the review, validation, and verification of data at the data generation level and the validation and verification of data at the project level. Data review determines if raw data is properly collected and ensures raw data are properly reduced. Data validation verifies that the data reported satisfies the requirements of the WIPP-WAP and is accompanied by signature release. Data verification authenticates that data as presented represent the sampling and analysis activities as performed and have been subject to the appropriate levels of data review. These requirements ensure that QAPjP records furnish documentary evidence of quality.

The AMWTP has implemented an electronic data processing system called the Waste Tracking System (WTS). Data are collected by the operator, entered into the WTS (automated or key entry), signed electronically, and promoted for data generation level review and validation. The data are progressively reviewed (on a batch basis) at the data generation level using paper/electronic data validation checklists. The reviews are performed in the sequence specified. If data are approved, the data are manually/automatically promoted to the next reviewer. If the data are rejected, the data are manually/automatically demoted to the data generator for problem resolution.

The following Batch Data Reports are used for data validation, verification, and QA activities:

- A Testing Batch Data Report or equivalent includes all data pertaining to RTR or VE for up to 20 waste containers without regard to waste matrix. Table C3-11 lists all of the information required in Testing Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Testing Batch Data Reports (identified with an "O").

- A Sampling Batch Data Report or equivalent includes all sample collection data pertaining to a group of no more than 20 samples headspace or homogeneous waste samples that were collected for chemical analysis. Table C3-12 lists all of the information required in Sampling Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Sampling Batch Data Reports (identified with an "O").

- An Analytical Batch Data Report or equivalent includes analytical data from the analysis of TRU mixed waste for up to 20 samples headspace or homogeneous waste samples. Analytical Batch Data Reports or equivalent that contain results for composited headspace gas samples must contain sufficient information to identify the containers that were composited for each composite sample and the sample volume that was taken from each waste container. Because Analytical Batch Data Reports are generated based on the number of samples analyzed, an Analytical Batch Data Report may contain results that are applicable to more than 20 containers depending on how many composite samples are part of the report, but may not exceed a total of 20 samples analyzed. Table C3-13 lists all of the information required in Analytical Batch Data Reports (identified with an "X") and other information that is necessary for data validation, but is optional in Analytical Batch Data Reports (identified with an "O").

  Raw analytical data need not be included in Analytical Batch Data Reports, but must be maintained in the site project files and be readily available for review upon request. Raw data may include all analytical bench sheet and instrumentation readouts for all calibration standard results, sample data, QC samples, sample preparation conditions and logs, sample run logs, and all re-extraction, re-analysis, or dilution information pertaining to the individual samples. Raw data may also include calculation records and any qualitative or semi-quantitative data collected for a sample and that has been recorded on a bench sheet or in a logbook.

- An On-line Batch Data Report or equivalent contains the combined information from the Sampling Batch Data Report and Analytical Batch Data Report that is relevant to the on-line method used.

C3-10a Data Generation Level

The following are the minimum requirements for raw data collection and management:

- All raw data are signed and dated in reproducible ink by the person generating it. Alternately, unalterable electronic signatures are used.

- All data are recorded clearly, legibly, and accurately in field and laboratory records (bench sheets and logbooks), and include applicable sample identification numbers (for sampling and analytical labs).

- Any changes to original data are lined out, initialed, and dated by the individual making the change. A justification for changing the original data is also included. The original data are not obliterated or otherwise disfigured so as not to be readable. Data changes are made by the individual who originally collected the data or an individual authorized to change the data.

- All data are transferred and reduced from field and laboratory records completely and accurately.
- All field and laboratory records are maintained as specified in Table C-6.
- Data are organized into a standard format for reporting purposes (Batch Data Report), as outlined in specific sampling and analytical procedures.
- All electronic and video data must be stored appropriately to ensure that waste container, sample, and associated QC data are readily retrievable. In the case of classified information, additional security provisions may apply that could restrict retrievability. The additional security provision will be documented in site procedures as outlined in the QAPjP in accordance with prevailing classified information security standards. AMWTP does not anticipate dealing with classified information, so no procedures have been developed.

Data review, validation, and verification at this level involve scrutiny and signature release from qualified independent technical reviewer(s) not involved in the generation or recording of the data under review, as specified below. Individuals conducting this data review, validation, and verification must use checklists that address all items included in this section. Checklists contain or reference tables showing the results of sampling, analytical, or on-line batch QC samples, as applicable. Checklists reflect review of all QC samples and QAO categories per criteria in Tables C3-2 through C3-9 (as applicable to the methods validated). Completed checklists are forwarded with Batch Data Reports to the project level. Analytical raw data must be available and reviewed by the data generation level reviewer. Nonconformance reports identified during data generation level validation and verification are documented per MP-Q&SI-5.4. All activities required to achieve these objectives are addressed in MP-TRUW-8.8 and CCP-TP-188, *Analytical Data Recording, Review, and Reporting*.

C3-10a(1) Independent Technical Review

The independent technical review (ITR) ensures by review of raw data that data generation and reduction are technically correct; calculations are verified correct; deviations are documented; and QA/QC results are complete, documented correctly, and compared against WIPP-WAP criteria. This review validates and verifies the work done by the originator.

One hundred percent of the Batch Data Reports receive an ITR. This review is performed by a trained and qualified individual who was not involved in the generation or recording of the data under review. This review is performed as soon as practicably possible to determine and correct negative quality trends in the sampling or analytical process. However, at a minimum, the ITR is performed before any waste associated with data is shipped to WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated after initial WSPF approval as described in Section C2-1. The reviewers release the data as evidenced by signature, and as a consequence ensure the following:

- Data generation and reduction were conducted in a technically correct manner per the method used (procedure with revision). Data were reported in the proper units and correct number of significant figures.

- Calculations have been verified by a valid calculation program, a spot check of verified calculation programs, and/or 100% check of all hand calculations. Values not verified to within rounding or significant difference discrepancies are rectified prior to completion of the ITR.

- The data were reviewed for transcription errors.

- The testing, sampling, or analytical data QA documentation for Batch Data Reports is complete and includes, as applicable, raw data, DAC and equilibrium calculations and times, calculation records, COC forms, calibration records (or references to an available calibration package), QC sample results, and copies or originals of the gas sample canister tags. Corrective action is taken to ensure all Batch Data Reports are complete and include all necessary raw data prior to completion of the ITR.

- QC sample results were within established control limits and, if not, the data were appropriately qualified per the data usability criteria. Data outside established control limits are qualified, as appropriate, assigned an appropriate qualifier flag, discussed in the case narrative, and included, as appropriate, in calculations for completeness. QC criteria that were not met are documented.

- Reporting flags (Table C3-14) were assigned correctly.

- Sample holding time and preservation requirements were met, or exceptions documented.

- Radiography tapes have been reviewed (independent observation) on a waste container basis once per testing batch, or once per day of operation, whichever is less frequent (Section C1-3). The RTR tapes are reviewed against the reported data on the radiography form to ensure the data are correct and complete.

- Field sampling records are complete. Incomplete or incorrect field sampling records are subject to resubmittal prior to completion of the ITR.

- QAOs have been met according to the methods outlined in Sections C3-2 through C3-9.

C3-10b Project Level

Data review, validation, and verification at this level involves scrutiny and signature release from the SPM or designee. MP-TRUW-8.9, *Level II Data Validation*, defines the project level validation and verification process. Any nonconformance identified during this process shall be documented on an NCR (Section C3-13).

The SPM shall ensure that a repeat of the data generation level review, validation, and verification is performed on the data for a minimum of one randomly chosen waste container quarterly (every three months). This exercise will document that the data generation level review, validation, and verification is being performed according to procedures.

C3-10b(1) Site Project Manager Review

The SPM review is the final validation that all of the data contained in Batch Data Reports from the data generation level are complete and have been properly reviewed as evidenced by signature release and completed checklists.

One hundred percent of the Batch Data Reports have an SPM or designee signature release. At a minimum, the SPM signature release is performed before any waste associated with data reviewed is shipped to WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated as described in Section C2-1. This signature release ensures the following:

- The validity of the DAC assignment made at the data generation level based upon an assessment of the data collection and evaluation necessary to make the assignment.

- Testing batch QC checks (e.g., replicate scans, measurement system checks) were properly performed. Radiography data are complete and acceptable based on evidence of videotape review of one waste container per day or once per testing batch, whichever is less frequent, as specified in C1-3.

- Sampling batch QC checks (e.g., equipment blanks, field duplicates, and field reference standards) were properly performed, meets the established QAOs, and is within established data usability criteria.

- Analytical QC checks (e.g., laboratory duplicates, laboratory blanks, matrix spikes, MSDs, LCSs) were properly performed, meet the established QAOs, and are within established data usability criteria.

- On-line batch QC checks (e.g., field blanks, on-line blanks, on-line duplicates, on line control samples) were properly performed, meet the established QAOs, and are within established data usability criteria.

- Proper procedures were followed to ensure representative samples of headspace gas and homogeneous solids and soil/gravel were taken.

- Data generation level ITR, validation, and verification have been performed as evidenced by completed review checklists and by the appropriate signature releases.

- ITRs were not involved in the generation or recording of the data under review.

- Batch data review checklists are complete.

- Batch Data Reports are complete and data are properly reported (e.g., data are reported in the correct units, with the correct number of significant figures, and with qualifying flags).

- Verification that data are within established data assessment criteria and meet the applicable QAOs (Section C3-2 through C3-9).

C3-10b(2) Prepare SPM Summary and Data Validation Summary

To document the project level validation and verification described above, the SPM (or designee) prepares the Site Project Manager Summary and Data Validation Summary. These reports may be combined to eliminate redundancy. The SPM Summary includes a validation checklist for each Batch Data Report. Checklists for the SPM Summary are sufficiently detailed to validate all aspects of a Batch Data Report that affect data quality.

The Data Validation Summary provides verification that, on a per waste container or sample basis as evidenced by Batch Data Report reviews, all data have been validated per this QAPjP. The Data Validation Summary must identify each Batch Data Report reviewed (including all waste container numbers), describe how the validation was performed and whether or not problems were detected (e.g., nonconformance reports), and include a statement indicating all data are acceptable. Summaries include release signatures.

Once the data are approved through project level validation and verification or when the SPM decides the sample no longer needs to be retained, the SPM notifies the laboratories. Samples must be retained until this notification is received. Gas sample canisters may then be released from storage for cleaning, recertification, and subsequent reuse. Sample tags are removed and

retained in the files before recycling the canisters. If the SPM requests that samples or canisters be retained for future use (e.g., an experimental holding time study), the same sample identification and COC forms are used and cross-referenced to documentation specifying the purpose for sample or canister retention.

C3-10b(3) Prepare Waste Stream Characterization Package

In the event the CBFO request detailed information on a waste stream, the SPM will provide a Waste Stream Characterization Package. The SPM will ensure the Waste Stream Characterization Package (Section C3-12b[3]) will support waste characterization determinations.

C3-10c CBFO Level

Not applicable to the AMWTP; this section refers to WIPP.

C3-11 Reconciliation with Data Quality Objectives

Reconciling the results of waste testing and analysis with the DQOs provides a way to ensure data are of adequate quality to support the regulatory compliance programs. Reconciliation with the DQOs takes place at both the project and the CBFO levels. At the project level, reconciliation is performed by the SPM, and submitted to CBFO for review and approval. Reconciliation is performed as described in MP-TRUW-8.11, *Data Reconciliation*.

C3-11a Reconciliation at the Project Level

The SPM ensures all data generated and used in decision making meet the DQOs provided in Section C-4a(1). The SPM assesses whether data of sufficient type, quality, and quantity have been collected for each waste stream. The SPM determines if the variability of the data set is small enough to provide the required confidence in the results.

The SPM also determines if, based on the desired error rates and confidence levels, a sufficient number of valid data points have been determined (as established by the associated completeness rate for each sampling and analytical process). In addition, the SPM documents that random sampling of containers was performed for the purposes of waste stream characterization.

For each waste stream characterized, the SPM determines if sufficient data have been collected to determine the following WIPP-WAP-required waste parameters:

- Waste Matrix Code
- Waste material parameter weights
- If each container of waste contains TRU radioactive waste

- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for each VOC in the headspace gas of waste containers in the waste stream (if applicable)

- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for VOCs, SVOCs, and metals in the waste stream

- Whether the waste stream exhibits a TCs (TC) under 40 CFR Part 261, Subpart C

- Whether the waste stream contains listed waste found in 20.4.1.200 NMAC incorporating 40 CFR Part §261, Subpart D

- Whether the waste stream is classified as hazardous or nonhazardous at the 90% confidence level

- Whether an appropriate packaging configuration and DAC were applied and documented in the headspace gas sampling documentation, and whether the drum age was met prior to sampling

- Whether all TICs were appropriately identified and reported in accordance with the requirements of Section C3-1 before submittal of a WSPF for a waste stream or waste stream lot

- Whether the overall completeness, comparability, and representativeness QAOs were met for each analytical and testing procedure as specified in Sections C3-2 through C3-9 before submittal of a WSPF for a waste stream or waste stream lot

- Whether the PRQLs for all analyses were met before submittal of a WSPF for a waste stream or waste stream lot.

If the SPM determines insufficient data have been collected to make the determinations listed above, additional data collection efforts must be undertaken. The reconciliation of a waste stream is performed as described in Attachment C4, prior to submittal of the WSPF and CIS to CBFO for that waste stream. The AMWTP will not ship containers from a TRU waste stream for disposal until the SPM determines that the required waste parameters listed above have been met for the waste stream.

The SPM (or designee) uses MP-TRUW-8.11 as the statistical procedure (Attachment C2) to evaluate and report waste characterization data from the analysis of homogeneous solids and soils/gravel. This procedure, which calculates UCL_{90} values, assesses compliance with the DQOs in Section C-4a(1) as well as the RCRA regulations. It applies to all laboratory analytical data for total VOCs, total SVOCs, and total metals. For RCRA regulatory compliance (40 CFR 261.24), data from the analysis if the appropriate metals and organic compounds is expressed as TC

leaching procedure (TLCP) values or results are compared to the TC levels expressed as total values. These total values will be considered RTL values. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC analyte that would give the regulatory weight/volume concentration (in the TLCP extract), assuming 100-percent dissolution.

C3-11b Reconciliation at the CBFO Level

Not applicable to the AMWTP.

C3-12 Data Reporting Requirements

Data reporting requirements define the type of information and the method of transmittal for data transfer from the data generation level to the project level and from the project level to WIPP.

C3-12a Data Generation Level

Data is transmitted by hardcopy or electronically with WTS (a hardcopy is available on demand) from the data generation level to the project level. Transmitted data includes all Batch Data Reports and data review checklists. The Batch Data Reports and checklists contain all information required by the testing, sampling, and analytical techniques described in Attachments C1 through C6, as well as the signature releases to document the review, validation, and verification described in Section C3-10. All batch data reports and checklists are in approved formats, as provided in approved procedures.

Hard copy and/or electronic Batch Data Reports are forwarded to the SPM. All Batch Data Reports are assigned serial numbers and each page is numbered. The serial number used may be the same as the batch number.

QA documentation and records, including raw data, are maintained in testing, sampling, and analytical facility files or site project files in accordance with the document storage requirements presented in Attachment C. In addition, CBFO-approved laboratories shall forward testing, sampling, and analytical QA documentation along with Batch Data Reports to the Site Project Office (SPO) for inclusion in the site project files.

C3-12b Project Level

The SPO prepares a WSPF in accordance with MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*, for each waste stream certified for shipment to WIPP based on information obtained from AK and Batch Data Reports, if applicable. In addition, the Characterization Information Summary and Waste Stream Characterization Package (when requested by the CBFO) are prepared as appropriate and transmitted to WIPP electronically or by hard copy. The SPM verifies these reports are consistent with information found in analytical batch reports. Summarized testing, sampling, and analytical data are included with the Characterization

Information Summary. The contents of the WSPF, the Characterization Information Summary, and the Waste Stream Characterization Package are discussed in the following sections.

After approval of a WSPF and the associated Characterization Information Summary, the AMWTP maintains a cross-reference of container identification numbers to each Batch Data Report.

A Waste Stream Characterization package must be submitted when requested by the CBFO.

C3-12b(1) Waste Stream Profile Form

The WSPF is prepared in accordance with MP-TRUW-8.14. The WSPF (Figure C-1) includes the following information:

- Generator/storage site name
- Generator/storage site EPA ID
- Date of audit report approval by NMED (if obtained)
- Original generator of waste stream
- Whether waste is Contact-Handled or Remote-Handled
- The waste stream WIPP identification number
- Summary Category Group
- Waste Matrix Code Group
- Waste Material Parameter Weight Estimates per unit of waste
- Waste stream name
- Description of the waste stream
- Applicable EPA HWNs
- Applicable TRUCON codes
- A listing of AK documentation used to identify the waste stream
- The waste characterization procedures used and the reference and date of the procedure
- Certification signature of SPM, name, title, and date signed.

C3-12b(2) Characterization Information Summary

The Characterization Information Summary is prepared in accordance with MP-TRUW-8.14. The Characterization Information Summary includes the following elements:

- Data reconciliation with DQOs

- Headspace gas summary data listing the identification numbers of samples used in the statistical reduction, the maximum, mean, standard deviation, UCL_{90}, RTL, and associated EPA HWNs that must be applied to the waste stream

- Total metal, VOC, and SVOC analytical results for homogeneous solids and soil/gravel (if applicable)
- TIC listing and evaluation
- Radiography and VE summary to document that all prohibited items are absent in the waste (if applicable)
- A justification for the selection of RTR and/or VE as an appropriate method for characterizing the waste
- A complete listing of container identification numbers used to generate the WSPF, cross referenced to each Batch Data Report
- Complete AK summary including waste stream name and number, point of generation, waste stream volume (current and projected), generation dates, TRUCON codes, Summary Category Group, Waste Matrix Code(s), and Waste Matrix Code Group, other TRU Waste Baseline Inventory Report (TWBIR) information, waste stream description, areas of operation, generating processes, RCRA determinations (including determination for ignitability, corrosivity, and reactivity), and radionuclide information, all references used to generate the AK summary, and any other information required by Section C4-2b
- Method for determining Waste Material Parameter Weights per unit of waste
- List of any AK Sufficiency Determination requested for the waste stream
- Certification through AK or testing and/or analysis that any waste assigned the EPA HWN of U134 (hydrofluoric acid) no longer exhibits the characteristic of corrosivity. This is verified by ensuring that no liquid is present in U134 waste.

C3-12b(3) Waste Stream Characterization Package

The Waste Stream Characterization Package, which is prepared in accordance with MP-TRUW-8.14, consists of the following elements:

- Waste Stream Profile Form (Section C3-12b[1])
- Accompanying Characterization Information Summary (Section C3-12b[2])
- Complete AK summary (C3-12b[2])
- Batch Data Reports supporting the characterization of the waste stream and any others requested by the CBFO.

- Raw analytical data requested by the CBFO.

C3-12b(4) Waste Data System/WIPP Waste Information System (WDS/WWIS) Data Reporting

The WDS/WWIS Data Dictionary contains all of the data fields, the field format, and the limits associated with the data as established by the WIPP-WAP. These data are subject to edit and limit checks performed automatically by the database, as defined in the *Waste Data System User's Manual* (DOE, 2009). If a container was part of a composite headspace gas sample, the analytical results from the composite sample must be assigned as the container headspace gas data results, including associated TICs for every waste container associated with the composite sample. The AMWTP coordinates the data transmission with WIPP in accordance with MP-TRUW-8.5, *TRU Waste Certification.*

C3-13 Nonconformances

The status of work and the QAPjP activities are monitored and controlled by the SPM, including nonconformance identification, documentation, and reporting. MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*, discusses specific nonconformance procedures and corrective action processes.

Nonconformances

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure. Nonconforming items and activities are those that do not meet the WIPP-WAP requirements, procurement document criteria, or approved procedures and are addressed in MP-Q&SI-5.4. Nonconforming items are marked, tagged, or segregated and the affected personnel notified. Any waste container for which an NCR has been written will not be shipped to the WIPP facility unless the condition that led to the NCR for that container has been dispositioned in accordance with the CBFO Quality Assurance Program Document (QAPD).

Disposition of nonconforming items shall be identified and documented. MP-Q&SI-5.4 identifies the person(s) responsible for evaluating and dispositioning nonconforming items.

For each container selected for confirmation pursuant to Attachment C7, the confirmation team will examine the respective NCR documentation to verify NCRs have been dispositioned for the selected container.

Management at all levels will foster a "no-fault" attitude to encourage the identification of nonconforming items and processes. Nonconformances may be detected and identified by anyone performing WIPP-WAP activities, including:

- Project staff – during field operations, supervision of subcontractors, data validation and verification, and self-assessment

- Laboratory staff – during the preparation for and performance of laboratory testing; calibration of equipment; QC activities; laboratory data review, validation, and verification; and self-assessment
- QA personnel – during oversight activities or audits.

An NCR shall be prepared for each nonconformance identified. Each NCR shall be initiated by the individual(s) identifying the nonconformance. The NCR shall then be processed by knowledgeable and appropriate personnel. For this purpose, an NCR including, or referencing as appropriate, results of laboratory analysis, QC rests, audit reports, internal memoranda, or letters shall be prepared. The NCR must provide the following information:

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

The SPM oversees the NCR process and is responsible for identifying and tracking all nonconformances and reports this information to CBFO. The SPM is also responsible for notifying project personnel of the nonconformance and verifying completion of the corrective action for nonconformances.

Nonconformance to DQOs

For any non-administrative nonconformance related to applicable requirements specified in this QAPjP, which are first identified at the SPM signature release level (i.e., a failure to meet a DQO), AMWTP will submit to CBFO a written notification within seven calendar days of identification and submit an NCR within thirty (30) calendar days of identification of the incident. The AMWTP will issue an NCR and implement corrective actions, which will be resolved prior to shipment.

C3-14 Special Training Requirements and Certifications

Before performing activities that affect QAPjP quality, all personnel receive indoctrination into the applicable scope, purpose, and objectives of the QAPjP and the specific QAOs of the assigned task. Personnel assigned to perform activities for the QAPjP have the education, experience, and training applicable to the functions associated with the work. Evidence of

personnel proficiency and demonstration of competence in the task(s) assigned is demonstrated and documented. All personnel designated to work on specific aspects of the QAPjP maintain qualification (that is, training and certification) throughout the duration of the work. Qualification requirements for personnel are documented in Individual Training Plans or qualification packages. Job performance is evaluated and documented at periodic intervals to ensure personnel maintain proficiency and record additions to training, as necessary per MP-RTQP-14.4.

Personnel involved in QAPjP activities receive continuing training to ensure job proficiency is maintained. Training includes both education in principles and enhancement of skills. Training records that specify the scope of the training, the date of completion, and documentation of job proficiency are maintained as QA Records. Maintenance of training records is addressed in MP-RTQP-14.19, *Training Records Administration.*

Analytical laboratory line management ensures analytical personnel are qualified to perform the analytical method(s) for which they are responsible. The minimum qualifications for certain specified positions for the WIPP-WAP are summarized in Table C3-10. Analytical laboratory personnel are trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan.*

An evaluation of personnel qualifications includes comparing and evaluating the requirements specified in the job/position description and the skills, training, and experience included in the person's current resume. This evaluation, done in accordance with MP-RTQP-14.1 and MP-RTQP-14.4, is also performed for personnel who change positions because of a transfer or promotion as well as personnel assigned to short-term or temporary work assignments that may affect the quality of the WIPP-WAP.

C3-15 Changes to Plans and Procedures

Controlled changes to WIPP-WAP related plans or procedures are made in accordance with the WIPP QAPD and managed through MP-DOCS-18.4, *Document Control.* The SPM shall review all non-administrative changes and evaluate whether those changes could impact DQOs specified in the permit. After AMWTP certification, any changes to WIPP-WAP related plans or procedures that could positively or negatively impact DQOs (i.e., those changes that require prior approval of the CBFO as defined in Section C5-2) shall be reported to the CBFO within five (5) days of identification by the project level review. The CBFO shall send NMED a monthly summary briefly describing the changes to plans and procedures identified pursuant to this section during the previous month.

Table C3-1. Waste Material Parameters and Descriptions

Waste Material Parameter	Description
Iron-based Metal/Alloys	Iron and steel alloys in the waste excluding the waste container materials.
Aluminum-based Metals/Alloys	Aluminum or aluminum-based alloys in the waste materials.
Other Metals	All other metals found in the waste materials (for example, copper, lead, zirconium, tantalum, etc.).
Other Inorganic Materials	Nonmetallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents.
Cellulosics	Materials generally derived from high polymer plant carbohydrates, for example, paper, cardboard, wood, cloth, etc.
Rubber	Natural or man-made elastic latex materials, for example, surgeon gloves, leaded rubber gloves, etc.
Plastics (Waste Materials)	Generally man-made materials, often derived from petroleum feedstock, for example, polyethylene, polyvinylchloride, etc.
Organic Matrix	Cemented organic resins, solidified organic liquids and sludges.
Inorganic Matrix	Any homogeneous materials consisting of sludge, or aqueous-based liquids solidified with cement, calcium silicate, or other solidification agents; for example, waste water treatment sludge, cemented aqueous liquids, and inorganic particulates, etc.
Soils/gravel	Generally consists of naturally occurring soils which have been contaminated with inorganic waste materials.
Steel (Packaging Materials)	208-liter (L) (55-gal) drums.
Plastics (Packaging Materials)	90 mil polyethylene drum liner and plastic bags.

Table C3-2. Gas Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives

Compound	Chemical Abstract Services (CAS) Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (ng)	PRQL (ppmv)	Completeness (%)
Benzene	71-43-2	≤25	70-130	10	10	90
Bromoform	75-25-2	≤25	70-130	10	10	90
Carbon tetrachloride	56-23-5	≤25	70-130	10	10	90
Chlorobenzene	108-90-7	≤25	70-130	10	10	90
Chloroform	67-66-3	≤25	70-130	10	10	90
1,1-Dichloroethane	75-34-3	≤25	70-130	10	10	90
1,2-Dichloroethane	107-06-2	≤25	70-130	10	10	90
1,1-Dichloroethylene	75-35-4	≤25	70-130	10	10	90
trans-1,2-Dichloroethylene	156-60-5	≤25	70-130	10	10	90
Ethyl benzene	100-41-4	≤25	70-130	10	10	90
Ethyl ether	60-29-7	≤25	70-130	10	10	90
Methylene chloride	75-09-2	≤25	70-130	10	10	90
1,1,2,2-Tetrachloroethane	79-34-5	≤25	70-130	10	10	90
Tetrachloroethylene	127-18-4	≤25	70-130	10	10	90
Toluene	108-88-3	≤25	70-130	10	10	90
1,1,1-Trichloroethane	71-55-6	≤25	70-130	10	10	90
Trichloroethylene	79-01-6	≤25	70-130	10	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	≤25	70-130	10	10	90
m-Xylene[c]	108-38-3	≤25	70-130	10	10	90
o-Xylene	95-47-6	≤25	70-130	10	10	90
p-Xylene[c]	106-42-3	≤25	70-130	10	10	90
Acetone	67-64-1	≤25	70-130	150	100	90
Butanol	71-36-3	≤25	70-130	150	100	90
Methanol	67-56-1	≤25	70-130	150	100	90
Methyl ethyl ketone	78-93-3	≤25	70-130	150	100	90
Methyl isobutyl ketone	108-10-1	≤25	70-130	150	100	90
Carbon disulfide[d]	75-15-0	≤25	70-130	10	10	90
Chloromethane[d]	74-87-3	≤25	70-130	10	10	90
1,2,4 – Trimethylbenzene[e]	95-36-3	≤25	70-130	10	10	90
1,3,5 – Trimethylbenzene[e]	108-67-8	≤25	70-130	10	10	90
Cyclohexane[e]	110-82-7	≤25	70-130	10	10	90

a. Criteria apply to PRQL concentrations.
b. Values based on delivering 10 mL to the analytical system.
c. These xylene isomers cannot be resolved by GC/MS and are reported as the m-p xylene total.
d. Chloromethane and carbon disulfide are compounds that have been added to the target list based on AK for certain waste streams.
e. These constituents have been added as target compounds on the Agilent system at the AMWTP for the purpose of supporting VOC flammability evaluations.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value), for GC/MS and GC/FID equals total number of ng delivered to the analytical system per sample.
PRQL = Program required quantitation limit (ppm/volume basis)

Table C3-3. Summary of Laboratory Quality Control Samples and Frequencies for Gas Volatile Organic Compound Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method Performance Samples	Seven samples initially and four semiannually	Meet method QAOs	Repeat until acceptable
Laboratory duplicates or on-line duplicates	One per analytical batch or on-line batch	RPD ≤ 25 [b]	Nonconformance if RPD > 25
Laboratory blanks or on-line blanks	Daily before sample analysis for GC/MS and GC/FID. Otherwise, daily prior to sample analysis and one (1) per analytical or on-line batch	Analyte amounts ≤ 3 × MDLs for GC/MS and GC/FID	Flag data if analyte > 3 × MDLs for GC/MS and GC/FID
Laboratory control samples or on-line control sample	One per analytical batch or on-line batch	70-130 %R	Nonconformance if %R < 70 or >130
Blind-audit Samples	Samples and frequency controlled by the Gas PDP Plan	Specified in the Gas PDP Plan	Specified in the Gas PDP Plan
GC/MS	BFB Tune Every 12 hours	Abundance criteria for key ions are met	Repeat until acceptable
GC/MS	Minimum 5-point intial calibration (minimum of 5 standards) Initially and as needed	%RSD of response factor for each target analyte <35	Repeat until acceptable
GC/MS	Continuing calibration every 12 hours	%D for all target analytes ≤30 of initial calibration	Repeat until acceptable
GC/FID	Minimum 3-point initial calibration (minimum of 3 standards) Initially as needed	Correlation coefficient ≥0.99 or %RSD <20 for each target analyte and the retention time of each target analyte within an acceptance criteria defined in this method	Repeat until acceptable
GC/FID	Continuing calibration every 12 hours	%RSD ≤15%	Repeat until acceptable

a. Corrective action per Section C3-13 when final reported QC does not meet the acceptance criteria.
b. Applies only to concentrations greater than the PRQLs listed in Table C3-2.

MDL = Method Detection Limit
QAO = Quality Assurance Objective
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference
BFB = 4-Bromofluorobenzene
%D = Percent difference
%RSD = Percent relative standard deviation

Table C3-4. Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision [a] (%RSD or RPD)	Accuracy [a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Benzene	71-43-2	≤45	37-151	1	10	90
Bromoform	75-25-2	≤47	45-169	1	10	90
Carbon disulfide	75-15-0	≤50	60-150	1	10	90
Carbon tetrachloride	56-23-5	≤30	70-140	1	10	90
Chlorobenzene	108-90-7	≤38	37-160	1	10	90
Chloroform	67-66-3	≤44	51-138	1	10	90
1,4-Dichlorobenzene[c]	106-46-7	≤60	18-190	1	10	90
ortho-Dichlorobenzene[c]	95-50-1	≤60	18-190	1	10	90
1,2-Dichloroethane	107-06-2	≤42	49-155	1	10	90
1,1-Dichloroethylene	75-35-4	≤250	D-234 [d]	1	10	90
trans-1, 2-Dichloroethylene	156-60-5	≤50	60-150	1	10	90
Ethyl benzene	100-41-4	≤43	37-162	1	10	90
Methylene chloride	75-09-2	≤50	D-221 [d]	1	10	90
1,1,2,2-Tetrachloroethane	79-34-5	≤55	46-157	1	10	90
Tetrachloroethylene	127-18-4	≤29	64-148	1	10	90
Toluene	108-88-3	≤29	47-150	1	10	90
1,1,1-Trichloroethane	71-55-6	≤33	52-162	1	10	90
1,1,2-Trichloroethane	79-00-5	≤38	52-150	1	10	90
Trichloroethylene	79-01-6	≤36	71-157	1	10	90
Trichlorofluoromethane	75-69-4	≤110	17-181	1	10	90
1,1,2-Trichloro 1,2,2-trifluoroethane	76-13-1	≤50	60-150	1	10	90
Vinyl chloride	75-01-4	≤200	D-251 [d]	1	4	90
m-Xylene [h]	108-38-3	≤50	60-150	1	10	90
o-Xylene	95-47-6	≤50	60-150	1	10	90
p-Xylene[h,]	106-42-3	≤50	60-150	1	10	90
Acetone	67-64-1	≤50	60-150	10 [e]	100	90
Butanol	71-36-3	≤50	60-150	10 [e]	100	90
Ethyl ether	60-29-7	≤50	60-150	10 [e]	100	90
Formaldehyde[f]	50-00-0	≤50	60-150	10 [e]	100	90
Hydrazine[g]	302-01-2	≤50	60-150	10 [e]	100	90
Isobutanol	78-83-1	≤50	60-150	10 [e]	100	90
Methanol	67-56-1	≤50	60-150	10 [e]	100	90

Table C3-4. (continued)

Compound	CAS Number	Precision [a] (%RSD or RPD)	Accuracy [a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Methyl ethyl ketone	78-93-3	≤50	60-150	10 [e]	100	90
Pyridine [c]	110-86-1	≤50	60-150	10 [e]	100	90

a. Applies to laboratory control samples, and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.
b. TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor or 20
c. Can also be analyzed as an SVOC. If analyzed as an SVOC, the QAOs of Table C3-6 apply.
d. Detected; result must be greater than zero.
e. Estimate, to be determined.
f. Required only for homogeneous solids and soil/gravel waste from Savannah River Site, if analysis is require to resolve assignment of EPA HWNs.
g. Required only for homogeneous solids and soil/gravel waste from Oak Ridge National Laboratory and Savannah River Site, if analysis is required to resolve assignment of EPA HWNs.
h. These xylene isomers cannot be resolved by GC/MS and are reported as the m/p xylene total.

%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kg)
PRQL = Program required quantitation limit; calculated from the TC level for benzene assuming a 25 g sample, 0.5 L of extraction fluid, and 100% analyte extraction (milligrams per kg)
CAS = Chemical Abstract Service

Table C3-5. Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compound Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method performance samples	Seven samples initially and four semi-annually	Meet Table C3-4 QAOs	Repeat until acceptable
Laboratory duplicate[b]	One per analytical batch	Meet Table C3-4 Precision QAOs	Nonconformance if RPDs > values in Table C3-4
Laboratory blanks	One per analytical batch	Analyte concentrations ≤3 × MDLs	Nonconformance if analyte concentrations >3 × MDLs.
Matrix spikes[b]	One per analytical batch	Meet Table C3-4 accuracy QAOs	Nonconformance if %Rs are outside the range specified in Table C3-4.
Matrix spike duplicates	One per analytical batch	Meet Table C3-4 accuracy and precision QAOs	Nonconformance if RPDs >values and %Rs outside the range in Table C3-4.
Laboratory control samples	One per analytical batch	Meet Table C3-4 accuracy QAOs	Nonconformance if %R < 80 or > 120.
GC/MS Calibration	4-bromofluorobenzene (BFB) Tune every 12 hours 5-point (pt). Initial Calibration initially, and as needed	Abundance criteria met per method Calibrate per SW-846 Method requirements: %RSD for calibration check compounds (CCCs) ≤ 30, % RSD for all other compounds < 15%. Average relative response factor (RRF) used if %RSD ≤15; use linear regression if % RSD >15; R or R^2 ≥ 0.990 if using alternative curve System Performance Check Compound (SPCC) minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01	Repeat until acceptable
	Continuing calibration every 12 hours	%D ≤ 20 for CCC SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be > 50% and < 200% of last daily calibration	Repeat until acceptable
GC/FID Calibration	3-pt. Initial Calibration initially and as needed	Correlation coefficient ≥ 0.990 or %RSD ≤ 20 for all analytes	Repeat until acceptable
	Continuing calibration every 12 hours	%D or %Drift for all analytes ≤ 15 of expected values RT ± 3 standard deviations from initial RT calibration per applicable SW-846 method	

Table C3-5. (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ± 3 standard deviations	Nonconformance if %R is less than (average %R-3 standard deviations) or greater than (average %R+3 standard deviations).
Blind-audit samples	Samples and frequency controlled by the solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective Action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedences.

b. Duplicate requirement may be satisfied using matrix spike duplicate; acceptance criteria applies only to concentrations greater than the PRQLs listed in Table C3-4.

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance demonstration program
%R = Percent recovery
RPD = Relative percent difference

Table C3-6. Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness %
Bis(2-Ethylhexyl)phthalate[e]	117-81-7	≤100	8-158	5	40	90
Cresols	1319-77-3	≤50	25-115	5	40	90
1,4-Dichlorobenzene[b,c]	106-46-7	≤86	20 – 124	5	40	90
ortho-Dichlorobenzene[c]	95-50-1	≤64	32 – 129	5	40	90
2,4-Dinitrophenol	51-28-5	≤119	D-172[d]	5	40	90
2,4-Dinitrotoluene	121-14-2	≤46	39 – 139	0.3	2.6	90
Fluoranthene[e]	206-44-0	≤80	26-137	5	40	90
Hexachlorobenzene	118-74-1	≤319	D-152[d]	0.3	2.6	90
Hexachloroethane	67-72-1	≤44	40 – 113	5	40	90
Nitrobenzene	98-95-3	≤72	35 – 180	5	40	90
Pentachlorophenol	87-86-5	≤128	14 – 176	5	40	90
Phenol[e]	108-95-2	≤55	5-112	5	40	90
Pyridine[c]	110-86-1	≤50	25-115	5	40	90

a. Applies to laboratory control samples, and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

b. TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20

c. Can also be analyzed as a VOC

d. Detected; result must be greater than zero

e. Site-specific target analyte

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent Recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kg)
PRQL = Program required quantitation limit; calculated from the TC level for nitrobenzene assuming a 100 g sample, 0.5 gal (2 L) of extraction fluid, and 100% analyte extraction (mg/kg)

Table C3-7. Summary of Laboratory Quality Control Samples and Frequencies for Semi-Volatile Organic Compounds Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action [a]
Method Performance Samples	Seven samples initially and four semiannually	Meet Table C3-6 QAOs	Repeat until acceptable
Laboratory duplicate[b]	One per analytical batch	Meet Table C3-6 Precision QAOs	Nonconformance if RPDs > values in Table C3-6
Laboratory blanks	One per analytical batch	Analyte concentrations ≤ 3 × MDLs	Nonconformance if analyte concentrations > 3 × MDLs
Matrix spikes	One per analytical batch	Meet Table C3-6 accuracy QAOs	Nonconformance if RPDs >values and %Rs outside the range specified in Table C3-6.
GC/MS Calibration	Decafluorotriphenylphosphine (DFTPP) Tune every 12 hours 5-pt. Initial Calibration initially, and as needed Continuing calibration every 12 hours	Abundance criteria met per method Calibrate per SW-846 Method requirements %RSD for CCC ≤ 30, %RSD for all other compound, ≤15% Average response factor (RRF) used if %RSD ≤15, use linear regression if >15; R or R^2 ≥ 0.990 if using alternative curve SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 %D ≤ 20 for CCC SPCC minimum RRF per SW-846 Method; RRF for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50 % and <200% of last daily calibration	Repeat until acceptable
Gas Chromatography/Electron Capture Detection (GC/ECD) Calibration	5-pt. Initial Calibration initially and as needed	Correlation coefficient ≥ 0.990 or %RSD < 20 for all analytes	Repeat until acceptable
	Continuing calibration every 12 hours	%D or %Drift for all analytes ≤ 15 of expected values RT ± 3 standard deviations from initial RT calibration per applicable SW-846 method	Repeat until acceptable
Matrix spikes duplicates	One per analytical batch	Meet Table C3-6 accuracy and precision QAOs	Nonconformance if RPDs > values and %Rs outside the ranges specified in Table C3-6.
Laboratory control samples	One per analytical batch	Meet Table C3-6 accuracy QAOs	Nonconformance if %R <80 or >120
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ± 3 standard deviations	Nonconformance if %R is less than (average %R-3 standard deviations) or greater than (average %R+3 standard deviations).
Blind-audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective Action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedences.
b. May be satisfied using matrix spike duplicate; acceptance criteria apply only to concentrations greater than the PRQLs in Table C3-6.

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance demonstration program
%R = Percent recovery
RPD = Relative percent difference

Table C3-8. Metals Target Analyte List and Quality Assurance Objectives

Analyte	CAS Number	Precision (% RSD OR RPD)[a]	Accuracy (%R)[b]	PRDL[c] (µg/L)	PRQL[d] (mg/kg)	Completeness (%)
Antimony	7440-36-0	≤ 30	80-120	100	100	90
Arsenic	7440-38-2	≤ 30	80-120	100	100	90
Barium	7440-39-3	≤ 30	80-120	2000	2000	90
Beryllium	7440-41-7	≤ 30	80-120	100	100	90
Cadmium	7440-43-9	≤ 30	80-120	20	20	90
Chromium	7440-47-3	≤ 30	80-120	100	100	90
Lead	7439-92-1	≤ 30	80-120	100	100	90
Mercury	7439-97-6	≤ 30	80-120	4.0	4.0	90
Nickel	7440-02-0	≤ 30	80-120	100	100	90
Selenium	7782-49-2	≤ 30	80-120	20	20	90
Silver	7440-22-4	≤ 30	80-120	100	100	90
Thallium	7440-28-0	≤ 30	80-120	100	100	90
Vanadium	7440-62-2	≤ 30	80-120	100	100	90
Zinc	7440-66-6	≤ 30	80-120	100	100	90

a. ≤ 30 % control limits apply when sample and duplicate concentrations are ≥ 10 × IDL for ICP AES and AA techniques and ≥ 100 × IDL for Inductively Coupled Plasma – Mass Spectometry (ICP-MS) techniques. If less than these limits, the absolute difference between the two values shall be less than or equal to the PRQL.

b. Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material that has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

c. PRDL set such that it is a factor of 10 below the PRQL for 100% solid samples, assuming a 100 × dilution during digestion.

d. TCLP PRQL values are responded in units of mg/l and limits are reduced by a factor of 20.

CAS = Chemical abstract service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
PRDL = Program required detection limit (i.e., maximum permissible value for IDL) (micrograms per liter)
PRQL = Program required quantitation limit (milligrams per kg)

Table C3-9. Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis

QC Samples	Minimum Frequency	Acceptance criteria	Corrective Actions [a]
Method performance samples	Seven (7) samples initially, and four (4) semiannually	Meet Table C3-8 QAOs	Repeat until acceptable
Laboratory blanks	One (1) per analytical batch	≤ 3 × IDL (≤ 5 × IDL for ICP-MS)[b]	Redigest and reanalyze any samples with analyte concentrations which are ≤ 10 × blank value and ≥ 0.5 × PRQL
Matrix spikes	One (1) per analytical batch	Meet Table C3-8 accuracy QAOs	Nonconformance if %R outside the range specified in Table C3-8.
Matrix spike duplicates	One (1) per analytical batch	Meet Table C3-8 accuracy and precision QAOs.	Nonconformance if RPDs > values and %Rs outside range specified in Table C3-8
ICP-MS Tune (ICP-MS Only)	Daily	4 Replicate %RSD ≤ 5 mass calibration within 0.9 amu; resolution < 1.0 amu full width at 10% peak height	Nonconformance if %RSD >5; mass calibrations > 0.9 amu; resolution >1.0 amu.
Initial Calibration 1 blank, 1 standard (ICP, ICP-MS), 3 standard, 1 blank (GFAA, FLAA), 5 standard, 1 blank (CVAA, HAA)	Daily	90-110 %R (80-120% for CVAA, GFAA, HAA, FLAA) for ICV solution. Regression coefficient (r) ≥ 0.995 for FLAA, CVA, GFAA, MAA	Correct problem and recalibrate; repeat initial calibration
Continuing calibration	Every 10 samples and beginning and end of run	90-110 % for continuing calibration verification solution. (80-120% for CVAA, GFAA, HAA, FLAA)	Correct problem and recalibrate; rerun last 10 samples
Serial dilution (ICP, ICP-MS)	One per analytical batch	5 × dilution must be ≤ 10 % D of initial value for sample > 50 × IDL	Flag Data if >10% and > 50 × IDL
Internal Standard Area Verification (ICP-MS)	Every Sample	Meet SW-846 Method 6020 criteria	Nonconformance if not reanalyzed at 5 × dilution until criteria are meet.
Interference Correction Verification (ICP, ICP-MS)	Beginning and end of run or every 12 hours (8 for ICP) whichever is more frequent	80-120% recovery for analytes NOTE: *Acceptance Criteria and Corrective Action apply only if interferents found in samples at levels greater than interference check standards (ICS) A Solution.*	Correct problem and recalibrate, nonconformance if not corrected

Table C3-9. (continued)

QC Samples	Minimum Frequency	Acceptance criteria	Corrective Actions [a]
Laboratory Control Samples	One (1) per analytical batch	Table C3-8 accuracy QAOs	Redigest and reanalyze for affected analytes; nonconformance if not reanalyzed
Blind-audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

a. Corrective action per Section C3-13 when final reported QC samples do not meet acceptance criteria. Nonconformance do not apply to matrix related exceedences.

b. Applies only to concentrations greater than the PRQLs listed in Table C3-8

IDL = Instrument Detection Limit
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference

Table C3-10. Minimum Training and Qualification

Personnel	Requirements[a]
Radiography Operators[c]	Site-specific training based on waste matrix codes and waste material parameters; requalification every two years.
GC Technical Supervisors[b] GC Operators[c]	B.S. or equivalent experience and six months previous applicable experience.
Gas Chromatography/Mass Spectrometry Operators[c] Mass Spectrometry Operators[c]	B.S. or equivalent experience and one year independent spectral interpretation or demonstrated expertise.
GC/MS Technical Supervisor[b] Mass Spectrometry Technical Supervisor[b] Atomic Absorption Spectroscopy Technical Supervisors[b] Atomic Absorption Spectroscopy Operators[c] Atomic Mass Spectroscopy Operators[c] Atomic Emission Spectroscopy Operators[c]	BS or equivalent experience and 1 year applicable experience
Atomic Mass Spectroscopy Technical Supervisor[b]	B. S. and specialized training in Atomic Mass Spectroscopy and two years applicable experience.
Atomic Emission Spectroscopy Technical Supervisors[b]	B. S. and specialized training in Atomic Emission Spectroscopy and two years applicable experience.

a. Based on requirements contained in US EPA Contract Laboratory Program Statement of Work for Organics Analysis (Document Number OLM 01.0) and Statement of Work for Inorganics Analysis (Document Number ILM 03.0).

b. Technical Supervisors are those persons responsible for the overall technical operation and development of a specific laboratory technique.

c. Operators are those persons responsible for the actual operation of analytical equipment.

Table C3-11.Testing Batch Data Report Contents

Required Information	Radiography	Visual Examination	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Waste container number	X	X	
Waste stream name and/or number	O	O	
Waste Matrix Code	X	X	Summary Category Group included in waste matrix code
Implementing procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container type	O	O	Drums, Standard Waste Box, Ten Drum Overpack, etc.
Video media reference	X	X	Reference to Video media applicable to each container. For visual examination of newly generated waste, video media not required if two trained operators review the contents of the waste container to ensure correct reporting.
Imaging check	O		
Camera check		O	
Audio check	O	O	
QC documentation	X	X	
Verification that the physical form matches the waste stream description and Waste Matrix Code.	X	X	Summary Category Group included in Waste Matrix Code.
Comments	X	X	Comments
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Verify absence of prohibited items	X	X	
Operator signature and date of test	X	X	2 signatures required for Visual Verification of Acceptable Knowledge
Data review checklists	X	X	All data checklists will be identified

Legend:

X – Required in batch data report
O – Information must be documented and traceable inclusion in batch data report is optional

Table C3-12.Sampling Batch Data Report Contents

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Waste stream name and/or number	O	O	
Waste Matrix Code		X	Summary Category Group included in Waste Matrix Code
Procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container number	X	X	
Container type	O	O	Drums, Standard Waste Box, Ten Drum Overpack, etc.
Sample matrix and type	X	X	
Analyses requested and laboratory	X	X	
Point of origin for sampling	X	X	Location where sample was taken (e.g., building number, room)
Sample number	X	X	
Sample Size	X	X	
Sample location	X	X	Location within container where sample is taken. (For HSG, specify what layer of confinement was sampled. For solids, physical location within container.)
Sample preservation	X	X	
Person collecting sample	X	X	
Person attaching custody seal	O	O	May or may not be the same as the person collecting the sample
Chain of Custody record	X	X	Original or copy is allowed
Sampling equipment numbers	X	X	For disposable equipment, a reference to the lot
Drum age	X		Must include all supporting determinative information, including but not limited to packaging date, equilibrium start time, storage temperature, and sampling date/time. If Scenario 3 is used, the packaging configuration, filter diffusivity, liner presence/absence, and rigid liner vent hole diameter used in determining the DAC must be documented. If Scenario 1 and 2 are used together, the filter diffusivity and rigid liner vent hole diameter used in determining the DAC must be documented. If default values are used for retrievably stored waste, these values must clearly be identified as such.
Cross-reference of sampling equipment numbers with associated cleaning batch numbers	O	X	As applicable to the equipment used for the sampling. For disposable equipment, a reference to the lot and procurement records to support cleanliness is sufficient
Equilibration time	X		
Verification of rigid liner venting	X		Only applicable to containers with rigid liners
Verification that sample volume taken is small in comparison to the available volume	X		Must include headspace gas volume when it can be estimated
Scale Calibration		O	
Depth of waste		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.

Table C3-12. (continued)

Required Information	Headspace Gas	Solid Sampling	Comment
Calculation of core recovery		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Co-located core description		X	For newly generated waste, if a sampling method other than coring is used, this is replaced by documentation that a QC sample has been taken.
Time between coring and subsampling		X	Only applicable to coring.
OVA calibration and reading	O		Only applicable to manifold systems. Must be done in accordance with manufacturer's specifications
Field Records	X	X	Must contain the following as applicable to the sampling method used: Collection problems, Sequence of sampling collection, Inspection of the solids sampling area, Inspection of the solids sampling equipment, Coring tool test, random location of sub-sample, canister pressure, and ambient temperature and pressure.
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator Signature and date and time of sampling	X	X	
Data review checklists	X	X	All data reviews checklists will be identified.

LEGEND:

X – Required in Batch Data Report.
O – Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-13.Analytical Batch Data Report Contents

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Sample numbers	X	X	
QC designation for sample	X	X	
Implementing procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
QC sample results	X	X	
Sample data forms	X	X	Form should contain reduced data for target analytes and TICs
Chain of custody	X	X	Original or copy
Gas canister tags	X		Original or copy
Sample preservation	X	X	
Holding time		X	
Cross-reference of field numbers to laboratory sample numbers	X	X	
Date and time analyzed	X	X	
Verification of spectra used for results	O	O	Analyst must qualitatively evaluate the validity of the results based on the spectra, can be implemented as a check box for each sample
TIC evaluation	X	X	
Reporting flags, if any	X	X	Table C3-14 lists applicable flags
Report narrative	X	X	
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator signature and analysis date	X	X	
Data review checklists	X	X	All data review checklists will be identified

LEGEND:

X – Required in Batch Data Report.
O – Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-14.Data Reporting Flags

Data Flag	Indicator
B	Analyte detected in blank (Organics/Headspace gases)
B	Analyte blank concentration greater than or equal to 20 percent of sample concentration prior to dilution corrections (Metals)
E	Analyte exceeds calibration curve (Organics/Headspace gases)
J	Analyte less than PRQL but greater than or equal to MDL (Organics/Headspace gases)
J	Analyte greater than or equal to IDL but less than 5 times the IDL before dilution correction (Metals)
U	Analyte was not detected and value is reported as the MDL (IDL for Metals)
D	Analyte was quantitated from a secondary dilution, or reduced sample aliquot (Organics/Headspace gases)
Z	One or more QC samples do not meet acceptance criteria
H	Holding time exceeded

Attachment C4.
TRU Waste Characterization Using Acceptable Knowledge

C4-1 Introduction

The RCRA regulations codified in 40 CFR Parts 260 through 265, 268, and 270, and the New Mexico Hazardous Waste Management Regulations in 20 NMAC 4.1 Subparts 100 through 600, Subpart 800, and Subpart 900, authorize the use of AK in appropriate circumstances by waste generators, or treatment, storage, or disposal facilities to characterize hazardous waste. AK is described in Waste Analysis: *EPA Guidance Manual for Facilities That Generate, Treat, Store and Dispose of Hazardous Waste*. AK, as an alternative to sampling and analysis, can be used to meet all or part of the waste characterization requirements under the RCRA.

EPA's 1994 Waste Analysis Guidance Manual broadly defines the term "acceptable knowledge" to include process knowledge, whereby detailed information on the waste is obtained from existing published or documented waste analysis data or studies conducted on hazardous waste generated by processes similar to that which generated the waste, facility records of analysis performed before the effective date of RCRA, and waste analysis data obtained from generators of similar waste that send their wastes off-site for treatment, storage, or disposal (EPA, 1994). If AMWTP determines that AK alone is insufficient to accurately characterize a waste, AMWTP may use RTR and/or VE, headspace gas sampling and analysis, and homogeneous waste sampling and analysis (specified in Attachment C1) to complete the waste characterization process and satisfy the requirements of the QAPjP. AK is used in TRU mixed waste characterization activities in five ways:

- To delineate TRU mixed waste streams
- To assess whether TRU mixed wastes comply with the applicable requirements of WIPP Hazardous Waste Permit TSDF-WAC
- To assess whether TRU mixed wastes exhibit a hazardous characteristic (20 NMAC 4.1.200, incorporating 40 CFR §261, Subpart C).
- To assess whether TRU mixed wastes are listed (20 NMAC 4.1.200, incorporating 40 CFR §261, Subpart D).
- To estimate waste material parameter weights.

Sampling and analysis may be performed to augment the characterization of wastes based on AK when an AK Sufficiency Determination has not been requested by AMWTP or, if requested, has not been granted by CBFO (see Section C4-3d). Sampling and analysis consists of RTR, VE, headspace gas, and homogeneous waste sampling and analysis. TRU mixed waste streams undergo applicable provisions of the AK process prior to management, storage, or disposal of the waste at WIPP.

C4-2 Acceptable Knowledge Documentation

The AMWTP AK information is presented in a logical sequence which progresses from general facility information (TRU mixed waste management program information) to the more detailed waste-specific information (TRU mixed waste stream information). Traceability of AK information for a selected container in the audited Waste Summary Category Group(s) will be examined during the CBFO audit of AMWTP. The consistent presentation of AK documentation among sites in auditable records[d] will allow the CBFO to verify the completeness and adequacy of AK for TRU mixed waste characterization during the audit process. AMWTP will implement the AK process as specified in this QAPjP to characterize TRU mixed waste and obtain sufficient waste characterization data to demonstrate compliance with the WIPP-WAP. This AK information applies at AMWTP to both the retrievably stored and newly generated waste streams. The AK process is described in MP-TRUW-8.13. The AMWTP does not develop AK baseline documents for off-site DOE CH-TRU wastes that are characterized and certified by another certified program, such as the Central Characterization Project (CCP). AMWTP also does not develop AK baseline documents for waste that is received for characterization only.

The following sections include the information required to characterize TRU mixed waste using AK. The AMWTP will augment the required AK records with additional supporting information. If the required information is not available for a particular waste, the waste stream is not eligible for an AK Sufficiency Determination as specified in Section C4-3d.

C4-2a Required TRU Mixed Waste Management Program Information

TRU mixed waste management program information clearly defines waste categorization schemes and terminology, provides a breakdown of the types and quantities of TRU mixed waste that are generated and stored at the AMWTP, and describes how waste is tracked and managed at the AMWTP, including historical and current operations. Information related to TRU mixed waste certification procedures and the types of documentation (e.g., waste profile forms) used to summarize AK is also provided.

[d] "Auditable Records" are those records which allow the CBFO to conduct a systematic assessment, analysis, and evaluation of the CBFO compliance with the WAP and the WIPP RCRA Permit.

The AMWTP will be involved in characterizing stored waste generated at multiple facilities and creating newly generated TRU mixed waste in the AMWTP processing facility. For each generator of waste the following general facility information shall be included as part of the AK written record:

- A map of the site with the areas and facilities involved in TRU mixed waste generation, treatment, and storage identified.
- Facility mission description as related to TRU mixed waste generation and management (e.g., nuclear weapons research may involve metallurgy, radiochemistry, and nuclear physics operations that result in specific waste streams).
- Description of the operations that generated TRU mixed waste at the site (e.g., plutonium recovery, weapons design, or weapons fabrication).
- Waste identification and category schemes used at the site (e.g., item description code (IDC), content codes).
- Types and quantities of TRU mixed waste generated, including historical generation through future projections.
- Correlation of waste streams generated for the same building and process, as appropriate (e.g., sludge, combustibles, metals, and glass).
- Waste certification procedures for retrievably stored and newly generated wastes to be sent to the WIPP facility.

C4-2b Required TRU Mixed Waste Stream Information

AK will be used to delineate waste streams. For each TRU mixed waste stream, the AMWTP compiles all process information and data that support the AK used to characterize that waste stream. The type and quantity of supporting documentation varies by waste stream depending on the process generation the waste and the site-specific requirements. At a minimum, the waste process information on each waste stream includes the following written information:

- Area(s) and building(s) from which the waste stream was or is generated.
- The waste stream volume and period of waste generation (e.g., 100 SWBs of retrievable stored waste generated from June 1977 through December 1977).
- Waste generating process for each building (e.g., batch waste stream generated during decommissioning operations of glove boxes), including processes associated with U134 waste generation, if applicable.

- Documentation regarding how the site has historically managed the waste, including the historical regulatory status of the waste (i.e., TRU mixed versus TRU non-mixed waste)

- Process flow diagrams (e.g., a diagram illustrating glove boxes from a specific building to a size reduction facility to a container storage area). In the case of research/development, analytical laboratory waste, or other similar processes where a process flow diagram cannot be created, a description of the waste generating process, rather than a formal process flow diagram, may be included if this modification is justified and the justification placed in the auditable record.

- Material inputs or other information that identifies the chemical content of the waste stream and the physical waste form (e.g., glove box materials and chemicals handled during glove box operations; events or processes that may have modified the chemical or physical properties of the waste stream after generation, data obtained through VE of newly generated waste that later undergoes RTR; information demonstrating neutralization of U134 [hydrofluoric acid] and waste compatibility).

The AK written record includes a summary that identifies all sources of waste characterization information used to delineate the waste stream. The basis and rationale for delineating each waste stream, based on the parameters of interest, is clearly summarized and traceable to referenced documents. Assumptions made in delineating each waste stream also are identified and justified.

If discrepancies exist between required information, the AMWTP may consider applying all EPA HWNs indicated by the information to the subject waste stream, but must assess and evaluate the information to determine the appropriate EPA HWNs consistent with RCRA requirements. Discrepancy resolution for the AK is described in MP-TRUW-8.13.

CBFO will obtain, at a minimum, procedures that comply with the following AK requirements:

- Procedures for identifying and assigning the physical waste form of the waste.

- Procedures for delineating waste streams and assigning Waste Matrix Codes.

- Procedures for resolving inconsistencies in AK documentation.

- Procedures for headspace gas sampling and analysis, VE and/or RTR, and homogeneous waste sampling and analysis, if applicable.

- For newly generated waste, procedures describing process controls used to ensure prohibited items (specified in the WIPP-WAP, Permit Attachment C) are documented and managed.

- Procedures to ensure RTR and VE include a list of prohibited items that the operator shall verify are not present in each container (e.g., liquid exceeding WIPP Hazardous Waste Permit TSDF-WAC limits, corrosives, ignitable, reactives, and incompatible wastes).

- Procedures to document how changes to Waste Matrix Codes, waste stream assignment, and associated EPA HWNs based on material composition are documented for any waste.

- Procedures that ensure the assignment of EPA HWNs is appropriate, consistent with RCRA requirements, and considers site historical waste management.

- Procedures for estimating waste material parameter weights.

C4-2c Additional Acceptable Knowledge Documentation

Additional AK information, as appropriate, is collected to augment required information and provide any other information obtained to further delineate waste streams. Adequacy of this information is assessed during audits (Section C4-3g). This information is included in the AK written record.

All additional specific, relevant AK documentation assembled and used in the AK process, whether it supports or contradicts any required AK documentation shall be identified and an explanation provided for its use (e.g., identification of a TC). Additional documentation may be used to further document the rationale for the hazardous characterization results. The collection and use of additional information shall be assessed during site audits to ensure that hazardous waste characterization is supported, as necessary, by such information. Similar to required information, if discrepancies exist between additional information and the required information, then the AMWTP may consider applying all EPA HWNs indicated by the additional information to the subject waste stream, but must assess and evaluate the information to determine the appropriate EPA HWNs consistent with RCRA requirements. All information considered must be documented and placed in the auditable record, including applicable discrepancy resolution documentation. Discrepancy resolution for the AK is described in MP-TRUW-8.13.

Additional AK documentation includes, but is not limited to, the following information:

- Process design documents (e.g., Title II Design).

- Standard operating procedures that may include a list of raw materials or reagents, a description of the process or experiment generating the waste, and a description of waste generated and how the wastes are managed at the point of generation.

- Preliminary and final safety analysis reports and technical safety requirements.

- Waste packaging records.

- Test plans or research project reports that describe reagents and other raw materials used in experiments.
- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).
- Information from site personnel (e.g., documented interviews).
- Standard industry documents (e.g., vendor information).
- Analytical data relevant to the waste stream, including results from fingerprint analyses, spot checks, routine verification sampling, or other processes that collect information pertinent to the waste stream. This may also include new information which augments required information (e.g., VE not performed in compliance with the WIPP-WAP, radiography screening for prohibited items).
- Material Safety Data Sheets (MSDSs), product labels, or other product package information.
- Sampling and analysis data from comparable or surrogate waste streams (e.g., equivalent nonradioactive materials).
- Laboratory notebooks that detail the research processes and raw materials used in an experiment.

C4-3 Acceptable Knowledge Training, Procedures, and Other Requirements

Consistency in using AK information to characterize TRU mixed waste is provided by use of the following: (1) compiling the required and additional AK documentation in an auditable record, (2) auditing AK records, and (3) WSPF approval and waste confirmation. This section specifies the qualification and training requirements, describes each phase of the process, specifies the procedures that AMWTP is required to develop to implement the requirements for using AK, and specifies the data quality requirements for AK.

C4-3a Qualifications and Training Requirements

To ensure compliance with the requirements for compiling assembling, evaluating, assessing and resolving discrepancies associated with AK, AMWTP AK personnel shall be trained in accordance with MP-RTQP-14.4.

The training requirements shall include the following subjects:

- WIPP-WAP in Permit Attachment C and the WIPP Hazardous Waste Permit TSDF-WAC specified in this QAPjP.

- State and Federal RCRA regulations associated with solid and hazardous waste characterization.
- Discrepancy resolution and reporting processes.
- Site-specific procedures associated with waste characterization using AK.

C4-3b Acceptable Knowledge Assembly and Compilation

Site-specific AK procedures address the following:

- A written procedure(s) outlining the specific methodology used to assemble AK records, including the origin of the documentation, how it will be used, and any limitations associated with the information (e.g., identify the purpose and scope of a study that included limited sampling and analysis data).
- A written procedure(s) to compile the required AK record.
- A written procedure(s) that ensures unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU mixed waste populations sent to WIPP.
- A written procedure(s) to evaluate AK and resolve discrepancies. For example, if different sources of information indicate different hazardous wastes are present, then AMWTP includes all sources of information in its records and may choose to either conservatively assign EPA HWNs or assign only those numbers deemed appropriate and consistent with RCRA requirements. All information used to justify assignment of EPA HWNs must be placed in the auditable record. Further, the assignment of EPA HWNs is tracked in the auditable record to all required documentation.
- A written procedure(s) to identify hazardous wastes and assign the appropriate EPA HWNs to each waste stream. The following are minimum baseline requirements/standards that site-specific procedures include to ensure comparable and consistent characterization of hazardous waste:
  - Compilation of all of the required information in an auditable record.
  - Review of the compiled information and delineate waste streams. Delineation of waste streams must comply with the definition in Section C-0a and justify combining waste historically managed separately as TRU mixed and TRU non-mixed waste streams into a single waste stream.
  - Review of the compiled information to determine if the waste stream is compliant with the WIPP Hazardous Waste Permit TSDF-WAC.

- Review of the required information to determine if the waste is listed under 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart D. All listed EPA HWNs are assigned unless AMWTP chooses to justify an alternative assignment and document the justification in the auditable record.

- Review of the required information to determine if the waste exhibits a hazardous characteristic or may contain hazardous constituents included in the TCs specified in 20 NMAC 4.1.200 (incorporating 40 CFR §261), Subpart C. If a TC contaminant is identified and is not included as a listed waste, the AMWTP may evaluate available data and assign TC HWN consistent with RCRA requirements. All data examined to reach the HWN determination must be placed in the auditable record and must present a clear justification for the EPA HWN analyses.

- Review the compiled information to provide an estimate of material parameter weights for each container to be stored or disposed of at WIPP.

For newly generated wastes, procedures are implemented to characterize hazardous waste using AK prior to packaging the waste.

- Ensure that results of audits of the TRU mixed waste characterization programs at the site are available in the records.

- AMWTP will identify all process controls (implemented to ensure that the waste contains no prohibited items and to control hazardous waste content and/or physical form) that may have been applied to retrievably stored waste and/or may presently be applied to newly generated waste. Process controls are applied at the time of waste generation/packaging to control waste content, whereas any activities performed after waste generation/packaging to identify prohibited items, hazardous waste content, or physical form are waste characterization activities, not process controls. The AK record must contain specific process controls and supporting documentation identifying when these process controls are used to control waste content. See Section C-2 for programmatic requirements related to process controls.

C4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream

MP-TRUW-8.13 provides an overview of the process for assembling AK documentation into an auditable record. The first step is to assemble all of the required AK information and any additional information regarding the materials and processes that generate a specific waste stream.

Procedures are implemented to establish AK records in compliance with the following criteria:

- AK information is compiled in an auditable record, including a road map for all applicable information.

- The overview of the facility and TRU mixed waste management operations in the context of the facility's mission is correlated to specific waste stream information.

- The method for documenting correlations between waste streams, with regard to time of generation, waste generating processes, and site-specific facilities are described in MP-TRUW-8.13. For newly generated waste, the rate (or schedule) and quantity of waste to be generated will be defined.

- A reference list shall be provided that identifies documents, databases, QA protocols, and other sources of information that support the AK information.

Container inventories for TRU mixed waste currently in retrievable storage can be found in the WTS. These container inventories will be delineated into waste streams by correlating the container identification to all of the required AK information and any additional AK information.

C4-3d AK Sufficiency Determination Request Contents

AMWTP may submit an AK Sufficiency Determination Request to meet all or part of the waste characterization requirements. The Determination Request shall include, at a minimum:

- Identification of the scenario for which the approval is sought (Section C-0b)
- A complete AK Summary that addresses the following technical requirements:
  - Executive Summary;
  - Waste Stream Identification Summary; including a demonstration that the waste stream has been properly delineated and meets the QAPjP definition of waste stream (Attachment C, Introduction);
  - Mandatory Program Information (including, but not limited to, facility location and description, mission, defense waste assessment, spent nuclear fuel and high-level waste assessment, description of waste generating processes, research/development [as necessary], facility support operations [as applicable], types and quantities of TRU waste generated, correlation of waste streams to buildings/processes, waste identification and categorization, physical form identifiers);
  - Mandatory Waste Stream Information (including, but not limited to, Area and Building of Generation, waste stream volume/period of generation (including, for newly generated waste, the rate and quantity of waste to be generated), waste generating activities, types of waste generated, material input related to physical form and identification of percentage of each waste material parameter in the waste stream, chemical content

information including hazardous constituents and hazardous waste identification, prohibited item content (including documented evidence that the waste meets the WIPP Hazardous Waste Permit TSDF-WAC Sections 2.3.3.1 through 2.3.3.10), waste packaging, presence of filter vents, number of layers of confinement);

- Types of additional information gathered;
- Container specific data (if available and relevant); and
- A complete reference list including all mandatory and additional information

- An AK roadmap (defined as a cross reference between mandatory programmatic and mandatory waste stream information, with references supporting these requirements)
- A complete reference list including all mandatory and additional documentation.
- Additional relevant information for the required programmatic and waste stream data addressed in the AK Summary, examples of which are presented in Section C4-2c.
- Identification of any mandatory requirements supported only by upper tier documents (i.e., there is insufficient supporting data).
- Description or other means of demonstrating that the AK process described in the QAPjP was followed (for example, AK personnel were appropriately trained; discrepancies were documented, etc).
- Information showing that the AMWTP has developed a written procedure for compiling the AK information and assigning EPA HWNs as required in Section C4-3b;
- Information showing that the AMWTP has assessed the AK process (e.g. internal audits, Section C4-3b).

The CBFO will evaluate the Determination Request for completeness and technical adequacy as specified in Attachment C.

C4-3e Requirements for Re-Evaluating AK Information

AK includes information regarding the physical form of the waste, the base materials composing the waste, and the process that generates the waste. Waste characterization sampling and analysis (i.e., RTR or VE, headspace-gas sampling and analysis, and homogeneous waste sampling and analysis) may be used to augment AK information.

The WSPF and CIS (including the AK summary) will be reviewed for each waste stream prior to CBFO approval of the WSPF. The CBFO review will ensure that the submitted AK information was collected under procedures that ensure implementation of the QAPjP, provides data

sufficient to meet the DQOs in Section C-4a(1), and allow the AMWTP to demonstrate compliance with the waste analysis requirements of the QAPjP. A detailed discussion of the CBFO's waste stream review and approval process is provided in Section C-1d.

The AMWTP has established procedures for reevaluating AK if the results of waste confirmation indicate that the waste to be shipped does not match the approved waste stream, or if data obtained from RTR or VE for waste streams without an AK Sufficiency Determination exhibit this discrepancy. These procedures describe how the waste is reassigned, AK reevaluated, and appropriate EPA HWNs assigned. If the reevaluation requires that the Waste Matrix Code be changed for the waste stream or the waste does not match the approved waste stream, the following minimum steps are taken to reevaluate AK. This process is implemented in MP-TRUW-8.13.

- Review existing information based on the container identification number and document all differences in EPA HWN assignments.
- If differences exist in the EPA HWNs that were assigned, reassess and document all required AK information (Section C4-3b) associated with the new designation.
- Reassess and document all sampling and analytical data associated with the waste.
- Verify and document that the reassigned Waste Matrix Code was generated within the specified time period, area and buildings, waste generating process, and that the process material inputs are consistent with the waste material parameter identified during RTR or VE.
- All changes to AK records are recorded.
- If discrepancies exist in the AK information for the revised Waste Matrix Code, the segregation of the affected portion of the waste stream is documented, and the actions necessary to fully characterize the waste are defined.

The base materials that compose TRU heterogeneous debris (S5000) waste (e.g., lead, stainless steel, and glass) are well established and potential TCs can be determined without destructive sampling and analysis based on AK. The AMWTP will assign a Waste Matrix Code and waste stream to each container of waste using AK. The AMWTP will assign the TC HWN consistent with RCRA requirements. If a TC underlying hazardous constituent is identified during AK, the potential assignment of an EPA HWN must be evaluated and the results placed in the AK record. Procedures describe how additions to EPA HWNs based on material composition are documented, as necessary (refer to Section C4-3b).

The AMWTP uses AK to identify spent solvents associated with each TRU mixed waste stream or waste stream lot. Headspace gas data is then used to resolve the assignment of EPA F-listed HWNs to debris waste streams when waste streams do not have an AK Sufficiency Determination approved by the CBFO. AMWTP will assign F-listed HWNs (20 NMAC 4.1.200, incorporating 40 CFR §261.31) by evaluating the average concentrations of each VOC detected in container headspace gas for each waste stream or waste stream lot using the UCL_{90}.

The UCL_{90} for the mean concentration is compared to the PRQL for the constituent. If the UCL_{90} for the mean concentration exceeds the PRQL, the AK information is reevaluated and the potential source of the solvents is determined. Documentation is provided to support any determination that F-listed organic constituents are associated with packaging materials, radioanalysis, or other uses not consistent with solvent use. If the source of the detected F-listed solvents cannot be identified, the appropriate spent solvent EPA HWN is conservatively applied to the waste stream. In the case of applicable TC VOCs and non-toxic F003 constituents, AMWTP may assess whether the head space gas concentration would render the waste non-hazardous for those characteristic and change the initial AK determination accordingly. This process is described by MP-TRUW-8.11 and MP-TRUW-8.13.

EPA hazardous wastes numbers associated with S3000 and S4000 waste streams is assigned based on the results of the Total/TCLP analysis of a representative homogeneous waste sample when waste streams do not have an AK Sufficiency Determination approved by CBFO. If the Total or TCLP results indicate that the concentration of a characteristic waste or non-toxic constituent of an F003 waste is below regulatory levels, the EPA HWN assigned initially by AK may be changed. If an F-listed waste constituent is detected the appropriate EPA HWN is applied.

If the site determines that the source of the F-listed constituent is a spent solvent used in the process or is determined to be the result of mixing a listed waste with a solid waste during waste packaging, or applicable TC constituents or non-toxic F003 wastes are present in excess of regulatory levels, then the AMWTP will either: (1) assign the applicable listed EPA HWN to the entire waste stream, or (2) segregate the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable EPA HWNs. The AMWTP documents, justifies, and consistently delineates waste streams and assign EPA HWNs as required in this QAPjP, and must consider all generator-specific waste streams and EPA HWN assignments. The AMWTP must also consider site-specific permit requirements and other state-enforced agreements in this analysis.

To determine the mean concentration of solvent VOCs, all headspace gas data or homogeneous waste data for a waste stream or waste stream lot (i.e., the portion of the waste stream that is characterized as a unit) are used, including data qualified with a 'J' flag (i.e., less than the PRQL but greater than the MDL) or qualified with a 'U' flag (i.e., undetected). For data qualified with a U flag, one-half the MDL is used in calculating the mean concentration. Because listed wastes are not defined based on concentration, the AMWTP will not remove listed EPA HWNs assigned using AK if listed hazardous constituents are not detected in the headspace gas or solids/soil analysis.

TRU mixed headspace gases and homogeneous waste matrices may contain one or two constituents (e.g., carbon tetrachloride and 1,1,1-trichloroethane) at concentrations that are orders of magnitude higher than the other target analytes. In these cases, samples shall be diluted to remain within the instrument calibration range for the elevated constituents. Sample dilution results in elevated MDLs for the constituents with elevated concentration. Only the concentrations of detected constituents will be used to calculate the mean for the purpose of assigning F-listed EPA HWNs. Because the presence or absence of F listed solvents can not be assigned based on the artificially high MDLs that are caused by sample dilution, data flagged as 'U' and showing an elevated MDL will not be used in calculating the mean concentration. The above process is described by MP-TRUW-8.11and MP-TRUW-8.13.

C4-3f Acceptable Knowledge Data Quality Requirements

The DQOs for sampling and analysis techniques are provided in Attachment C3. Analysis results are used to augment the characterization of wastes based on AK. To ensure that the AK process is consistently applied, the AMWTP complies with the data quality requirements for AK documentation described in Attachment C3.

The AMWTP addresses QC by tracking its performance with regard to the use of AK by: (1) assessing the frequency of inconsistencies among information, and (2) documenting the results of waste discrepancies identified by AMWTP during waste characterization or the CBFO during waste confirmation using RTR, review of RTR audio/video recordings, VE, or review of VE records. In addition, the AK process and waste stream documentation is evaluated through internal assessments by AMWTP QA organizations.

C4-3g Audits of Acceptable Knowledge

CBFO will conduct an initial audit prior to certifying AMWTP for shipment of TRU mixed waste to the WIPP facility. This initial audit will establish an approved baseline that will be reassessed annually. Those audits verify compliance with the WIPP-WAP, ensure the consistent compilation, application, and interpretation requirements of AK information throughout the DOE complex, and evaluate the completeness and defensibility of site-specific AK documentation related to hazardous waste determinations.

The QA organization performs a periodic independent audit, or several small scope audits, of AMWTP activities in accordance with MP-M&IA-17.2, *Independent Assessment*. QA AK audit checklists include the elements listed below for review during the periodic audit, and the AMWTP provides information as requested by QA to satisfy the AK audit/surveillance requirements:

- Documentation of the process used to compile, evaluate, and record AK is available and implemented.
- Personnel training and qualifications are documented.
- All of the required AK documentation specified in Section C4-2 has been compiled in an auditable record.
- All the required procedures specified in Section C4-3 have been developed and implemented, including but not limited to
  - A procedure exists for assigning EPA HWNs as referenced in Section C4-3b(5)
  - A procedure exists for resolving discrepancies in AK documentation in accordance with Section C4-3b.
- Results of other audits of the TRU mixed waste characterization programs at AMWTP are available in site records.

Attachment C5.
Quality Assurance Project Plan Requirements

C5-1 Quality Assurance Project Plans

The AMWTP has developed and implemented this QAPjP to address the applicable requirements specified in the WIPP-WAP. This QAPjP will be submitted and approved by the CBFO to ensure that it includes the qualitative or quantitative criteria to ensure that waste characterization activities are being performed satisfactorily.

The AMWTP uses standard operating procedures for all activities which affect the quality of the waste characterization program elements specified in this QAPjP. For the purposes of the QA program, the term *standard operating procedure* refers to any site-specific implementing document. Compliance with standard operating procedures ensures that tasks are performed in a consistent manner that results in achieving the quality required for the QA program. Throughout this QAPjP, site-specific documents are referenced that detail how each of the required elements of the characterization program are performed.

C5-2 Document Review, Approval, and Control

The preparation, issuance, and change to documents that specify quality requirements or prescribe activities affecting quality for the transuranic mixed characterization program elements specified in this QAPjP are controlled to ensure the correct and current documents are used and referenced. QAPjPs include a document control number consisting of a unique document identification number, current revision number, date, and page number which will be placed on the individual pages of the document. Qualified and independent individuals will review all quality documents for the waste characterization program prior to approval and issuance. There will be appropriate QAPjP approval that is indicated by a signature and date page included in the front of each document. AMWTP compliance with the WIPP-WAP requirements for document review, approval, and control is defined in Section 4 of MP-TRUW-8.1 and MP-DOCS-18.4. The CBFO approves this QAPjP and other program documents defining performance criteria or data quality.

Table C5-1. Minimum requirements for review, approval, implementation, and control of QAPjP.

	RESPONSIBLE PARTY				
	Manager, CBFO QA	CBFO Director National TRU Program	DOE-ID	AMWTP SPM	AMWTP QA Manager
Review/Approval	X	X	X	X	X
Implementation				X	X
Change Approval	X	X	X	X	X
Change Control				X	X

Table C5-1 presents the minimum requirements for review, approval, and implementation of the QAPjP. The QAPjP will be reviewed for technical adequacy, completeness, and correctness, and the inclusion of requirements established by the WIPP-WAP.

Revisions to documents that implement the requirements of the QAPjP will be denoted by including the current revision number on the document's title page, the revised signature page, and each page that has been revised. Only revised pages need to be reissued although the entire document may be reissued. Changes to documents, other than those defined as editorial changes or minor changes, will be reviewed and approved by the same functional organizations that performed the original review and approval, unless other organizations are specifically designated in accordance with approved procedures. Editorial or minor changes may be made without the same level of review and approval as the original or otherwise changed document. The following items are considered editorial or minor changes:

- Correcting grammar or spelling (the meaning has not changed)
- Renumbering sections or attachments
- Updating organizational titles
- Changes to nonquality-affecting schedules
- Revised or reformatted forms, providing the original intent of the form has not been altered
- Attachments marked "Example," "Sample," or exhibits that are clearly intended to be representative only.

A change in an organizational title accompanied by a change in the responsibilities is not considered an editorial change. Changes to the text shall be clearly indicated in the document. AMWTP shall provide CBFO with the final issued QAPjP.

CBFO ensures that QAPjPs include a detailed description of the reporting and approval requirements for changes to approved QA document and SOPs, including procedures for implementing changes to these documents. All members of the AMWTP site project staff are responsible for reporting any obsolete or superseded information to the SPM. All site-specific changes are evaluated and approved by the AMWTP SPM and QA Manager before implementation. The SPM notifies the appropriate personnel and the affected documents are revised as necessary. The SPM also is responsible for notifying the DOE field office of the changes. The SPM will contact CBFO for approval prior to implementing changes that affect performance criteria or data quality, such as sample handling and custody requirements, sampling and analytical procedures, QAOs, calibration requirements, or QC sample acceptance criteria to ensure compliance with the WAP (Attachment C).

Attachment C6.
Audit and Surveillance Program

C6-1 Introduction

The CBFO Audit and Surveillance Program shall ensure that: (1) the operators of each site and CBFO-approved laboratory that plan to transport TRU mixed waste to the WIPP facility conduct sampling and analysis of wastes in accordance with the current WIPP-WAP, and (2) the information supplied by each site to satisfy the waste screening and acceptability requirements of Section C-4 of the WAP is being managed properly. The CBFO will conduct these audits and surveillances at each site and CBFO approved-laboratory performing these activities in accordance with a standard operating procedure. Only personnel with appropriate DOE clearances will have access to classified information during audits. Classified information will not be included in audit reports and records.

Deficiencies may be identified during audits. A deficiency is any failure to comply with an applicable provision of the WAP. During audit interviews or audit meetings, AMWTP or CBFO-approved laboratory personnel may be advised of deficiencies identified within their areas of responsibility to establish a clear understanding of the identified condition.

AMWTP or CBFO-approved laboratory personnel will be given the opportunity to correct any deficiency that can be corrected during the audit period. Deficiencies and observations will be documented and included as part of the final audit report. Those items that have been resolved during the audit (isolated deficiencies that do not require a root cause determination or actions to preclude recurrence), will be verified prior to the end of the audit, and the resolution will be described in the audit report. Those items that affect the quality of the program, and/or the data generated by that program, which are required by the WIPP-WAP will be documented on a CAR and included as part of the final audit report. The CAR will be entered into the CBFO CAR tracking system and tracked until closure. RCRA-related items will be uniquely identified by the AMWTP or CBFO-approved laboratory during self-audits will be evaluated during the CBFO's audit and surveillance program and tracked in the CBFO tracking systems.

If a discrepancy is identified during a CBFO audit, the audit team may prepare a CAR. The AMWTP will review the CAR, evaluate the extent and cause of the deficiency, and provide a response to CBFO indicating the remedial actions and action taken to preclude recurrence. CBFO will review the response and, if acceptable, communicate the acceptance to AMWTP. After all corrective actions have been completed, the CBFO may schedule and perform a verification visit to assure that corrective actions have been completed and are effective.

AMWTP will submit a corrective action plan to CBFO to eliminate the deficiency stated on the CAR, including a resolution of the acceptability of any data generated prior to the resolution of the corrective action.

The corrective action response will include a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and actions to preclude recurrence. This process is described in MP-Q&SI-5.4 and MP-Q&SI-5.3.

The AMWTP will respond to any deficiencies and observations within thirty days after receipt of any CARs and indicate the corrective action taken or to be taken. If the corrective action has not been completed, the response will indicate the expected date the action will be completed. CARs applicable to WAP requirements will be resolved prior to shipment.

C6-2 Internal Management Assessments and Independent Surveillances

AMWTP personnel schedule and conduct management assessments of the TRU mixed waste characterization activities in accordance with MP-M&IA-17.1, *Management Assessments*. AMWTP QA schedule and conduct formal internal independent assessment in accordance with MP-M&IA-17.2, *Independent Assessment*.

When a deficiency is identified by the audit team the assessment team member who identified the deficiency prepares a CAR in accordance with MP-Q&SI-5.3.

The corrective action response will include a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and actions to preclude recurrence.

Attachment C7.
TRU Waste Confirmation

Introduction

This section of the QAPjP describes the actions that CBFO will take to approve and accept waste for and disposal at the WIPP, including waste confirmation activities. Discussion of the CBFO actions that are relevant to AMWTP will be included here.

CBFO demonstrates compliance with the Permit by ensuring that the waste characterization processes performed by AMWTP produce data compliant with the WIPP-WAP and through the waste screening and verification processes. Verification occurs at three levels: (1) the data generation level, (2) the project level, and (3) the CBFO level. The CBFO also examines a representative subpopulation of waste prior to shipment to confirm that the waste contains no ignitable, corrosive, or reactive waste; and that assigned EPA HWNs are allowed by the WIPP RCRA Permit. The waste confirmation activities described herein occur prior to receipt of TRU mixed waste at WIPP.

C7-1 Permittee Confirmation of TRU Mixed Waste

Waste confirmation is defined in Part 1 as the activities performed by the CBFO to satisfy the requirements in Section 310 of Public Law 108-447. Waste confirmation occurs after waste containers have been certified for disposal at WIPP.

C7-1a Permittee Confirmation of a Representative Subpopulation of the Waste

CBFO will confirm that the waste contains no ignitable, corrosive, or reactive waste through RTR or the use of VE of a statistically representative subpopulation of the waste. Prior to shipment to WIPP, waste confirmation will be performed on randomly selected containers from each CH and RH-TRU mixed waste stream shipment.

Waste confirmation encompasses ensuring that the physical characteristics of the TRU mixed waste correspond with its waste stream description and that the waste does not contain liquid in excess of TSDF-WAC limits or compressed gases.

Noncompliant waste identified during waste confirmation will be managed as described in Section C7-2.

CBFO randomly selects at least 7% of each waste stream shipment for waste confirmation. This equates to a minimum of one container from each fourteen containers in each waste stream in each designated shipment.

For each container selected for confirmation, the confirmation team will examine the respective NCR documentation to verify NCRs have been dispositioned for the selected container as required in Section C3-13.

C7-1a(1) Confirmation Training Requirements

This section does not apply to the AMWTP

C7-1b Radiography Methods Requirements

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

For containers that have been characterized using RTR by the AMWTP in accordance with the method in Attachment C1, Section C1-3, the CBFO may perform confirmation by review of the AMWTP's RTR audio/video recordings.

Independent replicate scans and replicate observations of the video output of the RTR process shall be performed under uniform conditions and procedures. Independent replicate scans will be performed on one waste container per day or once per shipment, whichever is less frequent, by a qualified RTR operator other than the individual who performed the first examination. When confirmation is performed by review of audio/video recorded scans produced by the AMWTP as specified in Section C1-3, independent observations will be performed on two waste containers per shipment or two containers per day, whichever is less frequent.

C7-1c Visual Examination Methods Requirements

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

VE may also be used as a waste confirmation method by the CBFO. VE shall be conducted by the CBFO in accordance with written standard operating procedures to describe the contents of a waste container. VE shall be conducted to identify and describe all waste items, packaging materials, and waste material parameters. VE may be used by the CBFO to examine a statistically representative subpopulation of the waste certified for shipment to WIPP to confirm that the waste contains no ignitable, corrosive, or reactive waste. This is achieved by confirming that the waste contains no liquid in excess of TSDF-WAC limits or compressed gases, and that the physical form of the waste matches the waste stream description documented on the WSPF. During packaging, the waste container contents are directly examined by trained personnel. This form of waste confirmation may be performed by the CBFO at AMWTP. VE may be documented on video and audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. When VE is performed using a second operator, each operator performing the VE shall observe for themselves the waste being placed in the waste container or the contents within the examined

waste container when waste is not removed. The results of all VE shall be documented on VE data forms which are used to document (1) the Waste Matrix Code, (2) that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and (3) that the physical form of the waste is consistent with the waste stream description documented on the WSPF.

In order to keep radiation doses as low as reasonably achievable at the AMWTP, the CBFO may use their own trained VE operators to perform VE for waste confirmation by reviewing VE data forms, waste packaging records, and may use the audio/video media. The confirmation team shall document their review of the AMWTP VE data on confirmation data forms.

If the AMWTP documents VE using audio/video media in accordance with Section C1-4, the confirmation team must use the audio/video to perform confirmation. If the waste confirmation team performs waste confirmation by review of audio/video media, the audio/video record of the VE must be sufficiently complete to confirm the Waste Matrix Code and waste stream description, and verify the waste contains no liquid in excess of TSDF-WAC limits or compressed gases. AMWTP VE video/audio media subject to review by the CBFO shall meet the following minimum requirements:

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

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

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

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

VE audio/video media of containers that contain classified shapes shall be considered classified information.

If the AMWTP did not document VE using audio/video media, the CBFO may use their own trained VE operators to perform VE for waste confirmation by reviewing VE data forms or packaging records prepared by the generator during their packaging of the waste. To be acceptable, the AMWTP VE data forms or packaging records must be signed by two AMWTP personnel who witnessed the packaging of the waste and must provide sufficient information for the CBFO to determine that the waste container contents match the waste stream description on the WSPF and the waste contains no liquids in excess of WIPP Hazardous Waste Permit TSDF-WAC limits or compressed gases. AMWTP VE forms or packaging records subject to review by CBFO shall meet the following minimum requirements:

- At least two generator site personnel shall approve the data forms or packaging records attesting to the contents of the waste container.
- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that a trained CBFO VE operator can identify the associated waste material parameters.
- The waste container identification number shall be recorded on the data forms or packaging records.
- VE video media of containers that contain classified shapes shall be considered classified information. VE data forms will not contain classified information.

C7-2 Noncompliant Waste Identified During Waste Confirmation

This section describes the portion of the CBFO confirmation program that applies to the AMWTP.

If the CBFO identifies noncompliant waste during waste confirmation at AMWTP (i.e., the waste does not match the waste stream description documented in the WSPF or there is liquid in excess of TSDF-WAC limits or compressed gases), the waste will not be shipped.

The CBFO will suspend further shipments of the affected waste stream and issue a CAR to the AMWTP. Shipments of affected waste streams will not resume until the CAR has been closed.

As part of the corrective action plan in response to the CAR, the AMWTP will evaluate whether the waste characterization information documented in the CIS and/or WSPF for the waste stream must be updated because the results of waste confirmation for the waste stream indicated that the TRU mixed waste being examined did not match the waste stream description. AMWTP will thoroughly evaluate the potential impacts on waste that has been shipped to WIPP. The CBFO will evaluate the potential that prohibited items were shipped to WIPP and what remedial actions should occur, if any. The results of these evaluations will be provided to NMED before shipments of affected waste stream resume. If the CIS and/or WSPF require revision, shipments of the affected waste stream shall not resume until the revised waste stream waste

characterization information has been reviewed and approved by the CBFO. If AMWTP certifies noncompliant waste more than once during a running 90-day period, the CBFO will suspend acceptance of AMWTP's waste until the CBFO find that all corrective actions have been implemented and the site complies with all applicable requirements of the WIPP-WAP.

D. RECORDS PROCESSING

Record Description	Classification
MP-TRUW-8.2, Case file	Nonpermanent WIPP / ENV1-J-1 Destroy 75 years after submittal

E. REFERENCES

E-0 AMWTP Documents

INST-OI-12, *Real-Time Radiography Operations (Drum)*

INST-OI-16, *Drum Coring Operations*

INST-OI-34, *Non-Facility Visual Examination Operations*

INST-OI-43, *HGAS Sampling and Analysis Operations*

INST-OI-73, *Manual Drum Coring Operations*

INST-OI-75, *Container-in-Container Sampling.*

INST-OI-81, *Real-Time Radiography Operations (for WIPP Certification of Boxes)*

INST-FOI-17, *Facility Visual Examination Operations*

INST-FOI-20, *Supercompactor and Post-Compaction Operations*

LST-RTQP-03, *WIPP Training Requirements List*

MP-CMNT-10.1, *Maintenance Management*

MP-CMNT-10.5, *Calibration and Control of Measuring and Test Equipment Program*

MP-DOCS-18.2, *Records Management*

MP-DOCS-18.4, *Document Control*

MP-M&IA-17.1, *Management Assessments*

MP-M&IA-17.2, *Independent Assessment*

MP-Q&SI-5.3, *Corrective Action*

MP-Q&SI-5.4, *Identification of Nonconforming Conditions*

MP-RTQP-14.1, *Preparation and Administration of Training Plans*

MP-RTQP-14.4, *Personnel Qualification and Certification*

MP-RTQP-14.19, *Training Records Administration*

MP-TRUW-8.1, *Certification Plan for INL Transuranic Waste*

MP-TRUW-8.5, *TRU Waste Certification*

MP-TRUW-8.8, *Level I Data Validation*

MP-TRUW-8.9, *Level II Data Validation*

MP-TRUW-8.11, *Data Reconciliation*

MP-TRUW-8.13, *Collection, Review, and Management of Acceptable Knowledge Documentation*

MP-TRUW-8.14, *Preparation of Waste Stream Profile Forms*

MP-TRUW-8.17, *Co-Located Core Sampling Control Charts*

MP-TRUW-8.25, *Random Selection of Containers for Headspace Gas and Solids Sampling and Analysis*

MP-TRUW-8.34, *WIPP Sample Transfers*

E-1 CCP Analytical Laboratory Department Documents

CCP-QP-002, *CCP Training and Qualification Plan*

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

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

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

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

CCP-TP-185, *CCP Semivolatile Organic Compounds by Gas Chromatograph Mass Spectrometry*

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

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

CCP-TP-188, *CCP Analytical Data Recording, Review, and Reporting*

E-2 External References

40 CFR Part 261. October 1994. 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 Waste. Code of Federal Regulations, Washington, D.C., Office of the Federal Register National Archives and Records Administration

20 NMAC 4.1. Hazardous Waste Management. Title 20, New Mexico Administrative Code, Chapter 4, Part 1, Sections 200, 300, 500, and 800

ASTM. 1983a. Test Method for Chemical Composition of Gases by Mass Spectrometry, ASTM D2650-83, American Society for Testing and Materials

ASTM. 1983b. Type II Water Dl 193-77, American Society for Testing and Materials

ASTM. 1993. Standard Practice for Reducing Samples of Aggregate to Testing Size, Method B Quartering, ASTM C702-93, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials

ASTM. 1998. Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds. ASTM D4547-98, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials

Carlsbad Field offices, CBFO:OCT:KWW:VW:05-1164:UFC:5822, Method for Reporting HSC in 100 Gallon Drums Containing Supercompacted 55-Gallon Drums with Rigid Liners

Resource Conservation and Recovery Act Part B Permit Application for the Waste Isolation Pilot Plant, Revision 6.5, U.S. Department of Energy (DOE) 1997

DOE/CAO-94-1005. Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report, Current Revision, Carlsbad, New Mexico, Carlsbad Area Office, U.S. Department of Energy

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

CAO-95-1076. Performance Demonstration Program Plan for Analysis of Simulated Headspace Gases. Current Revision, Carlsbad, New Mexico, Carlsbad Area Office, U.S. Department of Energy (DOE), 2003

CAO-95-1077. Performance Demonstration Program Plan for Analysis of Solid Waste. Current Revision, Carlsbad, New Mexico, Carlsbad Area Office, U.S. Department of Energy (DOE), 2005

DOE/WIPP-09-3427, Waste Data System User's Manual, U.S. Department of Energy (DOE), 2009, Carlsbad Field Office, Carlsbad, New Mexico.

DOE/LLW-217. January 1995. DOE Waste Treatability Group Guidance. U.S. Department of Energy

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

U.S. Environmental Protection Agency (EPA), Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/625/R-96/010b, January 1999).

U.S. Environmental Protection Agency (EPA), EPA Specifications and Guidance for Contaminant-Free Sample Containers. Directive No. 9240.0—5A, Office of Solid Waste and Emergency Response

U.S. Environmental Protection Agency (EPA), April 1980. A Method for Determining the Compatibility of Hazardous Wastes (EPA/600/2-80-076), California Department of Health Services and the U.S. Environmental Protection Agency, Office of Research and Development

U.S. Environmental Protection Agency (EPA), April 1994. Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Waste, a Guidance Manual, OSWER 9938.4-03, Office of Solid Waste and Emergency Response, Washington, D. C

U.S. Environmental Protection Agency (EPA), 1994a. EPA Laboratory Guidelines for Evaluating Organics Analyses, EPA/540/R/94/082, U.S. Environmental Protection Agency

U.S. Environmental Protection Agency (EPA), 1994b. Laboratory Guidelines for Evaluating Inorganics Analyses, EPA/540/R/94/083

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F. GLOSSARY

F-0 Acronyms and Abbreviations

AK	acceptable knowledge
AMWTP	Advanced Mixed Waste Treatment Project
ASTM	American Society for Testing and Materials
BFB	4-bromofluorobenzene
°C	degrees Celsius
%C	percent complete
CAR	Corrective Action Report
CAS	Chemical Abstract Services
CBFO	Carlsbad Field Office
CCC	calibration check compounds

CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	contact-handled
CH-TRU	contact-handled transuranic
COC	chain-of-custody
CVAA	Cold Vapor Atomic Absorption Spectrometry
%D	percent difference
DFTPP	decafluorotriphenylphosphine
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FRC	Federal Records Center
g	gram
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detection
GC/FID	Gas Chromatography/Flame Ionization Detection
GC/MS	Gas Chromatography/Mass Spectrometry
HSGS	Headspace Gas Sampling
HWN	EPA hazardous waste number
ICP	Idaho Cleanup Project
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICS	interference check standards
ICV	initial calibration verification
IDC	item description code
IDL	Instrument Detection Limit
INL	Idaho National Laboratory
INST	instruction
ITR	Independent Technical Review
kg	kilogram
L	liter
LCS	Laboratory Control Sample
LDR	Land Disposal Restrictions

µg/L	micrograms per liter
MDL	method detection limit
mg/kg	milligrams per kilogram
mL	milliliter
mm	millimeter
mm Hg	millimeters mercury
MP	management procedure
MSD	matrix spike duplicate
NCR	nonconformance report
NDA	nondestructive assay
NDE	nondestructive examination
ng	nanogram
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
OSHA	Occupational Safety and Health Administration
OJT	on-the-job training
PDP	Performance Demonstration Program
ppm	parts per million
ppmv	parts per million by volume
PRDL	Program Required Detection Limit
PRQL	Program Required Quantitation Limit
psig	pounds per square inch gauge
pt	point
QAO	Quality Assurance Objective
QA/QC	Quality Assurance/Quality Control
QAPD	Quality Assurance Program Document
QAPjP	Quality Assurance Project Plan
QC	Quality Control
r	regression coefficient
%R	percent recovery
%RSD	percent relative standard deviation
RA	radioassay
RCRA	Resource Conservation and Recovery Act
RH	remote-handled
RIDS	Records Inventory and Disposition Schedule
RPD	relative percent difference
RRF	relative response factor
RT	retention time
RTL	Regulatory Threshold Limit

RTR	real-time radiography
RWMC	Radioactive Waste Management Complex
SPCC	system performance check compound
SPM	Site Project Manager
SPO	Site Project Office
SVOC	semivolatile organic compound
SW-846	EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
SWB	standard waste box
TC	Toxicity Characteristic
TDOP	Ten-Drum Overpack
TIC	tentatively identified compound
TRU	transuranic
TRUCON	TRUPACT-II Content Codes (DOE 1992)
TRUPACT-II	Transuranic Package Transporter Model II
TSCA	Toxic Substance Control Act
TSDF	Treatment Storage Disposal Facility
TWBIR	TRU Waste Baseline Inventory Report
UCL_{90}	upper 90% confidence level
UHWM	Uniform Hazardous Waste Manifest
VE	Visual Examination
VEE	Visual Examination Expert
VOA	volatile organic analysis
VOC	volatile organic compound
WAC	waste acceptance criteria
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WIPP-WAP	Waste Analysis Plan for the Waste Isolation Pilot Plant, Attachment C of the WIPP Hazardous Waste Facility Permit
WSPF	Waste Stream Profile Form
WTS	Waste Tracking System
WWIS	WIPP Waste Information System

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Effective Date: DEC 2 9 2010

CCP-PO-001
Revision 19

CCP Transuranic Waste Characterization Quality Assurance Project Plan

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RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
3	01/14/2002	Added Tables B-9, B-10, and B-11; Revised the CCP Organization Chart, Figure A-1; and made numerous editorial corrections.
4	05/31/2002	Revised the CCP Organization Chart, Figure A-1 and added 3 new positions in the responsibilities Section A-4; corrected an error in Table B3-1; revised Section B4-2; revised Sections B3-10, B3-12,B-4, and subsections, and revised Tables B3-11, B3-12, and B3-13 to reflect the current WAP.
5	02/05/2003	Revised the CCP Organization Chart, Figure A-1 and section A-4c to update to the Vice President of National TRU Program Division title. Changes made to implement the Drum Age Criteria (DAC) permit Modification.
6	06/11/2003	Updated to Revision 5 of the QAPD.
7	01/08/2004	Added procedures to Table B-9 and Table B-11.
8	03/15/2004	Added procedures to Table B-9, Table B-10 and Table B-11. Modified Site Project Quality Assurance Officer description and CCP Organization chart. Updated Table B1-2, Table B3-3, Section B3-5 to reflect the WAP. Updated Table B3-6, Table B4, Table B1-4, Section B-3a(2), B-3d(1)(a), Table B-1, and Table B-8 to delete PCBs. Section B-1c, 6th bullet revised to reflect the language of the WAP.
9	01/14/05	Revised to add procedures to Table B-9, Table B-10, and Table B-11. Incorporated CBFO DRR comments.
10	02/24/05	Revised to add procedure to table B-11, to incorporate LANL Off-Site Recovery Program Project Scope.
11	03/10/2005	Revised to add procedures to Section B1-2a and Table B-11. Added new table, Table B-9A, Solids Sampling Procedures Used by CCP.
12	03/22/2006	Revised procedures tables, Added new Table B-9, Listing of Permitted hazardous waste numbers and updated responsibilities.

RECORD OF REVISION (Continued)

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14	03/28/2007	Revised procedure tables to add references to sections implemented by the procedure, and to align the wording of Section B7-2 with the wording in the permit.
15	08/10/2007	Revised to remove Visual Examination (VE) Expert decisions and signature and date from Table B3-11, Testing Batch Data Report Contents. Added the Idaho National Laboratory (INL) procedures to Attachment 1, Implementing Procedures.
16	10/31/2007	Revised to incorporate statistical terminology and text changes included in September 2007 Class 1 Permit Notifications and update Attachment 1, Implementing Procedures.
17	06/23/2009	Updated to agree with the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit Class 1 Modification dated July 2008.
18	06/30/2010	Revised to incorporate modifications to the Hazardous Waste Facility Permit. To make editorial changes that are needed and to change the Waste Isolation Pilot Plant (WIPP), Waste Information System (WWIS) to WWIS/Waste Data System (WDS).
19	12/29/2010	Revised to include changes from Permit Renewal.

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A INTRODUCTION

The Central Characterization Project (CCP) is tasked with characterizing and certifying transuranic (TRU) waste for disposal at the Waste Isolation Pilot Plant (WIPP). Characterization consists of acceptable knowledge (AK), radiography, visual examination (VE), headspace gas sampling and analyses, and total sampling and analyses; as applicable for the waste stream.

This Quality Assurance Project Plan (QAPjP) describes how the waste characterization and certification activities performed by the CCP comply with NM 4890139088-TSDF, *Waste Isolation Pilot Plant Hazardous Waste Facility Permit* (HWFP), *Attachment C - C6, Waste Analysis Plan* (WAP) (New Mexico Environment Department [NMED]). This QAPjP also implements the applicable quality requirements of DOE/CBFO-94-1012, Department of Energy-Carlsbad Field Office (DOE-CBFO) *Quality Assurance Program Document* (QAPD). The format of this QAPjP parallels that of the WAP.

NOTE

Throughout this document, there are references to procedures that implement the requirements. These references appear as a letter and one to three digits (e.g., T93) in parenthesis where the requirement is stated. Document users should then be able to refer to Attachment 1, Implementing Procedures, where these references list the procedure number and title.

A-1 Background

The WAP is organized such that it specifies that the generator/storage sites (hereinafter referred to as "sites") conduct their own TRU waste characterization and certification, including their own data generation level and project level data validation and verification. However, some sites (typically small quantity sites) do not have the resources necessary to characterize and certify their TRU waste. Additionally, other sites have expressed interest in using subcontractors to augment their existing capabilities. The CCP was established to assist these sites as well as to provide cost-effective TRU waste characterization, confirmation, and certification, including data generation level and project level data validation and verification.

The CCP may provide its services to a site by contracting directly with that site. If this is the case, the scope of services provided by CCP are specified in a Statement of Work (SOW) issued by the site. The SOW also specifies health and safety requirements, quality requirements, and other requirements specific to that site. A site-specific interface document may also be prepared which provides more detail on the site-CCP interface.

The site has general management oversight responsibility for work performed by the CCP at the site. The site is responsible for ensuring that CCP conducts its activities in compliance with site requirements.

A-2 Scope

This QAPjP specifies quality requirements, management activities, and procedures necessary to meet the specific data quality objectives (DQOs) for TRU waste characterization as defined in the WAP and QAPD. Only TRU waste that has been characterized and certified in accordance with the WAP is shipped to the WIPP facility. TRU waste characterization and certification activities conducted by the CCP are performed in accordance with the requirements and implementing procedures identified in this QAPjP. In some cases, some characterization or certification activities are shared between the CCP and the Host site. The applicable implementing site documentation is specified in a SOW and supplemented by a site interface document, if required.

This QAPjP meets WAP characterization and certification requirements for contact-handled (CH) and remote-handled (RH) TRU waste. As used in this document, the term TRU waste includes TRU and TRU-mixed wastes. The term "characterization" is used where applicable to indicate the entire characterization process. Additionally, the WAP allows waste streams to be divided into waste stream lots. Therefore, the term waste stream may be used to indicate waste stream lots.

B PROJECT DESCRIPTION

Consistent with requirements in the WAP, CCP uses AK to initially characterize TRU waste. Section C3 of this QAPjP outlines the process used to characterize TRU waste using AK. AK documentation provides the basis for identifying the TRU waste eligible for WIPP disposal. The characterization process is based on the following:

- Waste considered for characterization is defense-related and has a TRU alpha activity greater than 100 nanocuries (nCi) per gram (g)
- Resource Conservation and Recovery Act (RCRA) hazardous waste determinations are made initially using AK for TRU waste streams

AK information for each waste stream is compiled in AK reports and supporting documentation. Based on AK, waste streams are delineated according to Summary Category Group, and waste matrix codes are assigned to each waste stream.

The CCP evaluates the characterization necessary to certify a particular waste stream. If additional characterization is needed to supplement site capabilities, the CCP uses mobile characterization facilities to perform characterization activities. Mobile

characterization support is provided in accordance with this QAPjP. The CCP has the option to use data or transportation services from established TRU waste characterization activities at a DOE-CBFO-certified site.

B-1 Central Characterization Project Organization and Responsibilities

The CCP organization is shown in Figure B-1, CCP Organization, and responsibilities are described in the following sections. Figure B-1 includes generic CCP positions. More specific positions are described in the SOW or site interface plan.

B-2 Central Characterization Project (CCP) Manager

The CCP Manager is responsible for the day-to-day management and direction of CCP activities related to the characterization, certification, transportation, and disposal of TRU waste for DOE-CBFO. The CCP Manager is responsible for the following:

- Ensuring successful CCP/site interface
- Ensuring CCP plans and operations are coordinated, integrated, and consistent with DOE-CBFO programs, policies, and guidance
- Coordinating CCP activities and functioning as principal point of contact with DOE-CBFO and other regulating agencies
- Reviewing and approving this QAPjP

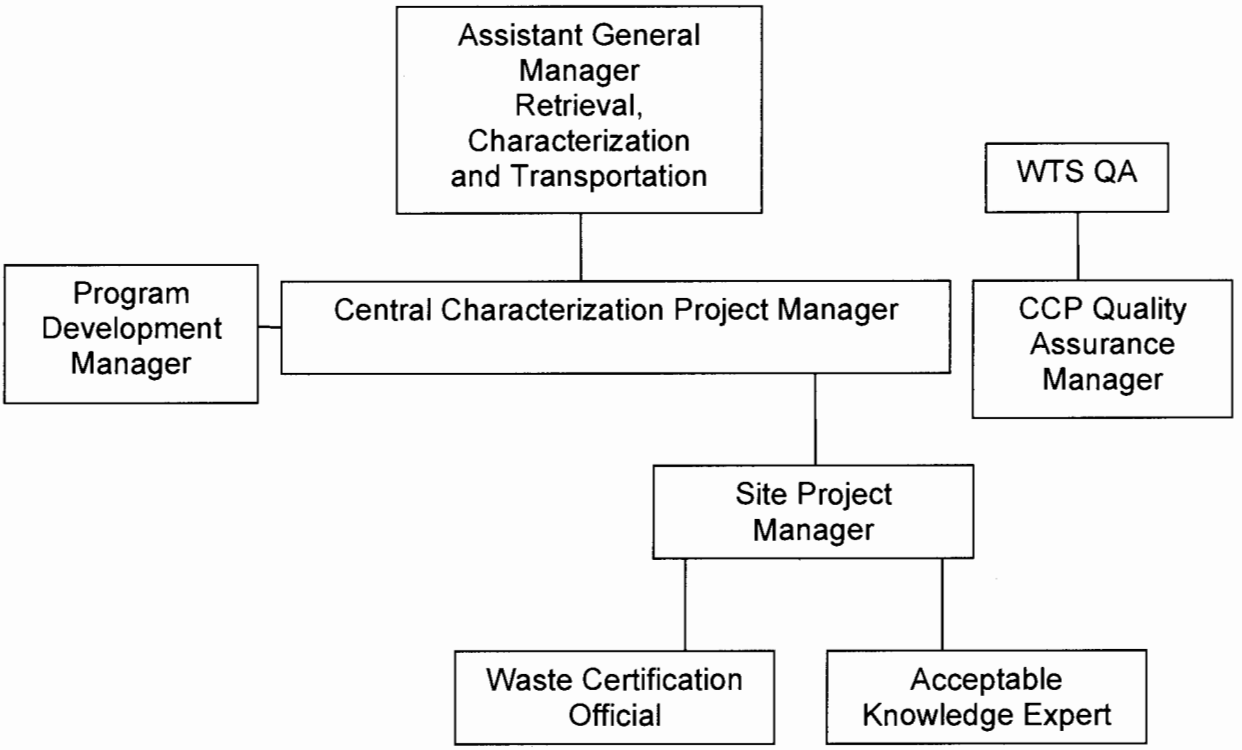
B-3 Site Project Manager

The Site Project Manager (SPM) oversees TRU waste characterization and certification activities and is responsible for the following:

- Developing, maintaining, reviewing, approving, and implementing CCP procedures and plans
- Scheduling revisions and distribution of CCP procedures and plans and forwarding these documents (if significantly revised) to DOE-CBFO for review and approval before implementation
- Reviewing and approving site interface documents (if used)
- Participating in internal audits and assessments
- Assisting CCP Quality Assurance (QA) in developing project assessment criteria and responses to deficiency reports

- Halting characterization or certification activities if problems affecting the quality of the certification or work processes exist
- Ensuring CCP personnel receive appropriate training and orientation and maintain proficiency in work assignments
- Evaluating AK reports
- Reconciling AK information with characterization data
- Reconciling verified data with DQOs
- Ensuring that conditions adverse to quality are resolved and that corrective actions are implemented in a timely manner
- Assigning additional Environmental Protection Agency (EPA) hazardous waste numbers to TRU waste on the basis of analytical results with concurrence from the site, as applicable
- Preparing and submitting SPM Data Validation Summaries, Waste Stream Profile Forms (WSPFs), Characterization Information Summaries, and Waste Stream Characterization Packages (if requested by DOE-CBFO)
- Reviewing semi-annual QA/Quality Control (QC) summary reports and forwarding them and comments to the DOE-CBFO

Figure B-1. CCP Organization



C WASTE ANALYSIS PLAN

C-0 Introduction and Attachment Highlights

This QAPjP has been prepared for waste characterization activities to be conducted to meet requirements set forth in 20.4.1.500 New Mexico Administrative Code (NMAC) (incorporating 40 Code of Federal Regulation [CFR] §264.13) for waste disposal at the WIPP. This QAPjP includes test methods, details of planned waste sampling and analysis for complying with the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.13), and a description of the QA/QC program. Before the CCP offers waste for shipment to the WIPP, the CCP implements the applicable requirements of this QAPjP.

TRU waste contains TRU radioactive components and may contain hazardous components, as defined in 20.4.1.800 (incorporating 40 CFR, §268.35[d]), and in the Federal Facility Compliance Act, Public Law 102-386, Title 1, §3021(d). TRU waste is designated and separately packaged as either CH or RH, based on the radiological dose rate at the surface of the waste container.

The hazardous components of the TRU waste to be managed at the WIPP facility are designated in Table C-9, Listing of Permitted Hazardous Waste Numbers. Some of the waste is also identified by unique state hazardous waste numbers and is certified by the CCP if it meets the conditions of the WIPP Hazardous Waste Permit, Part 2, Table 2.3.4. This document describes the measures that will be taken to ensure that the TRU mixed wastes received at the WIPP facility are within the scope of Table C-9 as established by 20.4.1.500 NMAC (incorporating 40 CFR §264), and that they comply with unit-specific requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.600), Miscellaneous Units.

The CCP has developed this QAPjP to comply with the requirements of the WAP for characterizing CH TRU wastes. The hazardous components of the TRU waste disposed at the WIPP facility are described on a WSPF for each waste stream (T2). TRU waste that may be certified by the CCP are generated at DOE facilities by defense activities, including the following:

- Production of nuclear products
- Plutonium recovery
- Research and development
- Decontamination and decommissioning

Some TRU waste is retrievably stored at the DOE sites. Additional TRU waste is generated and packaged into containers at these sites. Retrievably stored waste is defined as TRU waste generated after 1970 and before NMED notifies the Permittees, by approval of the final audit report, that the characterization requirements of the WAP at a site have been implemented. Newly-generated waste is defined as TRU waste generated after NMED approves the final audit report for a site. Waste characterization of retrievably stored TRU waste is performed on an ongoing basis, as the waste is retrieved. AK information is assembled for both the retrievably stored and newly generated waste. Waste characterization of newly generated TRU waste is performed as it is generated, although some characterization occurs post-generation. Waste characterization requirements for retrievably stored and newly generated TRU wastes differ, as discussed in Sections C-3d(2) and C-3d(1).

Waste characterization is defined in Part 1 as the activities performed by the waste generator to satisfy the general waste analysis requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.13[a]) before waste containers have been certified for disposal at WIPP. The characterization process for WIPP waste is presented in Figure C-2, Waste Characterization Process. CCP waste characterization programs are first audited by DOE, with the NMED approving the final audit report. After this, CCP determines whether AK alone is sufficient for characterization, or whether a sampling and analysis program in conjunction with AK is necessary to adequately characterize wastes. If an AK Sufficiency Determination is sought, information is provided to the Permittees for their review and DOE's provisional approval; NMED determination of adequacy of the AK information is required before final approval by DOE. If the sampling and analysis route is chosen, CCP will proceed to sample and analyze waste in conjunction with AK and in accordance with this QAPjP. Once an AK Sufficiency Determination is obtained, or when required sampling and analysis data are obtained, CCP would then prepare and submit the Waste Stream Profile Form for DOE's approval. Once the WSPF is approved, CCP may ship waste to WIPP. The Permittees will perform waste confirmation prior to shipment of the waste from the generator/storage site to WIPP pursuant to Section C7, performing radiography or VE of a representative subpopulation of certified waste containers, to ensure that the wastes meet the applicable requirements of the *Treatment, Storage, and Disposal Facility Waste Acceptance Criteria* (TSDF-WAC).

C-0a Waste Characterization

Characterization requirements for individual containers of TRU waste are specified on a waste stream basis. The WAP defines a waste stream as waste materials that have common physical form, that contain similar hazardous constituents, and that are generated from a single process or activity. Waste streams are grouped by waste matrix code groups related to the physical and chemical properties of the waste (DOE 1995b). The CCP uses the characterization techniques described in this QAPjP to assign the appropriate waste matrix code groups to waste streams for WIPP disposal.

The waste matrix code groups are solidified inorganics, solidified organics, salt waste, soils, lead/cadmium metal, inorganic nonmetal waste, combustible waste, graphite, filters, heterogeneous debris waste, and uncategorized metal. Waste matrix code groups are grouped into three Summary Category Groups: Homogeneous Solids (Summary Category Group S3000), Soil/Gravel (Summary Category Group S4000), and Debris Waste (Summary Category Group S5000).

TRU wastes are initially categorized into the three broad Summary Category Groups that are related to the final physical form of the wastes. Waste characterization requirements for these groups are specified separately in Section C-2. Each of the three groups is described below.

S3000 - Homogeneous Solids

Homogeneous solids, are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20.4.1.800 NMAC [incorporating 40 CFR §268.2(g) and (h)]). Included in the series of homogeneous solids are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this Summary Category Group based on the specific waste stream types and final waste form. This Summary Category Group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50 percent by volume homogeneous solids.

S4000 - Soils/Gravel

This Summary Category Group includes S4000 waste streams that are at least 50 percent by volume soil/gravel. This Summary Category Group is expected to contain toxic metals.

S5000 - Debris Wastes

This Summary Category Group includes heterogenous waste that is at least 50 percent by volume materials that meet the criteria specified in 20.4.1.800 (incorporating 40 CFR §268.2 [g]). Debris means solid material exceeding a 2.36 inch (in.) (60 millimeter) particle size that is intended for disposal and that is:

1. a manufactured object, or
2. plant or animal matter, or
3. natural geologic material.

Particles smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material.

If a waste does not include at least 50 percent of any given Summary Category Group by volume, characterization is performed using the waste characterization process required for the category constituting the greatest volume of waste for that waste stream (see Section C-3d).

The most common hazardous constituents in the TRU waste to be managed in the WIPP facility consist of the following:

Metals

Some of the TRU waste to be emplaced in the WIPP facility contains metals for which 20.4.1.200 NMAC (incorporating 40 CFR §261.24), toxicity characteristics were established (EPA Hazardous Waste Numbers D004 through D011). Cadmium, chromium, lead, mercury, selenium, and silver are present in discarded tools and equipment, solidified sludges, cemented laboratory liquids, and waste from decontamination and decommissioning activities. A large percentage of the waste consists of lead-lined gloveboxes, leaded rubber gloves and aprons, lead bricks and piping, lead tape, and other lead items. Lead, because of its radiation-shielding applications, is the most prevalent toxicity-characteristic metal present.

Halogenated Volatile Organic Compounds

Some of the TRU waste to be emplaced in the WIPP facility contains spent halogenated volatile organic compound (VOC) solvents identified in 20.4.1.200 NMAC (incorporating 40 CFR §261.31) (EPA Hazardous Waste Numbers F001 through F005). Tetrachloroethylene; trichloroethylene; methylene chloride; carbon tetrachloride; 1,1,1-trichloroethane; and 1,2-trichloro-1,2,2,-trifluoroethane (EPA Hazardous Waste Numbers F001 and F002) are the most prevalent halogenated organic compounds identified in TRU waste that may be managed at the WIPP facility during the Disposal Phase. These compounds are commonly used to clean metal surfaces prior to plating, polishing, or fabrication; to dissolve other compounds; or as coolants. Because they are highly volatile, only small amounts typically remain on equipment after cleaning or, in the case of treated waste waters, in the sludges after clarification and flocculation. Radiolysis may also generate halogenated volatile organic compounds.

Nonhalogenated Volatile Organic Compounds

Xylene, methanol, and n-butanol are the most prevalent nonhalogenated VOCs in TRU waste that may be managed at the WIPP facility during the Disposal Phase. Like the halogenated VOCs, they are used as degreasers and solvents and are similarly volatile. The same analytical methods that are used for halogenated VOCs are used to detect the presence of nonhalogenated VOCs. Radiolysis may also generate non-halogenated volatile organic compounds.

The CCP will characterize waste in accordance with this QAPjP, and ensure that waste proposed for storage and disposal at WIPP meets the applicable requirements of the TSDF-WAC in Part 2. The CCP will assemble the AK information in an auditable record[1] for the waste stream as described in Section C4. For those waste streams with an approved AK Sufficiency Determination (see below), sampling and analysis per the methods described in Sections C1 and C2 are not required.

All waste characterization activities specified in this QAPjP and associated attachments shall be carried out at generator/storage sites and DOE approved laboratories in accordance with this QAPjP. The DOE will audit the CCP waste characterization programs and activities as described in Section C-3. Waste characterization activities at the generator/storage sites include the following, although not all these techniques will be used on each container, as discussed in Section C-3:

- Radiography, an x-ray technique used to determine the physical contents of containers.
- VE of the contents of opened containers as an alternative way to determine their physical contents.
- Headspace gas sampling to determine VOC content of gases in the void volume of the containers.
- Sampling and analysis of waste forms that are homogeneous and can be representatively sampled to determine concentrations of hazardous waste constituents and toxicity characteristic contaminants of waste in containers.
- Compilation of AK documentation into an auditable record.

[1]"Auditable records" means those records which allow the Permittees to conduct a systematic assessment, analysis, and evaluation of the Permittees' compliance with the WAP and the Permit.

C-0b AK Sufficiency Determination

CCP may submit a request to the Permittees for an AK Sufficiency Determination (Determination Request) to meet all or part of the waste characterization requirements (T5). The contents of the Determination Request are specified in Section C4-3d. The Determination Request may take one of the following forms:

Scenario 1	Radiography or VE of the waste stream is not required, and chemical sampling and analysis is not required;
Scenario 2	Radiography or VE of the waste stream is not required, but chemical sampling and analysis of a representative sample of the waste stream is required; or
Scenario 3	Chemical sampling and analysis is not required, but radiography or VE of 100% of the containers in the waste stream is required.

The Permittees shall evaluate the Determination Request for completeness and technical adequacy. This evaluation shall include, but not be limited to whether the Determination Request is technically sufficient for the following:

- The Determination Request must include all information specified in Section C4-3d.
- The AK Summary must identify relevant hazardous constituents, and must correctly identify all toxicity characteristic and listed hazardous waste numbers.
- All hazardous waste number assignments must be substantiated by supporting data and, if not, whether this lack of substantiation comprises the interpretation.
- Resolution of data discrepancies between different AK sources must be technically correct and documented.
- The AK Summary must include all the identification of waste material parameter weights by percentage of the material in the waste stream, and determinations must be technically correct and substantiated by supporting information.
- All prohibited items specified in the TSDF-WAC should be addressed and conclusions drawn and must be substantiated by supporting information.
- If the AK record includes process control information specified in Section C4-3b, the information should include procedures, waste manifests, or other documentation demonstrating that the controls were adequate and sufficient.

- The site must provide the supporting information necessary to substantiate technical conclusions with the Determination Request, and this information must be correctly interpreted.

The Permittees will review the Determination Request for technical adequacy and compliance with the requirements of the Permit, using trained and qualified individuals in accordance with standard operating procedures that shall, at a minimum, address all of the technical and procedural requirements listed above. The Permittees shall resolve comments with the CCP, and the Permittees may change the scope of the Determination Request to one of the three scenarios.

If DOE determines that the AK is sufficient, it shall inform the public of the Determination Request, the Permittees' evaluation of it, and the date and time of a public meeting to provide information to and solicit comments from interested members of the public regarding the Determination Request. Notice of the meeting and comment period shall be provided by the following methods:

1. Written notice to all individuals on the facility mailing list;

2. Public notice in area newspapers, including the Carlsbad Current-Argus, Albuquerque Journal, and Santa Fe New Mexican;

3. Notice on the WIPP Home Page;

4. E-mail notification as specified In Permit Section 1.11.

DOE shall take written comment on the Determination Request for at least 30 days following the public meeting. DOE shall compile all such comments, including any disagreement between the DOE and commenters.

If DOE provisionally approves the Determination Request, it may forward it along with all relevant information submitted with the Determination Request to NMED for an evaluation that the provisional approval made by the DOE is adequate. DOE shall also provide to NMED, as a separate appendix to the Determination Request, the compilation of all comments and DOE's response to each comment. After submitting a Determination Request to NMED, the Permittees will post a link to the transmittal letter to NMED on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11. Based on the results of NMED's evaluation, the Permittees will notify the CCP whether the AK information is sufficient and the Determination Request is approved. The DOE will not approve a Determination Request that NMED has determined to be inadequate unless the CCP resolves the inadequacies and provides the resolution to NMED for evaluation of adequacy. Should the inadequacies not be resolved to NMED's satisfaction, the DOE shall not submit a Determination Request for the same waste stream at a later date. DOE shall not submit

a Determination Request, if a previous Determination Request is pending evaluation by NMED.

In the event the DOE disagrees, in whole or in part, with an evaluation performed by NMED resulting in a determination by NMED that the DOE's provisional approval for a particular waste stream is inadequate, the DOE may seek dispute resolution. The dispute resolution process is specified in Part 1. The Secretary's final decision under Permit Section 1.16.4 shall constitute a final agency action.

By July 1 of each year, the Permittees shall submit to NMED a list of waste streams the Permittees may submit for an AK Sufficiency Determination during the upcoming federal fiscal year. The Permittees will post a link to the transmittal letter to NMED and announce a public meeting to discuss the list with interested members of the public on the WIPP Home Page and inform those on the e-mail notification list as specified in Permit Section 1.11.

If the CCP does not submit a Determination Request, or if the DOE does not approve a Determination Request, or if NMED finds that the DOE's provisional approval of a Determination Request is inadequate, the CCP shall perform radiography or VE on 100% of the containers in a waste stream and chemical sampling and analysis on a representative sample of the waste stream using headspace gas sampling and analysis (for debris waste) or solids sampling and analysis (for homogeneous solid or soil/gravel waste) as specified in Sections C1 and C2.

If the CCP submits a Determination Request, the DOE provisionally approves the Determination Request as Scenario 1, and NMED finds that the DOE's provisional approval is adequate, neither radiography or VE nor chemical sampling and analysis of the waste stream is required.

If the CCP submits a Determination Request, the DOE provisionally approves the Determination Request as Scenario 2, and NMED finds that the DOE's provisional approval is adequate, chemical sampling and analysis of a representative sample of the waste stream is required, but radiography or VE is not required.

If the CCP submits a Determination Request, the DOE provisionally approves the Determination Request as Scenario 3, and NMED finds that the DOE's provisional approval is adequate, radiography or VE of 100% of the containers in the waste stream is required, but chemical sampling and analysis is not required.

C-0c Waste Stream Profile Form Completion

After a complete AK record has been compiled and either a Determination Request has been approved by the DOE or the CCP has completed the applicable representative sampling and analysis requirements specified in Sections C1 and C2, the CCP will complete a WSPF and Characterization Information Summary (CIS) (T3). The requirements for the completion of a WSPF and a CIS are specified in Sections C3-12b(1) and C3-12b(2) respectively.

The WSPF and the CIS for the waste stream resulting from waste characterization activities are transmitted to the Permittees, who shall review them for completeness, and screen them for acceptance before the CCP proceeds with payload assembly of TRU waste into the Contact-Handled or Remote-Handled Packaging. The review and approval process will ensure that the submitted waste analysis information is sufficient to meet the DQOs for AK in Section C-4a(1) and allow the Permittees to demonstrate compliance with the requirements of the WIPP-WAP. Only TRU waste that meets the characterization requirements of the WAP is certified by the CCP. Only waste certified to meet the TSDF-WAC, specified in the WAP, is accepted at the WIPP facility for disposal in the permitted Underground Hazardous Waste Disposal Unit (HWDU). DOE will approve and provide NMED with copies of the approved WSPF and accompanying CIS prior to waste stream shipment. Upon notification of DOE's approval of the WSPF, the CCP may be authorized to ship waste to WIPP.

In the event that the Permittees request detailed information on a waste stream, the CCP provides a Waste Stream Characterization Package, as described in Section C3-12b(3). For each waste stream, this package will include the WSPF, the CIS, and the AK summary. The Waste Stream Characterization Package will also include specific Batch Data Reports (BDRs), and raw analytical data associated with waste container characterization as requested by the Permittees.

C-0d Waste Confirmation

The Permittees will perform waste confirmation on a representative subpopulation of each waste stream shipment after certification and prior to shipment pursuant to Section C7. The Permittees will use radiography, review of radiography audio/video recordings, VE, or review of VE records (e.g., VE data sheets or packaging logs) to examine at least 7 percent of each waste stream shipment to confirm that the waste does not contain ignitable, corrosive, or reactive waste. Waste confirmation will be performed by the Permittees prior to shipment of the waste from the generator/storage site to WIPP.

C-1 Identification of TRU Waste to be Managed at the WIPP Facility

C-1a Waste Stream Identification

TRU waste destined for disposal at WIPP is characterized on a waste stream basis. The waste streams are delineated using AK. Required AK is specified in Section C-3b and Section C-4 of this QAPjP.

Not all of the waste containers within a waste stream may be accessible for sampling and analysis at one time. Section C-2 addresses the requirements for selecting waste containers used for characterization of waste streams as they are generated or retrieved.

C-1b Waste Summary Category Groups and Hazardous Waste Accepted at the WIPP Facility

Once a waste stream is delineated, a waste matrix code is assigned to the waste stream based on its physical form. Waste streams are then assigned to one of the Summary Category Groups; S3000-Homogeneous Solids, S4000-Soils/Gravel, and S5000-Debris Wastes. These Summary Category Groups are then used to determine further characterization requirements.

The CCP considers only those TRU waste streams that are assigned EPA hazardous waste numbers listed in Table C-9. Waste identified by unique state hazardous waste numbers is acceptable at WIPP provided they meet the requirements of the TSDF-WAC. The CCP performs characterization of all waste streams as required by the WAP. If during the characterization process, new hazardous waste numbers are identified, those wastes are prohibited for disposal at the WIPP facility until a permit modification has been submitted and approved by NMED.

C-1c Waste Prohibited at the WIPP Facility

The following TRU wastes are prohibited for disposal at the WIPP facility:

- Liquid waste is not acceptable at WIPP. Liquid in the quantities delineated below is acceptable.
  - Observable liquid shall be no more than 1 percent by volume of the outermost container at the time of radiography or visual examination
  - Internal containers with more than 60 milliliters or 3 percent by volume observable liquid, whichever is greater, are prohibited

- Containers with hazardous waste number U134 assigned shall have no observable liquid

- Overpacking the outermost container that was examined during radiography or visual examination or redistributing untreated liquid within the container shall not be used to meet the volume limits

- Non-radionuclide pyrophoric materials, such as elemental potassium.

- Hazardous wastes not occurring as co-contaminants with TRU waste (non-mixed hazardous waste).

- Wastes incompatible with backfill, seal and panel closure materials, container and packaging materials, shipping container materials, or other wastes.

- Wastes containing explosives or compressed gases.

- Wastes with polychlorinated biphenyls (PCBs) not authorized under an EPA PCB waste disposal authorization.

- Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (Hazardous Waste Numbers D001, D002, or D003).

- Any waste container from a waste stream (or waste stream lot) that has not undergone either radiographic or VE of a statistically representative subpopulation of the waste stream in each shipment, pursuant to Section C7.

- Any waste container from a waste stream which has not been preceded by an appropriate, certified WSPF (see Section C-1d).

- Waste that has ever been managed as high-level waste and waste from tanks specified in Table C-8, Waste Tanks Subject to Exclusion, unless specifically approved through a Class 3 permit modification.

Before accepting a container holding TRU waste, the Permittees will perform waste confirmation activities pursuant to Permit Attachment C7 on each waste stream shipped to confirm that the waste does not contain ignitable, corrosive, or reactive waste and the assigned EPA hazardous waste numbers are allowed for storage and disposal by this QAPjP. Waste confirmation activities will be performed on at least 7 percent of each waste stream shipment. If a waste stream shipment contains fewer than 14 containers, one container will be examined to satisfy waste confirmation requirements. Section C-4 and Section C7 include descriptions of the waste confirmation processes that the Permittees will conduct prior to receiving a shipment at the WIPP facility.

Containers are vented through filters allowing any gases that are generated by radiolytic and microbial processes within a waste container to escape, thereby preventing over pressurization or development of conditions within the container that would lead to the formation of ignitable, corrosive, reactive, or other characteristic wastes. To ensure the integrity of the WIPP facility, waste streams identified to contain incompatible materials or materials incompatible with waste containers are not shipped to WIPP unless they are treated to remove the incompatibility. The CCP does not certify waste streams identified to contain incompatible materials or materials incompatible with waste containers or backfill.

C-1d Control of Waste Acceptance

The CCP will provide a WSPF and CIS to the Permittee for each waste stream prior to shipment of the waste (T2). The WSPF and CIS elements are found in Section C3-12b(1) and Section C3-12b(2). The CCP will provide the WSPF to the Permittees for each waste stream prior to its acceptance for disposal at WIPP. The WSPF and the CIS will be transmitted to the Permittees for each waste stream. After WSPF submittal, if continued waste characterization activities reveal discrepancies that identify different hazardous waste numbers or indicate that the waste belongs to a different waste stream, the waste is redefined to a separate waste stream and a new WSPF is submitted.

The Permittees are responsible for the review of the WSPF and CISs to verify compliance with the restrictions on TRU wastes for WIPP disposal. Waste characterization data ensures the absence of prohibited items specified in Section C-1c. CCP determines by procedure the specific circumstances under which a WSPF is to be revised versus when a new WSPF is required.

The CCP provides a Waste Stream Characterization Package (as described in Section C3-12b(3)) to the Permittees upon request. The option for the Permittees to request additional information ensures that the waste being offered for disposal is adequately characterized and accurately described on the WSPF.

C-1e Waste Generating Processes at the WIPP Facility

Not applicable. This section applies to the Permittee.

C-2 Waste Characterization Program Requirements and Waste Characterization Parameters

The CCP has developed the procedures which specify the programmatic waste characterization requirements (Q10). DOE will evaluate the procedures during audits and as part of the review and approve of the WSPF.

CCP must notify the Permittees and obtain DOE approval prior to making data-affecting modifications to procedures (Q10). Program procedures shall address the following minimum elements:

- Waste characterization and certification procedures for retrievably stored and newly generated wastes to be sent to the WIPP facility.
- Methods used to ensure prohibited items are documented and managed. These will include procedures for performing radiography, VE, or treatment, if these methods are used to ensure prohibited items are not present in the waste prior to shipment of the waste to WIPP.
- Procedures used to verify packaging configurations to determine the correct Drum Age Criteria (DAC) if headspace gas sampling and analysis is used to collect waste characterization information per Section C1-1a(1).
- Identify the organization(s) responsible for compliance with waste characterization and certification procedures.
- Identify the oversight procedures and frequency of actions to verify compliance with waste characterization and certification procedures.
- Develop training specific to waste characterization and certification procedures.
- Ensure that personnel may stop work if noncompliance with waste characterization or certification procedures is identified.
- Develop a nonconformance process that complies with the requirements in Section C3 to document and establish corrective actions.
- As part of the corrective action process, assess the potential time frame of the noncompliance, the potentially affected waste population(s), and the reassessment and recertification of those wastes.
- A listing of all approved hazardous waste numbers which are acceptable at WIPP are included in Table C-9.

For those waste streams or containers that are not amenable to radiography (e.g., RH TRU waste, direct loaded ten-drum overpacks [TDOPs]) for waste confirmation by the Permittees pursuant to Section C7, CCP VE data may be used for waste acceptance. In those cases, the Permittees will review the CCP VE procedures to ensure that data sufficient for the Permittees' waste acceptance activities pursuant to

Section C7 will be obtained and the procedures meet the minimum requirements for VE specified in Section C1-3.

The following waste characterization parameters are obtained from the CCP prior to waste certification:

- Determination whether TRU waste streams comply with the applicable provisions of the TSDF-WAC.
- Determination whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261 Subpart C).
- Determination whether TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR §261 Subpart D).
- Estimation of waste material parameter weights.

Tables C-1, C-2, C-3, and C-4 provide the parameters of interest for the constituent groupings and analytical methodologies.

C-3 Generator Waste Characterization Methods

The characterization techniques used by the CCP include AK and may also include, as necessary, headspace gas sampling and analysis, homogeneous waste sampling and analysis, VE, and radiography. Characterization activities are performed in accordance with this QAPjP. Table C-5, Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored Waste), provides a summary of the characterization requirements for TRU waste.

C-3a Sampling and Analytical Methods

C-3a(1) Headspace Gas Sampling and Analysis

Representative headspace gas sampling and analysis shall be used by CCP to determine the types and concentrations of VOCs in the void volume of randomly selected waste containers in order to resolve the assignment of EPA hazardous waste numbers for those debris waste streams for which an AK Sufficiency Determination Request has not been approved by the DOE (T162). In addition, VOC constituents will be compared to those assigned by AK, which may include an analysis of radiolytically derived VOCs. The CCP also considers radiolysis and packaging materials when assessing the presence of hazardous constituents in the headspace gas results, and whether radiolysis generates wastes which exhibit the toxicity characteristic. Refer to Section C4 for additional clarification regarding hazardous waste number assignment and headspace gas results. The methods for random selection of containers for

headspace gas sampling and analysis are specified in Section C2. Headspace gas sampling and analysis shall be subject to the Audit and Surveillance Program.

In accordance with EPA convention, identification of hazardous constituents detected by Gas Chromatography/Mass Spectrometry (GC/MS) methods that are not on the list of target analytes are reported. These compounds are reported as tentatively identified compounds (TICs) in the BDR and are added to the target analyte list for that waste stream if they appear in 20.4.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII and are reported in 25 percent of the samples from a given waste stream (T2). The headspace gas analysis quality assurance objectives (QAOs) are specified in Table C3-2, Gas Volatile Organic Compound Target Analyte List and Quality Assurance Objectives.

C-3a(2) Homogeneous and Soil/Gravel Waste Sampling and Analysis

The CCP uses representative homogeneous and soil/gravel waste sampling and analysis to resolve the assignment of EPA hazardous waste numbers for homogeneous and soil/gravel waste streams for which an AK Sufficiency Determination Request has not been approved by the DOE (T162). The CCP samples homogeneous and soil/gravel wastes to resolve the assignment of hazardous waste numbers. Sampling is accomplished through coring or other EPA approved sampling which is described in Section C1-2. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes need not be sampled. The waste containers for sampling and analysis are selected randomly from the population of containers for the waste stream. The random selection methodology used is described in Section C2. Homogeneous and soil/gravel sampling and analysis shall be subject to the Audit and Surveillance Program.

The CCP uses totals or toxicity characteristic leaching procedures (TCLP) analyses for VOCs, semivolatile organic compounds (SVOCs), and RCRA-regulated metals to determine waste parameters in soils/gravels and solids that are important to the performance within the disposal system (Tables C-3 and C-4). To determine if a waste exhibits a toxicity characteristic for compounds specified in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C), TCLP may be used instead of total analyses. The CCP uses the results from these analyses to determine if a waste exhibits a toxicity characteristic. The mean concentration of toxicity characteristic contaminants is calculated for each waste stream and reported with an upper 90 percent confidence limit (UCL_{90}). The UCL_{90} values for the mean measured contaminant concentrations in a waste stream is compared to the specified regulatory levels in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C), expressed as total/TCLP values, to determine if the waste stream exhibits a toxicity characteristic. A comparison of total analyses and TCLP analyses is presented in Appendix C3 of the WIPP RCRA Part B Permit Application (DOE, 1997), and a discussion of the UCL_{90} is found in Section C2-2a. If

toxicity characteristic wastes are identified, they are compared to those determined by AK and toxicity characteristic waste codes are revised, as warranted.

C-3a(3) Laboratory Qualification

Laboratories providing analytical services are qualified through participation in the DOE-CBFO Performance Demonstration Programs (PDP). In addition, methods and supporting performance data demonstrating QAO compliance are ensured by the DOE during the annual certification audit of the laboratories.

Analytical methods used: 1) satisfy the appropriate QAOs; 2) follow EPA method guidance where available; and 3) are implemented through standard operating procedures. These analytical QAOs are discussed in detail in Section C3.

C-3b Acceptable Knowledge

AK is used in TRU waste characterization activities in five ways:

- To delineate TRU waste streams
- To assess whether TRU mixed wastes comply with the TSDF-WAC
- To assess whether TRU wastes exhibit a hazardous characteristic (New Mexico Hazardous Waste Management Regulations in 20.4.1.200 NMAC incorporating 40 CFR §261 Subpart C)
- To assess whether TRU wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR §261 Subpart D)
- To estimate waste material parameter weights

AK is discussed in detail in Section C4, which outlines the minimum set of requirements and DQOs met by the CCP in order to use AK.

C-3c Radiography and Visual Examination

Radiography and VE are nondestructive qualitative and quantitative techniques used to identify and verify waste container contents as specified in Section C1. The CCP performs radiography or VE of 100 percent of CH-TRU waste containers in waste streams except for those waste streams for which the DOE approves a Scenario 1 or Scenario 2 Determination Request. No RH-TRU waste will be shipped to WIPP for storage or disposal without documentation of radiography or VE of 100 percent of the containers as specified in Section C1. VE consists of either observing the filling of waste containers or opening full containers and physically examining their contents.

Radiography and/or VE are used, when necessary, to examine a waste container to verify its physical form. These techniques detect observable liquid in excess of TSDF-WAC limits and containerized gases which are prohibited for WIPP disposal. The prohibition of liquid in excess of TSDF-WAC limits and containerized gases prevents the shipment of corrosive, ignitable, or reactive wastes. Radiography and/or VE are also able to verify the physical form of the waste matches its waste stream description (i.e., Homogeneous Solids, Soil/Gravel, or Debris Waste [including uncategorized metals]).

If the physical form does not match the waste stream description, the waste is designated as another waste stream and assigned the preliminary hazardous waste numbers associated with that new waste stream assignment. That is, if radiography and/or VE indicate that the waste does not match the waste stream description produced by AK characterization, a nonconformance report (NCR) is completed and the inconsistency resolved as specified in Section C4 (Q5), and the NCR will be dispositioned as specified in Section C3-13. The proper waste stream assignment is determined (including preparation of a new WSPF), the correct hazardous waste numbers are assigned, and the resolution is documented. The AK verification process is discussed in Section C4.

If CCP uses VE , the detection of any liquid in non-transparent internal containers, detected from shaking the internal container, is handled by assuming that the internal container is filled with liquid and adding this volume to the total liquid in the container being characterized using VE. The container being characterized using VE is then repackaged or rejected to exclude the internal container if it does not meet the requirements of the TSDF-WAC. When radiography is used or VE of transparent containers is performed, if any liquid in internal containers is detected, the volume of liquid is added to the total for the container being characterized using radiography or VE. Radiography, or the equivalent, is used as necessary on the existing or stored waste containers to verify the physical characteristics of the TRU waste corresponding with its waste stream identification and waste matrix code and to identify prohibited items. Radiographic examination protocols and QA/QC methods are provided in Section C1-3. Radiography and VE shall be subject to the Audit and Surveillance Program.

C-3d Characterization Techniques and Frequency for Newly Generated and Retrievably Stored Waste

Section C4 describes the use of AK to delineate TRU waste streams for the purpose of grouping waste by Summary Category Group for further characterization. Analyses required may differ based on the waste stream, and the physical form of the waste (i.e., heterogeneous debris waste cannot be sampled for totals analysis). Both retrievably stored and newly generated waste streams are delineated using AK though the types of AK used may differ. Every TRU waste stream is assigned hazardous waste

numbers based on AK, and CCP may resolve the assignment of these hazardous waste numbers using headspace gas sampling and analysis (Summary Category Group S5000 only) and solid sampling and analysis (Summary Category Groups S3000 and S4000 only).

In the CIS for each waste stream, the CCP will document the methods, and the findings from the method used for determining the physical form of the waste and the presence or absence of prohibited items for both retrievably stored and newly generated waste (T3). CCP may use radiography or VE to verify the physical form of retrievably stored TRU mixed waste. For newly generated waste, physical form and prohibited items may either be documented during packaging using VE or will be verified after packaging using radiography or VE.

For debris waste streams that do not have an AK Sufficiency Determination approved by the DOE, containers selected in accordance with Section C2 from those waste streams must be sampled and analyzed for headspace gas VOCs. Likewise, a statistically selected portion of homogeneous solids and soil/gravel waste streams must be sampled and analyzed for RCRA-regulated total VOCs, SVOCs, and metals when those waste streams do not have an AK Sufficiency Determination approved by the DOE (T162). Sampling and analysis methods used to characterize waste are summarized in Section C-3a.

In the process of performing organic headspace and solid sample analyses, nontarget compounds may be identified on the current target analyte list. These compounds are reported as TICs. TICs reported in 25 percent of the samples and listed in 20.4.1.200 NMAC Appendix VIII (incorporating 40 CFR §261) are compared with AK data to determine whether the TIC is in a listed waste in the waste stream. TICs identified through headspace gas analysis that meet the Appendix VIII listing and 25 percent reporting criteria for a waste stream are added to the headspace gas waste stream target analyte list regardless of the hazardous waste listing associated with the waste stream.

TICs subject to inclusion on the target analyte list that are toxicity characteristic parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, for toxicity characteristic and non-toxic F003 constituents, the CCP takes concentration into account when assessing whether to add an EPA hazardous waste number. TICs reported from the total VOC, or SVOC analyses may be excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation described in AK documentation. If the TIC associated with a total VOC or SVOC analysis cannot be identified as a component of waste packaging materials or as a product of radiolysis, the CCP adds these TICs to the list of hazardous constituents for the waste stream (and assigns additional EPA listed hazardous waste numbers, if

appropriate). A permit modification is submitted to NMED for their approval to add these constituents (and hazardous waste numbers), if necessary. For toxicity characteristic compounds and non-toxic F003 constituents, the CCP considers the waste concentration when determining whether to change a hazardous waste number. Refer to Section C3-1 for additional information on TIC identification.

Waste characterization solid sampling and analysis activities may differ for retrievably stored waste and newly generated waste. The waste characterization processes used by the CCP for both retrievably stored and newly generated waste streams will be evaluated during the DOE's audit of the site. The typical waste characterization data collection design used by CCP for each type of waste is described in the following sections. Table C-1, Summary of Hazardous Waste Characterization Requirements for Transuranic Waste, provides a summary of hazardous waste characterization requirements for all TRU waste by waste characterization parameters. Table C-5 summarizes the parameters, characterization methods, and rationale for CH-TRU wastes according to their form.

The CCP disposes of repackaged or treated TRU waste at the WIPP facility. Treated waste shall retain the original waste stream's listed hazardous waste number designation.

C-3d(1) Newly Generated Waste (T6)

The RCRA-regulated constituents in newly generated wastes are typically documented at the time of generation based on AK for the waste stream. Newly generated TRU waste characterization typically begins with verification that processes generating waste have been operating within established written procedures. Waste containers are delineated into waste streams using AK. The CCP will document the methods used to delineate waste streams in the AK record and AK Summary Report. Determination that the physical form of the waste (Summary Category Group) corresponds to the physical form of the assigned waste stream may be accomplished either using VE during packaging or by performing radiography as specified in Section C1-3 for retrievably stored waste. Instead of using a video/audio tape and a single operator, the VE method for newly generated waste (or repackaged retrievably stored waste) may use a second operator, who is equally trained to the requirements stipulated in Section C1 to provide additional verification by reviewing the contents of the waste container to ensure accurate reporting. If the second operator cannot provide concurrence, corrective actions[2] are taken as specified in Section C3. The subsequent waste characterization activities depend on the assigned Summary Category Group, since waste within the Homogeneous Solids and Soil/Gravel Summary Category Groups may be characterized using different techniques than the waste in the Debris Waste Summary Category Group. The packaging configuration, type and number of filters, and rigid liner vent hole

[2] "Corrective Action" as used in this QAPjP does not mean corrective action as defined under New Mexico Hazardous Waste Act (HWA), RCRA, and their implementing regulations.

presence and diameter necessary to determine the appropriate DAC in accordance with Section C1-1, may be documented as part of the characterization information collected during the packaging of newly generated waste or repackaging of retrievably stored waste for those containers of debris waste that will undergo headspace gas sampling and analysis.

C-3d(1)(a) Sampling of Newly Generated Homogeneous Solids and Soil/Gravel

When a Determination Request has not been approved by the DOE, sampling and analysis of newly generated homogeneous solid and soil/gravel waste streams shall be conducted in accordance with the requirements specified in Section C1-2. The number of newly generated homogeneous solid and soil/gravel waste containers to be sampled will be determined using the procedure specified in Section C2-1, wherein a statistically selected portion of the waste will be sampled.

C-3d(2) Retrievably Stored Waste

Retrievably stored waste containers are first delineated into waste streams using AK (T5). CCP documents the methods used to delineate waste streams in the AK record and AK Summary Report. Retrievably stored waste containers may be examined using either radiography or VE to determine the physical waste form (Summary Category Group), the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Group. The headspace gas sampling method provided in Section C1 is used, when necessary, to resolve the assignment of EPA hazardous waste numbers to debris waste streams, as described in Section C4.

A statistically-selected portion of retrievably stored homogeneous solids and soil/gravel wastes are sampled and analyzed for total VOCs, SVOCs, and metals, when necessary. The sample location selection method is described in Section C1. The approach used to statistically select the number of drums to be visually examined is described in Section C2.

The CCP determines the toxicity characteristic of retrievably stored homogeneous solids and soil/gravel wastes using total analysis of toxicity characteristic parameters or TCLP. To determine if a waste exhibits a toxicity characteristic for compounds specified in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C), the CCP may use TCLP instead of total analyses. Appendix C3 of the WIPP RCRA Part B Permit Application (DOE, 1997) discusses comparability of totals analytical results to those of the TCLP method.

Representativeness of containers selected for headspace gas sampling and waste subjected to homogeneous solids and soil/gravel sampling and analysis will be validated by the CCP via examination of documentation that shows that true random samples were collected. (Because representativeness is a quality characteristic that expresses the degree to which a sample or group of samples represent the population being studied, the random sampling of waste streams ensures representativeness).

C-4 Data Verification and Quality Assurance

The CCP ensures that its applicable waste characterization process performance for generator/storage sites sending TRU waste to the WIPP for disposal meets WAP requirements through data validation, verification, usability and reporting controls. Verification occurs at three levels: 1) the CCP data generation level, 2) the CCP project level, which consists of verification and validation by the CCP to ensure that applicable WAP requirements are met and; 3) the Permittee level. The validation and verification process and requirements at each level are described in Section C3-10. The validation verification process at the Permittee Level is also described in C-5.

C-4a Data Generation and Project Level Verification Requirements

C-4a(1) Data Quality Objectives

The waste characterization data obtained through implementation of this QAPjP are used by the Permittees to ensure that the regulatory requirements of the WAP are met with regard to compliance and to ensure that TRU wastes are properly managed during the disposal phase.

To satisfy the RCRA regulatory compliance requirements, the following are DQOs established by the WAP and flowed down to this QAPjP (T2):

<u>Acceptable Knowledge</u>

- To delineate TRU waste streams.
- To assess whether TRU mixed wastes comply with the applicable requirements of the TSDF-WAC.
- To assess whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart C).
- To assess whether TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating 40 CFR §261, Subpart D).
- To estimate waste material parameter weights.

Headspace Gas Sampling and Analysis

- To identify VOCs and quantify the concentrations of VOC constituents in waste containers to resolve the assignment of EPA hazardous waste numbers

Homogeneous Waste Sampling and Analysis

- To compare UCL_{90} values for the mean measured contaminant concentrations in a waste stream with specified toxicity characteristic levels in 20 4.1.200 NMAC (incorporating 40 CFR §261), to determine if the waste is hazardous, and to resolve the assignment of EPA hazardous waste numbers

Radiography

- To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, S5000).

Visual Examination

- To determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used based on the Summary Category Groups (i.e., S3000, S4000, S5000).

Reconciliation of these DQOs by the SPM or DOE approved laboratories, as applicable, is addressed in Section C3-11. Reconciliation requires determining whether sufficient types, quality, and quantity of data have been collected to ensure that the DQOs cited above can be achieved.

C-4a(2) Quality Assurance Objectives

The CCP or the DOE approved laboratories, as applicable, demonstrates compliance with each QAO associated with the various characterization methods presented in Sections C3-2 through C3-9. The SPM or the DOE approved laboratories, as applicable, performs reconciliation of the data with the DQOs established in this QAPjP. The SPM or the DOE approved laboratories, as applicable, concludes that all of the DQOs have been met for the characterization of the waste stream prior to submitting a WSPF to the DOE for approval (T2).

The following QAO elements are considered for each technique, as a minimum:

- Precision - a measure of the mutual agreement among multiple measurements

- Accuracy - the degree of agreement between a measurement result and the true or known value
- Completeness - a measure of the amount of valid data obtained from a method compared to the total amount of data obtained (expressed as a percentage)
- Comparability - the degree to which one data set can be compared to another
- Representativeness - the degree to which sample data represent characteristics of a population

A more detailed discussion of the QAOs including a mathematical representation can be found in Section C3, which describes the QAOs associated with each sampling and analysis method.

C-4a(3) Sample Control

The CCP and DOE approved laboratories, as applicable, implement a sample handling and control program that includes the maintenance of field documentation records, proper labeling and a chain of custody (COC) record (T93, T177, and T180). The procedures referenced in the QAPjP document the sample control program and include COC forms to control the sample from the point of origin to the final analysis result reporting. The DOE reviews and approve the QAPjP, including the determination that the sample control program is adequate. The approved QAPjP is provided to the NMED by the Permittees prior to waste shipment and before the CCP audit. Details of the sample control program are provided in Section C1 and are summarized to include:

- Field documentation of samples including point of origin, date of sample, container identification, sample type, analysis requested, and COC number
- Labeling and/or tagging including sample number, sample ID, sample date, sampling conditions, and analysis requested
- COC control including name of sample relinquisher, sample receiver, and date and time of sample transfer
- Proper sample handling and preservation

C-4a(4) Data Generation

BDRs, in a format approved by the DOE, are used by CCP and DOE approved laboratories, as applicable, for reporting waste characterization data. The CCP and DOE approved laboratories, as applicable, formats for reporting waste characterization

data in BDRs are specified in several procedures. These procedures comply with the waste characterization data reporting requirements described in Section C3.

Analytical laboratories used by the CCP to analyze WIPP waste characterization samples have established and documented QA/QC programs.

The CCP and DOE approved laboratory analytical QA/QC program includes the following:

- Facility organization
- List of equipment/instrumentation
- Operating procedures
- Laboratory QA/QC procedures
- Quality assurance review
- Laboratory records management

C-4a(5) Data Verification

BDRs document the testing, sampling, analytical, and on-line results from required characterization activities, and required QA/QC activities. Data validation, review, and verification are performed at the data generation level and the CCP project level before the required data are transmitted to the Permittees (T1). Section C3-10 discusses the data validation process in greater detail. NMED may request, through the Permittees, copies of any BDR and/or the raw data validated by the CCP to check the DOE's audit of the validation and verification process.

C-4a(6) Data Transmittal

As part of the waste characterization data submittal, the CCP transmits the data electronically to the Permittees via the WIPP Waste Information System (WWIS)/Waste Data System (WDS) (T30, T530). Data will be entered into the WWIS/WDS in the exact format required by the data base as specified in Section C-5a(1) for WWIS/WDS reporting requirements and the *Waste Data System User's Manual* (DOE 2009) for the WWIS/WDS data fields and format requirements.

BDRs include the information required by Section C3-10 and are transmitted by hard copy or electronically (provided a hard copy is available on demand) from the data generation level to the CCP project level.

Once a waste stream is fully characterized the SPM submits a WSPF, accompanied by a Characterization Information Summary for that waste stream to the Permittees, which includes a record of reconciliation with DQOs as described in Sections C3-12b(1) and C3-12b(2).

The WSPF, the Characterization Information Summary, and information from the WWIS/WDS is used as the basis for acceptance of waste characterization information on TRU wastes to be disposed of at WIPP.

C-4a(7) Records Management

Records related to waste characterization activities performed by the generator/storage sites will be maintained in the testing, sampling or analytical facility files or generator/storage site project files or at the WIPP Records Archive facility. DOE approved laboratories will forward testing, sampling, and analytical records along with BDRs, to CCP Records for inclusion in the CCP's project files and to the Permittees for inclusion in the WIPP facility operating record. Raw data obtained by testing, sampling, and analyzing TRU mixed waste in support of the WAP will be identifiable, legible, and provide documentary evidence of quality. TRU mixed waste characterization records submitted to the Permittees shall be maintained in the WIPP facility operating record and be available for inspection by NMED. A detailed description of CCP site-specific records management activities is provided in Section C5-2.

Records inventory and disposition schedule (RIDS) or an equivalent system shall be prepared and approved by CCP. All records relevant to an enforcement action under this Permit, regardless of disposition, shall be maintained in CCP Records at the generator/storage site or at the WIPP Records Archive facility until NMED determines they are no longer needed for enforcement action, and then dispositioned as specified in the approved RIDS. All waste characterization data and related QA/QC records for TRU mixed waste to be shipped to the WIPP facility are designated as either Lifetime Records or Non-Permanent Records. Records that are designated as Lifetime Records shall be maintained for the life of the waste characterization program by CCP Records or generator/storage sites plus six years or transferred for permanent archival storage to the WIPP Records Archive facility.

Waste characterization records designated as Non-Permanent Records shall be maintained for 10 years from the date of (record) generation by CCP Records or at the participating generator/storage site or at the WIPP Records Archive facility and then dispositioned according to their approved RIDS. If a generator/storage site ceases to operate, all records shall be transferred before closeout to the Permittees for management at the WIPP Records Archive facility. Table C-6, Required Program Records, is a listing of records designated as Lifetime Records and Non-Permanent Records.

Classified information will not be transferred to WIPP. Notations will be provided to the Permittees indicating the absence of classified information. The approved CCP RIDS will identify the appropriate disposition of classified information. Nothing in the WIPP Permit is intended to, nor should it be interpreted to, require disclosure of any U.S. Department of Energy classified information to persons without appropriate clearance to view such information.

C-5 Permittee Level Waste Screening and Verification of TRU Mixed Waste

This section is not applicable to CCP. This section applies to the Permittees.

C-5a Phase I Waste Stream Screening and Verification

The first phase of the waste screening and verification process occurs before TRU waste is shipped to the WIPP facility. Before the Permittees begin the process of accepting TRU waste from the CCP, an initial audit is conducted as part of the Audit and Surveillance Program. The audit of CCP provides verification of characterization procedures; BDR preparation; and recordkeeping that ensures that all applicable provisions of the WAP requirements are met. Another portion of the Phase I verification is the WSPF approval process. At the WIPP facility, this process includes verification that all of the required elements of a WSPF and CIS are present and that the summarized waste characterization information meets acceptance criteria required for compliance with the WAP (Section C3-12b(1)).

The CCP has prepared this QAPjP, which includes applicable WAP requirements. This document is submitted to DOE for review and approval. The CCP implements the specific parameters of this QAPjP after Permittee approval. An initial audit is performed after QAPjP implementation and prior to the CCP being certified for shipment of waste to WIPP. Additional audits, focusing on the results of waste characterization, are performed at least annually. The DOE has the right to conduct unannounced audits and to examine any records that are related to the scope of the audit. See Section C-5a(3) for further information regarding audits.

When the required waste stream characterization data have been collected by the CCP and the initial audit is successfully completed, the SPM will verify that the waste stream characterization meets the applicable WAP requirements as part of the project level verification (T3). If the waste characterization does not meet the applicable requirements of the WAP, the waste stream cannot be managed, stored, or disposed of at the WIPP until those requirements are met. The SPM will then complete the WSPF and submit it to the Permittees, along with the accompanying CIS for that waste stream. All data necessary to check the accuracy of the WSPF is transmitted to the Permittees. This provides notification that the CCP considers that the waste stream (identified by the waste stream identification number) has been adequately characterized for disposal prior to shipment to WIPP. The Permittees then compare headspace gas, radiography,

VE and solid sampling and analysis data obtained subsequent to submittal and approval of the WSPF (and prior to submittal) with characterization information presented on this form. If the Permittees determine (through the data comparison) that the characterization information is adequate, DOE will approve the WSPF. Prior to the first shipment of containers from the approved waste stream, the approved WSPF and accompanying CIS is provided to NMED. If the data comparison indicates that analyzed containers have hazardous wastes not present on the WSPF, or a different waste matrix code applies, the WSPF is in error and is resubmitted. Ongoing WSPF examination is discussed in detail in Section C-5a(2).

Audits of CCP will be conducted as part of the Audit and Surveillance Program. The RCRA portion of the CCP audit program will provide on-site verification of waste characterization procedures; BDR preparation; and record keeping to ensure that all applicable provisions of the WAP requirements are met. As part of the waste characterization data submittal, the CCP also transmits the data on a container basis via the WWIS/WDS prior to shipment of that container. This data submittal occurs at any time as the data are being collected, but is complete for each container prior to shipment of that container. The WWIS/WDS conducts internal edit/limit checks based on the approved WSPF. The Permittees compare ongoing sampling and analysis characterization data obtained and submitted via the WWIS/WDS to the approved WSPF. If this comparison shows that containers have hazardous wastes not reported on the WSPF, or a different waste matrix code applies, the data are rejected and the waste containers are not accepted for shipment until a new or revised WSPF is submitted to Permittees' and approved by the DOE.

If discrepancies regarding hazardous waste number assignment or Waste Matrix Code designation arise as a result of the Phase I review, the CCP is contacted by the Permittees and provides the necessary additional information to resolve the discrepancy before that waste stream is approved for disposal at the WIPP facility. If the discrepancy is not resolved, the waste stream is not approved for shipment.

C-5a(1) WWIS/WDS Description

The CCP supplies the required data to the Permittees via the WWIS/WDS (T30, T530). The WWIS/WDS Data Dictionary includes all of the data fields, the field format and the limits associated with the data as established by the WIPP WAP. These data will be subjected to edit and limit checks that are performed automatically by the database, as defined in the *Waste Data System User's Manual* DOE/WIPP-09-3427(DOE, 2009). The Permittees will coordinate the data transmission with CCP. Actual data transmission will use appropriate technology to ensure the integrity of the data transmissions. The Permittees will require sites with large waste inventories and large databases to populate a data structure provided by the Permittees that contains the required data dictionary fields that are appropriate for the waste stream (or waste streams) at the site. For example, totals analysis data will not be requested from sites

that do not have homogeneous solids or soil/gravel waste. The Permittees will access these data via the Internet to ensure an efficient transfer of this data. Small quantity sites will be given a similar data structure by the Permittees that is tailored to their types of waste. Sites with very small quantities of waste will be provided with the ability to assemble the data interactively to this data structure on the WWIS/WDS.

The Permittees will use the WWIS/WDS to verify that all of the supplied data meet the applicable edit and limit checks prior to the shipment of any TRU waste to WIPP. The WWIS/WDS automatically notifies the CCP if any of the supplied data fails to meet the requirements of the edit and limit checks via an appropriate error message. The CCP corrects the discrepancy with the waste or the waste data and re-transmits the corrected data prior to acceptance of the data by the WWIS/WDS. The Permittees review data reported for each container of each shipment prior to providing notification to the CCP that the shipment is acceptable.

Access to the WWIS/WDS is controlled by the Permittees' Data Administrator (DA) who controls the WWIS/WDS users based on approval from management personnel.

The CCP only has access to CCP data supplied to WWIS/WDS, and only until the data have been formally accepted by the Permittees. After the data have been accepted, the data are protected from indiscriminate change and only changed by an authorized DA.

C-5a(2) Examination of the Waste Stream Profile Form and Container Data Checks

The Permittees verify the completeness and accuracy of the WSPF (Section C3-12b(1)). The assignment of the waste stream description, waste matrix code group, and Summary Category Groups; the results of waste analyses, as applicable; the AK summary documentation; the methods used for characterization; the DOE certification, and appropriate designation of hazardous waste number(s) are examined by the Permittees. If the WSPF is inaccurate, efforts are made to resolve discrepancies by contacting the CCP in order for the waste stream to be eligible for shipment to the WIPP facility. If discrepancies in the waste stream are detected, the CCP implements a non-conformance action to identify, document, and report discrepancies.

The WSPF shall pass all verification checks by the Permittees in order for the waste stream to be approved by DOE for shipment to the WIPP facility. The WSPF check against waste container data will occur during the initial WSPF process (Section C5a). Waste data transferred via the WWIS/WDS after WSPF approval is compared with the approved WSPF. Any container from an approved hazardous waste stream with a description different from its WSPF is not shipped to the WIPP for disposal.

The CCP verifies that the three different types of data specified below are available for every container holding TRU waste before that waste is managed, stored, or disposed at WIPP: 1) an assignment of the waste stream's waste description (by waste matrix codes) and waste matrix code group; 2) a determination of ignitability, reactivity, and corrosivity; and 3) a determination of compatibility. The CIS indicates if the waste was checked for the characteristics of ignitability, corrosivity, and reactivity.

Any container with unresolved discrepancies associated with hazardous waste characterization will not be managed, stored, or disposed at the WIPP facility until the discrepancies are resolved. If discrepancies cannot be resolved, the DOE will revoke the approval status of the waste stream and CCP will suspend shipments of the waste stream. Waste stream approval will not be reinstated until the CCP demonstrates all corrective actions have been implemented and the CCP waste characterization program is reassessed by the DOE.

C-5a(3) Audit and Surveillance Program

This section is not applicable to the CCP. It applies to the Permittees.

C-5b Phase II Waste Shipment Screening and Verification

For each container shipped, the CCP provides the following information (T86):

Hazardous Waste Manifest Information:

- Generator/storage site name and EPA Identification Number
- CCP contact name and phone number
- Quantity of waste
- List of up to six state and/or federal hazardous waste numbers in each line item
- Listing of all shipping container identification numbers (IDs) (Shipping Package serial number)
- Signature of authorized generator representative

Specific Waste Container information:

- Waste Stream Identification Number
- List of hazardous Waste Numbers per Container
- Certification Data
- Shipping Data (assembly numbers, ship date, shipping category, etc.)

This information is also supplied electronically to the WWIS/WDS. The container-specific information will be supplied electronically as described in Section C-5a(1), and is supplied prior to shipment.

C-5b(1) Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information

Manifest discrepancies will be identified during manifest examination and container bar-code WWIS/WDS data comparison. A manifest discrepancy is a difference between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste the WIPP facility actually receives. The CCP technical contact (as listed on the manifest) is contacted to resolve the discrepancy. Errors on the manifest are corrected by the WIPP facility with a verbal (followed by a mandatory written) concurrence by the CCP technical contact. If the manifest discrepancies are not resolved in thirty (30) days of waste receipt, the shipment is returned to the facility where the CCP performed the characterization.

C-5b(2) Examination of the Land Disposal Restriction Notice

TRU waste designated by the Secretary of Energy for disposal at WIPP is exempt from the Land Disposal Restrictions (LDRs) by the WIPP Land Withdrawal Act Amendment (Public Law 104-201). This amendment states that WIPP "Waste is exempted from treatment standards promulgated pursuant to section 3004(m) of the Solid Waste Disposal Act (42 U.S.C. 6924[m]) and shall not be subjected to the Land Disposal prohibitions in section 3004(d), (e), (f), and (g) of the Solid Waste Disposal Act." Therefore, with the initial shipment of a TRU waste stream, the CCP provides the Permittees with a one time written notice. The notice includes the information listed below:

Land Disposal Restriction Notice Information:

- EPA hazardous waste numbers and Manifest Numbers of first shipment of a mixed waste stream

- Statement: this waste is not prohibited from land disposal
- Date the waste is subject to prohibition

This information is the applicable information taken from column "268.7(a)(4)" of the "Generator Paperwork Requirements Table" in 20.4.1.800 NMAC (incorporating 40 CFR §268.7(a)(4)). Note that item "5" from the "Generator Paperwork Requirements Table" is not applicable since waste analysis data are provided electronically via the WWIS/WDS and item "7" is not applicable since waste designated by the Secretary of Energy for disposal at WIPP is exempted from the treatment standards.

The Permittees review the LDR notice for accuracy and completeness. The CCP prepares this notice in accordance with the applicable requirements of 20.4.1.800N MAC (incorporating 40 CFR §268.7(a)(4)).

C-5b(3) Verification

This section is not applicable to CCP. This section applies to the Permittees.

C-6 Permittees' Waste Shipment Screening QA/QC

This section is not applicable to CCP. This section applies to the Permittees.

C-7 Records Management and Reporting

All waste characterization data for each TRU waste container transmitted to WIPP shall be maintained by the Permittees for the active life of the WIPP facility plus two years (Q8). The active life of the WIPP facility is defined as the period from the initial receipt of TRU waste at the facility until NMED receives certification of final closure of the facility. After their active life, the records shall be retired to the WIPP Records Archive facility and maintained for 30 years. These records will then be offered to the National Archives. However, this disposition requirement does not preclude the inclusion of these records in the permanent marker system or other requirements for institutional control.

Waste characterization and waste confirmation data and documents related to waste characterization that are part of the WIPP facility operating record are managed in accordance with the following guidelines:

C-7a General Requirements

- Records shall be legible

- Corrections shall be made with a single line through the incorrect information, and the date and initial of the person making the correction shall be added
- Black ink is encouraged, unless a copy test has been conducted to ensure the other color ink will copy
- Use of highlighters on records is discouraged
- Records shall be reviewed for completeness
- Records shall be validated by the cognizant manager or designee

C-7b Records Storage

- Active records shall be stored when not in use
- Quality records shall be kept in a one-hour (certified) fire-rated container or a copy of a record shall be stored separately (sufficiently remote from the original) in order to prevent destruction of both copies as a result of a single event such as fire or natural disaster
- Unauthorized access to the records is controlled by locking the storage container or controlling personnel access to the storage area

C-8 Reporting

This section is not applicable to CCP. This section applies to the Permittees.

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste[a]

Parameter	Techniques and Procedure
Physical Waste Form Summary Category Names S3000 Homogeneous Solids S4000 Soil/Gravel S5000 Debris Wastes	Waste Inspection Procedures Radiography VE (Section C1)
Headspace Gases VOCs Alcohols and Ketones Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene trans-1,2-Dichloroethylene Ethyl benzene Ethyl ether Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Xylenes Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	Gas Analysis[f] GC/MS, EPA TO-14A, TO-15 or modified SW-846 Method 8240/8260 Gas Chromatography/Flame Ionization Detector (GC/FID), for alcohols and ketones, SW-846 Method 8015

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste[a] (Continued)

Total VOC		Total VOC Analysis
Acetone		TCLP, SW-846 1311
Benzene	Isobutanol	GC/MS, SW-846 8260
Bromoform	Methanol	GC/FID, SW-846 8015
Butanol	Methyl ethyl ketone	(Section C3)
Carbon disulfide	Methylene chloride	HPLC, SW-846 8315A
Carbon tetrachloride	Pyridine[d]	AK for Summary Category S5000 (Debris Wastes)
Chlorobenzene	1,1,2,2-Tetrachloroethane	
Chloroform	Tetrachloroethylene	
1,4-Dichlorobenzene[d]	Toluene	
1,2-Dichlorobenzene[d]	1,1,2-Trichloro-1,2,2-trifluoroethane	
1,2-Dichloroethane	Trichlorofluoromethane	
1,1-Dichloroethylene	1,1,1-Trichloroethane	
Ethyl benzene	1,1,2-Trichloroethane	
Ethyl ether	Trichloroethylene	
Formaldehyde[b]	Vinyl chloride	
Hydrazine[c]	Xylenes	
	(trans) 1,2-Dichloroethylene	
Total Semivolatile Organic Compounds (SVOC)		Total SVOC Analysis[g]
Cresols		TCLP, SW-846 1311
1,4-Dichlorobenzene[e]		GC/MS, SW-846 8270
1,2-Dichlorobenzene[e]		
2,4-Dinitrophenol		(Permit Attachment C3)
2,4-Dinitrotoluene		
Hexachlorobenzene		Acceptable Knowledge for Summary Category S5000 (Debris Wastes)
Hexachloroethane		
Nitrobenzene		
Pentachlorophenol		
Pyridine[e]		
Total Metals		Total Metals Analysis[g]
Antimony	Mercury	TCLP, SW-846 1311
Arsenic	Nickel	ICP- MS, SW-846 6020
Barium	Selenium	ICP Emission Spectroscopy, SW-846 6010
Beryllium	Silver	Atomic Absorption Spectroscopy, SW-846 7000
Cadmium	Thallium	(Permit Attachment C3)
Chromium	Vanadium	
Lead	Zinc	Acceptable Knowledge for Summary Category S5000 (Debris Wastes)

Table C-1. Summary of Hazardous Waste Characterization Requirements for Transuranic Mixed Waste[a] (Continued)

[a] WAP, HWFP, NMED.

[b] Required only for homogeneous solids and soil/gravel from the Savannah River Site (SRS) to resolve the assignment of EPA hazardous waste numbers.

[c] Required only for homogeneous solids and soil/gravel from Oak Ridge National Laboratory (ORNL) and SRS to resolve the assignment of EPA hazardous waste numbers.

[d] Can also be analyzed as a semi-volatile organic compound.

[e] Can also be analyzed as a volatile organic compound.

[f] Required only to resolve the assignment of EPA hazardous waste numbers to debris waste streams.

[g] Required only to resolve the assignment of EPA hazardous waste numbers to homogeneous solid and soil/gravel waste streams.

Table C-2. Headspace Gas Target Analyte List and Methods[b]

Parameter	Environmental Protection Agency (EPA) Specified Analytical Method
Benzene Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,1-Dichloroethane 1,2-Dichloroethane 1,1-Dichloroethylene trans-1,2-Dichloroethylene Ethyl benzene Ethyl ether Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene 1,1,2-Trichloro-1,2,2-trifluoroethane Xylenes	EPA: Modified TO-14A, TO-15[a] Modified SW-846 8240/8260
Acetone Butanol Methanol Methyl ethyl ketone Methyl isobutyl ketone	EPA: Modified TO-14A, TO-15[a] Modified SW-846 Method 8240/8260 SW-846 Method 8015

[a] U.S. Environmental Protection Agency (EPA), 1999 "Compendium Method TO-14, the Determination of Volatile Organic Compounds (VOC) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis," in *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*-Second Edition (EPA/625/R-96/010b). Research Triangle Park, North Carolina, Quality Assurance Division, Monitoring System Laboratory, U.S. EPA. The most current revision of the specified methods may be used.

[b] Required only for debris waste when required to resolve the assignment of EPA hazardous waste numbers.

Table C-3. Required Organic Analyses and Test Methods Organized by Organic Analytical Groups[e]

Organic Analytical Group	Required Organic Analyses	Environmental Protection Agency (EPA) Analytical Method[a,e]
Nonhalogenated Volatile Organic Compounds (VOCs)	Acetone Benzene n-Butanol Carbon disulfide Ethyl benzene Ethyl ether Formaldehyde Hydrazine[b] Isobutanol Methanol Methyl ethyl ketone Toluene Xylenes	8015 8260 8315A
Halogenated VOCs	Bromoform Carbon tetrachloride Chlorobenzene Chloroform 1,2-Dichloroethane 1,1-Dichloroethylene Methylene chloride 1,1,2,2-Tetrachloroethane Tetrachloroethylene trans-1,2-Dichloroethylene 1,1,2-Trichloroethane 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane Vinyl Chloride	8015 8260
Semivolatile Organic Compounds (SVOCs)	Cresols (o, m, p) 1,2-Dichlorobenzene[c] 1,4-Dichlorobenzene[c] 2,4-Dinitrophenol 2,4-Dinitrotoluene Hexachlorobenzene Hexachloroethane Nitrobenzene Pentachlorophenol Pyridine[c]	8270

[a] U.S. Environmental Protection Agency (EPA), 1996, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition.

[b] Generator/Storage Sites will have to develop an analytical method for hydrazine. This method will be submitted to DOE for approval.

[c] These compounds may also be analyzed as VOCs by SW-846 Method 8260.

[d] TCLP (SW-846 1311) may be used to determine if compounds in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C) exhibit a toxicity characteristic.

[e] Required only to resolve the assignment of EPA Hazardous Waste Numbers.

Table C-4. Summary of Sample Preparation and Analytical Methods for Metals

Parameters	EPA-Specified Analytical Methods[a,b,c]
Sample Preparation	3051, or equivalent, as appropriate for analytical method
Total Antimony	6010, 6020, 7000, 7010, 7062
Total Arsenic	6010, 6020, 7010, 7061, 7062
Total Barium	6010, 6020, 7000, 7010
Total Beryllium	6010, 6020, 7000, 7010
Total Cadmium	6010, 6020, 7000, 7010
Total Chromium	6010, 6020, 7000, 7010
Total Lead	6010, 6020, 7000, 7010
Total Mercury	7471
Total Nickel	6010, 6020, 7000, 7010
Total Selenium	6010, 7010, 7741, 7742
Total Silver	6010, 6020, 7000, 7010
Total Thallium	6010, 6020, 7000, 7010
Total Vanadium	6010, 7000, 7010
Total Zinc	6010, 6020, 7000, 7010

[a] U.S. Environmental Protection Agency (EPA), 1996. "Test Methods for Evaluating Solid Waste," Laboratory Manual Physical/Chemical Methods, SW-846, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

[b] TCLP (SW-846 1311) may be used to determine if compounds in 20.4.1.200 NMAC (incorporating 40 CFR §261, Subpart C) exhibit a toxicity characteristic.

[c] Required only for homogeneous solids and soil/gravel to resolve the assignment of EPA Hazardous Waste Numbers.

Table C-5. Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Stored Waste)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
S3000-Homogeneous Solids S4000-Soil/Gravel	• Solidified inorganics • Salt waste • Solidified organics • Contaminated soil/debris	Physical waste form	Acceptable knowledge, Radiography or VE	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents • Listed • Characteristic	Acceptable knowledge or statistical sampling (see Tables C-3, Required Organic Analyses and Test Methods Organized by Organic Analytical Groups, and C-4, Summary of Sample Preparation and Analytical Methods for Metals)	• Determine characteristic metals and organics • Resolve the assignment of EPA Hazardous Waste Numbers
S5000-Debris Waste	• Uncategorized metal (metal waste other than lead/cadmium) • Lead/cadmium waste • Inorganic nonmetal waste • Combustible waste • Graphite waste • Heterogeneous debris waste • Composite filter waste	Physical waste form	Acceptable knowledge, radiography, and/or VE	• Determine waste matrix • Demonstrate compliance with waste acceptance criteria (e.g., no free liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents • Characteristic • Listed	Statistical gas sampling and analysis [a] (see Table C-2, Headspace Gas Target Analyte List and Methods)	• Resolve the assignment of EPA Hazardous Waste Numbers
		Hazardous constituents • Characteristic	Acceptable knowledge	• Determine characteristic metals and organics

Table C-5. Summary of Parameters, Characterization Methods, and Rationale for CH TRU Waste (Newly Generated Waste) (Continued)

Waste Matrix Code Summary Categories	Waste Matrix Code Groups	Characterization Parameter	Method	Rationale
S3000-Homogeneous Solids S4000-Soil/Gravel	▪ Solidified inorganic ▪ Salt waste ▪ Solidified organics ▪ Contaminated soil/debris	Physical waste form	Acceptable Knowledge, radiography, and/or VE	▪ Determine waste matrix ▪ Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents ▪ Listed ▪ Characteristic	Statistical sampling[a] (see Tables C-3 and C-4)	▪ Determine characteristic metals and organics ▪ Resolve the assignment of EPA Hazardous Waste Numbers
S5000-Debris Waste	▪ Uncategorized metal (metal waste other than lead/cadmium) ▪ Lead/cadmium waste ▪ Inorganic nonmetal waste ▪ Combustible waste ▪ Graphite waste ▪ Heterogeneous debris waste ▪ Composite filter waste	Physical waste form	Acceptable Knowledge, radiography, and/or VE	▪ Determine waste matrix ▪ Demonstrate compliance with waste acceptance criteria (e.g., no liquid in excess of TSDF-WAC limits, no incompatible wastes, no compressed gases)
		Hazardous constituents ▪ Characteristic ▪ Listed Hazardous constituents ▪ Characteristic	Statistical gas sampling and analysis [a] (see Table C-2) Acceptable knowledge	▪ Resolve the assignment of EPA Hazardous Waste Numbers ▪ Determine characteristic metals and organics

[a] Applies to waste streams that require sampling.

Table C-6. Required Program Records Maintained in Generator/Storage Site Project Files

Lifetime Records
• Field sampling data forms • Field and laboratory chain-of-custody forms • Test facility and laboratory batch data reports • Waste Stream Characterization Packages • Sampling plans • Data reduction, validation, and reporting documentation • AK documentation • WSPFs and CIS
Non-Permanent Records
• Nonconformance documentation • Variance documentation • Assessment documentation • Gas canister tags • Methods performance documentation • PDP documentation • Sampling equipment certifications • Calculations and related software documentation • Training/qualification records • QAPjPs documentation (all revisions) • Calibration documentation • Analytical raw data • Procurement records • QA and technical procedures (all revisions) • Audio/video recordings (radiography, VE)

Table C-7. WIPP Waste Information System Data Fields[a]

Characterization Module Data Fields [b]	
Container ID [c] Generator EPA ID Generator Address Generator Name Generator Contact Hazardous Code Headspace Gas Sample Date Headspace Gas Analysis Date Headspace Gas Analyte [d] Headspace Gas Concentration [d] Headspace Gas Char. Method [d] Layers of Packaging Liner Exists Liner Hole Size Filter Model Number of Filters Installed Total VOC Char. Method [d] Total Metals Char. Method [d] Total Semi-VOC Char. Method [d] Item Description Code Haz. Manifest Number NDE Complete [e]	Total VOC Sample Date Total VOC Analysis Date Total VOC Analyte Name [d] Total VOC Analyte Concentration [d] Total Metal Sample Date Total Metal Analysis Date Total Metal Analyte Name [d] Total Metal Analyte Concentration [d] Semi-VOC Sample Date Semi-VOC Analysis Date Semi-VOC Analyte Name [d] Semi-VOC Concentration [d] Transporter EPA ID Transporter Name Visual Exam Container [e] Waste Material Parameter [d] Waste Material Weight [d] Waste Matrix Code Waste Matrix Code Group Waste Stream Profile Number
Certification Module Data Fields	
Container ID [c] Container type Container Weight Contact Dose Rate Container Certification date Container Closure Date Handling Code	
Transportation Data Module	
Contact Handled Package Number Assembly Number[f] Container IDs [c,d] ICV Closure Date Ship Date Receive Date	
Disposal Module Data	
Container ID [c] Disposal Date Disposal Location	

[a] This is not a complete list of the WWIS/WDS data fields.
[b] Some of the fields required for characterization are also required for certification and/or transportation.
[c] Container ID is the main relational field in the WWIS/WDS Database.
[d] This is a multiple occurring field for each analyte, nuclide, etc.
[e] These are logical fields requiring only a yes/no.
[f] Required for 7-Packs of 55-gallon drums, 4-packs of 85-gallon drums, or 3-packs of 100-gallon drums to tie all of the drums in that assembly together. This facilitates the identification of waste containers in a shipment without need to breakup the assembly.

Table C-8. Waste Tanks Subject to Exclusion

Hanford Site - 177 Tanks	
A-101 through A-106	C-201 through C-204
AN-101 through AN-107	S-101 through S-112
AP-101 through AP-108	SX-101 through SX-115
AW-101 through AW-106	SY-101 through SY-103
AX-101 through AX-104	T-101 through T-112
AY-101 through AY-102	T-201 through T-204
B-101 through B-112	TX-101 through TX-118
B-201 through B-204	TY-101 through TY-106
BX-101 through BX-112	U-101 through U-112
BY-101 through BY-112	U-201 through U-204
C-101 through C-112	
SRS - 51 Tanks	
Tank 1 through 51	
Idaho National Laboratory - 15 Tanks	
WM-103 through WM-106	WM-180 through 190

Table C-9. Listing of Permitted Hazardous Waste Numbers

EPA Hazardous Waste Numbers			
F001	D019	D043	U079
F002	D021	P015	U103
F003	D022	P030	U105
F004	D026	P098	U108
F005	D027	P099	U122
F006	D028	P106	U133*
F007	D029	P120	U134*
F009	D030	U002*	U151
D004	D032	U003*	U154*
D005	D033	U019*	U159*
D006	D034	U037	U196
D007	D035	U043	U209
D008	D036	U044	U210
D009	D037	U052	U220
D010	D038	U070	U226
D011	D039	U072	U228
D018	D040	U078	U239*

* Acceptance of U-numbered wastes listed for reactivity, ignitability, or corrosivity characteristics is contingent upon a demonstration that the wastes no longer exhibit the characteristic of reactivity, ignitability, or corrosivity.

Figure C-1. Waste Stream Profile Form (Example Only)

WASTE STREAM PROFILE FORM

Waste Stream Profile Number: _____
Generator Site Name: _____ Technical Contract: _____
Generator Site EPA ID: _____ Technical Contact Phone Number: _____
Date of audit report approval by NMED: _____
Title, version number and date of documents used for WAP Certification: _____
_____
Did your facility generate this waste? Yes No
If no, provide the name and EPA ID of the original generator: _____
_____
WIPP ID: _____ Summary Category Group: _____
Waste Stream Name _____
Description from the WTWBIR: _____
_____
Defense Waste: Yes No Check one: CH RH
Number of SWBs _____ Number of Drums _____ Number of Canisters _____
Batch Data Report numbers supporting this waste stream characterization: _____
List applicable EPA Hazardous Waste Numbers [12]: _____
Applicable TRUCON Content Numbers: _____
Acceptable Knowledge Information [1]
(For the following, enter supporting documentation used (i.e. references and dates.))

Required Program Information

- Map of site: _____
- Facility mission description: _____
- Description of operations that generate waste: _____
  _____
- Waste identification/categorization schemes: _____
- Types and quantities of waste generated: _____
- Correlation of waste streams generated from the same building and process as applicable: _____
  _____
- Waste certification procedures: _____

Required Waste Stream Information

- Area(s) and building(s) from which waste stream was generated: _____
- Waste stream volume and time period of generation: _____
- Waste generating process description for each building: _____
- Waste process flow diagrams: _____
  _____
- Material inputs or other information identifying chemical/radionuclide content and physical waste form: _____
  _____
- Waste material parameter estimates per unit of waste: _____
- Which Defense Activity generated the waste: (check one)

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

Figure C-1. Waste Stream Profile Form (Example Only) (continued)

WASTE STREAM PROFILE FORM

Supplemental Documentation
Process design documents: _____
Standard operating procedures: _____
Safety Analysis Reports: _____
Waste packaging logs: _____
Test plans/research project reports: _____
Site data bases: _____
Information from site personnel: _____
Standard industry documents: _____
Previous analytical data _____
Material safety data sheets: _____
Sampling and analysis data from comparable/surrogate waste: _____
Laboratory notebooks: _____

Confirmation Information[2]
[To the following when applicable enter procedure titles, numbers, and dates]

Radiography: _____

Visual Examination: _____

Waste Stream Profile Form Certification

I hereby certify that I have reviewed the information in this Waste Stream Profile Form, and it is complete and accurate to the best of my knowledge. I understand that this information will be made available to regulatory agencies and that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

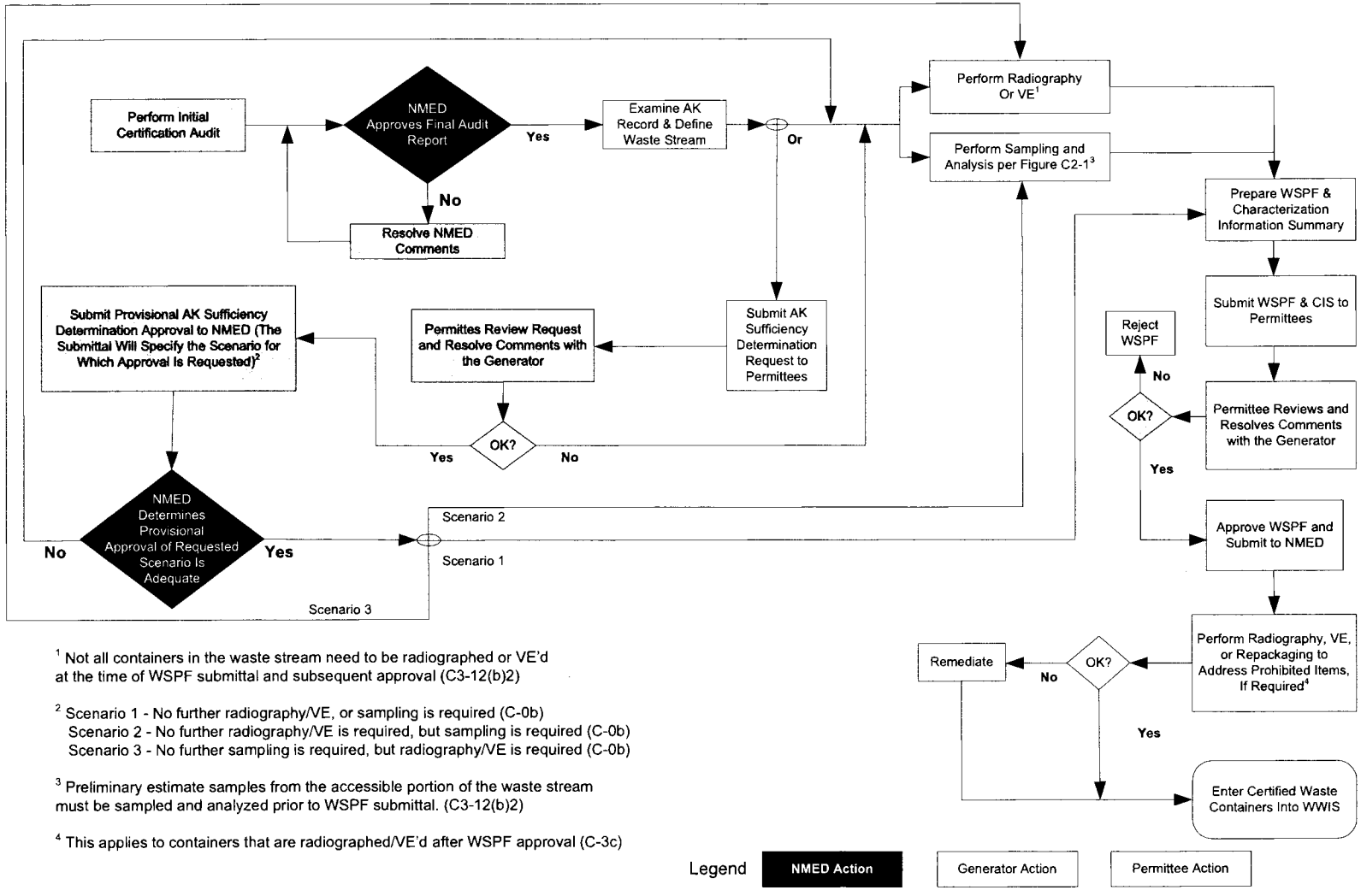
Signature of Site Project Manager Printed Name and Title Date

NOTE:

(1) Use back of sheet or continuation sheets, if required

(2) If radiography, visual examination were used to confirm EPA Hazardous Waste Numbers, attach signed Characterization Information Summary documenting this determination

Figure C-2. Waste Characterization Process (Reprinted from the WAP, Figure C-2)



[1] Not all containers in the waste stream need to be radiographed or VE'd at the time of WSPF submittal and subsequent approval (C3-12(b)2)

[2] Scenario 1 - No further radiography/VE, or sampling is required (C-0b)
Scenario 2 - No further radiography/VE is required, but sampling is required (C-0b)
Scenario 3 - No further sampling is required, but radiography/VE is required (C-0b)

[3] Preliminary estimate samples from the accessible portion of the waste stream must be sampled and analyzed prior to WSPF submittal. (C3-12(b)2)

[4] This applies to containers that are radiographed/VE'd after WSPF approval (C-3c)

Figure C-3. TRU Mixed Waste Screening and Verification Flow Diagram

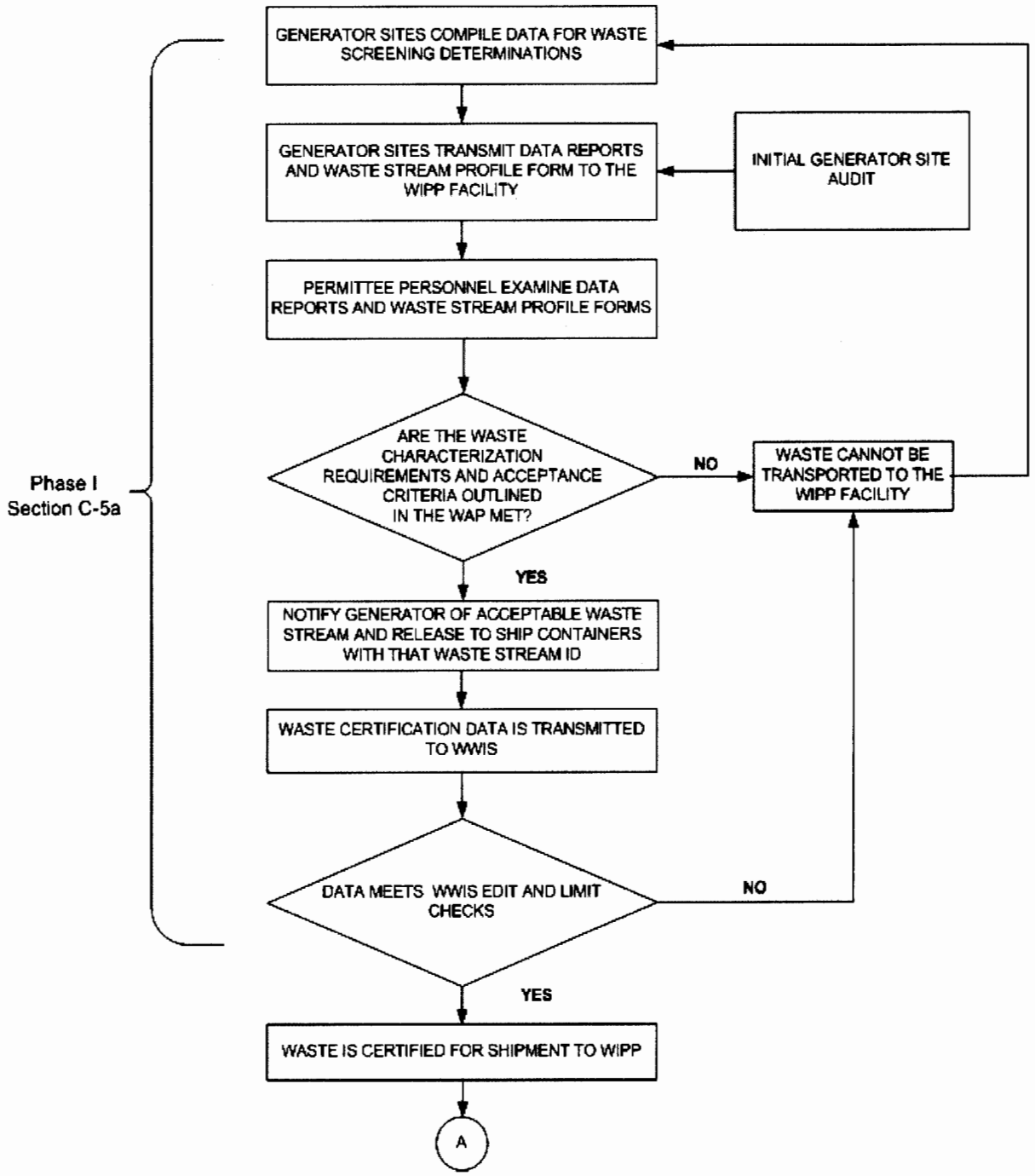
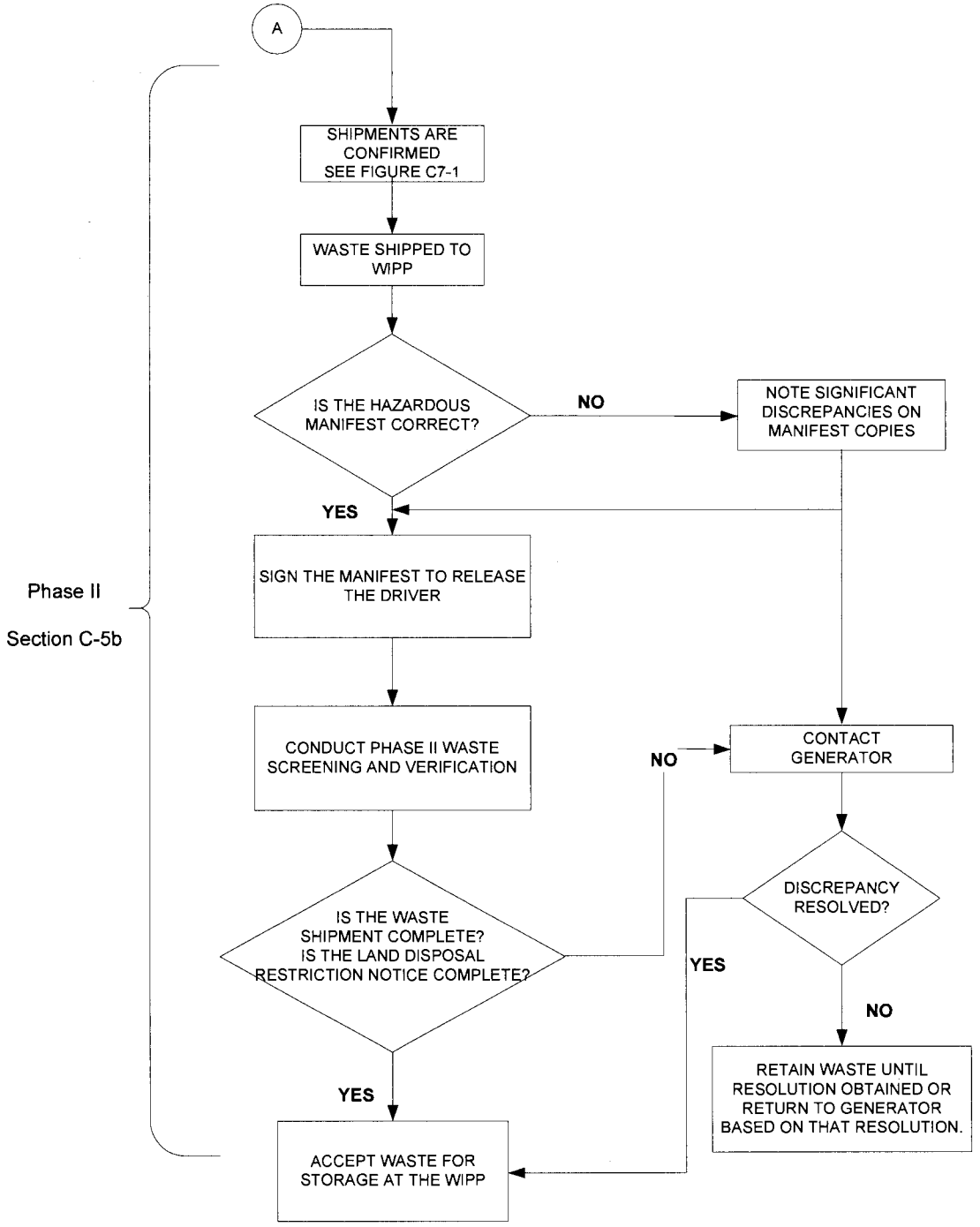


Figure C-3. TRU Mixed Waste Screening and Verification Flow Diagram (continued)



C1 WASTE CHARACTERIZATION SAMPLING METHODS

CCP characterizes TRU waste for shipment to WIPP by using the following methods, if applicable, for characterization of TRU waste. These methods include requirements for headspace gas sampling, sampling of homogeneous solids and soil/gravel, and radiography or VE. This section describes these methods, QC requirements, and sample control requirements.

C1-1 Sampling of Debris Waste (Summary Category S5000)

CCP will use headspace gas sampling and analysis to resolve the assignment of EPA Hazardous Waste Numbers to debris waste streams.

C1-1a Method Requirements

Headspace gas sampling is performed in radiation containment areas on waste containers that are in compliance with container equilibrium requirements (T93) (i.e., 72 hours at 18 degrees Celsius [°C] or higher).

For those waste streams without an AK Sufficiency Determination approved by the DOE, containers shall be randomly selected from waste streams designated as Summary Category Group S5000 (debris waste) and shall be categorized under one of the sampling scenarios shown in Table C1-5, Headspace Gas Drum Age Criteria Sampling Scenarios, and depicted in Figure C1-1, Headspace Gas Drum Age Criteria Sampling Scenario Selection Process. If the container is categorized under Scenario 1, the applicable DAC from Table C1-6, Scenario 1 Drum Age Criteria (in days) Matrix, must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table C1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table C1-7, Scenario 2 Drum Age Criteria (in days) Matrix, must be met after venting the container. The DAC for Scenario 2 containers that contain filters or rigid liner vent holes other than those listed in Table C1-7 shall be determined using footnotes 'a' and 'b' in Table C1-7. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. Containers categorized under Scenario 3 must be placed into one of the Packaging Configuration Groups listed in Table C1-8, Scenario 3 Packaging Configuration Groups. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment C, Section C-3d(1), a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for Standard Waste Boxes (SWBs) and TDOPs, and 8 for 85-gallon and 100-gallon drums, must be assigned, provided the drums do not contain pipe component packaging. If a container is designated as Packaging Group 4 (i.e., a pipe component), the headspace gas sample must be taken from the pipe component headspace. Drums, TDOPs, or SWBs that contain compacted 55-gallon drums containing a rigid liner may not be disposed of under any packaging configuration

unless headspace gas sampling was performed before compaction in accordance with this QAPjP. The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) shall be determined using the default conditions in footnote 'b' in Table C1-9, Scenario 3 Drum Age Criteria (in days) Matrix for S5000 Waste by Packaging Configuration Group. The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table C1-9 shall be determined using footnote 'a' in Table C1-9. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table C1-9 based on its packaging configuration (note: Packaging Configuration Groups 4, 5, 6, 7, and 8 are not summary category group dependent, and 85-gallon drum, 100-gallon drum, SWB or TDOP requirements apply when the 85-gallon drum, 100-gallon drum, SWB, or TDOP is used for the direct loading of waste).

C1-1a(1) General Requirements

The determination of packaging configuration consists of identifying the number of confinement layers and the identification of rigid poly liners when present. CCP will use either the default conditions specified in Tables C1-7 through C1-9 for retrievably stored waste or the data documented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) for determining the appropriate DAC for each container from which a headspace gas sample is collected (T7, T93). These drum age criteria are to ensure that the container contents have reached 90 percent of steady state concentration within each layer of confinement (Lockheed 1995; BWXT, 2000). The following information must be reported in the headspace gas sampling documents for each container from which a headspace gas sample is collected:

- sampling scenario from Table C1-5 and associated information from Tables C1-6 and/or Table C1-7;
- the packaging configuration from Table C1-8 and associated information from Tables C1-9, including the diameter of the rigid liner vent hole, the number of inner bags, the number of liner bags, the presence/absence of drum liner, and the filter hydrogen diffusivity,
- the permit-required equilibrium time, and
- the drum age,
- for supercompacted waste both:
    - the absence of rigid liners in the compacted 55-gallon drums which have not been headspace gas sampled in accordance with this QAPjP prior to compaction, and

- the absence of layers of confinement must be documented in the WWIS/WDS if Packaging Configuration Group 7 is used.

For all retrievably stored waste containers, the rigid liner vent hole diameter must be assumed to be 0.3 inches unless a different size is documented during drum venting or repackaging. For all retrievably stored waste containers, the filter hydrogen diffusivity must be assumed to be the most restrictive unless container-specific information clearly identifies a filter model and/or diffusivity characteristic that is less restrictive. For all retrievably stored waste containers that have not been repackaged, acceptable knowledge shall not be used to justify any packaging configuration less conservative than the default (i.e., Packaging Configuration Group 3 for 55-gallon drums, 6 for SWBs and TDOPs, 8 for 85-gallon and 100-gallon drums). For information reporting purposes listed above, sites may report the default packaging configuration for retrievably stored waste without further verification.

All waste containers with unvented rigid containers greater than 4 liters (exclusive of rigid poly liners) shall be subject to innermost layer of containment sampling or shall be vented prior to initiating drum age and equilibrium criteria. When sampling the rigid poly liner under Scenario 1, the sampling device must form an airtight seal with the rigid poly liner to ensure that a representative sample is collected (using a sampling needle connected to the sampling head to pierce the rigid poly liner, and that allows for the collection of a representative sample, satisfies this requirement). The configuration of the containment area and remote-handling equipment at each sampling facility are expected to differ. Headspace gas samples will be analyzed for the analytes listed in Table C3-2 of Section C3. If additional packaging configurations are identified, an appropriate Permit Modification will be submitted to incorporate the DAC using the methodology in BWXT (2000). Consistent with footnote "a" in Table C1-8, any waste container selected for headspace gas sampling that cannot be assigned a packaging configuration specified in Table C1-8 shall be assigned a conservative default packaging configuration.

DAC apply only to 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, and TDOPs. DAC for all other container types must be established through permit modification prior to performing headspace gas sampling.

The CCP requires personnel to collect samples in SUMMA® or equivalent canisters using standard headspace gas sampling methods that meet the general guidelines established by the EPA in the Compendium Method TO-14A or TO-15, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA 1999) or by using on-line integrated sampling/analysis systems. Samples are directed to an analytical instrument instead of being collected in SUMMA® or equivalent canister when the single-sample on-line integrated sampling/analysis system is used. When the multi-sample on-line integrated sampling/analysis system is used, samples are directed to an integrated holding area that meets the cleaning requirements of

Section C1-1c(1). The leak proof and inert nature of the integrated holding area interior surface is demonstrated and documented. Samples are not transported to another location when using on-line integrated sampling/analysis system; therefore, the sample custody requirements of Section C1-4 and C1-5 do not apply. The same sampling manifold and sampling heads are used with on-line integrated sampling/analysis systems and all of the requirements associated with sampling manifolds and sampling heads are met. However, when using an on-line integrated sampling and analysis system, the sampling batch and analytical batch QC samples are combined as on-line batch QC samples as outlined in Section C1-1b.

C1-1a(2) Manifold Headspace Gas Sampling

The Automated Manifold System employs a multiport manifold capable of collecting multiple headspace samples for analysis and QC purposes. The Single-Sample Manifold System uses an on-line piping manifold. The manifolds are used to collect samples in Silco steel (or equivalent) sample canisters, holding areas, or as part of an on-line integrated sampling and analysis system. The sampling equipment is leak checked and cleaned prior to first use and as needed thereafter. The manifolds and sample canisters are evacuated to 0.0039 in. (0.10 millimeters [mm] mercury (Hg) prior to sample collection. Cleaned and evacuated sample canisters or holding areas are attached to the evacuated manifold before the manifold inlet valve is opened. The manifold inlet valve is attached to a changeable filter connected to either a side port needle sampling head capable of forming an airtight seal (for penetrating a filter or rigid poly liner when necessary), a drum punch sampling head capable of forming an airtight seal (capable of punching through the metal lid of a drum for sampling through the drum lid), or a sampling head with an airtight fitting for sampling through a pipe overpack container filter vent hole. Refer to Section C1-1a(4) for description of these sampling heads.

The manifolds are equipped with a purge assembly that allows applicable QC samples to be collected through all sampling components that affect compliance with the QAOs. The CCP demonstrates and documents the effectiveness of the sampling equipment design to meet the QAOs. Field blanks are samples of room air collected in the sampling area in the immediate vicinity of the waste container to be sampled. If using gas sample canisters, field blanks are collected directly into the canister without the use of the manifold.

The manifolds, the associated sampling heads, and the headspace gas sample volume requirements are designed to ensure that a representative sample is collected. The manifold internal volume is calculated and documented in a field logbook dedicated to headspace gas sample collection. The total volume of headspace gases collected during each sampling operation is determined by adding the combined volume of the canisters attached to the manifold and the internal volume of the manifold. The sample volume remains small in comparison to the volume of the waste container. When an

estimate of the available headspace gas volume in the drum is made, less than 10 percent of that volume is withdrawn.

The sampling manifold consists of a sample side and a standard side. The sample side is connected to the standard side for cleaning and collecting equipment blanks and field reference standards. The sample side of the sampling manifolds consists of the following major components:

- An applicable sampling head that forms a leak-tight connection with the headspace sampling manifold.
- A flexible hose that allows movement of the sampling head from the purge assembly (standard side) to the waste container.
- A pressure sensor(s) that is pneumatically connected to the manifold. This manifold pressure sensor(s) is able to measure absolute pressure in the range from 0.002 in. (0.05 mm) Hg to 39.3 in. (1,000 mm) Hg. Resolution for the manifold pressure sensors is ±0.0004 in. (0.01 mm) Hg at 0.002 in. (0.05 mm) of Hg. The manifold pressure sensor(s) has an operating range from approximately 59 °Fahrenheit (°F) (15°C) to 104°F (40°C).
- The Automated Manifold System contains 24 stainless steel sample holding areas that provide sufficient capacity to hold a batch of samples plus necessary QC samples. It allows for simultaneous collection of headspace gas samples and duplicates for VOC analysis. When using the Single-Sample Manifold System only one port is necessary for the collection of comparison samples. Ports not occupied with sample canisters during cleaning or headspace gas sampling activities have a plug to prevent ambient air from entering the system. In place of using plugs, the CCP may choose to install valves that can be closed to prevent intrusion of ambient air into the manifold. Ports have VCR® fittings for connection to the sample canister(s) to prevent degradation of the fittings on the canisters and manifold.
- The Automated Manifold System uses sample holding areas that are leak-free, Silco steel passivated pressure vessels. The leak proof and inert nature of the canister interior surface is demonstrated and documented. The canisters are helium-leak tested to 1.5×10^{-7} standard cubic centimeters per second (cc/s). The manifold has all stainless steel construction. The sample holding areas are capable of tolerating temperatures up to 125°C. The gauge range is capable of operating in the leak test range as well as the sample collection range. The system has a VCR® fitting for connecting a sample canister.

- The Single-Sample Manifold System directs the headspace gas sample directly to the analytical equipment. The system is leak checked and made of stainless steel. The leak proof nature of the system is demonstrated and documented. The system has a pressure/ vacuum gauge attached to the sampling manifold. A VCR® fitting is included to allow connection of sample canisters. The canister must be helium-leak tested to 1.5×10^{-7} standard cc/s, have all stainless steel construction, and be capable of tolerating temperatures to 125°C. The gauge range is capable of operating in the leak test range as well as the sample collection range.

- A dry vacuum pump with the ability to reduce the pressure in the manifold to 0.05 mm Hg. If a vacuum pump that requires oil is used, precautions are taken to prevent diffusion of oil vapors back to the manifold. Precautions may include the use of a molecular sieve and a cryogenic trap in series between the headspace sampling ports and the pump.

- A minimum distance, based upon the design of the manifold system, between the tip of the needle and the valve that isolates the pump from the manifold in order to minimize the dead volume in the manifold.

- Real-time equipment blanks are not available with the Single-Sample Manifold System. The manifold is equipped with an organic vapor analyzer (OVA) that is capable of detecting all analytes listed in Table C3-2. The OVA is capable of measuring total VOC concentrations below the lowest headspace gas program required quantitation limit (PRQL). The OVA measurement is verified by the collection of equipment blanks at the frequency specified in Section C1-1 to check for manifold cleanliness.

The standard side consists of the following major elements:

- A cylinder of compressed zero air, helium, argon, or nitrogen gas to clean the manifold between samples and to provide gas for the collection of equipment blanks or on-line blanks. These high-purity gases are certified by the manufacturer to contain less than one part per million (ppm) total VOCs. The gases are metered into the standard side of the manifold using devices that are corrosion proof and that do not allow for the introduction of manifold gas into the purge gas cylinders or generator. Alternatively, if a zero air generator is used, a sample of the zero air is collected and demonstrated to contain less than one ppm total VOCs. Zero air from a generator is humidified.

- The standard side includes cylinders of field-reference standard gases or on-line control sample gases. These cylinders provide gases for evaluating the accuracy of the headspace gas sampling process. Each cylinder of field-reference gas or on-line control sample gas has a flow-regulating device. The field-reference standard gases or on-line control sample gas is certified by the manufacturer to contain analytes from Table C3-2 at known concentrations.

A humidifier filled with American Society for Testing and Materials (ASTM) Type I or II water, connected, and opened to the standard side of the manifold between the compressed gas cylinders and the purge assembly is used. Dry gases flowing to the purge assembly pick up moisture from the humidifier. Moisture is added to the dry gases to condition the equipment blanks and field-reference standards and to assist with system cleaning between headspace gas sample collection.

NOTE

Caution should be exercised to isolate the humidifier during the evacuation of the system to prevent flooding the manifold. In lieu of the humidifier, the compressed gas cylinders (e.g., zero air and field-reference standard gas) may contain water vapor in the concentration range of 1,000 to 10,000 parts per million by volume (ppmv).

- A purge assembly that allows the sampling head (sample side) to be connected to the standard side of the manifold. This connection is used to transfer gases from the compressed gas cylinders to the canisters or on-line analytical instrument. This connection is required for system cleaning.

- A flow-indicating device or a pressure regulator that is connected to the purge assembly to monitor the flow rate of gases through the purge assembly. The flow rate or pressure through the purge assembly is monitored to assure that excess flow exists during cleaning activities and during QC sample collection. Maintaining excess flow prevents ambient air from contaminating the QC samples and allows samples of gas from the compressed gas cylinders to be collected near ambient pressure.

In addition to a manifold consisting of a sample side and a standard side, the area in which the manifold is operated contains sensors for measuring ambient pressure and ambient temperature, as follows:

- The ambient-pressure sensor has a sufficient measurement range for the ambient barometric pressures expected at the sampling location. It is kept in the sampling area during sampling operations. Its resolution is 0.039 in. (1.0 mm) Hg or less. The Single-Sample Manifold System sensor calibration is performed by the manufacturer and is based on National Institute of

Standards and Technology (NIST), or equivalent, standards. The Automated Manifold System is calibrated in-house using NIST, or equivalent, standards.

- The temperature sensor has a sufficient measurement range for the ambient temperatures expected at the sampling location. The measurement range of the temperature sensor is from 18°C to 50°C. The temperature sensor calibration is traceable to NIST, or equivalent, standards.

C1-1a(3) Direct Canister Headspace Gas Sampling

This headspace gas sampling protocol employs a canister-sampling system to collect headspace gas samples for analysis and QC purposes without the use of the manifold described above. Rather than attaching sampling heads to the manifold, the sampling heads are attached directly to an evacuated sample canister (T93, T178, T142).

Canisters shall be evacuated to 0.0039 in. (0.10 mm) Hg prior to use and attached to a changeable filter connected to the appropriate sampling head. The sampling head(s) must be capable of either punching through the metal lid of the drums (and/or the rigid poly liner when necessary) while maintaining an airtight seal when sampling through the drum lid, or penetrating a filter or penetrating the septum in the orifice of the self-tapping screw, or maintaining an airtight seal for sampling through a pipe overpack container filter vent hole to obtain the drum headspace samples. Field duplicates must be collected at the same time, in the same manner, and using the same type of sampling apparatus as used for headspace gas sample collection. Field blanks shall be samples of room air collected in the immediate vicinity of the waste drum sampling area prior to removal of the drum lid. Equipment blanks and field-reference standards shall be collected using a purge assembly equivalent to the standard side of the manifold described above. These samples shall be collected from the needle tip through the same components (e.g., needle and filter) that the headspace gas samples pass through.

The sample canisters, associated sampling heads, and the headspace sample volume requirements ensure that a representative sample is collected. When an estimate of the available headspace gas volume of the waste container is made, less than 10 percent of that volume should be withdrawn. A determination of the sampling head internal volume shall be made and documented. The total volume of headspace gases collected during each headspace gas sampling operation can be determined by adding the volume of the sample canister(s) attached to the sampling head to the internal volume of the sampling head. Every effort shall be made to minimize the internal volume of sampling heads.

Each sample canister used has a pressure/vacuum gauge capable of indicating leaks and sample collection volumes. Canister gauges are intended to be gross leak-detection devices, not vacuum-certification devices. If a canister pressure/vacuum

gauge indicates an unexpected pressure change, determination of whether the change is a result of ambient temperature and pressure differences or a canister leak shall be made. This gauge shall be helium-leak tested to 1.5×10^{-7} standard cc/s, have all stainless steel construction, and shall be capable of tolerating temperatures to 125°C.

The SUMMA® or equivalent sample canisters as specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) shall be used when sampling each drum. These heads shall form a leak-tight connection with the canister and allow sampling through the drum-lid filter, through the drum-lid itself and/or rigid poly liner when necessary (by use of a punch or self-tapping screw), or using an airtight fitting to collect the sample through the existing filter vent hole of a pipe overpack container, or using a hollow side port needle.

C1-1a(4) Sampling Heads

A sample of the headspace gas directly under the container lid, pipe overpack filter vent hole, or rigid poly liner shall be collected. Several methods have been developed for collecting a representative sample; sampling through the filter, sampling through the drum lid by drum punching; sampling through a pipe overpack container filter vent hole, and sampling through the rigid poly liner. The chosen sampling method preserves the integrity of the drum to contain radionuclides (e.g., replace the damaged filter, replace the filter screw in filter housing, seal the punched drum lid).

C1-1a4(i) Sampling Through the Filter

To sample the drum-headspace gas through the drum's filter, a side-port needle (e.g., a hollow needle sealed at the tip with a small opening on its side close to the tip) is pressed through the filter and into the headspace beneath the drum-lid (T93). The gas is then drawn into the manifold or canister. The Automated Manifold System uses a needle manually inserted by an operator. The Single-Sample Manifold System does not sample through the filter. To assure that the sample collected is representative, all of the general method requirements, sampling apparatus requirements, and QC requirements described in this section are met in addition to the following requirements that are pertinent to drum headspace gas sampling through the filter:

- The lid of the drum's 90-mil rigid poly liner contains a hole for venting to the drum headspace. A representative sample is not collected from the drum headspace until the 90-mil rigid poly liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If the sample is collected by removing the drum lid, the sampling device shall form an airtight seal with the rigid poly liner to prevent the intrusion of outside air into the sample (using a sampling needle connected to the sampling head to pierce the rigid poly liner satisfies this requirement). If headspace gas samples are collected from the drum headspace prior to

venting the 90-mil rigid poly liner, the sample is not accepted and a nonconformance report is prepared, submitted, and resolved. Nonconformances are addressed in Section C3-13.

- For sample collection, the drum's filter is sealed to prevent outside air from entering the drum and diluting and/or contaminating the sample.

The sampling head for collecting drum headspace by penetrating the filter consists of a side-port needle, a filter to prevent particles from contaminating the gas sample, and an adapter to connect the side-port needle to the filter. To prevent cross contamination, the sampling head is cleaned or replaced after sample collection, after field-reference standard collection, and after field-blank collection. The following requirements are met:

- The housing of the filter allows insertion of the sampling needle through the filter element or a sampling port with septum that by-passes the filter element into the drum headspace.
- The side-port needle is used to reduce the potential for plugging.
- The purge assembly has been modified for compatibility with the side-port needle.

C1-1a4(ii) Sampling Through the Drum Lid By Drum Punching

A sample is obtained through the drum lid at the time of drum punching or thereafter may be performed as an alternative to sampling through the drum's filter if an airtight seal can be maintained (T7). To sample the drum headspace gas through the drum lid at the time of drum punching or thereafter, the lid is breached using an appropriate punch. The punch forms an airtight seal between the drum lid and the manifold or direct canister sampling equipment. The Automated Manifold System uses a self-tapping screw, while the Single-Sample Manifold System uses a drill/filter assembly. The drill bit and self-tapping screw forms an airtight seal between the drum lid and the sampling head. To ensure that the sample collected is representative, all of the general method requirements, sampling apparatus requirements, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999), as appropriate, are met, in addition to the following requirements:

- The seal between the drum lid and sampling head minimizes intrusion of ambient air.
- All components of the sampling system that come into contact with sample gases are purged with humidified zero air, nitrogen, or helium prior to sample collection.

- Equipment blanks and field reference standards are collected through the same components of the punch that contact the headspace gas sample.

- Pressure is applied to the punch until the drum lid has been breached.

- Provisions are made to relieve excessive drum pressure increases during drum-punch operations; potential pressure increases may occur during sealing of the drum punch to the lid.

- The lid of the drum's 90-mil rigid poly liner contains a hole for venting to the drum headspace. A representative sample cannot be collected from the drum headspace until the 90-mil rigid poly liner has been vented. If the DAC for Scenario 1 is met, a sample may be collected from inside the 90-mil rigid poly liner. If headspace gas samples are collected from the drum headspace prior to venting the 90-mil rigid poly liner, the sample is not acceptable and a nonconformance report is prepared, submitted, and resolved. Nonconformance procedures are outlined in Section C3-13.

- During sampling, the drum's filter, if present, is sealed to prevent outside air from entering the drum.

- While sampling through the drum lid using manifold sampling, a flow-indicating device or pressure regulator to verify flow of gases is pneumatically connected to the drum punch and operated in the same manner as the flow-indicating device described above in Section C1-1a(2).

- Equipment is used to adequately secure the drum-punch sampling system to the drum lid. The drill bit sampling system used in the Single-Sample Manifold System is secured to the drum lid. The self-tapping screw used with the Automated Manifold System secures itself to the drum lid.

- If the headspace gas sample is not taken at the time of drum punching, the presence and diameter of the rigid liner vent hole shall be documented during the punching operation for use in determining an appropriate Scenario 2 DAC.

C1-1a4(iii) Sampling Through a Pipe Overpack Container Existing Filter Vent Hole

The CCP does not currently use sampling through an existing filter vent hole in a pipe overpack container. If this method is initiated, the CCP will incorporate the following requirements in a technical procedure.

When sampling through an existing pipe overpack container filter vent hole an appropriate airtight seal shall be used. The sampling apparatus forms an airtight seal between the pipe overpack container surface and the manifold or direct canister sampling equipment. To assure that the sample collected is representative, all of the general method, sampling apparatus, and QC requirements specified in EPA's Compendium Method TO-14A or TO-15 (EPA 1999) as appropriate, shall be met in addition to the following requirements:

- The seal between the pipe overpack container surface and sampling apparatus shall be designed to minimize intrusion of ambient air.
- The filter shall be replaced as quickly as is practicable with the airtight sampling apparatus to ensure that a representative sample can be taken. CCP must provide documentation demonstrating that the time between removing the filter and installing the airtight sampling device has been established by testing to assure a representative sample.
- All components of the sampling system that come into contact with sample gases shall be cleaned according to requirements for direct canister sampling or manifold sampling, whichever is appropriate, prior to sample collection.
- Equipment blanks and field reference standards shall be collected through all the components of the sampling system that contact the headspace gas sample.
- During sampling, openings in the pipe overpack container shall be sealed to prevent outside air from entering the container.
- A flow-indicating device shall be connected to the sampling system and operated according to the direct canister or manifold sampling requirements, as appropriate.

C1-1b Quality Control

For manifold and direct canister systems, field QC samples are collected and analyzed on an on-line batch or sampling batch basis. Holding temperatures and container requirements for gas sample containers are provided in Table C1-1, Gas Sample Requirements. An on-line batch is the number of headspace gas samples collected within a 12 hour period using the same on-line system. A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding QC samples), all of which are collected within 14 days of the first sample in the batch. For on-line systems, QC samples are collected and analyzed on a per on-line batch basis. The analytical batch requirements are specified by the analytical method used with the on-line system.

Table C1-2, Summary of Drum Field QC Headspace Sample Frequencies, summarizes headspace gas QC sample collection requirements, while Table C1-3, Summary of Sampling Quality Control Sample Acceptance Criteria, presents QC sample acceptance criteria.

For the on-line integrated sampling and analysis system, the on-line batch QC samples serve as combined sampling and analytical batch QC samples as follows:

- The on-line blank replaces the equipment blank and laboratory blank.
- The on-line control sample replaces the field reference standard and laboratory control sample (LCS).
- The on-line duplicate replaces the field duplicate and laboratory duplicate.

The acceptance criteria for on-line batch QC samples are the same as for the sampling batch and analytical batch QC samples they replace. A separate field blank is collected and analyzed for each on-line batch. Acceptance criteria are shown in Table C1-3. For the Single-Sample Manifold System and Automated Manifold System a separate field blank is collected and analyzed for each on-line batch, but if the results of a field blank collected through the sampling head meets the acceptance criterion, a separate on-line blank is not collected.

The Site Project Manager monitors and documents field QC sample results. An NCR is initiated and resolved if acceptance or frequency criteria are not met. The SPM ensures appropriate corrective action is taken.

C1-1b(1) Field Blanks

Field blanks are collected to evaluate background levels of program-required analytes. Field blanks are collected prior to sample collection, and at a frequency of one per sampling batch. The SPM uses the field blank data to assess impacts of ambient contamination, if any, on the sample results. Field blank results determined by GC/MS and GC/FID are acceptable if the concentration of each VOC analyte is less than or equal to three times the method detection limit (MDL) listed in Table C3-2. An NCR is initiated and resolved if the final reported QC sample results do not meet the acceptance criteria.

C1-1b(2) Equipment Blanks

Equipment blanks are collected to assess cleanliness prior to first use after cleaning of all sampling equipment. On-line blanks are used to assess both equipment cleanliness and analytical contamination. After the initial cleanliness check, equipment blanks are collected through the manifold once per on-line sampling batch for VOC analysis or

once per day, whichever is more frequent. If the direct canister method is used, field blanks may be used in lieu of equipment blanks. The SPM uses equipment blank data to assess impacts of potentially contaminated sampling equipment on sample results. Equipment blank results determined by GC/MS or GC/FID shall be acceptable if the concentration of each VOC analyte is less than or equal to three times the MDL listed in Table C3-2.

C1-1b(3) Field Reference Standards

Field reference standards are used to assess the accuracy with which the sampling equipment collects VOC samples into canisters prior to first use of the sampling equipment. The on-line control sample is used to assess the accuracy with which the sampling equipment collects VOC samples and as an indicator of the analytical accuracy of the on-line sampling system. Field reference standards contain a minimum of six of the analytes listed in Table C3-2 at concentrations within 10 to 100 ppmv and greater than the MDL for each compound. Field reference standards are traceable to a nationally recognized standard (e.g., NIST) or, if commercial gases are used, a Certificate of Analysis from the manufacturer documenting traceability is obtained. Commercial stock gases are not used beyond their manufacturer-specified shelf life. After the initial accuracy check, field reference standards are collected at a frequency of one per sampling batch and submitted as blind samples to the analytical laboratory. For the direct canister method, field reference standard collection may be discontinued if the field reference standard results demonstrate the QAOs for accuracy specified in Section C3. Field reference standard results shall be acceptable if the accuracy for each tested compound has a recovery of 70 to 130 percent.

C1-1b(4) Field Duplicates

Field duplicates are collected sequentially and in accordance with Table C1-1 to assess the precision with which the sampling procedure can collect samples into canisters. Field duplicates also serve as a measure of analytical precision for the on-line sampling system. Field duplicate results are acceptable if the relative percent difference is less than or equal to 25 for each tested compound found in concentrations greater than the PRQL in both duplicates.

C1-1c Equipment Testing, Inspection, and Maintenance

Sampling equipment components that come into contact with headspace sample gases are constructed of relatively inert materials such as stainless steel with passivated interior surface or Teflon®.

To minimize the potential for cross contamination of samples, the headspace sampling equipment (manifold and canisters) are properly cleaned and leak-checked prior to each sampling event. Procedures used for cleaning and preparing the manifold and sample

canisters shall be equivalent to those provided in EPA's Compendium Method TO-14A or TO-15 (EPA 1999). Cleaning requirements are presented below.

C1-1c(1) Headspace Gas Sample Canister Cleaning

Silco steel passivated sample holding areas used in the Automated Manifold System or gas canisters used with the direct canister method are subjected to a rigorous cleaning procedure prior to use in the collection of any samples. Guidance for the development of this procedure is derived from Method TO-14A or TO-15 (EPA 1999). Specific detailed instructions are provided in CCP procedures for the cleaning and certification of canisters.

Canisters shall be cleaned and certified on an equipment cleaning batch basis. An equipment cleaning batch will be any number of canisters cleaned together at one time using the same cleaning method. A cleaning system, capable of processing multiple canisters at one time, composed of an oven (optional) and a vacuum manifold which uses a dry vacuum pump or a cryogenic trap backed by an oil sealed pump shall be used to clean SUMMA® or equivalent canisters. Prior to cleaning, a positive or negative pressure leak test shall be performed on all canisters. The duration of the leak test must be greater than or equal to the time it takes to collect a sample, but not greater than 24 hours. For a leak test, a canister passes if the pressure does not change by more than ±2 pounds per square inch gauge (psig) per 24 hours. Any canister that fails shall be checked for leaks, repaired, and reprocessed. One canister per equipment cleaning batch shall be filled with humid zero air or humid high purity nitrogen and analyzed for VOCs. The equipment cleaning batch of canisters shall be considered clean if there are no VOCs above three times the MDLs listed in Table C3-2. After the canisters have been certified for leak-tightness and found to be free of background contamination, they shall be evacuated to 0.0039 in. (0.10 mm) Hg or less for storage prior to shipment. The CCP shall maintain certification documentation and initiate the canister tags as described in Section C3, as appropriate.

C1-1c(2) Sampling Equipment Initial Cleaning and Leak Check

The surfaces of headspace gas sampling equipment components that come into contact with headspace gas are thoroughly inspected and cleaned prior to assembly. The manifold and sampling heads are purged with humidified zero air, nitrogen, or helium, and leak checked after assembly. This cleaning is repeated if the manifold and/or sampling heads are contaminated to the extent that the routine system cleaning is inadequate.

C1-1c(3) Sampling Equipment Routine Cleaning and Leak Check

The sampling heads and manifold used with the Automated Manifold System and Single Sample Manifold System that are reused are cleaned and checked for leaks in

accordance with the cleaning and leak check procedures described in EPA's Compendium Method TO-14A or TO-15 (EPA 1999), rinsing, drying, and sampling system purging. The procedures are conducted after headspace gas and on-line or field duplicate collection through the manifold; after field blank collection; and after the additional cleaning required for on-line control sample collection is completed. The protocol for routine cleaning and leak check requires that sampling ports be capped or closed by valves and that the sampling heads be attached to the purge assembly.

VOCs are removed from the internal surfaces of the headspace sampling equipment to levels less than or equal to three times the MDLs of the analytes listed in Table C3-2, as determined by analysis of an on-line blank in the Automated Manifold System or through use of an OVA in the Single-Sample Manifold System or equipment blank. As recommended, the headspace sampling equipment is typically heated to 150°C and periodically evacuated and flushed with humidified zero air, nitrogen, or helium. When not in use, the sampling equipment is demonstrated clean before storage with a positive pressure of high purity gas (i.e., zero air, nitrogen, or helium) in both the standard and sample sides.

Sampling is suspended and corrective actions are taken when the analysis of an on-line or equipment blank indicates that the VOC limits have been exceeded or if a leak test fails. The SPM ensures that corrective action is taken prior to resumption of sampling.

C1-1c(4) Manifold Cleaning After Field Reference Standard Collection

The sampling system is specially cleaned after a field reference standard is collected because the field reference standard gases contaminate the standard site of the headspace sampling manifold when they are regulated through the purge assembly. This cleaning requires the installation of a gas-tight connector in place of the sampling head, between the flexible hose and the purge assembly. This configuration allows both the sample and the standard sides of the sampling system to be flushed (evacuated and pressurized) with humidified zero air, nitrogen, or helium which, combined with heating the pneumatic lines, should sweep and adequately clean the system's internal surfaces. After this protocol has been completed and prior to collecting another sample, the routine system cleaning and leak check shall also be performed.

C1-1c(5) Sampling Head Cleaning

To prevent cross contamination, the needle, airtight fitting or airtight seal, adapters, and filter of the sampling heads are cleaned in accordance with the cleaning procedures described in EPA's Compendium Method TO-14 (EPA 1988). After sample collection, a sampling head is disposed or cleaned in accordance with Compendium Method TO-14A or TO-15 (EPA 1999) prior to re-use.

As a further QC measure the needle, airtight fitting or airtight seal and filter, after cleaning, is purged with zero air, nitrogen, or helium, and capped for storage to prevent sample contamination by VOCs potentially present in ambient air.

C1-1d Equipment Calibration and Frequency

Pressure sensors are certified prior to initial use and annually thereafter using NIST traceable, or equivalent, standards. If necessary, the pressure indicated by the pressure sensors is temperature compensated. The ambient air temperature sensor is certified prior to initial use and annually thereafter to NIST traceable, or equivalent, temperature standards.

The OVA used with the Single-Sample Manifold System is calibrated once per day, prior to first use, or as necessary according to the manufacturer's specifications. Calibration gases are certified to contain known analytes from Table C3-2 at known concentrations. The balance of the OVA calibration gas is consistent with the purge gas when the OVA is used (i.e., zero air, nitrogen, or helium).

C1-2 Sampling of Homogeneous Solids and Soil/Gravel (Summary Categories S3000/S4000)

For those waste streams without an AK Sufficiency Determination approved by the DOE, randomly selected containers of homogeneous solids and/or soil/gravel waste streams (S3000/S4000) shall be sampled and analyzed to resolve the assignment of EPA Hazardous Waste Numbers. For example, analytical results may be useful to resolve uncertainty regarding hazardous constituents used in a process that generated the waste stream when the hazardous constituents are not documented in the acceptable knowledge information for the waste.

C1-2a Method Requirements

The CCP will ensure that methods used to collect samples of TRU waste, classified as homogeneous solids and soil/gravel from waste containers, are such that the samples are representative of the waste from which they were taken. To minimize the quantity of investigation-derived waste, the CCP laboratories conducting the analytical work will require no more sample than is required for the analysis, based on the analytical methods. However, a sufficient number of samples will be collected to adequately represent waste being sampled. For those waste streams defined as Summary Category Groups S3000 or S4000, debris that may also be present within these wastes need not be sampled.

Samples of retrievably stored waste containers will be collected using appropriate coring equipment or other EPA approved methods to collect a representative sample. Newly generated wastes that are sampled from a process as it is generated may be

sampled using EPA approved methods, including scoops and ladles that are capable of collecting a representative sample. All sampling and core sampling will comply with the QC requirements specified in C1-2b.

C1-2a(1) Core Collection

Coring tools will be used to collect cores of homogeneous solids and soil/gravel from waste containers, when possible, in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, to cut, lift the waste cuttings, and collect a core from the bore hole, will be used to collect sample cores from waste containers. For homogeneous solids and soil/gravel that are relatively soft, non-rotational coring tools may be used in lieu of a rotational coring tool.

The following requirements will apply to the use of coring tools:

- Each coring tool shall contain a removable tube (liner) that is constructed of fairly rigid material unlikely to affect the composition or concentrations of target analytes in the sample core. Materials used for coring device sleeves will be constructed of polycarbonate, teflon, or glass for most samples, and stainless steel or brass if samples are not to be analyzed for metals. Analytes of concern will not be present in liner material used for coring by CCP. Materials to be used are unlikely to affect sample results and will be documented through the collection and analysis of an equipment blank prior to first use as specified in Section C1-2b(2). Liner outer diameter will be recommended to be no more than 2 in. and no less than 1 in. Liner wall thickness will be recommended to be no greater than 1/16 in. Before use, the liner will be cleaned in accordance with the requirements in Section C1-2b. The liner will fit flush with the inner wall of the coring tool and will be of sufficient length to hold a core that will be representative of the waste along the entire depth of the waste. The depth of the waste will be calculated as the distance from the top of the sludge to the bottom of the drum (based on the thickness of the liner and the rim at the bottom of the drum). The liner material will have sufficient transparency to allow VE of the core after sampling. If sub-sampling is not conducted immediately after core collection and liner extrusion, then end caps constructed of material unlikely to affect the composition or concentrations of target analytes in the core (e.g., Teflon®) will be placed over the ends of the liner. End caps will fit tightly to the ends of the liner. The CCP will require procedures to indicate the acceptable materials for core liners and end caps.

- A spring retainer will be used with each coring tool when the physical properties of the waste are such that the waste may fall out of the coring tool's liner during sampling activities. The spring retainer will be constructed of relatively inert material (e.g., stainless steel or Teflon®) and its inner diameter will not be less than the inner diameter of the liner. Before use, spring retainers will be cleaned in accordance with the requirements in Section C1-2b.

- Coring tools may have an air-lock mechanism that opens to allow air inside the liners to escape as the tool is pressed into the waste (e.g., ball check valve). If used, this air-lock mechanism also closes when the core is removed from the waste container.

- After disassembling the coring tool, a device (extruder) to forcefully extrude the liner from the coring tool will be used if the liner does not slide freely. All surfaces of the extruder that may come into contact with the core will be cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- Coring tools will be of sufficient length to hold the liner and will be constructed to allow placement of the liner leading edge as close as possible to the coring tools leading edge.

- All surfaces of the coring tool that have the potential to contact the sample core or sample media will be cleaned in accordance with the requirements in Section C1-2(b) prior to use.

- The leading edge of the coring tools may be sharpened and tapered to a diameter equivalent to, or slightly smaller than, the inner diameter of the liner to reduce the drag of the homogeneous solids and soil/gravel against the internal surfaces of the liner, thereby enhancing sample recovery.

- Rotational coring tools will have a mechanism to minimize the rotation of the liner inside the coring tool during coring activities, thereby minimizing physical disturbance to the core.

- Rotational coring will be conducted in a manner that minimizes transfer of frictional heat to the core, thereby minimizing potential loss of VOCs.

- Non-rotational coring tools will be designed such that the tool's kerf width is minimized. Kerf width will be defined as one-half of the difference between the outer diameter of the tool and the inner diameter of the tool's inlet.

C1-2a(2) Sample Collection

Sampling of cores will be conducted in accordance with the following requirements:

- Sampling will be conducted as soon as possible after core collection. If a substantial delay (i.e., more than 60 minutes) is expected between core collection and sampling, the core remains in the liner and the liner is capped at each end. If the liner containing the core is not extruded from the coring tool and capped, then the liner will be left in the coring tool and the coring tool will be capped at each end.

- Samples of homogeneous solids and soil/gravel for VOC analyses will be collected prior to extruding the core from the liner. These samples may be collected by collecting a single sample from the representative subsection of the core, or three sub-samples may be collected from the vertical core to form a single 15-gram composite sample. Smaller sample sizes may be used if method PRQL requirements are met for all analytes. The sampling locations will be randomly selected. If a single sample is used, the representative subsection will be chosen by randomly selecting a location along the portion of the core (i.e., core length). If the three sub-sample method is used, the sampling locations will be randomly selected within three equal-length subsections of the core along the long axis of the liner and access to the waste will be gained by making a perpendicular cut through the liner and the core. The CCP will develop documented procedures to select, and record the selection, of random sampling locations by properly using random numbers for identifying sampling locations. The procedures used to select the random sampling locations will be subject to review as part of annual audits by the DOE. A sampling device such as the metal coring cylinder described in EPA's SW-846 Manual (1996), or equivalent, will be immediately used to collect the sample once the core has been exposed to air. Immediately after sample collection, the sample will be placed in an airtight sample container for VOC analysis, the top rim of the container visually inspected and wiped clean of any waste residue, and the cap secured. Sample handling requirements are outlined in Table C1-4, Sample Handling Requirements for Homogenous Solids and Soil/Gravel. Additional guidance for this type of sampling can be found in SW-846 (EPA 1996).

- Samples of the homogeneous solids and soil/gravel for semi-volatile organic compound, and metals analyses will be collected. These samples may be collected from the same sub-sample locations and in the same manner as the sample collected for VOC analysis, or they may be collected by splitting or compositing the representative subsection of the core. The representative subsection will be chosen by randomly selecting a location along the portion of the core (i.e., core length). The CCP will develop documented procedures

to select, and record the selection, of random sampling locations by properly using random numbers for identifying sampling locations. The procedures used to select the random sampling locations are subject to review as part of annual audits by the DOE. Guidance for splitting and compositing solid materials can be found in SW-846 (EPA 1996). All surfaces of the sampling tools that have the potential to come into contact with the sample will be constructed of materials unlikely to affect the composition or concentrations of target analytes in the waste (e.g., Teflon®). In addition, all surfaces that have the potential to come into contact with core sample media will be either disposed of or decontaminated according to the procedures found in Section C1-2(b). Sample sizes and handling requirements are outlined in Table C1-4.

Newly generated waste samples may be collected using methods other than coring, as discussed in Section C1-2a. Newly generated waste samples will be collected as soon as possible after sampling, but the spatial and temporal homogeneity of the waste stream dictate whether a representative grab sample or composite sample will be collected. As part of the site audit, the DOE shall assess waste sampling to ensure collection of representative samples.

C1-2b Quality Control

QC requirements for sampling of homogeneous solids and soil/gravel include collecting co-located samples from cores or other sample types to determine precision; equipment blanks to verify cleanliness of the sampling and coring tools and sampling equipment; and analysis of reagent blanks to ensure reagents, such as deionized or high pressure liquid chromatography (HPLC) water, will be of sufficient quality. Coring and sampling of homogeneous solids and soil/gravel by the CCP will comply, at a minimum, with the following QC requirements.

C1-2b(1) Co-Located Samples

In accordance with the requirement to collect field duplicates required by the EPA methods found in SW-846 (EPA 1996), samples will be collected to determine the combined precision of the coring and sampling procedures. The co-located core methodology will include a duplicate sample collection methodology intended to collect samples from a second core placed at approximately the same location within the drum when samples are collected by coring. Waste may not be amenable to coring in some instances. In this case, a co-located sample will be collected from a sample (e.g., scoop) collected from approximately the same location in the waste stream. A sample from each co-located core or waste sample collected by other means will be collected side by side as close as feasible to one another, handled in the same manner, visually inspected through the transparent liner (if cored), and sampled in the same manner at the same randomly selected sample location(s). If the VE detects

inconsistencies such as color, texture, or waste type in the waste at the sample location, another sampling location may be randomly selected, or the samples may be invalidated and co-located samples or cores may again be collected. Co-located samples, from either core or other sample type, will be collected at a frequency of one per sampling batch or once per week, whichever is more frequent. A sampling batch will be a suite of homogeneous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which will be collected within 14 days of the first sample in the batch.

C1-2b(2) Equipment Blanks

In accordance with SW-846 (EPA 1996), equipment blanks will be collected from fully assembled sampling and coring tools (i.e., at least those portions of the sampling equipment that contact the sample) prior to first use after cleaning at a frequency of one per equipment cleaning batch. An equipment cleaning batch will be the number of sampling equipment items cleaned together at one time using the same cleaning method. The equipment blank will be collected from the fully assembled sampling or coring tool, in the area where the sampling or coring tools will be cleaned, prior to covering with protective wrapping and storage. The equipment blank will be collected by pouring clean water (e.g., deionized water, HPLC water) down the inside of the assembled sampling or coring tool. The water will be collected in a clean sample container placed at the leading edge of the sampling or coring tool and analyzed for the analytes listed in Tables C3-4, C3-6, and C3-8, Metals Target Analyte List and Quality Assurance Objectives. The results of the equipment blank will be considered acceptable if the analysis indicates no analyte at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 or in the Program Required Detection Limits (PRDL) in Table C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling or coring tools will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank.

Equipment blanks for coring tools will be collected from liners that will be cleaned separately from the coring tools. These equipment blanks will be collected at a frequency of one per equipment cleaning batch. The equipment blanks will be collected by randomly selecting a liner from the equipment cleaning batch, pouring clean water (e.g., deionized water or HPLC water) across its internal surface, collecting the water in a clean sample container, and analyzing the water for the analytes listed in Tables C3-4, C3-6, and the PRDLs in Table C3-8. The results of the equipment blank analysis will be considered acceptable if the results indicate no analyte at a concentration greater than three times the MDLs listed in Tables C3-4, C3-6, or PRDLs in Table C3-8. If analytes are detected at concentrations greater than three times the

MDLs (or PRDLs for metals), then the associated equipment cleaning batch of liners will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank.

Sampling equipment (e.g., bowls, spoons, chisel, VOC sub-sampler) will also be cleaned. Equipment blanks will be collected for the sampling equipment at a frequency of one per equipment cleaning batch. After the sampling equipment will be cleaned, one item from the equipment cleaning batch will be randomly selected, water (e.g., deionized water, HPLC water) will be passed over its surface, collected in a clean container, and analyzed for the analytes listed in Tables C3-4, C3-6, and C3-8. The results of the equipment blank will be considered acceptable if the results indicate no analyte present at a concentration greater than three times the MDLs listed in Tables C3-4 and C3-6 and in the PRDLs in C3-8. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank. The above equipment blanks may be performed on a purchased batch basis for sampling equipment purchased sterile and sealed in protective packaging. Equipment blanks need not be performed for equipment purchased in sealed protective packaging accompanied by a certificate certifying cleanliness.

The results of equipment blanks will be traceable to the items in the equipment cleaning batch that the equipment blank represents. All sampling items will be identified, and the associated equipment cleaning batch will be documented. The method of documenting the connection between equipment and equipment cleaning batches will be documented. Equipment blank results for the coring tools, liners, and sampling equipment will be reviewed prior to use. A sufficient quantity of these items will be maintained in storage to prevent disruption of sampling operations.

The Permittees may require a site to use certified clean disposable sampling equipment and discard liners and sampling tools after one use. In this instance, cleaning and equipment blank collection will not be required.

C1-2b(3) Coring Tool and Sampling Equipment Cleaning

Coring tools and sampling equipment shall be cleaned in accordance with the following requirements:

- All surfaces of coring tools and sampling equipment that will come into contact with the samples will be clean prior to use. All sampling equipment will be cleaned in the same manner. Immediately following cleaning, coring

tools and sampling equipment will be assembled and sealed inside clean protective wrapping.

- Each reusable sampling or coring tool will have a unique identification number. Each number will be referenced to the waste container on which it is used. This information will be recorded in the field records. One sampling or coring tool from each equipment cleaning batch will be tested for cleanliness in accordance with the requirements specified above. The identification number of the sampling or coring tool from which the equipment blank was collected will be recorded in the field records. The results of the equipment blank analysis for the equipment cleaning batch in which each sampling or coring tool was cleaned will be submitted to the sampling facility with the identification numbers of all sampling or coring tools in the equipment cleaning batch. If analytes are detected at concentrations greater than three times the MDLs (or PRDLs for metals), then the associated equipment cleaning batch of sampling equipment will be cleaned again and another equipment blank collected. Equipment from an equipment cleaning batch will not be used until analytical results are received verifying an adequately low level of contamination in the equipment blank.

- Sample containers will be cleaned in accordance with SW-846 (EPA 1996).

C1-2c Equipment Testing, Inspection and Maintenance

Prior to initiation of sampling or coring activities, sampling and coring tools are tested in accordance with manufacturer specifications to ensure operation within the manufacturer's tolerance limits. Other specifications specific to the sampling operations (e.g., operation of containment structure and safety systems) are tested and verified as operating properly prior to initiating coring activities. Coring tools are assembled, including liners, and tested. Air-lock mechanisms and rotation mechanisms are inspected for free movement of critical parts. Sampling and coring tools found to be malfunctioning are repaired or replaced prior to use.

Coring tools and sample collection equipment are maintained in accordance with manufacturer's specifications. Clean sampling and coring tools and sampling equipment are sealed inside clean protective wrapping and maintained in a clean storage area prior to use. Sampling equipment is properly maintained to avoid contamination. A sufficient supply of spare parts is maintained to prevent delays in sampling activities due to equipment down time. Records of equipment maintenance and repair are maintained in the field records in accordance with site Standard Operating Procedures (SOPs).

Inspection of sampling equipment and work areas includes the following:

- Sample collection equipment in the immediate area of sample collection is inspected daily for cleanliness. Visible contamination on any equipment (e.g., waste on floor of sampling area, hydraulic fluid from hoses) that has the potential to contaminate a waste core or waste sample is thoroughly cleaned upon its discovery.

- The waste coring and sampling work areas are maintained in clean condition to minimize the potential for cross contamination between waste (including cores) and samples.

- Expendable equipment (e.g., plastic sheeting, plastic gloves) is visually inspected for cleanliness prior to use and properly discarded after each sample.

- Prior to removal of the protective wrapping from a coring tool designated for use, the condition of the protective wrapping should be visually assessed. Coring tools with torn protective wrapping should be returned for cleaning. Coring tools visibly contaminated after the protective wrapping has been removed are not used and are returned for cleaning or properly discarded.

- Sampling equipment is visually inspected prior to use. All sampling equipment that comes into contact with waste samples are stored in protective wrapping until use. Prior to removal of the protective wrapping from sampling equipment, the condition of the protective wrapping is visually assessed. Sampling equipment with torn protective wrapping is discarded or returned for cleaning. Sampling equipment visibly contaminated after the protective wrapping has been removed is not used and is returned for cleaning or properly discarded.

- Cleaned sampling and coring equipment is physically segregated from all equipment that was used for a sampling event and was not decontaminated.

C1-2d Equipment Calibration and Frequency

The scale used for weighing sub-samples is calibrated as necessary to maintain its operation within manufacturer's specifications, and after repairs and routine maintenance. Weights used for calibration are traceable to a nationally recognized standard. Calibration records are maintained in the field records.

C1-3 Radiography

Radiography aids in the examination and identification of containerized waste. There is no equivalent EPA method. Personnel perform radiography in accordance with the procedures to meet the WAP requirements described in the following sections (T53, T508). Additionally, these procedures include instructions specific to the radiography method used. For example, details about moving the drum in a specific way in order to detect liquids are included in the radiography procedures. QAOs for radiography are contained in Section C3-4.

All activities required to achieve the radiography objectives are described in the QAPjP and radiography-related SOPs. A radiography system (e.g., real time radiography, digital radiography/computed tomography) normally consists of the following components: x-ray-producing device; imaging system; an enclosure for radiation protection; a waste container handling system; an audio/visual recording system; and an operator control and data acquisition station. The radiography equipment has controls (or an equivalent process) that allow the operator to control image quality for materials of varying density. On some radiography systems, it should be possible to vary the voltage, typically between 150-400 kilovolts (kV), to provide an optimum degree of penetration through the waste. For example, high-density material is examined with the x-ray device set on the maximum voltage. This ensures maximum penetration through the waste container. Low-density material is examined at lower voltage settings to improve contrast and image definition. The imaging system utilizes a fluorescent screen, a low-light television camera, or x-ray detectors to generate the image.

To perform radiography, the waste container is scanned while the operator views the television screen. A video and audio recording is made of the waste container scan and is maintained as a Non-Permanent Record. A radiography data form is also used to document the waste matrix code, to ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK Summary Report. Containers whose contents prevent full examination of the remaining contents are subject to VE unless the CCP certifies that VE would provide no additional relevant information for that container based on the acceptable knowledge information for the waste stream. Such certification shall be documented in CCP records.

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

The radiography system involves qualitative and semi-quantitative evaluations of visual displays. Operator training and experience are the most important considerations for ensuring QC in regard to the operation of the radiography system and for interpretation

and disposition of radiography results. Only trained personnel are allowed to operate radiography equipment.

Standardized training requirements for radiographic operators are based on existing industry standard training requirements.

Formal and on-the-job training (OJT) elements are listed below. In addition, radiography personnel are instructed in the specific waste generating practices, typical packaging configurations, and associated waste material parameters expected to be found in the waste matrix code. OJT and apprenticeship of radiography personnel are conducted by experienced, qualified radiography operators prior to qualification of training candidates. Training describes the site equipment, waste configurations, and the level of waste characterization efforts for the CCP. In addition, radiography operators are trained on the types of waste, physical forms, packaging configurations, and QC requirements for site waste characterized by the CCP.

All of the radiography QC requirements specified in the QAPjP shall be incorporated into the CCP training programs and radiography operations, so that data quality and comparability will not be affected (T28, T510). The radiography training program is subject to the audit and surveillance program. The training program includes items required by CCP-QP-002, *CCP Training and Qualification Plan,* and the required elements listed below.

One or more training containers with items (including prohibited items) common to the waste streams to be characterized and internal containers of various sizes is scanned semi-annually by each operator. The audio and video media are then reviewed by a supervisor to ensure that operators' interpretations remain consistent and accurate. Imaging system characteristics are verified on a routine basis.

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

Oversight functions include periodic audio/video media reviews of accepted waste containers and are performed by qualified radiography operators that were not involved in the original scans of the waste containers. The results of this independent verification are available to the radiography operators who performed the original scans. The SPM

is responsible for monitoring the quality of the radiography data and calling for corrective action, when necessary.

C1-4 Visual Examination

The CCP may use VE to verify container's contents. VE is performed by physically examining the contents of waste containers to verify the Waste Matrix Code and to verify that the container is properly included in the appropriate waste stream (T6, T69, T113, T163, T500).

VE is conducted on a waste container to identify and describe all waste items, packaging materials, and waste material parameters in the waste containers. VE activities are documented on video/audio media or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. When VE is performed using a second operator, each operator performing the VE will observe for themselves the waste being placed in the waste container or the contents within the examined waste container when waste is not removed. The results of all VE are documented on VE data forms, which are used to document the Waste Matrix Code, ensure that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and verify that the physical form of the waste is consistent with the waste stream description documented in the AK Summary.

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

- The video/audio media shall record the waste packaging event for the container such that all waste items placed into the container are recorded in sufficient detail and shall contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.
- The video/audio media shall capture the waste container identification number.
- The personnel loading the waste container shall be identified on the video/audio media or on packaging records traceable to the loading of the waste container.
- The date of loading of the waste container will be recorded on the video/audio media or on packaging records traceable to the loading of the waste container.

VE performed using two generator site personnel shall meet the following minimum requirements:

- At least two generator site personnel who witnessed the packaging of the waste shall approve the data forms or packaging records attesting to the contents of the waste container.
- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that another trained VE operator can identify the associated waste material parameters.
- The waste container identification number shall be recorded on the data forms or packaging records.

VE video/audio media of containers which contain classified shapes, shall be considered classified information. VE data forms or packaging records will not contain classified information.

Waste container packaging records may be used to meet the VE DQOs, Sections C-4a(1). These records must meet the minimum requirements listed above for either VE recorded on video/audio media or VE performed by two generator site personnel, and shall be reviewed by operators trained and qualified to the requirements listed below. The operators will prepare data forms based on the VE records. VE batch data reports will be prepared, reviewed, and approved as described in Section C-4 and Section C3.

There will be standardized training for VE. VE operators are instructed in the specific waste-generating processes, typical packaging configurations, and waste material parameters expected to be found in each waste matrix code at the site. The training covers the various waste configurations generated/stored at the site. The particular physical forms and packaging configurations will vary at each site, so operators will be trained to examine the types of waste that are generated, stored and/or characterized at that site. Training will include the following regardless of Summary Category Group:

- Identifying and describing the contents of a waste container by examining all items in waste containers of previously packaged waste
- Identifying when VE cannot be used to meet the DQOs

VE personnel are requalified once every two years.

The Program Manager designates VE experts. Designated VE experts are familiar with the waste-generating processes that have taken place at the site and waste types for wastes being characterized at a particular site. VE experts are responsible for the

overall direction and implementation of VE activities for the CCP at that site. VE experts meet the qualification and training requirements specified in CCP-QP-002 and make decisions based on training, previous experience, and knowledge of the waste stream.

C1-5 Custody of Samples

Chain-of-Custody on field samples (including field QC samples) will be initiated immediately after sample collection or preparation. Sample custody will be maintained by ensuring samples are custody sealed during shipment to the laboratory. After samples are accepted by the analytical laboratory, custody will be maintained by assuring that the samples are in the possession of an authorized individual, in that individual's view, in a sealed or locked container controlled by that individual, or in a secure controlled access location. Sample custody will be maintained until the sample is released by the SPM or until the sample is expended. The CCP procedures contain a copy of the sample chain-of-custody form and instructions for completing sample chain-of-custody forms in a legally defensible manner. These forms include provisions for each of the following:

- Signature of individual initiating custody control, along with the date and time.
- Documentation of sample numbers for each sample under custody. Sample numbers are referenced to a specific sampling event description that identifies the sampler(s) through signature, the date and time of sample collection, type/number containers for each sample, sample matrix, preservatives (if applicable), requested methods of analysis, place/address of sample collection and the waste container number.
- For off-site shipping, method of shipping transfer, responsible shipping organization or corporation, and associated air bill or lading number.
- Signatures of custodians relinquishing and receiving custody, along with date and time of the transfer.
- Description of final sample container disposition, along with signature of individual removing sample container from custody.
- Comment section.
- Documentation of discrepancies, breakage or tampering.

All samples and sampling equipment will be identified with unique identification numbers. Sampling coring tools and equipment will be identified with unique equipment numbers that ensure all sampling equipment, coring tools, and sampling canisters will be traceable to equipment cleaning batches.

All samples will be uniquely identified to ensure the integrity of the sample and will be used to identify the facility and date of collection. Sample tags or labels will be affixed to all samples and identify at a minimum:

- Sample ID number
- Sampler initials and organization
- Ambient temperature and pressure (for gas samples only)
- Sample description
- Requested analyses
- Data and time of collection
- QC designation (if applicable)

COC procedures are contained in the sampling procedures identified in Sections C1-1 and C1-2.

C1-6 Sample Packing and Shipping

In the event that the analytical facilities are not at the generator/storage site, the samples shall be packaged and shipped to an off-site laboratory. Sample containers shall be packed to prevent any damage to the sampling container and maintain the preservation temperature, if necessary. Department of Transportation (DOT) regulations shall be adhered to for shipment of the package.

When preparing SUMMA® or equivalent canisters for shipment, special care shall be taken with the pressure gauge and the associated connections. Metal boxes which have separate compartments, or cardboard boxes with foam inserts, are standard shipping containers. The chosen shipping container shall meet selected DOT regulations. If temperatures shall be maintained, an adequate number of cold packs necessary to maintain the preservation temperature shall be added to the package.

Glass jars will be wrapped in bubble wrap or another type of protection. The wrapped jar should be placed in a plastic bag inside of the shipping container, so that if the jar breaks, the inside of the shipping container and the other samples will not be contaminated. The plastic bag will enable the receiving analytical lab to prevent contamination of their shipping and receiving area. Plastic jars do not present a problem for shipping purposes. All shipping containers will contain appropriate blank samples to detect any VOC cross-contamination. A DOT approved cooler, or similar package may be used as the shipping container. If temperatures must be maintained, an adequate number of cold packs necessary to maintain the preservation temperature

shall be added to the package. If fill material is needed, compatibility between the samples and the fill should be evaluated prior to use.

All sample containers should be affixed with signed tamper-proof seals or devices so that it is apparent if the sample integrity has been compromised and that the identity of the seal or device is traceable to the individual who affixed the seal. A seal should also be placed on the outside of the shipping container for the same reason. Sample custody documentation shall be placed inside the sealed or locked shipping container, with the current custodian signing to release custody. Transfer of custody will be completed when the receiving custodian opens the shipping container and signs the custody documentation. The shipping documentation will serve to track the physical transfer of samples between the two custodians.

A Uniform Hazardous Waste Manifest is not required, since samples are exempted from the definition of hazardous waste under RCRA. All other shipping documentation specified in the site-specific SOP for sample shipment (i.e., bill of lading, site-specific shipping documentation) will be required.

Sampling packaging and shipping procedures are included in the sampling procedures listed in Section C1 and C2, where appropriate.

Table C1-1. Gas Sample Requirements

Parameter	Container[a]	Minimum Drum Headspace Sample Volume[b]	Holding Temperatures
VOCs	SUMMA® Canister	250 ml	0-40°C

[a] Alternately, canisters that meet QAOs may be used.

[b] Alternately, if available headspace is limited, a single 100 ml sample may be collected for determination of VOCS.

Table C1-2. Summary of Drum Field QC Headspace Sample Frequencies

QC Samples	Manifold	Direct Canister	On-Line Systems
Field blanks[a]	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]
Equipment blanks[b]	1 per sampling batch[d]	once[e]	1 per on-line batch[f]
Field reference standards[c]	1 per sampling batch[d]	once[e]	1 per on-line batch[f]
Field duplicates	1 per sampling batch[d]	1 per sampling batch[d]	1 per on-line batch[f]

[a] Analysis of field blanks for VOCs (Table C3-2), only, is required. For on-line integrated sampling/ analysis systems, if field blank results meet the acceptance criterion, a separate on-line blank is not required.

[b] One equipment blank or on-line sample shall be collected, analyzed for VOCs (Table C3-2), and demonstrated clean prior to first use of the headspace gas sampling equipment with each of the sampling heads, then at the specified frequency, for VOCs only thereafter. Daily, prior to work, the sampling manifold, if in use, shall be verified clean using an OVA.

[c] One field reference standard or on-line control sample shall be collected, analyzed, and demonstrated to meet the QAOs specified in Table C3-2 prior to first use, then at the specified frequency thereafter.

[d] A sampling batch is a suite of samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which shall be collected within 14 days of the first sample in the batch.

[e] One equipment blank and field reference standard shall be collected after equipment purchase, cleaning, and assembly.

[f] An on-line batch is the number of samples collected within a 12-hour period using the same on-line integrated sampling/analysis system. The analytical batch requirements are specified by the analytical method being used in the on-line system.

Table C1-3. Summary of Sampling Quality Control Sample Acceptance Criteria

Quality Control (QC) Samples	Acceptance Criteria	Corrective Action[a]
Field Blanks	Gas Chromatography (GC)/Mass Spectrometry (MS), GC/Flame Ionization Detector (FID) Volatile Organic Compounds (VOCs) ≤ 3 x Method Detection Limits (MDLs) in Table C3-2	Nonconformance if any VOC amount is greater than 3 x MDLs in Table C3-2 for GC/MS and GC/FID
Equipment Blanks	GC/MS, GC/FID VOCs ≤ 3 x MDLs in Table C3-2	Nonconformance if any VOC amount is greater than 3 x MDLs in Table C3-2 for GC/MS and GC/FID
Field Reference Standards or On-Line Control Sample	70 - 130 Percent Recovery (%R)	Nonconformance if %R < 70 or > 130
Field Duplicate or On-Line Duplicate Sample	RPD ≤ 25	Nonconformance if RPD > 25

[a] Corrective action is only required if the final reported QC sample results do not meet the acceptance criteria.

MDL = Method Detection Limit

%R = Percent Recovery

RPD = Relative percent difference

Table C1-4. Sample Handling Requirements for Homogeneous Solids and Soil/Gravel

Parameter	Suggested Quantity[a]	Required Preservative	Suggested Container	Maximum Holding Time[b]
VOCs	15 grams	Cool to 4°C	Glass Vial[c]	14 Days Prep/ 40 Days Analyze[d]
SVOCs	50 grams	Cool to 4°C	Glass Jar[e]	14 Days Prep/ 40 Days Analyze[d]
Metals	10 grams	Cool to 4°C	Plastic Jar[f]	180 Days[g]

[a] Quantity may be increased or decreased according to the requirements of the analytical laboratory, as long as the QAOs are met.

[b] Holding time begins at sample collection (holding times are consistent with SW-846 requirements).

[c] 40-ml VOA vial or other appropriate containers shall have an airtight cap.

[d] 40-day holding time allowable only for methanol extract - 14-day holding time for non-extracted VOCs.

[e] Appropriate containers should be used and should have Teflon® lined caps.

[f] Polyethylene or polypropylene preferred, glass jar is allowable.

[g] Holding time for mercury analysis is 28 days.

Note: Preservation requirements in the most recent version of SW-846 may be used if appropriate.

Table C1-5. Headspace Gas Drum Age Criteria Sampling Scenarios

Scenario	Description
1	A. Unvented 55-gallon drums without rigid poly liners are sampled through the drum lid at the time of venting. B1. Unvented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. B2. Vented 55-gallon drums with unvented rigid poly liners are sampled through the rigid poly liner at the time of venting or prior to venting. C. Unvented 55-gallon drums with vented rigid poly liners are sampled through the drum lid at the time of venting.
2	55-gallon drums that have met the criteria for Scenario 1 and then are vented, but not sampled at the time of venting. [a]
3	Containers (i.e., 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, TDOPs and pipe components) that are initially packaged in a vented condition and sampled in the container headspace and containers that are not sampled under Scenario 1 or 2.

[a] Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. This requires the additional information required of each container in Scenario 3 (i.e., determination of packaging configuration) and such containers can only be sampled after meeting the appropriate Scenario 3 DAC.

Table C1-6. Scenario 1 Drum Age Criteria (in days) Matrix

Summary Category Group	DAC (days)
S5000	53

Note: Containers that are sampled using the Scenario 1 DAC do not require information on the packaging configuration because the Scenario 1 DAC are based on a bounding packaging configuration. In addition, information on the rigid liner vent hole presence and diameter do not apply to containers that are sampled using the Scenario 1 DAC because they are unvented prior to sampling.

Table C1-7. Scenario 2 Drum Age Criteria (in days) Matrix

	Summary Category Group S5000			
Filter H_2 Diffusivity [a]	Rigid Liner Vent Hole Diameter (in) [b]			
(mol/s/mod fraction)	0.30	0.375	0.75	1.0
1.9×10^{-6}	29	22	13	12
3.7×10^{-6}	25	20	12	11
3.7×10^{-5}	7	6	6	4

[a] The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with a 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9×10^{-6} filter H_2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

[b] The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging (Section C-3(d)1), repackaging (Section C-3(d)1), and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

Note: Containers that are sampled using the Scenario 2 DAC do not require information on the packaging configuration because the Scenario 2 DAC are based on a bounding packaging configuration.

Table C1-8. Scenario 3 Packaging Configuration Groups

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 1, 55-gallon drums[a]	• No layers of confinement, filtered inner lid[b] • No inner bags, no liner bags (bounding case)
Packaging Configuration Group 2, 55-gallon drums[a]	• 1 inner bag • 1 filtered inner bag • 1 liner bag • 1 filtered liner bag • 1 inner bag, 1 liner bag • 1 filtered inner bag, 1 filtered liner bag • 2 inner bags • 2 filtered inner bags • 2 inner bags, 1 liner bag • 2 filtered inner bags, 1 filtered liner bag • 3 inner bags • 3 filtered inner bags • 3 filtered inner bags, 1 filtered liner bag • 3 inner bags, 1 liner bag (bounding case)
Packaging Configuration Group 3, 55-gallon drums[a]	• 2 liner bags • 2 filtered liner bags • 1 inner bag, 2 liner bags • 1 filtered inner bag, 2 filtered liner bags • 2 inner bags, 2 liner bags • 2 filtered inner bags, 2 filtered liner bags • 3 filtered inner bags, 2 filtered liner bags • 4 inner bags • 3 inner bags, 2 liner bags • 4 inner bags, 2 liner bags (bounding case)
Packaging Configuration Group 4, pipe components	• No layers of confinement inside a pipe component • 1 filtered inner bag, 1 filtered metal can inside a pipe component • 2 inner bags inside a pipe component • 2 filtered inner bags inside a pipe component • 2 filtered inner bags, 1 filtered metal can inside a pipe component • 2 inner bags, 1 filtered metal can inside a pipe component (bounding case)

Table C1-8. Scenario 3 Packaging Configuration Groups (continued)

Packaging Configuration Group 5, Standard Waste Box or Ten-Drum Overpack [a]	• No layers of confinement • 1 SWB liner bag (bounding case)
Packaging Configuration Group 6, Standard Waste Box or Ten-Drum Overpack [a]	• any combination of inner and/or liner bags that is less than or equal to 6 • 5 inner bags, 1 SWB liner bag (bounding case)
Packaging Configuration Group 7, 85-gallon Drums and 100-gallon Drums [a]	• No inner bags, no liner bags, no rigid liner, filtered inner lid (bounding case)[b] • No inner bags, no liner bags, no rigid liner
Packaging Configuration Group 8, 85-gallon Drums and 100-gallon Drums [a]	• 4 inner bags and 2 liner bags, no ridid liner, filtered inner lid (bounding case)[b]

[a] If a specific Packaging Configuration Groups cannot be determined based on the data collected during packaging (Section C-3(d)1) and/or repackaging (Section C-3(d)1), a conservative default Packaging Configuration Group of 3 for 55-gallon drums, 6 for SWBs and TDOPs, and 8 for 85-gallon and 100-gallon drums must be assigned provided the drums do not contain pipe component packaging. If pipe components are present as packaging in the drums, the pipe components must be sampled following the requirements for Packaging Configuration Group 4.

[b] A "filtered inner lid" is the inner lid on a double lid drum that contains a filter.

Definitions:

Liner Bags: One or more optional plastic bags that are used to control radiological contamination. Liner bags for drums have a thickness of approximately 11 mils. SWB liner bags have a thickness of approximately 14 mils. Liner bags are typically similar in size to the container. TDOPs use SWB liner bags.

Inner Bags: One or more optional plastic bags that are used to control radiological contamination. Inner bags have a thickness of approximately 5 mils and are typically smaller than liner bags.

Table C1-9. Scenario 3 Drum Age Criteria (in days) Matrix for S5000 Waste by Packaging Configuration Group

Packaging Configuration Group 1						
	Rigid Liner Vent Hole Diameter[b]					
Filter H_2 Diffusivity[a] (mol/s/mol fraction)	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole	No Liner Lid	No Liner
1.9×10^{-6}	131	95	37	24	4	4
3.7×10^{-6}	111	85	36	24	4	4
3.7×10^{-5}	28	28	23	19	4	4

Packaging Configuration Group 2						
	Rigid Liner Vent Hole Diameter[b]					
Filter H2 Diffusivity[a] (mol/s/mol fraction)	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole	No Liner Lid	No Liner
1.9×10^{-6}	175	138	75	60	30	11
3.7×10^{-6}	152	126	73	59	30	11
3.7×10^{-5}	58	57	52	47	28	8

Packaging Configuration Group 3						
	Rigid Liner Vent Hole Diameter[b]					
Filter H_2 Diffusivity[a] (mol/s/mol fraction)	0.3-inch Diameter Hole	0.375-inch Diameter Hole	0.75-inch Diameter Hole	1-inch Diameter Hole	No Liner Lid	No Liner
1.9×10^{-6}	199	161	96	80	46	16
3.7×10^{-6}	175	148	93	79	46	16
3.7×10^{-5}	72	72	67	62	42	10

Table C1-9. Scenario 3 Drum Age Criteria (in days) Matrix for S5000 Waste by Packaging Configuration Group (continued)

Packaging Configuration Group 4	
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Headspace Sample Taken Inside Pipe Component
$>1.9 \times 10^{-6}$	152

Packaging Configuration Group 5	
Filter H_2 Diffusivity [a,c] (mol/s/mol fraction)	Headspace Sample Taken Inside SWB/TDOP
$>7.4 \times 10^{-6}$ (SWB)	15
3.33×10^{-5} (TDOP)	15

Packaging Configuration Group 6	
Filter H_2 Diffusivity [a,c] (mol/s/mol fraction)	Headspace Sample Taken Inside SWB/TDOP
$>7.4 \times 10^{-6}$ (SWB)	56
3.33×10^{-5} (TDOP)	56

Packaging Configuration Group 7 [d]			
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol fraction) [a]		
	7.4×10^{-6}	1.85×10^{-5}	9.25×10^{-5} [e]
3.7×10^{-6}	13	7	2
7.4×10^{-6}	10	6	2
1.85×10^{-5}	6	4	2

Table C1-9. Scenario 3 Drum Age Criteria (in days) Matrix for S5000 Waste by Packaging Configuration Group (continued)

Packaging Configuration Group 8	
Filter H_2 Diffusivity [a] (mol/s/mol fraction)	Inner Lid Filter Vent Minimum H_2 Diffusivity (mol/s/mol fraction)
	7.4×10^{-6}
3.7×10^{-6}	21

[a] The documented filter H_2 diffusivity must be greater than or equal to the listed value to use the DAC for the listed filter H_2 diffusivity (e.g., a container with a filter H_2 diffusivity of 4.2×10^{-6} must use a DAC for a filter with a 3.7×10^{-6} filter H_2 diffusivity). If a filter H_2 diffusivity for a container is undocumented or unknown or is less than 1.9×10^{-6} filter H_2 diffusivity, a filter of known H_2 diffusivity that is greater than or equal to 1.9×10^{-6} filter H_2 diffusivity must be installed prior to initiation of the relevant DAC period.

[b] The documented rigid liner vent hole diameter must be greater than or equal to the listed value to use the DAC for the listed rigid liner vent hole diameter (e.g., a container with a rigid liner vent hole of 0.5 in. must use a DAC for a rigid liner vent hole of 0.375 in.). If the rigid liner vent hole diameter for a container is undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]), that container must use a DAC for a rigid liner vent hole diameter of 0.30 in.

[c] The filter H_2 diffusivity for SWBs or TDOPs is the sum of the diffusivities for all of the filters on the container because SWBs and TDOPs have more than one filter.

[d] Headspace sample taken between inner and outer drum lids. If headspace sample is taken inside the filtered inner drum lid prior to placement of the outer drum lid, then a DAC value of two days may be used. Footnote e is also applicable. Packaging Configuration Group seven DAC values apply to drums with up to two lids.

[e] While a DAC value of 2 days may be determined, containers must comply with the equilibrium requirements specified in Section C1-1a (i.e., 72 hours at 18°C or higher). The equilibrium requirement for headspace gas sampling shall be met separately.

Figure C1-1. Headspace Gas Drum Age Criteria Sampling Scenario Selection Process

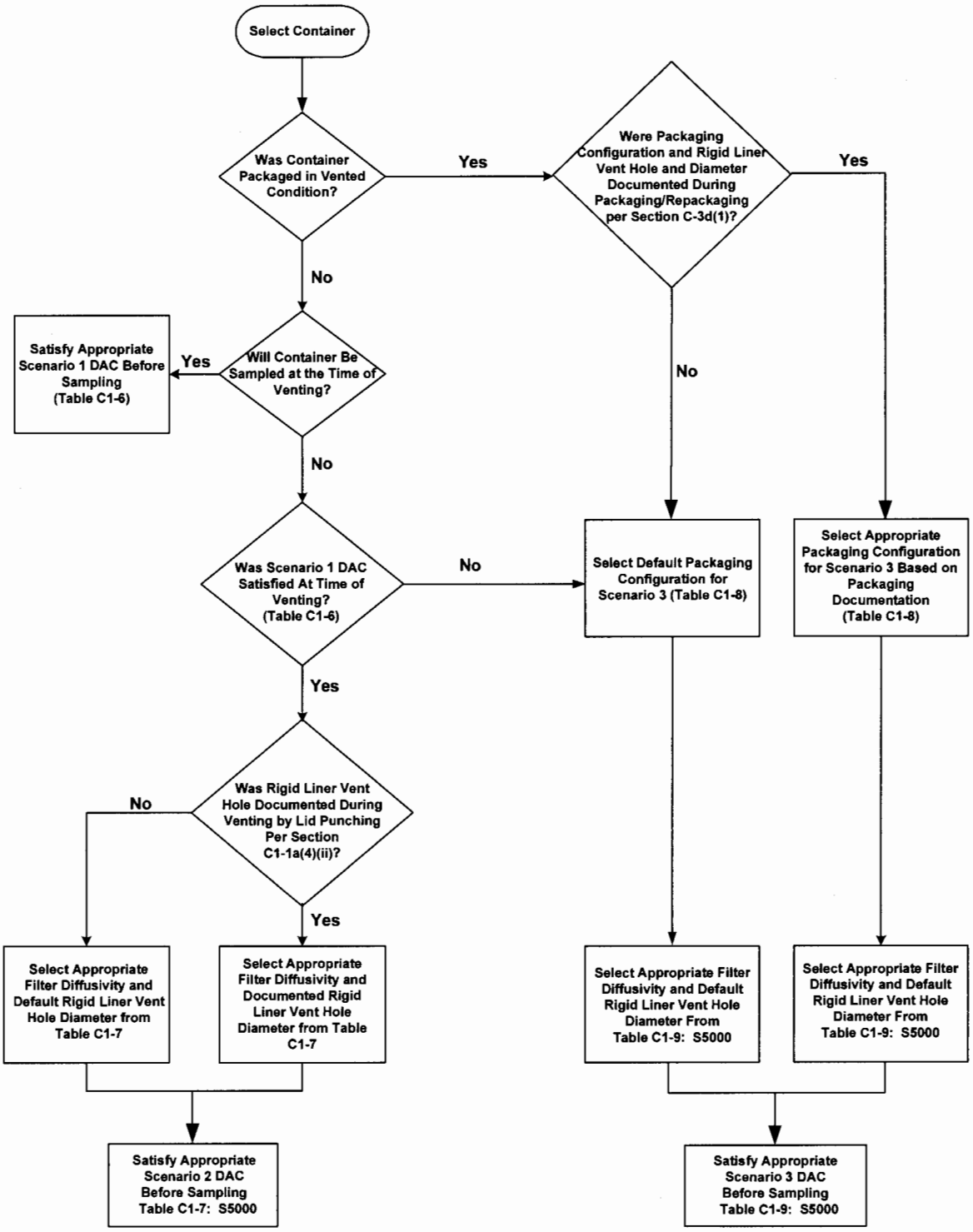


Figure C1-2. Headspace Sampling Manifold

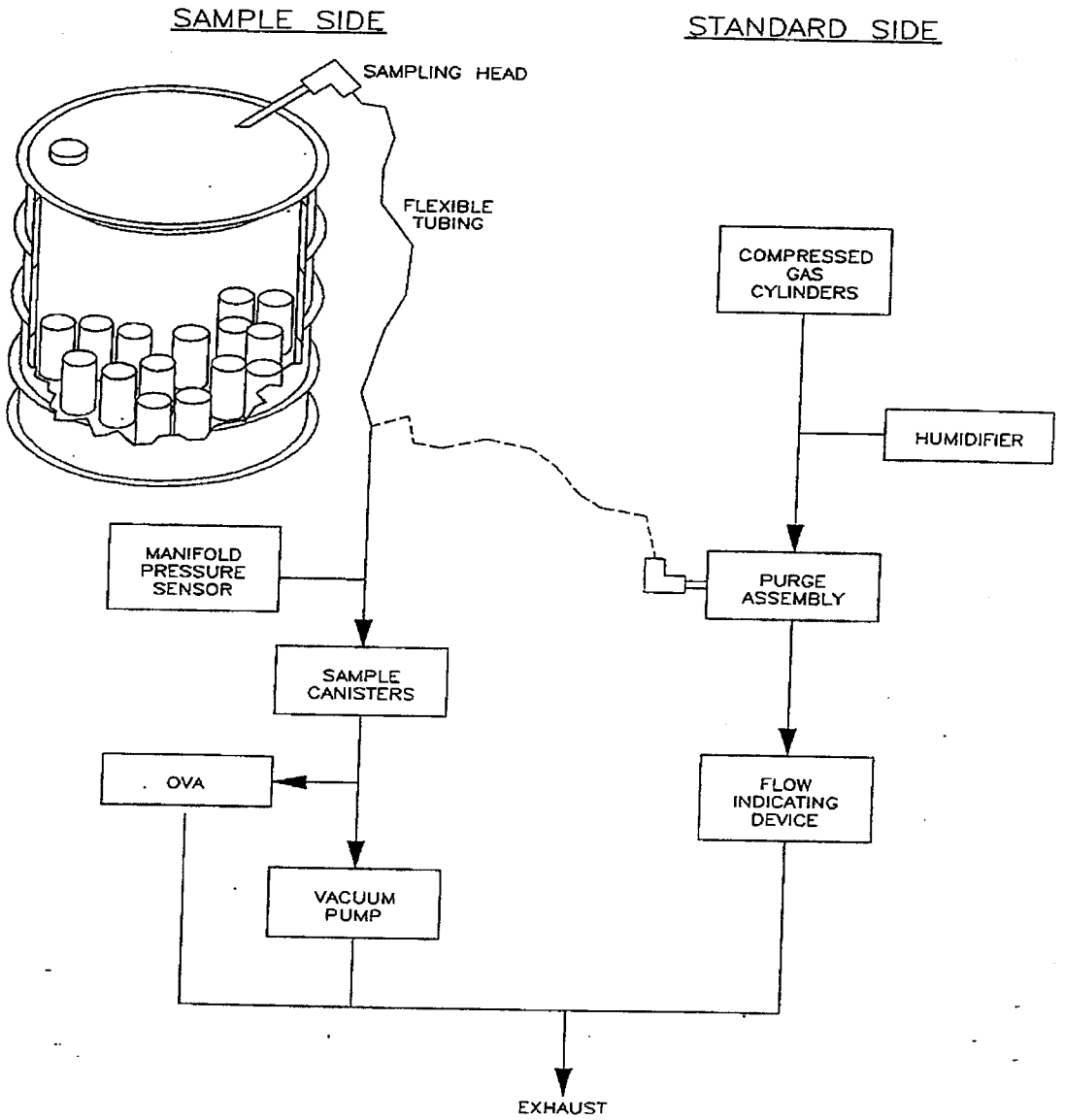


Figure C1-2
Headspace Sampling Manifold

Figure C1-3. SUMMA® C Components Configuration (Not-to-Scale)

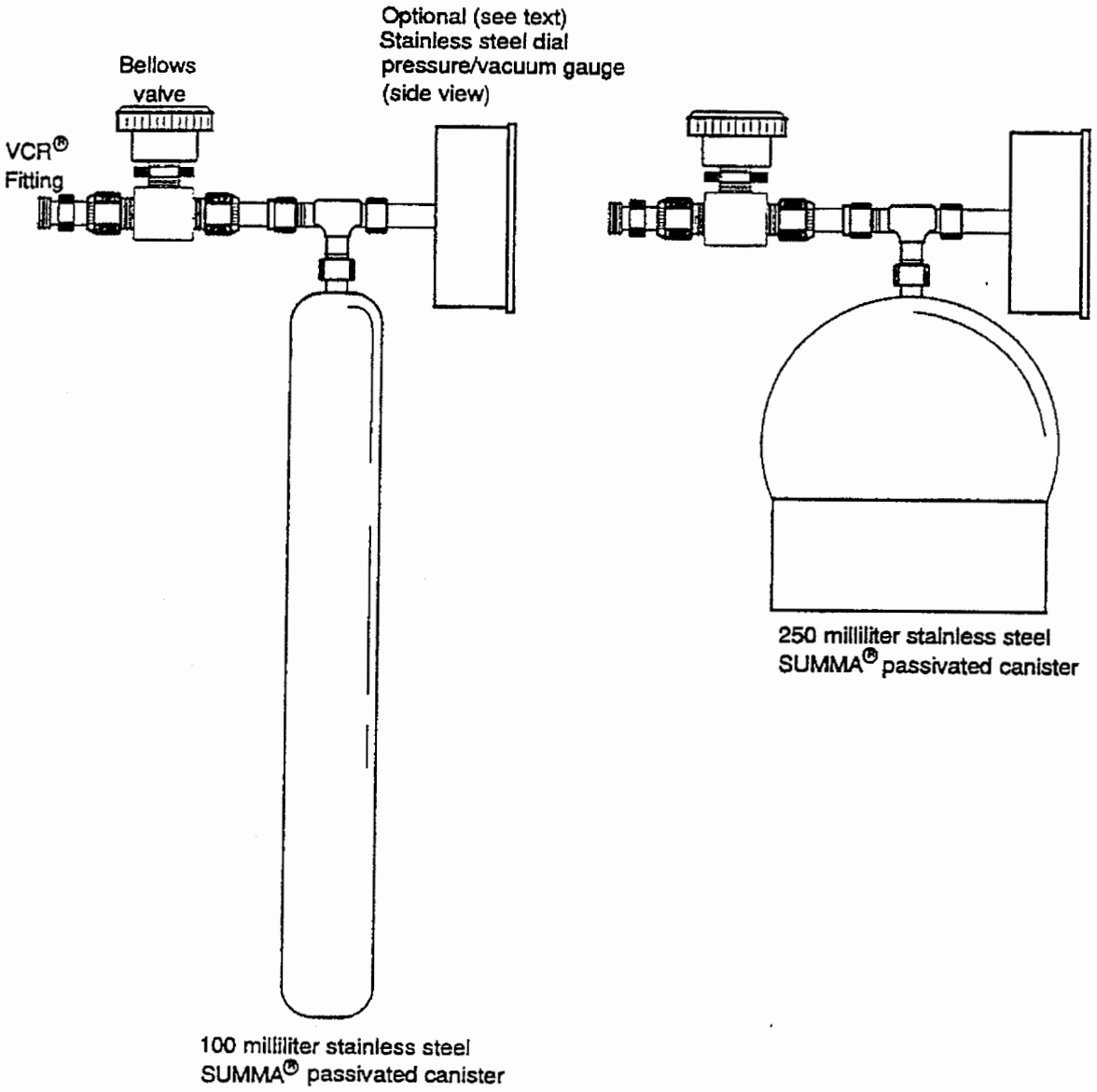


Figure C1-4. Schematic Diagram of Direct Canister with the Poly Bag Sampling Head

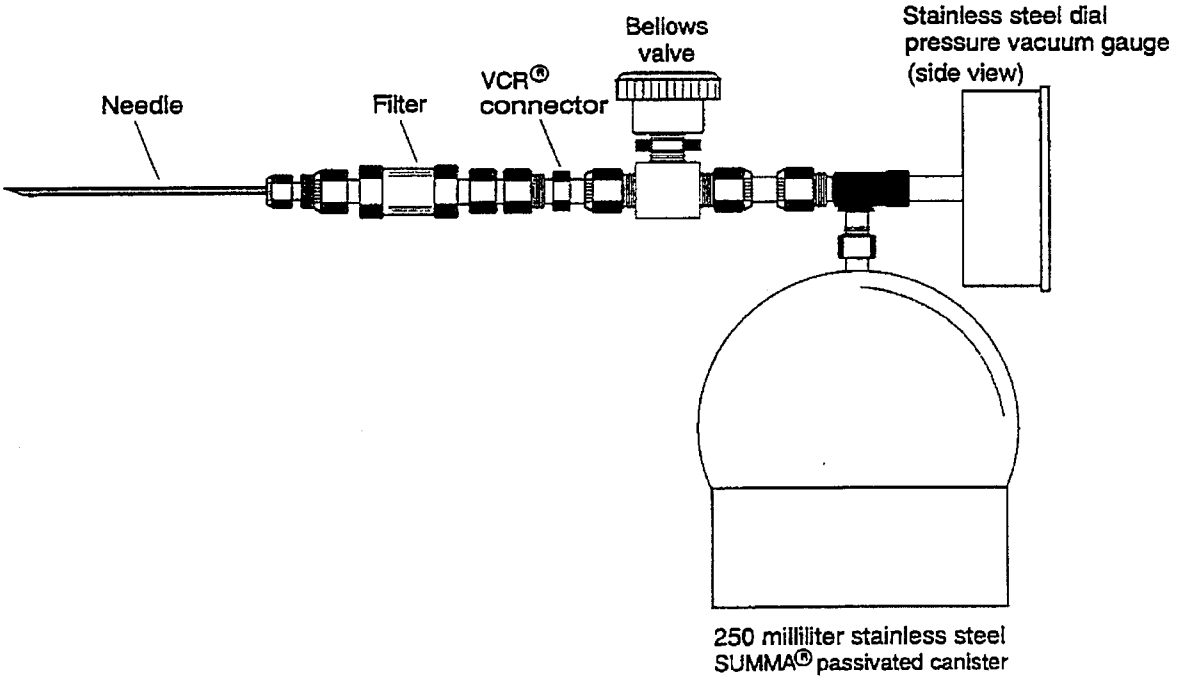
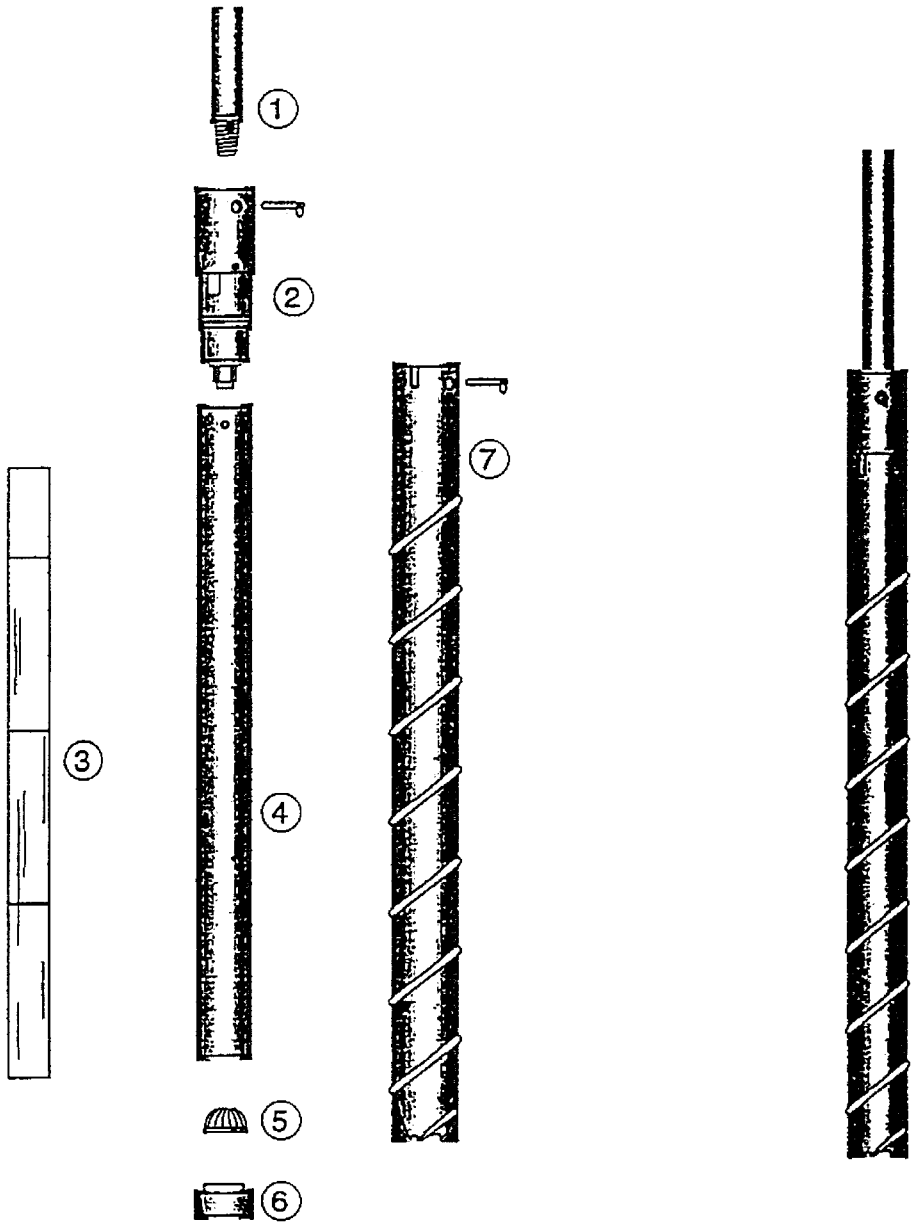
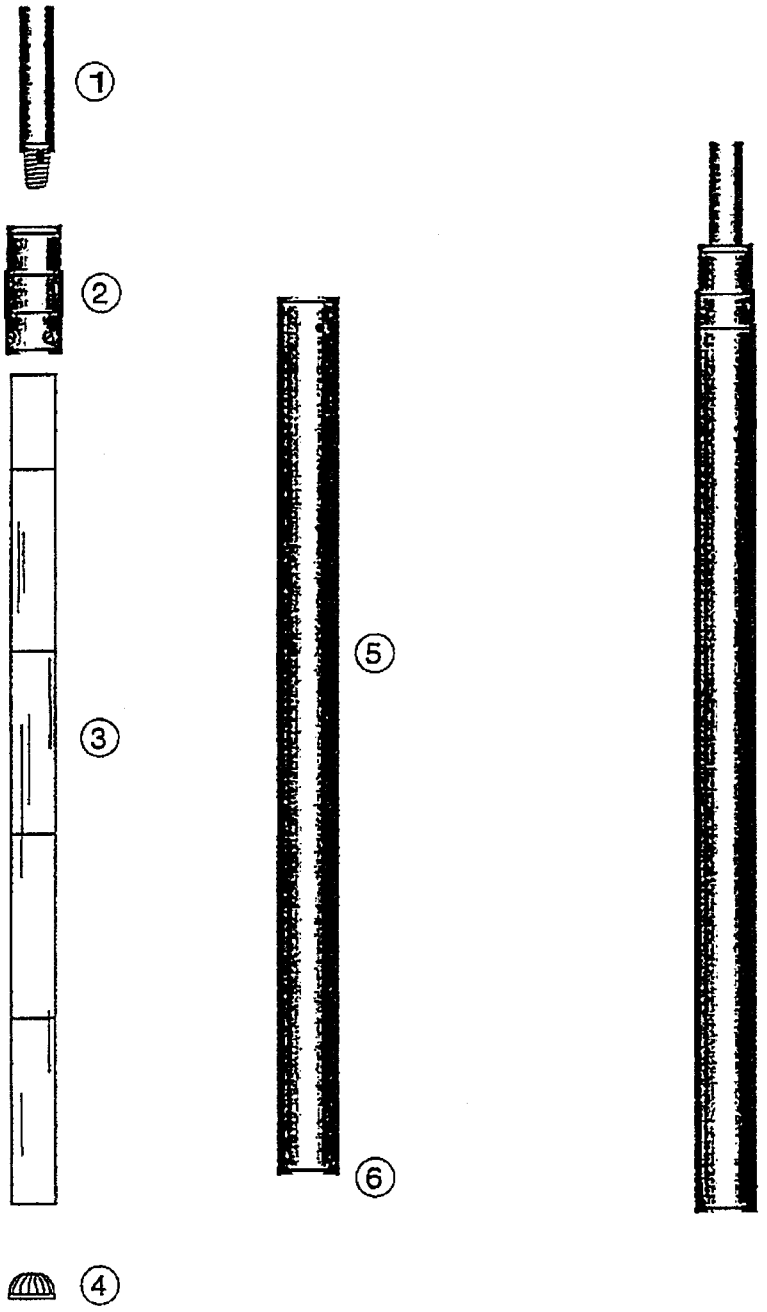


Figure C1-5. Rotational Coring Tool (Light Weight Auger)



1. Drill Rod
2. Thrust Bearing Ball Check Valve
3. Clear Teflon® Liners
4. Core Barrel
5. Spring Retainer (optional)
6. Core barrel tip
7. Auger and Pin

Figure C1-6. Non-Rotational Coring Tool (Thin Walled Sampler)



1. Drill Rod
2. Ball check valve
3. Clear Teflon®liners
4. Spring Retainer (optional)
5. Tube
6. Tapered Tip

C2 STATISTICAL METHODS USED IN SAMPLING AND ANALYSIS

The CCP uses the following statistical methods for sampling and analysis of TRU waste to be disposed at the WIPP, unless determined unnecessary by the DOE as a result of an AK Sufficiency Determination. These statistical methods include methods for selecting waste containers for totals analysis, selecting waste containers for headspace gas sampling and analysis, and setting the upper confidence limit.

C2-1 Approach for Selecting Waste Containers for Statistical Sampling

C2-1a Statistical Selection of Containers for Totals Analysis

The statistical approach for characterizing retrievably stored and newly generated homogeneous solids (S3000) and soil/gravel (S4000) waste and repackaged or treated S3000 waste will rely on using AK to segregate waste containers into relatively homogeneous waste streams. Using AK, the CCP will classify the entire waste stream as hazardous or nonhazardous rather than individual waste containers. Individual waste containers will serve as convenient units for characterizing the combined mass of waste from the waste stream of interest. Once segregated by waste stream, random selection and sampling of the waste containers will be followed by analysis of the waste samples, performed to ensure that the resulting mean contaminant concentration provides an unbiased representation of the true mean contaminant concentration for each waste stream. The SPM will verify that the samples collected from within a waste stream were selected randomly (T162).

An end use of analytical results for retrievably stored homogeneous solids and soil/gravel is for assigning the EPA hazardous waste numbers associated D-numbers that apply to each mixed waste stream. The toxicity characteristic D-numbers are indicators that the waste exhibits the toxicity characteristic for specific contaminants under the RCRA. The RCRA-toxicity determination is made on the basis of sampling and analysis of waste streams and on whether or not the waste stream includes F-numbers wastes. If a waste stream includes one or more RCRA F-numbers identified via AK, toxicity characteristic contaminants associated with the F-numbers waste(s) are not included in the RCRA-toxicity characteristic determination. That is, the F-numbers take precedence over RCRA-toxicity D-numbers, and the waste stream is assumed hazardous regardless of the concentration. Therefore, toxicity characteristics contaminants associated with F-numbers for a waste stream shall be omitted from all calculations for determining the number of containers to sample because these wastes streams are assumed to be hazardous. In addition, each toxicity characteristic contaminant associated with the F-numbers shall be excluded from evaluation of analytical results to determine D-numbers. Contaminants of interest for the sampling, analysis, and RCRA-toxicity determination of a waste stream, then, excludes contaminants associated with F-numbers that have been assigned to the waste stream.

The sampling and analysis strategy is implemented in accordance with approved procedures (T3, T512). Preliminary estimates of the mean concentration and variance of each RCRA regulated contaminant in the waste will be used to determine the number of waste containers to select for sampling and analysis. Preliminary estimates will be based on a minimum of five samples selected randomly from the waste stream. If the entire waste stream is not accessible for sampling then a minimum of five preliminary samples will be selected randomly from the accessible population. As the rest of the waste stream is retrieved or generated, additional selected containers will be sampled as provided below and the analytical results will be reported to the Permittees. Samples collected to establish preliminary estimates that are selected, sampled, and analyzed using a DOE approved laboratory in accordance with applicable provisions of this QAPjP may be used as part of the required number of samples to be collected. The applicability of the preliminary estimates to the waste stream to be sampled will be justified and documented. The preliminary estimates will be determined in accordance with the following equations:

$$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{(C2-1)}$$

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \overline{x}\right)^2 \qquad \text{(C2-2)}$$

Where:

$\overline{x}$ = the calculated mean.
s^2 = the calculated concentration variance.
n = the number of samples analyzed.
x_i = the concentration determined in the *ith* sample.
i = an index from 1 to n.

Based upon the preliminary estimates of $\bar{x}$ and s^2 for each chemical contaminant of concern, the appropriate minimum number of samples (*n*) to be collected for each contaminant will be estimated using the following formulas from SW-846 (EPA 1996):

$$n = \frac{t^2_{\alpha,n_o-1} s^2}{(RT - \bar{x})^2} \qquad \text{(C2-3)}$$

Where:

n_0 = the initial number of samples used to calculate the preliminary estimates.
n = the calculated minimum number of required samples.
$t_{\alpha,n-1}$= the 90th percentile for the *t* distribution with n_0-1 degrees of freedom.
RT = the Regulatory Threshold of the contaminant (limit for toxicity characteristic wastes, PRQL for listed wastes).

The number of samples to be collected is based upon the largest *n* calculated for each of the contaminants of concern. The actual number of samples collected will be adjusted as necessary to ensure that an adequate number of samples are collected to allow for acceptable levels of completeness.

Non-integer results of calculations for required sample size should be rounded up to the next integer. A minimum of five containers will be sampled and analyzed in each waste stream. If there are fewer containers than the minimum or required number of samples in a waste stream, one or more randomly selected containers will be sampled more than once to obtain the number of needed samples of the waste. Otherwise the CCP selects any one container for sampling only once.

The calculated total number of required waste containers will then be randomly sampled and analyzed using a DOE approved laboratory. The CCP may count waste container samples from the preliminary mean and variance estimates as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples were identical to the methodology to be employed for the required samples.

- There is documented evidence that the method of sample analysis in the preliminary estimate samples was identical to the analytical methodology employed for the required samples.

- There is documented evidence that the validation of the sample analyses, in the preliminary estimate samples, was comparable to the validation employed for the required samples. In addition, the validated sample results indicate that all sample results were valid according to the analytical methodology.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage at the generator/storage site, or only a portion of the waste stream has been repackaged, treated, or generated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. DOE may approve the WSPF and authorize the CCP to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream have been obtained.

The CCP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of five randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers) become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste steams from ongoing processes) or to facilitate waste processing, the CCP may divide the waste stream into lots. In this case, a minimum of five randomly selected sample locations will be selected from within each subsequent lot. As those randomly selected locations (e.g., buried or newly generated waste containers) become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the CCP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The CCP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2a and assign EPA hazardous waste numbers as appropriate. The CCP will submit the analytical data from subsequent sampling to the Permittees for inclusion in the WIPP facility operating record upon completion of project level data validation in Section C3-10b. If changes to EPA hazardous waste numbers are required as a result of subsequent sampling, the CCP will notify the Permittees and shipments of the affected waste stream shall be suspended until the DOE approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the CCP may presumptively assign EPA hazardous waste numbers to a waste stream even if the calculated number of required

samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the CCP collects the required number of samples if it intends to establish that the constituent is below the regulatory threshold.

C2-1b Statistical Selection of Containers for Headspace Gas Analysis

Headspace gas sampling of a waste stream may be done on a randomly selected portion of containers in the waste stream (T162). The CCP determines the minimum number of containers, *n*, to be sampled by taking an initial VOC sample from 10 randomly selected containers. These samples are analyzed for all the target analytes using a DOE approved laboratory. The standard deviation, *s*, is calculated for each of the nine VOCs in the HWFP Part 4, Table 4.4.1. The value of *n* is determined as the largest number of samples (not to exceed the number of containers in the waste stream or waste stream lot) calculated using the following equation:

$$n_{VOC_i} = \frac{t^2_{\alpha,n-1} \times s^2_{e_{VOC_i}}}{E^2_{VOC_i}} \qquad \text{(C2-4)}$$

where:

n_{VOC_i} = the number of samples needed to representatively sample the waste stream for VOC_i from Table 4.4.1.

$t_{\alpha,n-1}$ = the 90th percentile of the *t* distribution with *n* - 1 degrees of freedom.

$s_{e_{VOC_i}}$ = the estimated standard deviation, based on the initial *n* samples, for VOC_i from Table 4.4.1.

E_{VOC_i} = the allowable error, determined as 1 percent of the limiting concentration for VOC_i from Table 4.4.1.

Non-integer results of calculations for the required sample size should be rounded up to the next integer. A minimum of 10 containers shall be sampled and analyzed in each waste stream. If there are fewer than the minimum or required number of containers in a waste stream, then each container should be sampled once. The calculated total number of required waste containers will then be randomly sampled and analyzed. The CCP may count waste container samples from the preliminary mean and variance estimates as part of the total number of calculated required samples if and only if:

- There is documented evidence that the waste containers for the preliminary estimate samples were selected in the same random manner as is chosen for the required samples.
- There is documented evidence that the method of sample collection in the preliminary estimate samples was identical to the methodology to be employed for the required samples.
- There is documented evidence that the method of sample analysis in the preliminary estimate samples, was identical to the analytical methodology employed for the required samples.
- There is documented evidence that the validation of the sample analyses, in the preliminary estimate samples, was comparable to the validation employed for the required samples. In addition, the validated sample results indicate that all sample results were valid according to the analytical methodology.

The mean and standard deviation calculated after sampling *n* containers are used to calculate a UCL_{90} for each of the headspace gas VOCs using the methodology presented in Section C2-2b.

If only a portion of a waste stream is accessible for sampling (e.g., the remainder of the waste stream will be recovered from storage at the generator/storage site or only a portion of the waste stream has been repackaged or treated), the calculated number of samples will be randomly selected from the accessible portion of the waste stream. A minimum of 10 randomly selected samples will be obtained and analyzed from the accessible portion of the waste stream. The DOE may approve the WSPF and authorize the CCP to begin shipping the waste stream to WIPP once the analytical data for the randomly selected samples from the accessible portion of the waste stream has been obtained.

CCP will also randomly select the calculated number of sample locations from the waste stream as a whole. A minimum of 10 randomly selected sample locations will be selected from the waste stream as a whole. As those randomly selected locations (e.g., buried or newly generated waste containers) become accessible for sampling, samples will be obtained and analyzed.

For those waste streams where the population of the waste stream as a whole is indeterminate (e.g., continually generated waste streams from ongoing processes) or to facilitate waste processing, the CCP may divide the waste stream into lots. In this case, a minimum of 10 randomly selected containers will be selected from within each subsequent lot. As those randomly selected containers (e.g., buried or newly generated waste containers) become accessible, samples will be obtained and analyzed. As with sampling from the waste stream as a whole, the CCP may ship waste from the lot being generated or retrieved prior to completing sampling and analysis of the lot.

The CCP will use the data to update the UCL_{90} values for the waste stream as described in Section C2-2b and assign EPA Hazardous Waste Numbers as appropriate. The CCP will submit the analytical data from subsequent sampling to the Permittees for inclusion in the WIPP facility operating record upon completion of project level data validation in Section C3-10b. If changes to EPA Hazardous Waste Numbers are required as a result of subsequent sampling, the CCP will notify the Permittees, and shipments of the affected waste stream shall be suspended until the DOE approves a revised WSPF for the affected waste stream.

Upon collection and analysis of the preliminary samples, or at any time after the preliminary samples have been analyzed, the CCP may presumptively assign hazardous waste numbers to a waste stream even if the calculated number of required samples is greater than the preliminary number of samples collected. For waste streams with calculated upper confidence limits below the regulatory threshold, the site shall collect the required number of samples if the site intends to establish that the constituent is below the regulatory threshold.

C2-2 Upper Confidence Limits for Statistical Sampling

C2-2a Upper Confidence Limits for Statistical Solid Sampling

Upon completion of the required sampling, final mean and variance estimates and the UCL_{90} for the mean concentration for each contaminant is determined. The observed sample n^* is checked against the preliminary estimate for the number of samples (n) to be collected before proceeding, where n^* is:

$$n^* = \frac{t^2_{\alpha,n_0-1} s^2}{\left(RT - \bar{x}\right)^2} \qquad \text{(C2-5)}$$

And the right-side terms in equation are as defined in Section C2-1a.

Where:

n_0 = the initial number of samples used to calculate the preliminary sample estimate.
t_{α,n_0-1} = the 90th percentile for the t distribution with n_0-1 degrees of freedom.
RT = the Regulatory Threshold of the contaminant (limit for toxicity characteristic wastes, PRQL for listed wastes).

$\bar{x}$ = the calculated sample mean
s = the calculated sample standard deviation.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and continues until the difference between n^* and the previous sample size determination is less than 20 percent.

Once sufficient sampling and analysis has occurred, the waste characterization proceeds. The assessment is made at the 90 percent confidence level. The UCL_{90} for the mean concentration of each contaminant is calculated using the following equation from OSWER 9285.6-10 (EPA 2002):

$$UCL_{90} = \bar{x} + \frac{t_{\alpha,n-1} s}{\sqrt{n}} \qquad \text{(C2-6)}$$

Where:

$\bar{x}$ = the calculated sample mean
n = the number of samples used to calculate the sample estimate.
$t_{\alpha,n-1}$ = the 90th percentile for the t distribution with n-1 degrees of freedom.
s = the calculated sample standard deviation.

If the UCL_{90} for the mean concentration is less than the regulatory threshold limit, the waste stream is not required to be assigned the hazardous waste number for the associated contaminant. If the UCL_{90} is greater than or equal to the regulatory threshold limit, the hazardous waste number for the associated contaminant is assigned to the waste stream. UCL_{90} calculations are performed and documented using CCP-TP-003, *CCP Data Analysis for S3000, S4000, and S5000 Characterization*.

C2-2b Upper Confidence Limits for Statistical Headspace Gas Sampling

A UCL_{90} concentration for each of the headspace gas VOCs is calculated from the sample data collected. The observed sample n^* is checked against the estimate for the number of samples (n) to be collected before proceeding, where n* is:

$$n^* = \frac{t^2_{\alpha,n-1} s^2}{E^2} \qquad \text{(C2-7)}$$

where E is as defined in Section C2-1b and the remaining right-side terms in the equation are defined in Section C2-1a. When composite headspace gas sample results are used, the mean, standard deviation and t-statistic are based on the number of composite samples analyzed, rather than the number of drums sampled.

If the observed sample n^* estimate results in greater than 20 percent or more required samples than were originally calculated, then the additional samples required to fulfill the revised sample estimate are collected and analyzed. The determination of n^* is an iterative process that follows the collection and analysis of any additional samples and

continues until the difference between n^* and the previous sample determination is less than 20 percent. The UCL_{90} is then calculated using equation C2-6. In this case, UCL_{90} is the 90 percent upper confidence limit for the mean VOC concentration, $\bar{x}$ is the calculated sample mean VOC concentration, and s is the calculated sample standard deviation. The value of $t(_{\alpha}, _{n-1})$ is found in Table 9-2 of Chapter 9 of SW-846.

C3 QUALITY ASSURANCE OBJECTIVES AND DATA VALIDATION TECHNIQUES FOR WASTE CHARACTERIZATION SAMPLING AND ANALYTICAL METHODS

C3-1 Validation Methods

The CCP performs validation of qualitative and quantitative data so that characterization data are of known and acceptable quality. Validation methods quantitatively assess precision, accuracy, MDLs (as appropriate), and completeness for analytical data (headspace gas VOCs, and total VOCs, SVOCs, and metals). Quantitative data validation is performed according to the methods outlined in this section. Data are assessed for compliance with the QAOs in Sections C3-2 through C3-9.

Comparability and representativeness parameters are assessed qualitatively. The qualitative data or descriptive information generated by radiography and VE are not amenable to statistical data quality analysis. However, radiography and VE are complementary techniques yielding similar data for determining the waste matrix code. The waste matrix code is determined to ensure that the container is properly included in the appropriate waste stream.

Data validation is used to assess the quality of waste characterization data collected based on project precision, accuracy, completeness, comparability, and representativeness objectives. These objectives are described below:

Precision

Precision is a measure of the mutual agreement among multiple measurements of a single analyte, either by the same or different methods. Precision is either expressed as the RPD for duplicate measurements or as the percent relative standard deviation (%RSD) for three or more replicate measurements. For duplicate measurements, the precision expressed as the RPD is calculated as follows:

$$RPD = \frac{C_1 - C_2}{\left(\frac{C_1 + C_2}{2}\right)} \times 100 \qquad \text{(C3-1)}$$

where C_1 and C_2 are the two values obtained by analyzing duplicate samples. C_1 is the larger of the two observed values.

For three or more replicate measurements, the precision expressed as the %RSD is calculated as follows:

$$\%RSD = \frac{s}{y_{mean}} \times 100 \qquad \text{(C3-2)}$$

where s is the standard deviation and y_{mean} is the mean of the replicate sample analysis.

The standard deviation, s, is calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (y_i - y_{mean})^2}{n-1}} \qquad \text{(C3-3)}$$

where y_i is the measured value of the ith replicate sample analysis measurement and n is the number of replicate analysis.

Another aspect of precision is associated with analytical equipment calibration. In these instances, the percent difference (%D) between multiple measurements of an equipment calibration standard is calculated as follows:

$$\%D = \frac{|C_1 - C_2|}{C_1} \times 100 \qquad \text{(C3-4)}$$

where C_1 is the initial measurement and C_2 is the second or other additional measurement.

Accuracy

Accuracy is the degree of agreement between a measured analyte concentration (or the average of replicate measurements of a single analyte concentration) and the true or known concentration. Accuracy is determined as the percent recovery (%R).
For situations in which a standard reference material is used, %R is calculated as follows:

$$\%R = \frac{C_m}{C_{srm}} \times 100 \qquad \text{(C3-5)}$$

where C_m is the measured concentration value obtained by analyzing the sample and C_{srm} is the "true" or certified concentration of the analyte in the sample. For measurements where matrix spikes are used, the %R is calculated as follows:

$$\%R = \frac{S - U}{C_{sc}} \times 100 \qquad \text{(C3-6)}$$

where S is the measured concentration in the spiked aliquot, U is the measured concentration in the unspiked aliquot, and C_{sc} is the actual concentration of the spike added.

Method Detection Limit

The MDL is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The MDL for quantitative measurements is defined as follows:

$$MDL = t_{(n-1,1-\alpha=.99)} \times s \quad \text{(C3-7)}$$

where $t_{(n-1,\ 1-\alpha=.99)}$ is the t-distribution value corresponding to a 99 percent confidence level with n-1 degrees of freedom, n is the number of observations, and s is the standard deviation of replicate measurements.

For headspace gas analysis using Fourier Transform Infrared Spectroscopy (FTIRS), MDL is defined as follows:

$$MDL = 3s \quad \text{(C3-8)}$$

where s is the standard deviation. Initially, a minimum of seven samples spiked at a level of three to five times the estimated MDL and analyzed on non-consecutive days must be used to establish the MDLs. MDLs should be updated using the results of the laboratory control sample or on-line control samples. CCP does not currently use FTIRS.

Completeness

Completeness is a measure of the amount of valid data obtained from the overall measurement system compared to the amount of data collected and submitted for analysis. Completeness is expressed as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Completeness, expressed as the percent complete (%C), is calculated as follows:

$$\%C = \frac{V}{n} \times 100 \quad \text{(C3-9)}$$

where V is the number of valid sampling or analytical results obtained and n is the number of samples submitted for analysis.

Comparability

Comparability is the degree to which one data set can be compared to another. Comparability of data generated at different sites is ensured through the use of standardized, approved testing, sampling, preservation, and analytical techniques and equipment and by meeting the QAOs specified in Sections C3-2 through C3-9.

The comparability of waste characterization data is ensured by using EPA data usability criteria (EPA 1994b and 1994c). The criteria include the following information:

- Definition or reference of criteria used to define and assign data qualifier flags based on QAO results;
- Criteria for assessing the usability of data impacted by matrix interferences;
- Criteria for assessing usability of data based on positive and negative bias indicated by QC data, and data qualifier flags;
- Criteria for assessing the usability of data due to severe matrix effects, misidentification of compounds, gross exceedance of holding times, and failure to meet calibration or tuning criteria;
- Criteria for assessing usability of data that do not meet MDL requirements.

Representativeness

Representativeness is the degree to which sample data represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that concerns the proper design of the sampling program.

Representativeness of waste containers from waste streams subjected to headspace gas homogeneous solids and soil/gravel sampling and analysis is validated through documentation that a true random sample from an adequate population was identified and collected consistent with Section C2-1. Since representativeness is a qualitative characteristic that expresses the degree to which a sample represents the population being studied, the random selection of waste containers ensures representativeness on a Program level. The SPM documents that the selected waste containers from within a waste stream were randomly selected. Sampling personnel verify that proper procedures are followed to ensure that samples are representative of the waste contained in a particular waste container or waste stream.

Identification of Tentatively Identified Compounds (T2)

In accordance with the convention of SW-846, identification of compounds detected by GC/MS that are not on the target analyte list are reported. Both composited and individual container headspace gas, VOC (total/TCLP), and SVOC (total/TCLP) analyses are subject to TIC reporting. The process for adding TICs to the target analyte list is described in CCP-TP-002, *CCP Reconciliation of DQOs and Reporting Characterization Data*.

TICs for GC/MS methods are identified in accordance with the following SW-846 criteria:

- Relative intensities of major ions in the reference spectrum (ions greater than 10 percent of the most abundant ion) should be present in the sample spectrum.
- The relative intensities of the major ions should agree within ± 20 percent.
- Molecular ions present in the reference spectrum should be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of coeluting compounds.
- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting peaks.
- The reference spectra used for identifying TICs should include, at a minimum, all of the available spectra for compounds that appear in the 20.4.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII list. The reference spectra may be limited to VOCs when analyzing headspace gas samples.

TICs are reported as part of the analytical batch data reports for GC/MS Methods in accordance with the following minimum criteria:

- A TIC in an individual container headspace gas or solids sample is reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 10% of the area of the nearest internal standard.
- A TIC in a composited headspace gas sample that contains two to five individual container samples is reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 2% of the area of the nearest internal standard.
- A TIC in a composited headspace gas sample that contains six to 10 individual container samples is reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 1% of the area of the nearest internal standard.
- A TIC in a composited headspace gas sample that contains 11 to 20 individual container samples is reported in the analytical batch data report if the TIC meets the SW-846 identification criteria listed above and is present with a minimum of 0.5% of the area of the nearest internal standard.

TICs meeting the SW-846 criteria, are reported in 25 percent of all waste sample containers from a given waste stream, and listed in 20.4.1.200 NMAC (incorporating 40 CFR §261) Appendix VIII, are compared with AK data, to determine if the TIC is a listed constituent in the waste stream (T2, T5). TICs identified through headspace gas analyses that are on the Appendix VIII list and meet the 25 percent reporting criteria for a waste stream are added to the headspace gas waste stream target analyte list, regardless of the Hazardous Waste Codes associated with the waste stream.

TICs reported from the totals VOC or SVOC analyses are excluded from the target analyte list for a waste stream if the TIC is a constituent in an F-listed waste whose presence is attributable to waste packaging materials or radiolytic degradation described in AK documentation. If a listed waste constituent TIC cannot be attributed to waste packaging materials, radiolysis, or other origins, the constituent is added to the target analyte list and new hazardous waste numbers are assigned, if appropriate. TICs subject to inclusion on the target analyte list that are also toxicity characteristic parameters are added to the target analyte list regardless of origin because the hazardous waste designation for these numbers is not based on source. However, toxicity characteristic parameter and nontoxic F003 constituent concentration is taken into account when assessing whether to add a hazardous waste number. If a target analyte list for a waste stream is expanded due to the presence of TICs, all subsequent

samples collected from that waste stream are analyzed for constituents on the expanded list.

C3-2 Headspace Gas Sampling (T7 and T106)

Quality Assurance Objectives

The precision and accuracy of the container headspace gas sampling operations are assessed by analyzing field QC headspace gas samples. These samples include equipment blanks, field reference standards, field blanks, and field duplicates. If the QAOs described below are not met, a nonconformance report is prepared, submitted, and resolved (Section C3-13).

Precision

The precision of the headspace gas sampling and analysis operation is assessed by sequential collection of field duplicates for manifold sampling operations or simultaneous collection of field duplicates for direct canister sampling operations for VOCs determination. Corrective actions are taken if the RPD exceeds 25 percent for any analyte found greater than the PRQL in both of the duplicate samples.

Accuracy

A field reference standard is collected using headspace gas sampling equipment to assess the accuracy of the headspace gas sampling operation at a frequency of one field reference standard for every 20 containers sampled or per sampling batch. Corrective action is taken if the %R of the field-reference standard is less than 70 or greater than 130.

Field blanks are also collected at a frequency of 1 field blank for every 20 containers or sampling batch sampled to assess possible contamination in the headspace gas sampling method. Equipment blanks are also collected at a frequency of 1 equipment blank for each equipment cleaning batch to assess possible contamination in the equipment cleaning method. Corrective actions are taken if the blank exceeds three times the MDLs listed for any of the compounds listed in Table C3-2.

Completeness

Sampling completeness is expressed as the number of valid samples collected as a percent of the total number of samples collected for each waste stream. A valid sample is defined as a sample collected in accordance with approved sampling methods and the container was properly prepared for sampling (e.g., the polyliner was vented to the container headspace). The CCP achieves a minimum of 90 percent completeness. The amount and type of data that may be lost during the headspace gas sampling operation cannot be predicted in advance.

The CCP SPM evaluates the importance of any lost or contaminated headspace gas samples and take corrective action as appropriate.

Comparability

Consistent use and application of uniform procedures and equipment, as specified in Section C1 and application of data usability criteria (EPA 1994b and 1994c), ensures that headspace gas sampling operations are comparable when sampling headspace at the different sampling facilities. The CCP will take corrective actions if uniform procedures, equipment, or operations are not followed without approved and justified deviations. In addition, CCP laboratories analyzing samples participate in the PDP.

Representativeness

Specific headspace gas sampling steps to ensure samples are representative include:

- Selection of the correct DAC Scenario and waste packaging configuration and meeting DAC equilibrium times.
- A sample canister cleaning and leak check after assembly.
- Sampling equipment cleaning or disposal after use.
- Sampling equipment leak check after sample collection.
- Use of sample canisters with passivated internal surfaces.
- Use of low-internal-volume sampling equipment.
- Collection of samples with a low-sample volume to available headspace volume ratio (less than 10 percent of the headspace when the headspace can be determined).
- Careful and documented pressure regulation of all activities specified in Section C1-1.
- Performance audits.
- Collection of equipment blanks, field reference standard, field blanks, and field duplicates at the specified frequencies.
- Manifold pressure sensors and temperature sensors calibrated before initial use and annually using NIST, or equivalent standards.

- OVA calibrated daily, prior to first use, or as necessary according to manufacturers specifications.

Failure to perform the checks at the prescribed frequencies would result in corrective actions.

C3-3 Sampling of Homogeneous Solids and Soils/Gravel

Quality Assurance Objectives

For waste containers of homogeneous solids and soil/gravel, the CCP will collect samples randomly in both the horizontal and vertical planes of each container to ensure that sampling is conducted in a representative manner on a waste stream basis. For waste containers that contain homogeneous solids and soil/gravel in smaller containers (e.g., 1 gallon [4.0 L] poly bottles) within the waste container, the CCP will randomly select and sample one smaller container from each container.

Precision

The CCP will determine sampling precision by collecting and sampling field duplicates (e.g., co-located cores or co-located samples) once per sampling batch or once per week during sampling operations, whichever is more frequent. A sampling batch is a suite of homogeneous solids and soil/gravel samples collected consecutively using the same sampling equipment within a specific time period. A sampling batch can be up to 20 samples (excluding field QC samples), all of which must be collected within 14 days of the first sample in the batch. The CCP SPM will calculate and report the RPD between co-located core/samples.

The CCP will use the recommended method (F-test) for establishing acceptance criteria for co-located cores and co-located samples. After 25 to 30 pairs of co-located cores or samples are collected, control charts of the RPD will be developed for each constituent and for each waste matrix or waste type (e.g., pyrochemical salts or organic sludges). The limits for the control chart will be three standard deviations above or below the average RPD. Once constructed, RPDs for additional co-located pairs will be compared with the control charts to determine whether or not the co-located cores are acceptable. Periodically, the CCP will update the control charts using all available data (CCP-TP-003).

The CCP will calculate the variance for co-located cores and samples by pooling the variances computed for each pair of duplicate results. To achieve independence, the variance for the waste stream will be computed excluding any data from containers with co-located cores. All data will be transformed to normality prior to computing variances and performing the test. The test hypothesis will be evaluated using the F distribution and the method for testing the difference in variances.

Accuracy

The CCP does not determine sampling accuracy through the use of standard reference materials. Because waste containers containing homogeneous solids and soil/gravel with known quantities of analytes are not available, sampling accuracy cannot be determined. However, the CCP will use the sampling methods and requirements described in order to minimize sample degradation and maximize sampling accuracy.

Sampling accuracy as a function of sampling cross-contamination will be measured. Equipment blanks will be collected at a frequency of once per equipment cleaning batch. Corrective actions will be taken if the blank exceeds three times the MDLs (PRDLs for metals) listed for any of the compounds or analytes listed in Tables C3-4, C3-6, and C3-8. Equipment blanks will be collected from the following equipment types:

- Fully assembled coring tools
- Liners cleaned separately from coring tools
- Miscellaneous sampling equipment that is reused (bowls, spoons, chisels)

Completeness

The CCP will ensure sampling completeness by expressing the number of valid samples collected as a percent of the total number of samples collected for each waste stream. A valid sample is any sample that is collected from a randomly selected container using randomly selected horizontal and vertical planes in accordance with the approved sampling methods. The sampling facility will achieve a minimum 90 percent completeness.

Comparability

The CCP consistently uses uniform procedures, sampling equipment, and measurement units, and applies data usability criteria (EPA 1994b and 1994c) to ensure that sampling operations are comparable. The CCP participates in the PDP.

Representativeness

The CCP will ensure the representativeness of samples for both waste containers and smaller containers through the following steps:

- Coring tools and sampling equipment will be cleaned prior to sampling.

- The entire depth of the waste, minus a CCP-defined approved safety factor will be cored, and the core collected will have a length greater than or equal to 50 percent of the depth of the waste. The CCP will calculate this core recovery as follows:

$$\text{Core recovery (percent)} = \frac{y}{x} \times 100 \qquad \text{(C3-10)}$$

where:

x = the depth of the waste in the container
y = the length of the core collected from the waste.

- Coring operations and tool selection should be designed to minimize alteration of the in-place waste characteristics. The CCP will verify that minimal waste disturbance occurs by visually examining the core and describing the observation (e.g., undisturbed, cracked, or pulverized) in the field logbook.

  If core recovery is less than 50 percent of the depth of the waste, a second coring location will be randomly selected and the core with the best core recovery will be used for sample collection.

- One randomly selected container within a container will be chosen if the container contains individual waste containers.

C3-4 Nondestructive Examination Methods

Quality Assurance Objectives

The QAOs for nondestructive examination (NDE) are detailed in this section. NDE can be either radiography or VE. If the QAOs in this section are not met, then corrective actions are taken. NDE does not have a specific MDL because it is primarily a qualitative determination. The objective of NDE for the program is to determine the physical waste form, the absence of prohibited items, and additional waste characterization techniques that may be used on the Summary Category Group (i.e., S3000, S4000, and S5000). CCP describes all of the activities required to achieve these objectives in this QAPjP and the operating procedures listed in Section C1.

C3-4a Radiography (T53, T508)

Data to meet the QAOs for radiography are obtained from a video and audio recorded scan provided by trained radiography operators at the Host site. Results are also recorded on a radiography data form. The precision, accuracy, completeness, and comparability objectives for radiography data follow.

Precision

Precision is maintained by reconciling any discrepancies between two radiography operators with regard to identification of the waste matrix code, liquids in excess of TSDF-WAC limits, and compressed gases through independent replicate scans and independent observations. The precision of radiography is also verified prior to use by tuning precisely enough to demonstrate compliance with QAOs listed in Section C-4a through viewing an image test pattern.

Accuracy

Accuracy is obtained by using a target to tune the image for maximum sharpness and by requiring operators to successfully identify 100 percent of the items required to meet the DQOs for radiography specified in Permit Attachment C. Section C-4a(1) in a training container during their initial qualification and subsequent requalification.

Completeness

To ensure completeness, video and audio media recording of the radiography of the radiography examination and a validated radiography data form are obtained for 100 percent of retrievably stored waste containers that are examined by radiography. All video and audio media recordings and radiography data forms are subject to validation as indicated in Section C3-10.

Comparability

The comparability of radiography data from different operators is enhanced by using standardized radiography procedures and operator qualifications.

C3-4b Visual Examination (T6, T113, T163, T500)

Results must be recorded on a VE data form. The precision, accuracy, completeness, and comparability objectives for VE data are presented below.

Precision

Precision is maintained by reconciling any discrepancies between the operator and the independent technical reviewer with regard to identification of waste matrix code, liquids in excess of TSDF-WAC limits, and compressed gases.

Accuracy

Accuracy is maintained by requiring operators to pass a comprehensive examination and demonstrate satisfactory performance in the presence of the VE expert during their initial qualification. VE operators shall be requalified every two years.

Completeness

A validated VE data form will be obtained for 100 percent of the waste containers subject to VE.

Comparability

The comparability of VE data from different operators shall be enhanced by using standardized VE procedures and operator qualifications.

C3-5 Gas Volatile Organic Compound Analysis (T32, T143, T173, T175)

Quality Assurance Objectives

The development of DQOs specifically for this program has resulted in the QAOs listed in Table C3-2. The specified QAOs represent the required quality of data necessary to draw valid conclusions regarding program activities. QAPjP-required limits, such as the PRQL associated with VOC analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of the Quality Control Samples and the associated acceptance criteria is included in Table C3-3, Summary of Laboratory Quality Control Samples and Frequencies for Gas Volatile Organic Compound Analysis. The key data quality indicators for headspace gas sampling and analysis are defined below.

Precision

The CCP assesses precision by analyzing laboratory duplicates and replicate analyses of laboratory-control samples, and PDP blind audit samples. Results are compared to the criteria listed in Table C3-2. The QC measurements are used to demonstrate acceptable method performance. The CCP takes corrective action if the QAOs are not met.

Accuracy

The CCP assesses accuracy as %R for laboratory operations by analyzing PDP blind-audit samples and laboratory control samples. Results are compared to the QAO's listed in Table C3-2. These QC measurements are used to demonstrate acceptable method performance and to trigger corrective action when controls are exceeded.

Calibration

GC/MS tunes, initial calibration, and continuing calibration are performed by the CCP and evaluated using the procedures and criteria specified in Table C3-3. Acceptable performance is demonstrated before sample analysis begins. Corrective action is taken if the control limits are exceeded.

Method Detection Limit

The CCP determines MDLs in accordance with the headspace gas procedures, which comply with the method described in Section C3-1. MDLs are expressed in nanograms (ng) and are less than or equal to those listed in Table C3-2.

Program Required Quantitation Limits

The CCP demonstrates the capability to quantify analytes at or below the PRQL listed in Table C3-2 by setting the concentration of at least one calibration standard below the PRQL as found in the headspace gas procedures.

Completeness

The CCP determines laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. A composited sample is treated as one sample for the purposes of completeness because only one sample is run through the analytical instrument. Valid results are defined as those that meet the data usability criteria based on application of the QC Criteria specified in Tables C3-2 and C3-3; and meet the detection limit, calibration representativeness, and compatibility criteria within this section.

The CCP meets the criterion of 90 percent for completeness.

Comparability

For VOC analysis, data generated through analysis of samples from different sites are comparable. CCP achieves comparability by using standardized methods, traceable standards, and successful participation in the PDP.

Representativeness

Representatives for VOC analysis is achieved by collecting sufficient numbers of samples using clean sampling equipment that does not introduce sample bias. Samples must be collected as described in Section C1.

C3-6 Total Volatile Organic Compound Analysis (T184 and T186)

Quality Assurance Objectives

The QAOs for total VOC analysis are listed in Table C3-4, Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives. These QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. WAP-required limits, such as the PRQL associated with VOC analysis, will be specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of quality control samples and associated acceptance criteria for this analysis are included in Table C3-5, Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compounds Analysis. The key data-quality indicators for laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table C3-4. These QC measurements demonstrate acceptable method performance and trigger corrective action if control limits are exceeded.

Accuracy

The CCP will analyze laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples will be used to assess accuracy as %R for the laboratory operations. Results from these measurements for matrix spike samples will be compared to the %R criteria listed in Table C3-4. Results for surrogates and internal standards will be evaluated as specified in the SW-846 method (EPA 1996) or Table C3-5. These QC measurements demonstrate acceptable method performance and trigger corrective action when control limits are exceeded.

Laboratory blanks will be assessed and evaluated as specified in Table C3-5 to determine possible laboratory contamination. The QC measurements will demonstrate acceptable levels of laboratory contamination and trigger corrective action if control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table C3-5 and the SW-846 method (EPA 1996). These criteria demonstrate acceptable calibration and trigger correction action if control limits are exceeded.

Method Detection Limit

MDLs will be expressed in milligrams per kilogram (mg/kg) for total VOCs and will be less than or equal to those listed in Table C3-4. The detailed procedures for MDL determination are included in the CCP total VOC analysis procedures.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs given in Table C3-4. The concentration of at least one calibration standard will be set below the PRQL. The process for PRQL demonstration will be incorporated in the CCP total VOC analysis procedures.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria based on application of criteria specified in Tables C3-4 and C3-5, and meet the calibration, detection limit, representativeness, and comparability criteria within this section. The CCP is required to meet the completeness criteria specified in Table C3-4.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1996) that meet the QAO requirements in Tables C3-4 and C3-5, using traceable standards, and successfully participating in the DOE-CBFO PDP. The CCP will use the most recent version of SW-846 (EPA 1996). Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods in use by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

The CCP will accomplish representativeness for total VOC analysis by collecting unbiased samples in accordance with Section C1.

C3-7 Total Semivolatile Organic Compound Analysis (T185 and T187)

Quality Assurance Objectives

The QAOs for total SVOC analyses are listed in Table C3-6, Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives. These QAOs represent the required quality of data necessary to draw valid conclusions regarding program objectives. QAPjP-required limits, such as the PRQLs, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of quality control samples and associated acceptance criteria for this analysis are included in Table C3-7, Summary of Laboratory Quality Control Samples and Frequencies for Semi-volatile Organic Compounds. Key data-quality indicators for CCP laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or matrix spike duplicates, replicate analyses of laboratory control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table C3-6. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Accuracy

The CCP will analyze laboratory control samples, matrix spikes, surrogate compounds, and PDP blind-audit samples will be used to assess accuracy as %R for the laboratory operations. Results from these measurements for matrix spikes samples will be compared to the %R criteria listed in Table C3-6. Results for surrogates and internal standards will be evaluated as specified in the SW-846 method (EPA 1996) or Table C3-7. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Laboratory blanks shall be assessed to determine possible laboratory contamination and are evaluated as specified in Table C3-7. The CCP will use these QC measurements to demonstrate acceptable levels of laboratory contamination and to trigger corrective action when control limits are exceeded.

Calibration

GC/MS tunes, initial calibrations, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table C3-7 and the SW-846 method (EPA 1996). The QC criteria will be used to demonstrate acceptable calibration and corrective action is initiated if control limits are exceeded.

Method Detection Limit

MDLs will be expressed in mg/kg for total SVOCs and will be less than or equal to those listed in Table C3-6. The detailed procedures for MDL determination will be included in the CCP SOPs.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs given in Table C3-6. The concentration of at least one calibration standard will be set below the PRQL. The process for PRQL demonstration will be included in laboratory SOPs.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria based on application of criteria specified in Tables C3-6 and C3-7, and meet the calibration, detection limit, representativeness, and comparability criteria within this section. The CCP will be required to meet the level of completeness specified in Table C3-6, Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1996) that meet the QAO requirements in Tables C3-6 and C3-7, using traceable standards, and successfully participating in the DOE-CBFO PDP. The CCP will use the most recent version of SW-846 if the methods are consistent with QAO requirements. Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods in use by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

Representativeness for total SVOC analysis will be accomplished by collecting unbiased samples as described in Section C1.

C3-8 Total Metal Analysis (T181, T182, and T183)

Quality Assurance Objectives

The QAOs for total metals analysis are listed in Table C3-8. The QAOs represent the required quality of data necessary to draw valid conclusions regarding program

objectives. QAPjP-required limits, such as the PRQLs associated with total metals analysis, are specified to ensure that the analytical data collected satisfy the requirements of all data users. A summary of QC samples and the associated acceptance criteria for this analysis are included in Table C3-9, Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis. Key data-quality indicators for CCP laboratory measurements are defined below.

Precision

The CCP will assess precision by analyzing laboratory duplicates or laboratory matrix spike duplicates, replicate analyses of laboratory-control samples, and PDP blind-audit samples. Results from measurements on these samples will be compared to the criteria listed in Table C3-8. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Accuracy

The CCP will analyze laboratory matrix spikes, PDP blind-audit samples, serial dilutions, interference check samples, and laboratory control samples to assess accuracy. Results from these measurements will be compared to the criteria listed in Tables C3-8 and C3-9. The QC measurements will demonstrate acceptable method performance and corrective action will be initiated if control limits are exceeded.

Laboratory blanks and calibration blanks will be assessed and evaluated as specified in Table C3-9 to determine possible laboratory contamination. The QC measurements will demonstrate acceptable levels of laboratory contamination and corrective action will be initiated if control limits are exceeded.

Calibration

Mass Tunes (for Inductively Coupled Plasma [ICP] MS only), standards calibration, initial calibration verifications, and continuing calibrations will be performed and evaluated using the procedures and criteria specified in Table C3-9 and the SW-846 method (EPA 1996). The criteria will demonstrate acceptable calibration and corrective action will be initiated if control limits are exceeded.

Program Required Detection Limits

PRDLs, expressed in units of micrograms per liter (μg/L), will be the maximum values for instrument detection limits (IDL) permissible for program support under the WAP. IDLs will be less than or equal to the PRDL for the method used to quantitate a specific analyte. Any method listed in Table C-5 may be used if the IDL meets this criteria. For high concentration samples, an exception to the above requirements may be made in cases where the sample concentration exceeds five times the IDL of the instrument

being used. In this case, the CCP may report the analyte concentration even though the IDL may exceed the PRDL. IDLs will be determined semiannually (i.e., every six months). Details for IDL determination will be included in the CCP total metals procedures.

Program Required Quantitation Limit

The CCP will quantitate analytes in samples at or below the PRQLs in units of mg/kg wet weight given in Table C3-8. The PRDLs will be set an order of magnitude less than the PRQLs (assuming 100 percent solid sample diluted by a factor of 100 during preparation). The concentration of at least one QC or calibration standard will be set at or below the solution concentration equivalent of the PRQL. Details for calibration will be found in the CCP total metals analysis procedures.

Completeness

The CCP will express laboratory completeness as the number of samples analyzed with valid results as a percent of the total number of samples submitted for analysis. Valid results will be defined as results that meet the data usability criteria based upon application of the QC criteria specified in Tables C3-8 and C3-9, and meet the detection limit, calibration, representativeness, and comparability criteria within this Section. The CCP will be required to meet the level of completeness specified in Table C3-8.

Comparability

The CCP will achieve comparability by using standardized SW-846 sample preparation and methods (EPA 1999) that meet the QAO requirements in Tables C3-8 and C3-9, using traceable standards, and by successfully participating in the DOE-CBFO PDP. The CCP may use the most recent version of SW-846 if the methods are consistent with QAO requirements. Any changes to SW-846 methodology that result in the elimination of sample preparation or analytical methods used by the CCP will result in a corrective action to address the comparability of data before and after the SW-846 modification.

Representativeness

The CCP will accomplish representativeness for total metals analysis by collecting unbiased samples as described in Section C1 and preparing the samples in the laboratory using representative and unbiased methods.

C3-9 Acceptable Knowledge (T5)

QAOs for analytical results are described in terms of precision, accuracy, completeness, comparability, and representativeness. However, AK documentation provides qualitative information that cannot be assessed according to specific data quality goals

that may be used for analytical techniques. Appropriate analytical and testing results are used to augment the characterization of wastes based on AK. To ensure that the AK process is consistently applied, the CCP complies with the following data quality requirements for AK documentation.

- Precision - Precision is the agreement among a set of replicate measurements without assumption of the knowledge of a true value. The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. However, the AK information is assessed by independent review during internal and external audits.

- Accuracy - Accuracy is the degree of agreement between an observed sample result and the true value. The percentage of waste containers which require reassignment to a new waste matrix code and/or designation of a different hazardous waste number, based on sampling and analysis data and discrepancies identified during waste confirmation is reported as a measure of AK accuracy. The CCP calculates the AK accuracy in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*.

- Completeness - Completeness is an assessment of the number of waste streams or number of samples collected to the number of samples determined to be useable through the data validation process. The AK record contains 100 percent of the required information (Section C4-3). The usability of the AK information is assessed for completeness during audits.

- Comparability - Data are considered comparable when one set of data can be compared to another set of data. The CCP ensures comparability by meeting the training requirements and complying with the minimum standards outlined for procedures that are used to implement the AK process. The CCP assign hazardous waste numbers in accordance with Section C4-3b and will provide the information regarding the waste being characterized to other sites that store or generate a similar waste stream.

- Representativeness - Representativeness expresses the degree to which sample data accurately and precisely represent characteristics of a population. Representativeness is a qualitative parameter that is satisfied by ensuring that the process of obtaining, evaluating, and documenting AK information is performed in accordance with the minimum standards established in Section C4. The CCP assesses and documents the limitations of the AK information used to assign hazardous waste numbers (e.g., purpose and scope of information, date of publication, type and extent to which waste parameters are addressed).

The CCP complies with the nonconformance notification and reporting requirements of Section C3-13 of this QAPjP if the results of sampling and analysis specified in this QAPjP are inconsistent with AK documentation.

In addition, performance with regard to the use of AK information is tracked by assessing the frequency of inconsistencies among information, and documenting AK inconsistencies identified through radiography, VE, headspace gas analysis, and solidified waste analyses, as appropriate. The AK process and waste stream documentation are evaluated through internal assessments by CCP QA and assessments by auditors external to the organization (i.e. the Permittees).

C3-10 Data Review, Validation, and Verification Requirements

Data review, validation, and verification are performed at the CCP data generation level in accordance with CCP data generation level characterization procedures. Data validation and verification are performed at the project level by the CCP project staff.

Data review determines whether raw data was properly collected and ensures that it was properly reduced. Data validation verifies that the reported data satisfy the WAP requirements and are accompanied by signature release. Data verification authenticates that the data are presented accurately, represent the sampling and analysis activities performed, and have been subject to the appropriate level of review. By meeting the requirements in this section, the CCP ensures that records furnish documentary evidence of quality.

The following types of BDRs (as applicable to the characterization process in use) are required for data validation and verification, and quality assurance activities:

- The Testing BDR or equivalent includes all data pertaining to radiography or VE for up to 20 waste containers without regard to waste matrix. Table C3-11 lists the information required in Testing BDRs (identified with an "X") and other information necessary for data validation but optional for inclusion in the Testing BDR (identified with an "O")

- The Sampling BDR or equivalent includes all sample collection data pertaining to a group of no more than 20 headspace gas or homogeneous waste samples that were collected for chemical analysis. Table C3-12, Sampling Batch Data Report Contents, lists the information required in a Sampling BDR (identified with an "X") and other information not required in the Sampling BDR but necessary for data validation (indicated with an "O")

- The Analytical BDR or equivalent includes analytical data from the analysis of TRU waste for up to 20 headspace gas or homogeneous samples. Analytical BDRs or equivalent that contain results for composited headspace gas samples must contain sufficient information to identify the containers that were composited for each composite sample and the sample volume that was taken from each container. Because Analytical BDRs are generated based on the number of samples analyzed, an Analytical BDR may contain results that are applicable to more than 20 containers depending on how many composite samples are part of the report, but may not exceed a total of 20 samples analyzed. Table C3-13 lists the information required in Analytical BDR (identified with an "X") and other information that is necessary for data validation, but is optional for Analytical Batch Data Reports (identified with an "O").

  Raw analytical data need not be included in Analytical BDRs, but is maintained in the CCP files and/or the site records system and is readily available for review upon request. Raw data may include analytical bench sheet and instrumentation readouts for calibration standard results, sample data, QC samples, sample preparation conditions and logs, sample run logs, and re-extraction, re-analysis, or dilution information pertaining to the individual samples. Raw data may also include calculation records and any qualitative or semi-quantitative data collected for a sample and that has been recorded on a bench sheet or in a log book.

- On-line BDRs or their equivalent contain the combined information from the Sampling BDR and Analytical BDR that is relevant to the on-line method used.

C3-10a Data Generation Level (T6, T32, T53, T106, T113, T143, T188, T500, T508)

The minimum requirements for raw data collection and management, as well as the definitions and limitations of testing, sampling, analytical, and on-line batches, are described in the data generation level procedures (See Tables C3-9, C3-10, and C3-11 for implementing procedures). The minimum requirements for raw data review include the following:

- All data are signed and dated in reproducible ink by the individual generating the data, or by use of unalterable electronic signature.

- All data are recorded clearly, legibly, and accurately in field and laboratory records (i.e., bench sheets and logbooks [Q11]) as applicable, and include applicable sample identification numbers (for sampling and analytical laboratories).

- All changes to original data are lined out, initialed, and dated by the individual making the change. A justification for changing the original data may also be included. Original data are not obliterated or otherwise disfigured so as to be unreadable. Data changes are made only by the individual who originally collected the data, or by an individual authorized to change the data.

- All data are transferred and reduced from field and laboratory records completely and accurately.

- All field and laboratory records are maintained as specified in Table C-6.

- All data are organized in standard formats (i.e., BDRs) specified in procedures.

- All electronic and video data are stored appropriately to ensure that waste container, sample, and associated QC data are readily retrievable. In the case of classified information, additional security provisions may apply that could restrict retrievability. The additional security provisions will be documented in CCP procedures when required.

Data review, validation, and verification at this level involves scrutiny and signature release from qualified independent technical reviewers not involved in the generation or recording of the data under review as specified below. Individuals conducting the data review, validation, and verification use checklists that address the items in this section. These checklists contain or reference tables showing the results of testing, sampling, analytical, or on-line batch QC samples, if applicable. Checklists reflect review of QC samples and QAOs in accordance with the criteria established in Tables C3-2 through C3-9, as applicable. Checklists are forwarded with BDRs to the CCP Project Office. Analytical raw data are available and reviewed by the data generation level reviewer; however, it does not need to be included in the Batch Data Report. Reviews are conducted as soon as possible following analytical activities, and are performed before any corresponding waste is shipped to WIPP.

C3-10a(1) Independent Technical Review (T6, T32, T53, T106, T113, T143, T188, T500, T508)

The independent technical reviewer ensures by review of raw data that data generation and reduction are technically correct, calculations are verified correct, deviations are documented, and QA/QC results are complete, documented correctly, and compared against the criteria specified in this QAPjP. This review is to validate and verify all of the work done by the originator.

One hundred percent of the BDRs must receive an independent technical review. This review is performed by an individual by a trained and qualified individual who was not involved in the generation or recording of the data under review. The independent technical review is performed as soon as practicably possible in order to determine and correct negative quality trends in the testing, sampling, analytical, and on-line process. However at a minimum, the independent technical review must be performed before any waste associated with the data reviewed is managed, stored, or disposed at WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated after initial WSPF approval as described in Section C2-1. The reviewer(s) must release the data as evidenced by signature, and as a consequence ensure the following:

- Data generation and reduction were conducted in a technically correct manner in accordance with the methods used (procedure revision) and data were reported in the proper units and correct number of significant figures.
- Calculations were verified by a valid calculation program, a spot check of verified calculation programs, and/or 100 percent check of all hand calculations. Values that are not verifiable to within rounding or significant difference discrepancies are rectified prior to completion of independent technical review.
- The data were reviewed for transcription errors.
- The testing, sampling, or analytical data QA documentation for BDRs is complete and includes, as applicable, raw data, DAC and equilibrium calculations and times, calculation records, chain-of-custody forms, calibration records, (or reference to an available calibration package), and QC sample results, copies or originals of gas canister sample tags. Corrective action is taken to ensure that all BDRs are complete and include all necessary raw data prior to completion of the independent technical review.
- QC sample results are within established control limits, and if not, the data are appropriately qualified in accordance with data usability criteria. Data outside of established control limits are assigned an appropriate qualifier flag, discussed in the case narrative, and included as appropriate in calculations for completeness. QC criteria that were not met are documented.
- Data qualifier flags specified in Table C3-14, Data Reporting Flags were assigned correctly.
- The sample holding time and preservation requirements were met, or exceptions documented.

- Radiography tapes were reviewed (independent observation) on a waste container basis at a minimum of once per testing batch or once per day of operation, whichever is less frequent (Section C1-3). The radiography tape was reviewed against the data reported on the radiography form to ensure that the data are correct and complete.

- Field sampling records are complete. Incomplete or incorrect field sampling records are subject to resubmittal prior to completion of the independent technical review.

- QAOs have been met according to the methods outlined in Sections C3-2 through C3-9.

C3-10b Project Level

Data validation and verification at this level involves scrutiny and signature release from the SPM (T1, T500, T508). Any nonconformance identified during this process is documented on an NCR (Section C3-13).

The SPM ensures that a repeat of the data generation level review, verification and validation is performed on the data for a minimum of one randomly chosen waste container quarterly (every three months). This exercise documents that the data generation level review, verification, and validation are being performed in accordance with implementing procedures.

C3-10b(1) Site Project Manager Review

The SPM review is the final validation that all of the data contained in BDRs from the data generation level are complete and are properly reviewed, as evidenced by signature release and completed checklists.

One hundred percent of the BDRs have SPM signature release. At a minimum, the SPM signature release is performed before any waste associated with data reviewed is shipped to the WIPP, unless the data are being obtained from waste sampling and analysis as containers are being retrieved or generated as described in Section C2-1. This signature release ensures the following (T1, T500, T508):

- Proper procedures were followed to ensure representative samples of headspace gas and homogeneous solids and soil/gravel were taken.

- Data generation level independent technical review, validation, and verification are performed as evidenced by completed review checklists and by the appropriate signature releases.

- Independent technical reviewers were not involved in the generation or recording of the data under review.
- Batch data review checklists are complete.
- BDRs are complete and data are properly reported (i.e., data are reported in the correct units, with the correct significant figures, and with qualifying flags).
- Data are within established data assessment criteria and meet all applicable QAOs as described in Sections C3-2 through C3-9.
- The validity of the DAC assignment made at the Data Generation Level based upon assessment of the data collection and evaluation necessary to make the assignment.
- Testing batch QC checks (e.g., replicate scans, measurement system checks) were properly performed. Radiography data are complete and acceptable based on evidence of videotape review of one waste container per day or once per testing batch, whichever is less frequent, as specified in C1-3.
- Sampling batch QC checks (e.g., equipment blanks, field duplicates, field reference standards) were properly performed, and meet the established QAOs and are within established data usability criteria.
- Analytical batch QC checks (e.g., laboratory duplicates, laboratory blanks, matrix spikes, matrix spike duplicates, laboratory control samples) were properly performed and meet the established QAOs and are within established data usability criteria.
- On-line batch QC checks (e.g., field blanks, on-line blanks, on-line duplicates, on-line control samples) were properly performed and meet the established QAOs and are within established data useability criteria.

C3-10b(2) Preparing SPM Summary and Data Validation Summary

To document the project level validation and verification described above, the SPM (or designee) prepares an SPM Summary, and Data Validation Summary (T1). These reports may be combined to eliminate redundancy. The SPM Summary includes a validation checklist for each BDR. Checklists for the SPM Summary are of sufficient detail to validate all aspects of a BDR that affect data quality.

The SPM Data Validation Summary provides verification that, on a per waste container or sample basis as evidenced by BDR reviews, all data have been validated in

accordance with this QAPjP. The SPM Data Validation Summary identifies each BDR data report reviewed (including all waste container numbers), describes how the validation was performed and whether or not problems were detected (e.g., nonconformance reports), and includes a statement indicating that data are acceptable. Summaries must include release signatures.

Once the data have received project-level validation and verification or when the SPM decides the sample no longer needs to be retained, the SPM ensures that the laboratory is notified. Samples are retained by the laboratory until this notification is received. Gas sample canisters are then released from storage for cleaning, recertification, and subsequent reuse. Sample tags are removed and retained in the project files before recycling the canisters. If the SPM requests that samples or canisters be retained for future use (e.g., an experimental holding time study), the same sample identification and COC forms are used and cross-referenced to a document which specifies the purpose for sample or canister retention.

C3-10b(3) Preparing Waste Stream Characterization Packages

If requested by the Permittee, the SPM provides a Waste Stream Characterization Package. The SPM must ensure that the Waste Stream Characterization Package (described in Section C3-12b(3)) supports the waste characterization determinations.

C3-10c Permittee Level

Not applicable to CCP. This is a Permittee function.

C3-11 Reconciliation with Data Quality Objectives

Reconciling the results of waste testing and analysis with DQOs ensures that data are of adequate quality to support regulatory compliance programs. When waste is characterized by CCP, reconciliation with the DQOs is the responsibility of the SPM and occurs prior to waste shipment (T2).

C3-11a Reconciliation at the Project Level

The SPM ensures that all data generated and used in decision making meet the DQOs providing in Section C-4a(1). DQO reconciliation is the responsibility of the SPM, who assesses whether data of sufficient type, quality, and quantity to meet the DQOs (Section C-4a(1)) have been collected and determines whether the variability of the data set is small enough to provide the required confidence in the results. The SPM also determines whether, based on the desired error rates and confidence levels, a sufficient number of valid data points have been determined (as established by the associated completeness rate for each sampling and analytical process). The SPM documents that

random sampling of containers was performed for the purposes of waste stream characterization.

The SPM determines for each waste stream characterized, whether sufficient data have been collected to determine the following required waste parameters (T2):

- Waste matrix code.
- Waste material parameter weights.
- That each container of waste is transuranic radioactive waste.
- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for each VOC in the headspace gas of waste containers in the waste stream.
- Mean concentrations, UCL_{90} for the mean concentrations, standard deviations, and the number of samples collected for VOCs, SVOCs, and metals in the waste stream.
- Whether the waste stream exhibits a toxic characteristic or is listed under 40 CFR §261, Subpart C.
- Whether the waste stream contains listed waste found in 20.1.4.200 NMAC incorporating 40 CFR §261, Subpart D.
- Whether the waste stream can be classified as hazardous or nonhazardous at the 90 percent confidence level.
- Whether all TICs were appropriately identified and reported in accordance with the requirements of Section C3-1 prior to submittal of a WSPF for a waste stream or waste stream lot.
- Whether an appropriate packaging configuration and DAC were applied and documented in the headspace gas sampling documentation and whether the drum age was met prior to sampling.
- Whether the overall completeness, comparability, and representativeness QAOs were met for the on-line, sampling, analytical, and testing procedures specified in Sections C3-2 through C3-9 prior to submittal of a WSPF for a waste stream or waste stream lot.
- Whether the PRQLs for all analyses were met prior to submittal of a WSPF for a waste stream or waste stream lot.

If the SPM determines that insufficient data have been collected to make the determinations listed above, additional data collection efforts are undertaken. The reconciliation of a waste stream is performed, as described in Section C4, prior to submittal of the WSPF and CIS to the Permittees for that waste stream. The CCP does not ship TRU waste stream to the WIPP unless the SPM determines that the WAP-required waste parameters listed above are met for that waste stream.

The statistical procedure presented in Section C2 shall be used by the SPM to evaluate and report waste characterization data from the analysis of homogeneous solids and soil/gravel. The procedure, which calculates UCL_{90} values, shall be used to assess compliance with the DQOs in Section C-4a(1) as well as with RCRA regulations. The procedure must be applied to all laboratory analytical data for total VOCs, total SVOCs, and total metals. For RCRA regulatory compliance (40 CFR § 261.24), data from the analysis of the appropriate metals and organic compounds may be expressed as TCLP values or results may also be compared to the toxicity characteristic levels expressed as total values. These total values will be considered the regulatory threshold limit (RTL) values for the WAP. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a toxicity characteristic analyte that would give the regulatory weight/volume concentration (in the TCLP extract), assuming 100-percent analyte dissolution.

C3-11b Reconciliation at the Permittee Level

Not applicable to the CCP. This is a Permittee function.

C3-12 Data Reporting Requirements

Data reporting requirements define the type of information and the method of transmittal for data transfer from the data generation level to the CCP Project Office and from the CCP Project Office to the Permittee.

C3-12a Data Generation Level

As described in the data generation procedures, data are transmitted by hard copy or electronically (with hard copies available on demand) from the data generation level to the CCP Project Office. Transmitted data include all testing, sampling, analytical, and on-line BDR, as well as data review checklists. The BDR forms and checklists must contain all the information required by the testing, sampling, and analytical techniques described in Sections C1 through C6, as well as the signature releases to document the review, validation, and verification as described in Section C3-10. BDRs and checklists are on approved forms as provided in procedures. The checklists must be signed.

BDRs are forwarded to the SPM. All BDRs are assigned serial numbers, and each page is numbered. The serial number is the same as the batch number.

QA documentation, including raw data, is maintained in either testing, sampling, and analytical facility files, or the CCP files in accordance with CCP-QP-008. DOE approved laboratories forward testing, sampling and analytical QA documentation along with BDRs to the CCP Project Office for inclusion in site project files.

C3-12b Project Level

The CCP Project Office prepares a WSPF for each waste stream certified for shipment to the WIPP based on information obtained from AK and BDRs, if applicable (T2). The CCP Project Office ensures that the CIS and Waste Stream Characterization Package (when requested by the Permittee) are prepared as appropriate. The SPM verifies these reports are consistent with information found in BDRs. Summarized testing, sampling, analytical, and on-line data are included in the CIS. The contents of the WSPF, the CIS, and the Waste Stream Characterization Package are discussed in the following sections.

A Waste Stream Characterization Package is submitted only when requested by the Permittee. These reports are reviewed, validated, and verified by the SPM (T2).

After approval of a WSPF and the associated Characterization Information Summary by the DOE, CCP will maintain a cross reference of container identification number to each Batch Data Report.

A Waste Stream Characterization Package will be transmitted by hard copy or electronically from the SPM to the Permittees when requested.

C3-12b(1) Waste Stream Profile Form (T2)

The WSPF shall include the following information:

- Site name
- Site EPA ID
- Date of audit report approval by NMED (if obtained)
- Original generator of waste stream
- Whether waste is CH or RH
- The Waste Stream WIPP Identification Number
- Summary category group

- Waste matrix code group
- Waste Material Parameter Weight Estimates per unit of waste
- Waste stream name
- A description of the waste stream
- Applicable U.S. EPA Hazardous Waste Numbers
- Applicable TRUPACT II Content (TRUCON) codes
- A listing of AK documentation used to identify the waste stream
- The waste characterization procedures used and the reference and date of the procedure
- Certification signature of SPM, name, title, and date signed

C3-12b(2) Characterization Information Summary (T2)

The CIS shall include the following elements, if applicable:

- Data reconciliation with DQOs.
- Headspace gas summary data listing the identification numbers of samples used in the statistical reduction, associated descriptive statistics (maximum, mean, standard deviation, RTL, and UCL_{90}), and associated hazardous waste numbers that were applied to the waste stream.
- Total metal, VOC, and SVOC analytical results for homogeneous solids and soil/gravel (if applicable).
- TIC listing and evaluation.
- Radiography and VE summary to document that prohibited items are not present, if applicable.
- A justification for the selection of radiography and/or VE as an appropriate method for characterization the waste.
- A complete listing of all container identification numbers used to generate the WSPF, cross-referenced to each BDR.

- Complete AK summary, including waste stream name and number, the point of generation, waste stream volume (current or projected), generation dates, TRUCON codes, Summary Category Group, Waste Matrix Code(s) and Waste Matrix Code Group, other TRU Waste Baseline Inventory Report (TWBIR) information, waste stream description, areas of operation, generation processes, RCRA determinations, radionuclide information, all references used to generate the AK summary, and any other information required by Section C4-2b.

- Method for determining Waste Material Parameter Weights per unit of waste.

- List of any AK Sufficiency Determinations requested for the waste stream.

- Certification through acceptable knowledge or testing and/or analysis that any waste assigned the Hazardous Waste Number of U134 (hydrofluoric acid) no longer exhibits the characteristic of corrosivity. This is verified by ensuring that no liquid is present in U134 waste.

C3-12b(3) Waste Stream Characterization Package (T2)

The waste stream characterization package is submitted when requested by the Permittee and includes the following information:

- WSPF (Section C3-12b(1))

- Applicable Characterization Information Summary (Section C3-12b(2))

- Complete AK summary (Section C3-12b(2))

- Batch Data Reports supporting the characterization of the waste stream and any others requested by the Permittee

- Raw analytical data requested by the Permittee

C3-12b(4) WIPP Waste Information System Data Reporting (T30)

The WWIS/WDS data dictionary includes the data, field formats, and limits associated with waste characterization data established by the WAP. These data are subject to edit and limit checks that are performed automatically by the database, as defined in the "Waste Data System User's Manual" (DOE 2009). If a container is part of a composite headspace gas sample, the analytical results from the composite sample is assigned as the container headspace gas data results, including associated TICs, for every waste container associated with the composite sample.

C3-13 Nonconformances (Q5)

The status of CCP activities are monitored and controlled by the SPM in accordance with the nonconformance and procurement procedures identified below. This includes nonconformance identification, documentation, and reporting.

Nonconformances

Nonconformances are uncontrolled and unapproved deviations from an approved plan or procedure (e.g., this QAPjP). In the context of this QAPjP, deficiencies and nonconformances are synonymous. Nonconforming items and activities are those that do not meet the CCP requirements, procurement document criteria, or approved work procedures. The CCP personnel are responsible for promptly reporting any nonconformance to management. The CCP reconciles and corrects nonconformance items, as appropriate, in accordance with the DOE-CBFO QAPD (DOE). The disposition of nonconforming items is identified and documented and nonconforming items are identified by marking, tagging, or segregating and appropriate notifications are made to the site. When a nonconformance related to the CCP is observed or detected, the CCP QA is notified, and affected management reviews the content of the NCRs and assists the CCP QA in processing the NCR. For each container selected for confirmation pursuant to Permit Attachment C7, the Permittees will examine the respective NCR documentation to verify NCRs have been dispositioned for the selected container.

The CCP identifies and documents nonconformances as follows:

- The NCR procedure establishes the method for CCP personnel to identify, document, control, and disposition nonconforming activities, processes, items, and materials. NCRs are initiated by any individual identifying a nonconformance during performance of work tasks, random observations, inspections, or any other review of CCP procedures, operations, and activities. The CCP personnel identify deficient items by marking, tagging, or segregating them. This procedure implements the requirements of Section 1.3.2 (Nonconformances) of the DOE-CBFO QAPD.

- Corrective Action Reporting and Control procedures establishes the method for personnel to identify and correct potential problems and conditions adverse to quality, in addition to precluding their recurrence, and if necessary, stopping associated work activities (Q8). Any person may temporarily stop work prior to evaluation of the condition by the responsible CCP supervisor. The CCP supervisor then evaluates and reports the condition, as necessary, in accordance with CCP-QP-006, *CCP Corrective Action Reporting and Control*. This procedure implements the requirements of Section 1.3.3 (Corrective Action) of the DOE-CBFO QAPD.

Management at all levels fosters a "no-fault" attitude to encourage the identification of nonconforming items and processes within the CCP. Nonconformances may be detected and identified by anyone performing activities in support of this QAPjP, including:

- The CCP project staff - during field operations, supervision of subcontractors, data validation and verification, and self-assessment
- Laboratory Staff - during the preparation for and performance of laboratory testing; calibration of equipment; QC activities; laboratory data review, validation, and verification; and self-assessment.
- CCP QA personnel - during oversight activities or audits

An NCR is prepared for each nonconformance identified. Each NCR is initiated by the individual(s) identifying the nonconformance. The NCR is then processed by knowledgeable and appropriate personnel. The NCR includes or references results of laboratory analysis, QC tests, audit reports, internal memoranda, or letters, as appropriate. The NCR provides the following information:

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

The SPM oversees the NCR process for the CCP, identifies and tracks the status of deficiencies, reports this information to the Permittees, and is responsible for verifying the close-out of the NCRs.

Nonconformances are tracked and trended in accordance with procedures (Q5, Q14) that establish the method for evaluating trends in nonconformances and identifying appropriate corrective actions.

The SPM ensures that relevant project personnel are notified of nonconformances and verifying completion of corrective action for nonconformances.

Nonconformance to DQOs

For any non-administrative nonconformance related to applicable requirements specified in this QAPjP which are first identified at the SPM signature release level (i.e., a failure to meet a DQO), the SPM will provide a written notification to the Permittees within seven (7) calendar days of identification and shall also provide a nonconformance report within 30 calendar days of identification of the incident. The CCP implements a corrective action process and resolves identified nonconformances prior to shipment of any affected waste to the WIPP.

DOE Corrective Action Process

This section is not applicable to the CCP.

C3-14 Special Training Requirements and Certifications (Q2)

The SPM is responsible for ensuring that all personnel maintain proficiency in the work performed and identifies additional training if required. The training and qualification process for CCP personnel and subcontracted personnel who perform work to support the CCP is documented and controlled. In accordance with these plans, only personnel trained to applicable CCP-related plans and procedures perform CCP activities. Before performing CCP-related activities, assigned staff receive indoctrination into the scope, purpose, and objectives of the WAP and the specific QAOs of assigned tasks. Personnel assigned to perform activities under this QAPjP have the education, experience, and training applicable to the functions associated with the work.

Evidence of personnel proficiency and demonstration of competence in the task(s) assigned are demonstrated and documented. All personnel designated to work on specific aspects of the WAP maintain qualification (i.e., training and certification) throughout the duration of the work as specified in this QAPjP and applicable procedures. Job performance is evaluated and documented at periodic intervals, as specified in the appropriate implementing procedures.

CCP personnel involved in WAP activities (as flowed down in this QAPjP) receive continuing training to ensure that job proficiency is maintained and documented. Training includes both education in principles and enhancement of skills. Job performance is evaluated and documented at periodic intervals, as specified in the implementing procedures or in CCP-QP-002, *CCP Training and Qualification Plan*. Documentation of training, consisting of training records that specify the scope of training, dates of completion, and job proficiency are maintained by the CCP Project Office and/or the site records system as QA records. Personnel assigned to perform analytical or radiography activities for the CCP have obtained the education, experience, and training applicable to their work activities as summarized in Table C3-10, Minimum Training and Qualification Requirments. The requirements in

the table are based on EPA's *Contract Laboratory Program Statement of Work for Organics Analysis* (EPA 1999b).

Analytical laboratory line management must ensure that analytical personnel are qualified to perform the analytical methods for which they are responsible. The minimum qualifications for certain specified positions for the WAP are summarized in Table C3-10. This QAPjP and laboratory procedures specify the titles and minimum training and qualification requirements for personnel performing QAPjP activities.

Evaluation of CCP personnel qualifications includes a comparison of the job description to the skills, training, and experience included in the individual's resume, training records, and other documented bases for job assignment. This evaluation is also performed for personnel who change positions because of a transfer or promotion as well as personnel assigned to short-term or temporary work assignments that may affect the quality of CCP activities. Procedures identify the responsible persons for ensuring all personnel maintain proficiency in the work performed and identify any additional training that may be required.

C3-15 Changes to WAP Related Plans or Procedures

Controlled changes to WAP-related CCP plans or procedures are managed through the document control process (Q10). The SPM reviews all nonadministrative changes and evaluates whether those changes could impact DQOs specified in the WAP. Any changes to the WAP-related plans or procedures that could impact DQOs (i.e., those changes that require prior approval of the DOE as defined in Section C5-2) are reported to the DOE within five days of identification by the project level review.

Table C3-1. Waste Material Parameters and Descriptions

Waste Material Parameter	Description
Iron-Based Metals/Alloys	Iron and steel alloys in the waste excluding the waste container materials.
Aluminum-Based Metals/Alloys	Aluminum or aluminum-based alloys in the waste materials.
Other Metals	All other metals found in the waste materials (e.g., copper, lead, zirconium, tantalum, etc.).
Other Inorganic Materials	Non-metallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents.
Cellulosics	Materials generally derived from high polymer plant carbohydrates (e.g., paper, cardboard, wood, cloth).
Rubber	Natural or man-made elastic latex materials (e.g., surgeon's gloves, leaded rubber gloves).
Plastics (Waste Materials)	Generally man-made materials, often derived from petroleum feedstock (e.g., polyethylene and polyvinylchloride).
Organic Matrix	Cemented organic resins, solidified organic liquids and sludges.
Inorganic Matrix	Any homogeneous materials consisting of sludge or aqueous-based liquids that are solidified with cement, calcium silicate, or other solidification agents; (e.g., waste water treatment sludge, cemented aqueous liquids, and inorganic particulates).
Soils/Gravel	Generally consists of naturally-occurring soils that have been contaminated with inorganic waste materials.
Steel (Packaging Materials)	208-liter (55-gallon) drums.
Plastics (Packaging Materials)	90-mil polyethylene drum liner and plastic bags.

Table C3-2. Gas Volatile Organic Compound Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b,d] (ng)	PRQL (ppmv)	Completeness (%)
Benzene	71-43-2	≤25	70-130	10	10	90
Bromoform	75-25-2	≤25	70-130	10	10	90
Carbon tetrachloride	56-23-5	≤25	70-130	10	10	90
Chlorobenzene	108-90-7	≤25	70-130	10	10	90
Chloroform	67-66-3	≤25	70-130	10	10	90
1,1-Dichloroethane	75-34-3	≤25	70-130	10	10	90
1,2-Dichloroethane	107-06-2	≤25	70-130	10	10	90
1,1-Dichloroethylene	75-35-4	≤25	70-130	10	10	90
trans-1,2-Dichloroethylene	156-60-5	≤25	70-130	10	10	90
Ethyl benzene[d]	100-41-4	≤25	70-130	10	10	90
Ethyl ether	60-29-7	≤25	70-130	10	10	90
Methylene chloride	75-09-2	≤25	70-130	10	10	90
1,1,2,2-Tetrachloro-ethane	79-34-5	≤25	70-130	10	10	90
Tetrachloroethylene	127-18-4	≤25	70-130	10	10	90
Toluene	108-88-3	≤25	70-130	10	10	90
1,1,1-Trichloroethane	71-55-6	≤25	70-130	10	10	90
Trichloroethylene	79-01-6	≤25	70-130	10	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	≤25	70-130	10	10	90
m-Xylene[c]	108-38-3	≤25	70-130	10	10	90
o-Xylene	95-47-6	≤25	70-130	10	10	90
p-Xylene[c]	106-42-3	≤25	70-130	10	10	90
Acetone	67-64-1	≤25	70-130	150	100	90
Butanol	71-36-3	≤25	70-130	150	100	90
Methanol	67-56-1	≤25	70-130	150	100	90
Methyl ethyl ketone	78-93-3	≤25	70-130	150	100	90
Methyl isobutyl ketone	108-10-1	≤25	70-130	150	100	90

[a] Criteria apply to concentrations exceeding the PRQL

[b] Values based on delivering 10 mL to the analytical system

[c] These xylene isomers cannot be resolved by gas chromatography/mass spectroscopy

[d] The ethyl benezene PRQL for FTIRS is 20 ppm

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit
PRQL = Program required quantitation limit

Table C3-3. Summary of Laboratory Quality Control Samples and Frequencies For Gas Volatile Organic Compound Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet method QAOs	Repeat until acceptable
Laboratory duplicates or on-line duplicates	One (1) per analytical batch or on-line batch	RPD ≤ 25%[b]	Nonconformance if RPD > 25
Laboratory blanks or on-line blanks	Daily prior to sample analysis for GC/MS and GC/FID. Otherwise, daily prior to sample analysis and one (1) per analytical batch or on-line	Analyte amounts ≤ 3 x MDLs for GC/MS and GC/FID; ≤ PRQL for FTIRS	Flag Data if analyte amounts > 3 x MDLs for GC/MS and GC/FID; > PRQL for FTIRS
Laboratory control samples or on-line control samples	One (1) per analytical batch or on-line batch	70-130 %R	Nonconformance if %R < 70 or >130
GC/MS comparison samples (for FTIRS only)	One (1) per analytical or on-line batch	RPD ≤ 25[b]	Nonconformance if RPD > 25
Blind audit samples	Samples and frequency controlled by the Gas PDP Plan	Specified in the Gas PDP Plan	Specified in the Gas PDP Plan
GC/MS	Bromofluorobenzene (BFB) Tune Every 12 hours	Abundance criteria for key ions are met	Repeat Until Acceptable
GC/MS	Minimum 5-point initial calibration (minimum of 5 standards) Initially and as needed	%RSD of response factor for each target analyte <35	Repeat Until Acceptable
GC/MS	Continuing calibration Every 12 hours	%D for all target analytes ≤ 30 of initial calibration	Repeat Until Acceptable
GC/FID	Minimum 3-point initial calibration (minimum of 3 standards) Initially and as needed	Correlation coefficient ≥ 0.99 or %RSD <20 for each target analyte and the retention time of each target analyte within an acceptable criteria defined in the method	Repeat Until Acceptable
GC/FID	Continuing calibration Every 12 hours	%RSD ≤ 15%	Repeat Until Acceptable

Table C3-3. Summary of Laboratory Quality Control Samples and Frequencies For Gas Volatile Organic Compound Analysis (Continued)

[a] Corrective action per Section C3-13 when final reported QC samples do not meet the acceptance criteria.

[b] Applies only to concentrations greater than the PRQLs listed in Table C3-2.

MDL	=	Method Detection Limit
QAO	=	Quality Assurance Objective
PDP	=	Performance Demonstration Program
PRQL	=	Program Required Quantitation Limit
%R	=	Percent Recovery
RPD	=	Relative Percent Difference
BFB	=	4-Bromofluorobenzene
%D	=	Percent difference
%RSD	=	Percent relative standard deviation

Table C3-4. Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Complete-ness (%)
Benzene	71-43-2	≤45	37-151	1	10	90
Bromoform	75-25-2	≤47	45-169	1	10	90
Carbon disulfide	75-15-0	≤50	60-150	1	10	90
Carbon tetrachloride	56-23-5	≤30	70-140	1	10	90
Chlorobenzene	108-90-7	≤38	37-160	1	10	90
Chloroform	67-66-3	≤44	51-138	1	10	90
1,4-Dichlorobenzene[c]	106-46-7	≤60	18-190	1	10	90
ortho-Dichlorobenzene[c]	95-50-1	≤60	18-190	1	10	90
1,2-Dichloroethane	107-06-2	≤42	49-155	1	10	90
1,1-Dichloroethylene	75-35-4	≤250	D-234[d]	1	10	90
trans-1,2-Dichloroethylene	156-60-5	≤50	60-150	1	10	90
Ethyl benzene	100-41-4	≤43	37-162	1	10	90
Methylene chloride	75-09-2	≤50	D-221[d]	1	10	90
1,1,2,2-Tetrachloroethane	79-34-5	≤55	46-157	1	10	90
Tetrachloroethylene	127-18-4	≤29	64-148	1	10	90
Toluene	108-88-3	≤29	47-150	1	10	90
1,1,1-Trichloroethane	71-55-6	≤33	52-162	1	10	90
1,1,2-Trichloroethane	79-00-5	≤38	52-150	1	10	90
Trichloroethylene	79-01-6	≤36	71-157	1	10	90
Trichlorofluoromethane	75-69-4	≤110	17-181	1	10	90
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	≤50	60-150	1	10	90
Vinyl chloride	75-01-4	≤200	D-251[d]	1	4	90
m-xylene	108-38-3	≤50	60-150	1	10	90
o-xylene	95-47-6	≤50	60-150	1	10	90
p-xylene	106-42-3	≤50	60-150	1	10	90
Acetone	67-64-1	≤50	60-150	10[e]	100	90
Butanol	71-36-3	≤50	60-150	10[e]	100	90
Ethyl ether	60-29-7	≤50	60-150	10[e]	100	90
Formaldehyde[f]	50-00-0	≤50	60-150	10[e]	100	90
Hydrazine[g]	302-01-2	≤50	60-150	10[e]	100	90
Isobutanol	78-83-1	≤50	60-150	10[e]	100	90
Methanol	67-56-1	≤50	60-150	10[e]	100	90
Methyl ethyl ketone	78-93-3	≤50	60-150	10[e]	100	90
Pyridine[c]	110-86-1	≤50	60-150	10[e]	100	90

Table C3-4. Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives (continued)

[a] Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

[b] TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

[c] Can also be analyzed as a semi-volatile organic compound. If analyzed as a semi-volatile compound, the QAOs of Table C3-6 apply.

[d] Detected; result must be greater than zero.

[e] Estimate, to be determined.

[f] Required only for homogeneous solids and soil/gravel from the Savannah River Site, if analysis is required to resolve assignment of EPA hazardous waste numbers.

[g] Required only for homogeneous solids and soil/gravel from Oak Ridge National Laboratory and Savannah River Site, if analysis is required to resolve assignment of EPA hazardous waste numbers.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kilogram)
PRQL = Program required quantitation limit; calculated from the toxicity characteristic level for benzene assuming a 0.9 oz (25-gram [g]) sample, 0.1 gallon (0.5 liter [L]) of extraction fluid, and 100 percent analyte extraction (milligrams per kilogram)

Table C3-5. Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compounds Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table C3-4 QAOs	Repeat until acceptable
Laboratory duplicates[b]	One (1) per analytical batch	Meet Table C3-4 precision QAOs	Nonconformance if RPDs > values in Table C3-4
Laboratory blanks	One (1) per analytical batch	Analyte concentrations ≤ 3 x MDLs	Nonconformance if analyte concentrations > 3 x MDLs
Matrix spikes[b]	One (1) per analytical batch	Meet Table C3-4 accuracy QAOs	Nonconformance if %Rs are outside the range specified in Table C3-4
Matrix spike duplicates	One (1) per analytical batch	Meet Table C3-4 accuracy and precision QAOs	Nonconformance if RPD>values and %Rs outside range specified in Table C3-4
Laboratory control samples	One (1) per analytical batch	Meet Table C3-4 accuracy QAO's	Nonconformance if %R <80 or >120
GC/MS Calibration	BFB Tune every 12 hours 5-pt. Initial Calibration initially, and as needed	Abundance criteria met as per method Calibrate according to SW-846 Method requirements: %RSD for CCC ≤ 30, %RSD for all other compounds ≤ 15% Average response factor (RRF) used if %RSD ≤ 15, use linear regression if %RSD >15; R or R^2 ≥ 0.990 if using alternative curve System Performance Check Compound (SPCC) minimum average response factor as per SW-846 Method; RRF for all other compounds ≥ 0.01	Repeat until acceptable

Table C3-5. Summary of Laboratory Quality Control Samples and Frequencies for Volatile Organic Compounds Analysis (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
GC/MS Calibration (continued)	Continuing Calibration every 12 hours	%D ≤ 20 for CCC; SPCC minimum average response factor as per SW-846 Method; RRF for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50% and <200% of last daily calibration	Repeat until acceptable
GC/FID Calibration	3-pt. Initial Calibration initially and as needed Continuing Calibration every 12 hours	Correlation Coefficient ≥ 0.990 or %RSD ≤ 20 for all analytes %D or %Drift for all analytes ≤ 15 of expected values, RT ± 3 standard deviations from initial RT calibration per applicable SW-846 Method	Repeat until acceptable.
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples for a given matrix ±3 standard deviations	Nonconformance if %R < (average %R - 3 standard deviation) or > (average %R + 3 standard deviation)
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

[a] Corrective Action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.

[b] May be satisfied using matrix spike duplicate; acceptance criteria applies only to concentrations greater than the PRQLs listed in Table C3-4.

MDL = Method detection limit
QAO = Quality assurance objective
PDP = Performance Demonstration Program
%R = Percent recovery
RPD = Relative percent difference

Table C3-6. Semi-Volatile Organic Compound Target Analyte List and Quality Assurance Objectives

Compound	CAS Number	Precision[a] (%RSD or RPD)	Accuracy[a] (%R)	MDL[b] (mg/kg)	PRQL[b] (mg/kg)	Completeness (%)
Cresols	1319-77-3	≤50	25-115	5	40	90
1,4-Dichlorobenzene[bc]	106-46-7	≤86	20-124	5	40	90
ortho-Dichlorobenzene[c]	95-50-1	≤64	32-129	5	40	90
2,4-Dinitrophenol	51-28-5	≤119	D-172[d]	5	40	90
2,4-Dinitrotoluene	121-14-2	≤46	39-139	0.3	2.6	90
Hexachlorobenzene	118-74-1	≤319	D-152[d]	0.3	2.6	90
Hexachloroethane	67-72-1	≤44	40-113	5	40	90
Nitrobenzene	98-95-3	≤72	35-180	5	40	90
Pentachlorophenol	87-86-5	≤128	14-176	5	40	90
Pyridine[c]	110-86-1	≤50	25-115	5	40	90

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
MDL = Method detection limit (maximum permissible value) (milligrams per kilogram)
PRQL = Program required quantitation limit; calculated from the toxicity characteristic level for nitrobenzene assuming a 100-gram (g) sample, 0.5 gallon (2 liter [L]) of extraction fluid, and 100 percent analyte extraction (milligrams per kilograms)

[a] Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

[b] TCLP MDL and PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

[c] Can also be analyzed as a volatile organic compound.

[d] Detected; result must be greater than zero.

Table C3-7. Summary of Laboratory Quality Control Samples and Frequencies for Semi-volatile Organic Compounds

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table C3-6 QAOs	Repeat until acceptable
Laboratory duplicates[b]	One (1) per analytical batch	Meet Table C3-6 precision QAOs	Nonconformance if RPDs > values in Table C3-6
Laboratory blanks	One (1) per analytical batch	Analyte concentrations ≤ 3 x MDLs	Nonconformance if analyte concentrations > 3 x MDLs
Matrix spikes	One (1) per analytical batch	Meet Table C3-6 accuracy QAOs	Nonconformance if RPDs > values and %Rs > outside range specified in Table C3-6
GC/MS Calibration	DFTPP Tune every 12 hours 5-pt. Initial Calibration initially, and as needed Continuing Calibration every 12 hours	Abundance criteria met as per method Calibrate according to SW-846 Method requirements: %RSD for CCC ≤ 30, %RSD for all other compounds ≤ 15% Average response factor used if %RSD ≤ 15, use linear regression if >15; R or R^2 ≥0.990 if using alternative curve System Performance Check Compound SPCC minimum average response factor as per SW-846 Method; average response factor for all other compounds ≥ 0.01 %D≤ 20 for CCC, SPCC minimum average response factor as per SW-846 Method; average response factor for all other compounds ≥ 0.01 RT for internal standard must be ± 30 seconds from last daily calibration, internal standard area count must be >50% and <200% of last daily calibration	Repeat until acceptable

Table C3-7. Summary of Laboratory Quality Control Samples and Frequencies for Semi-volatile Organic Compounds (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
GC/ECD Calibration	5 pt. Initial Calibration initially, and as needed Continuing Calibration every 12 hours	Correlation Coefficient 0.990 or %RSD < 20 for all analytes %D or %Drift for all analytes 15 of expected values, RT ± 3 standard deviations of initial RT calibration per applicable SW-846 Method	Repeat until acceptable
Matrix spike duplicates	One (1) per analytical batch	Meet Table C3-6 accuracy and precision QAOs	Nonconformance if RPDs > values and %Rs outside range specified in Table C3-6
Laboratory control samples	One (1) per analytical batch	Meet Table C3-6 accuracy QAO's	Nonconformance if %R < 80 or > 120
Surrogate compounds	Each analytical sample	Average %R from minimum of 30 samples from a given matrix ±3 standard deviations	Nonconformance if %R < (average %R - 3 standard deviations) or > (average %R + 3 standard deviations)
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan [c]	Specified in the Solid PDP Plan [c]

[a] Corrective action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.

[b] May be satisfied by using matrix spike duplicate; acceptance criteria applies only to concentrations greater than the PRQLs listed in Table C3-6.

[c] *Performance Demonstration Program Plan for RCRA Constitution Analysis of Solidified Wastes* (DOE 2001b).

MDL = Method Detection Limit
QAO = Quality Assurance Objective
PDP = Performance Demonstration Program
%R = Percent Recovery
RPD = Relative Percent Difference

Table C3-8. Metals Target Analyte List and Quality Assurance Objectives

Analyte	CAS Number	Precision (%RSD or RPD)[a]	Accuracy (%R)[b]	PRDL[d] (μg/L)	PRQL[c] (mg/kg)	Completeness (%)
Antimony	7440-36-0	≤30	80-120	100	100	90
Arsenic	7440-38-2	≤30	80-120	100	100	90
Barium	7440-39-3	≤30	80-120	2000	2000	90
Beryllium	7440-41-7	≤30	80-120	100	100	90
Cadmium	7440-43-9	≤30	80-120	20	20	90
Chromium	7440-47-3	≤30	80-120	100	100	90
Lead	7439-92-1	≤30	80-120	100	100	90
Mercury	7439-97-6	≤30	80-120	4.0	4.0	90
Nickel	7440-02-0	≤30	80-120	100	100	90
Selenium	7782-49-2	≤30	80-120	20	20	90
Silver	7440-22-4	≤30	80-120	100	100	90
Thallium	7440-28-0	≤30	80-120	100	100	90
Vanadium	7440-62-2	≤30	80-120	100	100	90
Zinc	7440-66-6	≤30	80-120	100	100	90

[a] ≤ 30 percent control limits apply when sample and duplicate concentrations are ≥ 10 x IDL for ICP-AES and AA techniques, and ≥ 100 x IDL for Inductively Coupled Plasma—Mass Spectrometry (ICP-MS) techniques. If less than these limits, the absolute difference between the two values shall be less than or equal to the PRQL.

[b] Applies to laboratory control samples and laboratory matrix spikes. If a solid laboratory control sample material which has established statistical control limits is used, then the established control limits for that material should be used for accuracy requirements.

[c] TCLP PRQL values are reported in units of mg/l and limits are reduced by a factor of 20.

[d] PRDL set such that it is a factor of 10 below the PRQL for 100 percent solid samples, assuming a 100x dilution during digestion.

CAS = Chemical Abstract Service
%RSD = Percent relative standard deviation
RPD = Relative percent difference
%R = Percent recovery
PRDL = Program required detection limit (i.e., maximum permissible value for IDL) (micrograms per liter)
PRQL = Program required quantitation limit (milligrams per kilogram)

Table C3-9. Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Method performance samples	Seven (7) samples initially and four (4) semiannually	Meet Table C3-8 QAOs	Repeat until acceptable
Laboratory blanks	One (1) per analytical batch	≤ 3 x IDL (≤ 5 x IDL for ICP-MS)[b]	Redigest and reanalyze any samples with analyte concentrations which are ≤10 x blank value and ≥ 0.5 x PRQL
Matrix spikes	One (1) per analytical batch	Meet Table C3-8 accuracy QAOs	Nonconformance if %R outside the range specified in Table C3-8
Matrix spike duplicates	One (1) per analytical batch	Meet Table C3-8 accuracy and precision QAOs	Nonconformance if RPDs > values and %Rs outside the range specified in Table C3-8
ICP-MS Tune (ICP-MS Only)	Daily	4 Replicate %RSD ≤ 5; mass calibration within 0.9 amu; resolution < 1.0 amu full width at 10% peak height	Nonconformance if %RSD > 5; mass calibration > 0.9 amu; resolution > 1.0 amu
Initial Calibration 1 blank, 1 standard (ICP, ICP-MS) 3 standard, 1 blank (GFAA, FLAA) 5 standard, 1 blank (CVAA, HAA)	Daily	90-110 %R (80-120% for CVAA, GFAA, HAA, FLAA) for initial calibration verification solution. Regression coefficient ≥ 0.995 for FLAA, CVAA, GFAA, HAA	Correct problem and recalibrate; repeat initial calibration
Continuing Calibration	Every 10 samples and beginning and end of run	90-110% for continuing calibration verification solution. (80-120% for CVAA, GFAA, HAA, FLAA)	Correct problem and recalibrate; rerun last 10 samples
Internal Standard Area Verification (ICP-MS)	Every Sample	Meet SW-846 Method 6020 criteria	Nonconformance if not reanalyzed at 5 X dilution until criteria are met

Table C3-9. Summary of Laboratory Quality Control Samples and Frequencies for Metals Analysis (continued)

QC Sample	Minimum Frequency	Acceptance Criteria	Corrective Actiona
Serial Dilution (ICP, ICP-MS)	One (1) per analytical batch	5 X dilution must be ≤10% D of initial value for sample > 50xIDL	Flag Data if >10% and > 50xIDL
Interference Correction Verification (ICP, ICP-MS)	Beginning and end of run or every 12 hours (8 for ICP) whichever is more frequent	80-120% recovery for analytes Note: Acceptance Criteria and Corrective Action apply only if interferents found in samples at levels greater than ICS A Solution	Correct problem and recalibrate, nonconformance if not corrected
Laboratory Control Samples	One (1) per analytical batch	Table C3-8 accuracy QAOs	Redigest and reanalyze for affected analytes; non conformance if not reanalyzed
Blind audit samples	Samples and frequency controlled by the Solid PDP Plan	Specified in the Solid PDP Plan	Specified in the Solid PDP Plan

[a] Corrective action per Section C3-13 when final reported QC samples do not meet the acceptance criteria. Nonconformances do not apply to matrix related exceedances.

[b] Applies only to concentrations greater than the PRQLs listed in Table C3-8.

IDL = Instrument Detection Limit
PDP = Performance Demonstration Program
PRQL = Program Required Quantitation Limit
%R = Percent Recovery
RPD = Relative Percent Difference

Table C3-10. Minimum Training and Qualification Requirements

Personnel	Requirements[a]
Radiography Operators[c]	Site-specific training based on waste matrix codes and waste material parameters as described in Section C3-4; requalification every 2 years
Gas Chromatography Technical Supervisors (Lead Operator)[b] Gas Chromatography Operators[c]	Bachelor of Science (BS) or equivalent experience and 6 months previous applicable experience
Gas Chromatography/Mass Spectrometry Operators[c] Mass Spectrometry Operators[c]	BS or equivalent experience and 1 year independent spectral interpretation or demonstrated expertise
Gas Chromatography/Mass Spectrometry Technical Supervisors (Lead Operator)[b] Mass Spectrometry Technical Supervisors (Lead Operator)[b] Atomic Absorption Spectroscopy Technical Supervisors (Lead Operator)[b] Atomic Absorption Spectroscopy Operators[c] Atomic Mass Spectrometry Operators[c] Atomic Emission Spectroscopy Operators[c]	BS or equivalent experience and 1 year applicable experience
Atomic Mass Spectrometry Technical Supervisors (Lead Operator)[b]	BS and specialized training in Atomic Mass Spectrometry and 2 years applicable experience
Atomic Emission Spectroscopy Technical Supervisors (Lead Operator)[b]	BS and specialized training in Atomic Emission Spectroscopy and 2 years applicable experience

[a] Based on requirements contained in U.S. EPA Contract Laboratory Program Statement of Work for Organics Analysis (Document Number OLM 01.0) and Statement of Work for Inorganic Analysis (Document Number ILM 03.0).

[b] Technical Supervisors (Lead Operator) are responsible for the overall technical operation and development of a specific laboratory technique.

[c] Operators are responsible for the actual operation of analytical equipment.

Table C3-11. Testing Batch Data Report Contents

Required Information	Radiography	VE	Comment
Batch Data Report Date	X	X	
Batch number	X	X	
Waste container number	X	X	
Waste stream name and/or number	O	O	
Waste matrix code	X	X	Summary Category Group included in waste matrix code.
Implementing procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to track specific version used.
Container type	O	O	Drums, Pipe Overpack, SWB, TDOP, etc.
Video media reference	X	X	Reference to video media applicable to each container. For VE for newly generated waste, video media is not required if two trained operators review the contents of the waste container to ensure correct reporting.
Imaging check	O		
Camera check		O	
Audio check	O	O	
QC documentation	X	X	

Table C3-11. Testing Batch Data Report Contents (continued)

Required Information	Radiography	VE	Comment
Verification that the physical form matches the waste stream description and waste matrix code	X	X	Summary Category Group included in waste matrix code.
Comments	X	X	
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Verify absence of prohibited items	X	X	
Operator signature and date of test	X	X	Signatures of both operators required for visual verification of AK.
Data review checklists	X	X	All data review checklists will be identified.

LEGEND:
X = Required in Batch Data Report
O = Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-12. Sampling Batch Data Report Contents

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report date	X	X	
Batch number	X	X	
Waste stream name and/or number	O	O	
Waste matrix code		X	Summary Category Group included in Waste Matrix Code.
Procedure (specific version used)	X	X	If procedure cited contains more than one method, the method used must also be cited. Can use revision number, date, or other means to denote the version used.
Container number	X	X	
Container type	O	O	Drum, Pipe Overpack, SWB, TDOP, etc.
Sample matrix and type	X	X	
Analyses requested and laboratory	X	X	
Point of origin for sampling	X	X	Location where sample was taken (e.g., building number, room).
Sample number	X	X	
Sample size	X	X	
Sample location	X	X	Location within container where sample is taken. For headspace gas, specify what layer of confinement was sampled. For solids, physical location within container.
Sample preservation	X	X	
Person collecting sample	X	X	

Table C3-12. Sampling Batch Data Report Contents (continued)

Required Information	Headspace Gas	Solid Sampling	Comment
Person attaching custody seal	O	O	May or may not be the same as the person collecting the sample.
Chain of custody record	X	X	Original or copy is attached.
Sampling equipment numbers	X	X	For disposable equipment, a reference to the lot.
Cross-reference of sampling equipment numbers to associated cleaning batch numbers	O	X	As applicable to the equipment used for the sampling. For disposable equipment, a reference to the lot and procurement records to support cleanliness is sufficient.
Drum age	X		Must include all supporting determinative information, including but not limited to packaging date, equilibrium start time, storage temperature, and sampling date/time. If Scenario 3 is used, the packaging configuration, filter diffusivity, liner presence/absence, and rigid liner vent hole diameter used in determining the DAC must be documented. If Scenario 1 and 2 are used together, the filter diffusivity and rigid liner vent hole diameter used in determining the DAC must be documented. If default values are used for retrievably stored waste, these values must clearly be identified as such.
Equilibration time	X		
Verification of rigid liner venting	X		Only applicable to containers with rigid liners.
Verification that sample volume taken is small in comparison to the available volume	X		Must include headspace gas volume when it can be estimated.
Scale calibration		O	Must have reference to calibration records.

Table C3-12. Sampling Batch Data Report Contents (continued)

Required Information	Headspace Gas	Solid Sampling	Comment
Depth of waste		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Calculation of core recovery		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a representative sample has been taken.
Co-located core description		X	For newly generated waste, if sampling method other than coring is used, this is replaced by documentation that a QC sample has been taken.
Time between coring and subsampling		X	Only applicable to coring.
OVA calibration and reading	O		Only applicable to manifold systems. Must be done in accordance with manufacturer's specifications.
Field Records	X	X	Must contain the following as applicable to the sampling method used: Collection problems; sequence of sampling collection; inspection of the solids sampling area; coring tool test; random location of sub-sample; canister pressure; and ambient temperature and pressure.
Reference to or copy of associated NCRs, if any	X	X	Copies of associated NCRs must be available.
Operator signature and date and time of sampling	X	X	
Data review checklists	X	X	All data review checklists will be identified.

LEGEND:
X = Required in Batch Data Report
O = Information must be documented and traceable; inclusion in Batch Data Report is optional

Table C3-13. Analytical Batch Data Report Contents

Required Information	Headspace Gas	Solid Sampling	Comment
Batch Data Report date	X	X	
Batch number	X	X	
Sample numbers	X	X	
QC designation for sample	X	X	
Implementing procedure (specific version used)	X	X	If the procedure cited contains more than one method, the method used must also be cited. Use revision number, date, or other means to track version used.
QC sample results	X	X	
Sample data forms	X	X	Form should contain reduced data for target analytes and TICs.
Chain of custody	X	X	Original or copy
Gas canister tags	X		Original or copy
Sample preservation	X	X	
Holding time		X	
Cross-reference of field numbers to laboratory sample numbers	X	X	
Date and time analyzed	X	X	
Verification of spectra used for results	O	O	Analyst must qualitatively evaluate the validity of the results based on the spectra. Can be implemented as a check box for each sample.
TIC evaluation	X	X	

Table C3-13. Analytical Batch Data Report Contents (continued)

Required Information	Headspace Gas	Solid Sampling	Comment
Reporting flags, If any	X	X	Table C3-14 lists applicable flags.
Case narrative	X	X	
Reference/copy of any associated NCRs	X	X	Copies of associated NCRs must be available.
Operators signature and analysis is date	X	X	
Data review checklists	X	X	All data review checklists will be titled.

LEGEND:
X = Required in Batch Data Report;
O = Information must be documented and traceable; inclusion in Batch Data Report is optional.

Table C3-14. Data Reporting Flags

Data Flag	Indicator
B	Analyte detected in blank (Organics/Headspace gases)
B	Analyte blank concentration greater than or equal to 20 percent of sample concentration prior to dilution corrections (Metals)
E	Analyte exceeds calibration curve (Organics/Headspace gases)
J	Analyte less than PRQL but greater than or equal to the MDL (Organics/Headspace gases)
J	Analyte greater than or equal to IDL but less than 5 times the IDL before dilution correction (Metals)
U	Analyte was not detected and value is reported as the MDL (IDL for Metals)
D	Analyte was quantified from a secondary dilution, or reduced sample aliquot (Organics/Headspace gases)
Z	One or more QC samples do not meet acceptance criteria
H	Holding time exceeded

C4 ACCEPTABLE KNOWLEDGE

C4-1 Introduction

The RCRA regulations codified in 40 CFR and the New Mexico Hazardous Waste Management Regulations in 20.4.1 NMAC, Subparts 100 through 600, Subpart 800, and Subpart 900, authorize the use of AK in appropriate circumstances by waste generators or treatment, storage, or disposal facilities to characterize hazardous waste. AK is described in *Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste: A Guidance Manual* (EPA 1994a). AK, as an alternative to waste sampling and analysis, is used to meet all or part of RCRA waste characterization requirements (EPA 1994a).

EPA's 1994 Waste Analysis Guidance Manual broadly defines the term "acceptable knowledge" to include process knowledge, whereby detailed information on the wastes is obtained from existing published or documented waste analysis data or studies conducted on hazardous waste generated by processes similar to that which generated the waste; facility records of analysis performed before the effective date of RCRA; and sampling and waste analysis data obtained from generators of similar wastes that send their wastes off-site for treatment, storage, or disposal (EPA 1994a). If it is determined that AK alone is insufficient to accurately characterize a waste, radiography and/or VE, headspace gas sampling and analysis, and homogeneous waste sampling and analysis may be used to complete the waste characterization process and satisfy the requirements of the WAP. AK is used in TRU waste characterization activities in five ways:

- To delineate TRU waste streams
- To assess whether TRU mixed wastes comply with the applicable requirements of the Treatment, Storage, and Disposal Facility Waste Acceptance Criteria (TSDF-WAC)
- To assess whether TRU mixed wastes exhibit hazardous characteristic (20 NMAC 4.1.200, incorporating 40 CFR § 261 Subpart C)
- To assess whether TRU mixed wastes are listed wastes (20 NMAC 4.1.200, incorporating 40 CFR § 261 Subpart D)
- To estimate waste material parameter weights

Sampling and analysis may be performed to augment the characterization of wastes based on AK when an AK Sufficiency Determination has not been requested by the generator/storage site or, if requested, has not been granted by the DOE (see Section C4-3d). Sampling and analysis consists of VE, radiography, headspace gas,

and homogeneous waste sampling and analysis. TRU waste streams undergo applicable provisions of the AK process prior to shipment of the waste to WIPP.

C4-2 Acceptable Knowledge Documentation

The CCP collects and compiles, in a logical sequence, AK information that progresses from general facility information (TRU waste management program information) to more detailed waste-specific information (TRU waste stream information).

The CCP implements the AK process as specified in the WAP to characterize TRU waste (T5). The AK information is then compiled into the AK report (and supporting documentation), as shown in Figure C4-1, Compilation of Acceptable Knowledge Documentation, in Attachment C-4 of the WAP.

The following sections include the information the Permittee will require for the CCP to characterize TRU waste using AK. Because waste generating processes are site-specific, CCP will, as necessary, augment the required AK records with additional supporting information as discussed in Section C4-2c. If the required information is not available for a particular waste stream, the waste stream is not eligible for an AK Sufficiency Determination as specified in Section C4-3d.

C4-2a Required TRU Waste Management Program Information

TRU waste management program information clearly defines waste categorization schemes and terminology, provides a breakdown of the types and quantities of TRU waste that are generated and stored by the site (and processed by the CCP), and describes how waste is tracked and managed, including historical and current operations. Information related to TRU waste certification procedures and the types of documentation (e.g., WSPFs) used to summarize AK are also provided.

The following information is included as part of the AK written record:

- A map of the site with the areas and facilities involved in TRU waste generation, treatment, and storage identified
- Facility mission description as related to TRU waste generation and management
- Description of the operations that generate TRU waste at the site
- Description of waste identification and characterization schemes used at the site or facility (e.g., content codes, item description codes)
- Types and quantities of TRU waste generated, including historical generation through future projections. Includes time and facility/site of generation

- Description of correlation of waste streams generated from the same building and process (e.g., sludge, combustibles, metals, and glass)
- Waste certification procedures for TRU wastes to be shipped to the WIPP

C4-2b Required TRU Waste Stream Information

The CCP uses AK to delineate site-specific waste streams for shipment to the WIPP. The available process information and data that supports the AK used to characterize waste streams are compiled in AK summary reports and supporting documentation in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*. The type and quantity of supporting documentation may vary by waste stream, depending on the waste generating process and site specific requirements imposed by the Permittee. At a minimum, the waste process information on each waste stream includes the following written information:

- Areas and buildings from which the waste stream was or is generated
- The waste stream volume and time period of waste generation
- Waste generating process described for each building (e.g., batch waste stream generated during decommissioning operations of glove boxes), including processes associated with U134 waste generation, if applicable
- Documentation regarding how the site has historically managed the waste, including the historical regulatory status of the waste (i.e., TRU mixed versus TRU non-mixed waste)
- Process flow diagrams. In the event that a process flow diagram cannot be created, a description of the waste generating process, rather than a formal process flow diagram, is used to satisfy this requirement. The use of the waste generating process description is justified, and the justification is placed in the AK record
- Material inputs or other information that identify the chemical content of the waste stream and physical waste form (e.g., glove box materials and chemicals handled during glove box operations; events or processes that may have modified the chemical or physical properties of the waste stream after generation; data obtained through VE of newly generated waste that later undergoes radiography; information demonstrating neutralization of U134 [hydrofluoric acid] and waste compatibility)

The AK written record includes a summary that identifies all sources of waste characterization information used to delineate the waste stream. The basis and rationale for delineating each waste stream, based on the parameters of interest, is

clearly summarized and traceable to referenced documents. Assumptions made in delineating each waste stream also are identified and justified. If discrepancies exist between required information, then the CCP may consider applying all hazardous waste numbers indicated by the information to the subject waste stream but must assess and evaluate the information to determine the appropriate hazardous waste numbers consistent with RCRA requirements.

Implementing procedures address the following AK processes:

- Identifying and assigning the physical waste form of the waste
- Delineating waste streams and assigning Summary Category Groups and waste matrix codes
- Resolving inconsistencies in AK documentation
- Headspace gas sampling and analysis, radiography, VE, and homogeneous waste sampling and analysis, if applicable
- For newly generated waste, procedures describing process controls used to ensure prohibited items (specified in Section C) are documented and managed
- Procedures to ensure that radiography and VE include a list of prohibited items that the operator verifies are not present in each container (e.g., liquid exceeding TSDF-WAC limits, corrosives, ignitables, reactives, and incompatible wastes)
- Procedures for documenting how changes to waste matrix code, waste stream assignment, and associated hazardous waste numbers based on material composition are documented for any waste
- Procedures that ensure the assignment of EPA hazardous waste numbers is appropriate, consistent with RCRA requirements, and considers site historical waste management
- Procedures for estimating waste material parameter weights

C4-2c Additional Acceptable Knowledge Information

CCP shall obtain additional acceptable knowledge information. CCP shall collect information as appropriate to augment required information and provide any other information obtained to further delineate waste stream. Adequacy of this information shall be assessed by DOE during audits. CCP will use this information to compile the acceptable knowledge written record.

All additional specific, relevant acceptable knowledge documentation assembled and used in the acceptable knowledge process, whether it supports or contradicts any required acceptable knowledge documentation, shall be identified and an explanation provided for its use (e.g., identification of a toxicity characteristic). Additional documentation may be used to further document the rationale for the hazardous characterization results. The collection and use of additional information shall be assessed by DOE during site audits to ensure that hazardous waste characterization is supported, as necessary, by such information. Similar to required information, if discrepancies exist between additional information and the required information, then CCP may consider applying all hazardous waste numbers indicated by the additional information to the subject waste stream, but must assess and evaluate the information to determine the appropriate hazardous waste numbers consistent with RCRA requirements. All information considered must be documented and placed in the auditable record, including applicable discrepancy resolution documentation.

Additional AK documentation includes, but is not limited to, the following information:

- Process design documents (e.g., Title II Design)
- Standard operating procedures that may include a list of raw materials or reagents, a description of the process or experiment generating the waste, and a description of wastes generated and how the wastes are managed at the point of generation.
- Preliminary and final safety analysis reports and technical safety requirements
- Waste packaging records
- Test plans or research project reports that describe reagents and other raw materials used in experiments
- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements)
- Information from site personnel (e.g., documented interviews)
- Standard industry documents (e.g., vendor information)
- Analytical data relevant to the waste stream, including results from fingerprint analyses, spot checks, routine verification sampling or other processes that collected information pertinent to the waste stream. This may also include new information which augments required information (e.g., VE not performed in compliance with the WAP, radiography screening for prohibited items)

- Material Safety Data Sheet, product labels, or other product package information
- Sampling and analysis data from comparable or surrogate waste streams (e.g., residues, equivalent nonradioactive materials)
- Laboratory notebooks that detail the research processes and raw materials used in an experiment

For waste containers that belong to LANL sealed sources waste streams, these containers do not require headspace gas sampling and analysis, if the following information is part of the AK documentation:

- Documentation that the waste container contents meet the definition of sealed sources per 10 CFR §30.4 and 10 CFR §835.2 (effective January 1, 2004).
- Documentation of the certification of the sealed sources as U.S. Department of Transportation Special Form Class 7 (Radioactive) Material per 49 CFR §173.403 (effective October 1, 2003).
- Documentation of contamination survey results that validate the integrity of each sealed source per 10 CFR §34.27 (effective January 1, 2004).
- AK documentation does not indicate the use of VOCs or VOC-bearing materials as constituents of the sealed sources.
- The outer casing of each sealed source must be of a non-VOC bearing material, which must be verified at the time of packaging.
- AK Documentation shall also include but shall not be limited to, as available and as necessary to determine the hazardous constituents associated with sealed sources, the following: source manufacturer's sales catalogues, original purchase records, source manufacturer's fabrication documents, source manufacturer's drawings, source manufacturer's fuel capture assembly reports, source manufacturer's operational procedures for cleanliness requirements, source manufacturer's shipping documents, source manufacturer's welding records, transuranic batch material records, and information from national databases (e.g., NMMSS). All of this information may not and need not be available for each source, but sufficient information must be included in the auditable record to derive an adequate understanding of source construction and history to ensure that no VOCs are present in association with the sealed source itself that would render the source hazardous. If AK data indicate that assignment of a hazardous waste number related to organic materials is required in association with a source, this specific source will be assigned to a separate waste stream and that waste

stream will be subject to representative headspace gas sampling unless a separate AK Sufficiency Determination is approved by DOE for the waste stream.

C4-3 Acceptable Knowledge Training, Procedures, and Other Requirements

The CCP uses the following to characterize TRU waste by means of AK information:

1) compiling the required and supporting additional AK documentation in an auditable record;

2) auditing AK records, and

3) WSPF approval and waste confirmation.

C4-3a Qualifications and Training Requirements (Q2)

The CCP and site personnel responsible for compiling AK, assessing AK, and resolving discrepancies associated with AK are qualified and trained in the following areas, at a minimum:

- WAP and TSDF-WAC requirements;
- State and Federal RCRA regulations associated with solid and hazardous waste characterization;
- Discrepancy resolution and reporting; and
- CCP and site-specific procedures associated with waste characterization using AK.

Position-specific qualification and training requirements such as those listed above for functional positions within the CCP are established by the SPM and documented (Q2). The SPM ensures that personnel conducting AK activities are qualified and trained as specified.

C4-3b Acceptable Knowledge Assembly and Compilation

The CCP process allows for the consistent application of the AK process and requirements, and addresses the following requirements (T5):

- Written procedures outlining the specific methodology used to assemble AK records, including the origin of the documentation, how it is used, and any limitations associated with the information (e.g., identify the purpose and scope of a study that included limited sampling and analysis data).

- Written procedures to compile the required AK record.

- Written procedures ensuring that unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU waste populations sent to the WIPP.

- Procedures to evaluate AK and resolve discrepancies. For example, if different sources of information indicate hazardous wastes are present in a waste stream, the CCP includes all sources of information in its records and may choose to either conservatively assigns hazardous waste numbers or assigns only those numbers deemed appropriate and consistent with RCRA requirements. All information used to justify assignment of hazardous waste numbers must be placed in the auditable record. Further the assignment of hazardous waste numbers is traceable in the AK record to required documentation.

- Procedures to identify hazardous wastes and assign the appropriate hazardous waste numbers to each waste stream in accordance with the following minimum baseline requirements:

  - Compiling all of the required information in an auditable AK record.

  - Reviewing the compiled information and delineating waste streams. Delineation of waste streams must comply with the definition in C-0a and justify combining waste historically managed separately as TRU mixed and TRU non-mixed waste streams into a single waste stream.

  - Reviewing the compiled information to determine if the waste stream is compliant with the TSDF-WAC.

  - Reviewing the required information to determine whether the waste is listed under 20.4.1.200 NMAC (incorporating 40 CFR §261), Subpart D. Assigning all the hazardous waste numbers unless the CCP chooses to justify an alternative assignment and documents the justification in an auditable record.

  - Reviewing the required information to determine if the waste exhibits a hazardous characteristic or contains toxicity characteristic hazardous constituents specified in 20.4.1.200 NMAC (incorporating 40 CFR §261), Subpart C. If a toxicity characteristic contaminant is identified and is not included as a listed waste, sites may evaluate available data and assign the toxicity characteristic hazardous waste number consistent with RCRA requirements. All data examined to reach the hazardous waste number determination must be placed in the auditable record and must present a clear justification for the hazardous waste number analyses.

- Reviewing the compiled information to provide an estimate of material parameter weights for each container to be stored or disposed of at WIPP.

- For newly generated wastes, procedures are developed and implemented to characterize hazardous waste using AK prior to packaging the waste.

- The CCP ensures that results of other audits of the CCP TRU waste characterization activities are available in the CCP files.

- The CCP identifies all process controls (implemented to ensure that the waste contains no prohibited items and to control hazardous waste content and/or physical form) that may have been applied to retrievably stored waste and/or may presently be applied to newly generated waste. Process controls are applied at the time of waste generation/packaging to control waste content, whereas any activities performed after waste generation/packaging to identify prohibited items, hazardous waste content, or physical form are waste characterization activities not process controls. The AK record must contain specific process controls and supporting documentation identifying when these process controls are used to control waste content. See Section C-2 for programmatic requirements related to process controls.

C4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste Stream

CCP-TP-005 describes the process for assembling AK documentation into an auditable record. The first step is to assemble the required AK information and any additional information regarding the materials and processes that generate a specific waste stream. AK records are generated in compliance with the following criteria (T5):

- AK information is compiled in an auditable record, including a road map for applicable information.

- The overview of the facility and TRU waste management operations in the context of the facility's mission is correlated to specific waste stream information.

- Correlations between waste streams, with regard to time of generation, waste generating processes, and site-facilities are described in the AK summary report (Section C4-2b). For newly generated wastes, the rate (or schedule) and quantity of waste to be generated are also maintained in the AK process descriptions compiled in the AK summary report.

- A reference list provided in Section C4-3b that identifies documents, databases, QA protocols, and other sources of information that support AK information.

Container inventories are delineated into waste streams by correlating the container identifications to all of the required AK information and additional information (T5). The CCP assigns a waste matrix code and waste stream description to each container of waste using AK.

C4-3d AK Sufficiency Determination Request Contents (T5)

The CCP may submit an AK Sufficiency Determination Request (Determination Request). The Determination Request shall include, at a minimum.

- Identification of the scenario for which the approval is sought (Section C-0b).
- A complete AK Summary that addresses the following technical requirements:
  - Executive Summary
  - Waste Stream Identification Summary including a demonstration that the waste stream has been properly delineated and meets the Permit definition of waste stream (Attachment C, Introduction);
  - Mandatory Program Information (including, but not limited to, facility location and description, mission, defense waste assessment, spent nuclear fuel and high-level waste assessment, description of waste generating processes, research/development [as necessary], facility support operations [as applicable], types and quantities of TRU waste generated, correlation of waste streams to buildings/processes, waste identification and categorization, physical form identifiers);
  - Mandatory Waste Stream Information (including, but not limited to, Area and Building of Generation, waste stream volume/period of generation) (including, for newly generated waste, the rate and quantity of waste to be generation), waste generating activities, types of waste generated, material input related to physical form and identification of percentage of each waste material parameter in the waste stream, chemical content information including hazardous constituents and hazardous waste identification, prohibited item content (including documented evidence that the waste meets the TSDF-WAC Permit Sections 2.3.3.1 through 2.3.3.10), waste packaging, presence of filter vents, number of layers of confinement;
  - Types of supporting information gathered;
  - Container specific data (if available and relevant); and

- A complete reference list including all mandatory and additional information.

- An AK roadmap (defined as a cross reference between mandatory programmatic and mandatory waste stream information, with references supporting these requirements).

- A complete reference list including all mandatory and additional documentation.

- Additional relevant information for the required programmatic and waste stream data addressed in the AK Summary, examples of which are presented in Section C4-2c.

- Identification of any mandatory requirements supported only by upper tier documents (i.e., there is insufficient supporting data).

- Description or other means of demonstrating that the AK process described in the Permit was followed (for example, AK personnel were appropriately trained; discrepancies were documented, etc.).

- Information showing that CCP has developed a written procedure for compiling the AK information and assigning hazardous waste numbers as required in Section C4-3b.

- Information showing that CCP has assessed the AK process (e.g., internal audits, Section C4-3b).

C4-3e Requirements for Re-evaluating Acceptable Knowledge Information (T5)

AK includes information on the waste physical form, base materials composing the waste, and the waste generating process. Sampling and analysis of waste (i.e., radiography/VE, headspace gas sampling and analysis, and homogeneous sampling and analysis) may be used to augment AK information prior to waste shipment. If retrievably stored waste must be repackaged, either VE prior to or during waste packaging or radiography after waste packaging, shall be used to confirm acceptable knowledge information.

The WSPF and Characterization Information Summary (including the AK summary) will be reviewed by the Permittees for each waste stream prior to DOE approval of the WSPF. The Permittees review will ensure that the submitted AK information was collected under procedures that ensure implementation of the WAP, provides data sufficient to meet the DQOs in Section C-4a(1), and allow the Permittees to demonstrate compliance with the waste analysis requirements of the Permit. A detailed

discussion of the Permittees' waste stream review and DOE's WSPF approval process is provided in Section C-1d.

Re-Evaluation Based on Visual Examination and Radiography

The CCP has established procedures for re-evaluating AK if the results of waste confirmation indicate that the waste to be shipped does not match the approved waste stream, or if data obtained from VE or radiography for waste streams without an AK Sufficiency Determination exhibit this discrepancy. The CCP procedures describe how waste AK is re-evaluated, the waste is reassigned, and appropriate hazardous waste numbers assigned. If the re-evaluation requires that the waste matrix code be changed for the waste stream or the waste does not match the approved waste stream, the following minimum steps are taken to re-evaluate AK:

- Existing information is reviewed based on the container identification number and all differences in hazardous waste number assignments are documented
- If differences exist between the hazardous waste numbers that were assigned, the information is re-assessed, and required AK information associated with the new designation is documented
- Waste sampling and analytical data are re-assessed and documented
- The reassignment of the waste matrix code is documented and verified (e.g., verification that the waste was generated within the specified time period, area, and building and waste generating process, and that the process material inputs are consistent with the waste material parameters of waste identified during VE or radiography)
- Changes to AK records are recorded
- If discrepancies exist in the AK information for the revised waste matrix code, the discrepancies are documented in an NCR in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*. The NCR documents the segregation of the affected portion of the waste stream, and defines the corrective actions necessary to fully characterize the waste.

CCP will assign the toxicity characteristic hazardous waste numbers consistent with RCRA requirements. If a toxicity characteristic underlying hazardous constituent is identified during AK, the potential assignment of a hazardous waste number must be evaluated and the results placed in the AK record.

TRU Heterogeneous Debris

The base materials that compose TRU heterogeneous debris (S5000) waste (e.g., lead, stainless steel, glass) are well established and potential toxicity characteristic constituents can be determined without destructive sampling and analysis.

The Summary Category Group, waste matrix code, and waste stream of the waste (waste material parameter) assigned for each container of waste using AK are based on the waste materials and the waste generating process.

Headspace Gas Sampling

The CCP utilizes AK to identify spent solvents associated with each TRU waste stream or waste stream lot.

Headspace gas data are used to resolve the assignment EPA F-listed Hazardous Waste Numbers to debris waste streams when waste streams do not have an AK Sufficiency Determination approved by DOE. In this case, the CCP assigns F-listed Hazardous Waste Numbers (20.4.1.200 NMAC, incorporating 40 CFR § 261.31) by evaluating the average concentrations of each VOC detected in container headspace gas for each waste stream or waste stream lot using the UCL_{90}. The UCL_{90} for the mean concentration is compared to the PRQL for the constituent. If the UCL_{90} for the mean concentration exceeds the PRQL, the AK information is reevaluated to determine the potential source of the constituent.

Documentation is provided to support any determination that F-listed organic constituents are associated with packaging materials, radiolysis, or other uses not consistent with solvent use. If the source of the detected F-listed solvents cannot be identified, the appropriate spent solvent hazardous waste number is conservatively applied to the waste stream. In the case of applicable toxicity characteristic (D-listed) VOCs and non-toxic F003 constituents, the CCP may assess whether the headspace gas concentration renders the waste non-hazardous for those characteristics and change the initial AK determination accordingly.

EPA hazardous waste numbers associated with S3000 and S4000 waste streams will be assigned based on the results of the total/TCLP analysis of a representative homogeneous waste sample when waste streams do not have an AK Sufficiency Determination approved by DOE. As with headspace gas, if the total/TCLP results indicate that the concentration of a toxicity characteristic waste or non-toxic constituent of an F003 waste is below regulatory levels, the hazardous waste number assigned initially by AK will be changed. Otherwise, if an F-listed waste constituent is detected, the appropriate hazardous waste number will be applied.

If the CCP determines that the source of the F-listed constituent is a spent solvent used in the process or is determined to be the result of mixing a listed waste with a solid

waste during waste packaging, or applicable toxicity characteristic or non-toxic F003 wastes are present in excess of regulatory levels, then the CCP either: 1) assigns the applicable listed hazardous waste number to the entire waste stream, or 2) segregates the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable hazardous waste numbers. The CCP documents, justifies, consistently delineates waste streams, and assigns hazardous waste numbers as required in this QAPjP and consider all generator specific waste streams and hazardous waste number assignments. The CCP must also consider original site-specific permit requirements and other state-enforced agreements in this analysis.

To determine the mean concentration of solvent VOCs, headspace gas data or homogeneous waste data for a waste stream or lot will be used, including data qualified with a 'J' flag (i.e., less than the PRQL but greater than the MDL) or qualified with a 'U' flag (undetected). For data qualified with a 'U' flag, the CCP uses one-half the MDL to calculate the mean concentration. Because listed wastes are not defined based on concentration, the CCP does not remove hazardous waste numbers assigned using AK if hazardous constituents are not detected in the headspace gas or solids/soils analysis.

TRU headspace gas and homogeneous waste may contain one or two constituents at concentrations that are orders of magnitude higher than the other target analytes. In these cases, samples are diluted to remain within the instrument calibration range for the elevated constituents. Sample dilution results in elevated MDLs for the constituents with elevated concentrations. Only the concentrations of detected constituents are used to calculate the mean for the purpose of assigning F-listed hazardous waste numbers. Because the presence or absence of F-listed solvents cannot be confirmed based on the artificially high MDLs that are caused by sample dilution, data flagged as 'U' and showing an elevated MDL are not used in calculating the mean concentration.

C4-3f Acceptable Knowledge Data Quality Requirements (T5)

Data quality objectives for sampling and analysis techniques are described in Section C3. Analytical results are used to augment the characterization of wastes based on AK. To ensure the process is consistently applied and ensure that AK information is accurate, complete, and is representative of the waste stream being evaluated, the CCP complies with data quality requirements for AK documentation in Section C3.

The CCP addresses quality control by tracking its performance with regard to the use of AK by:

- Assessing the frequency of inconsistencies among information
- Documenting the results of waste discrepancies identified by CCP during waste confirmation using radiography, review of radiography audio/video recordings, VE, or review of VE records

In addition, the AK process and waste stream documentation is evaluated through internal assessments by CCP QA organizations and assessment by auditors or observers external to the CCP (i.e., DOE-CBFO, NMED, EPA).

C4-3g Audits of Acceptable Knowledge

The DOE conduct an initial audit of the CCP prior to certifying the CCP for shipment of waste to the WIPP. This audit establishes an approved baseline that is reassessed annually by the DOE. The CCP does not certify waste for disposal until all corrective actions have been completed.

C5 QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS

C5-1 Quality Assurance Project Plans

The CCP has developed and implemented this QAPjP to address the applicable waste characterization requirements specified in the WAP (P1). This QAPjP includes the qualitative or quantitative criteria to ensure that waste characterization activities are being performed satisfactorily. The organization(s) and position(s) responsible for implementation of this QAPjP are identified in Section B. Throughout this QAPjP, CCP documents are referenced that detail how each of the required elements of the characterization project are performed.

This QAPjP follows the format of the WAP and is implemented by the CCP through procedures that address TRU waste characterization activities. Compliance with CCP documents ensures that tasks are performed in a consistent manner that results in achieving the quality required under the CCP QA program. The organization, format, content, and designation of the CCP procedures is described in the CCP-QP-010, *CCP Document Preparation, Approval, and Control.*

C5-2 Document Review, Approval, and Control (Q10)

Prior to the implementation of characterization activities, the SPM ensures that written procedures have been developed for implementing the requirements of this QAPjP. Procedures ensure that tasks are performed in a consistent manner and achieve the quality required for the quality assurance program. The SPM is responsible for ensuring that the procedures meet the organization, format, content, and designation of standard operating procedures. CCP procedures are written so that they may be implemented at several sites simultaneously. Site-specific issues such as safety policies, technical specification requirements, or organizational necessities, may require the CCP to prepare site-specific procedures to supplement the procedures used to ensure WAP compliance. These procedures are identified in the SOW or site interface document. These procedures are prepared and controlled as are the other existing CCP operating

procedures and are subject to site specific review requirements. As a minimum, the following requirements are addressed in CCP procedures:

- Responsibilities of the organizations affected by the document,
- Technical, regulatory, quality assurance, or other program requirements.
- Sequential description of work to be performed,
- Quantitative or qualitative acceptance criteria sufficient for determining that activities were satisfactorily accomplished.
- Prerequisites, limits, precautions, process parameters, and environmental conditions,
- Special qualifications and training requirements,
- Verification points and hold points,
- Methods for demonstrating that the work was performed as required (such as provisions for recording inspection and test results, checklists, or sign-off blocks), and
- Identification and classification of QA records to be generated by the implementing procedure.

Procedures also include examples of data (e.g., reports, forms, and data validation checklists), as appropriate. Internal review and approval requirements are specified. In addition, CCP procedures are formatted, as follows:

- Purpose
- Scope
- Requirements
- Responsibilities
- Procedures
- Records

CCP procedures are reviewed for consistency with the QAPjP in accordance with the above listed requirements. The SPM is responsible for ensuring that the most current

version of all procedures is readily available for use as needed by project personnel after procedures have been reviewed and approved for use.

The SPM ensures that the preparation, issuance, and change to documents that specify quality requirements or prescribe activities affecting quality for the CCP program be controlled to assure that correct and current documents are used and referenced. The CCP uses a document control format consisting of a unique document identification number, current revision number, data, and page number, which will be placed in the header on the individual pages of the document. CCP documents are delineated into five areas: quality procedures, denoted by CCP-QP-XXX; technical procedures, denoted by CCP-TP-XXX; health and safety plans denoted by CCP-HSP-XXX; configuration management denoted by CCP-CM-XXX; and CCP Project Office documents (i.e., this QAPjP), denoted by CCP-PO-XXX. "XXX" denotes a sequential number.

Qualified and independent personnel review all CCP documents (including this QAPjP) prior to approval and issuance. Reviews consider the technical adequacy, completeness, and correctness of CCP documents and the inclusion of and compliance with the requirements established by the WAP. Approval is indicated by a signature and date page included in the front of the document. The SPM ensures that:

- Revisions to site implementing documents are denoted by including the current revision number and date on the document title page and each page of the document.
- Revised pages are marked in redline/strikeout for expeditious review of the entire document.
- A vertical bar, indicating the change to the text, is included along the left-hand margin of the page, except in the case of full document revisions.
- Revised document submittals identify the changes, the reason for the changes, and the justification for concluding that the revised contents continue to satisfy the requirements of the QA program.
- Revisions that affect performance criteria or data quality (e.g., sampling or analytical methods, QAO, calibration requirements), other than editorial or minor changes, undergo the same level of review and approval as the baseline version of each document. These documents are reviewed and approved by the same functional organizations that performed the original review/approval, unless other organizations are specifically designated in accordance with approved procedures. Editorial or minor changes may be made without the same level of review and approval as the original or

otherwise changed documents. The following items are considered editorial or minor changes:

- Correcting grammar or spelling (provided the meaning has not changed),
- Renumbering sections or attachments,
- Updating organizational titles (*A change in an organizational title accompanied by a change in responsibilities is not considered an editorial change*),
- Changes to non-quality-affecting schedules,
- Revised or reformatted forms, providing the original intent is not altered, and
- Attachments marked "Example" or exhibits clearly intended to be representative only

- CCP personnel are responsible for reporting any obsolete or superseded information to the SPM
- All CCP changes are evaluated and approved by the SPM, the appropriate personnel are notified before implementation, and the affected documents are revised as necessary
- Changes that affect performance criteria or data quality, and would take the activity out of compliance because they alter a requirement are not made without prior approval by DOE.

In addition, the SPM is responsible for ensuring that non-administrative changes, non-editorial changes, or changes that could affect performance criteria or data quality (such as sample handling, custody requirements, sampling and analytical procedures, quality assurance objectives, calibration requirements, or QC sample acceptance criteria, to this QAPjP and other WAP-related plans and procedures are reported to the DOE within five days of Project Level review). The SPM ensures that the document control system is implemented to control the process for initiating, revising, modifying, reviewing, and distributing project documents and changes to project documents. As potential changes to project information are identified by the SPM, documents are revised as necessary and distributed to affected organizations in accordance with this procedure.

C6 AUDIT AND SURVEILLANCE PROGRAM

C6-1 Introduction

The WIPP audit and surveillance program ensures that the CCP conducts sampling and analysis of wastes in accordance with the current WAP and that waste certification information is being managed properly. The CCP addresses deficiencies identified during the audits. A deficiency is any failure to comply with an applicable requirement of the WAP.

C6-2 Audit Procedures

This section does not apply to the CCP.

C6-3 Audit Position Functions

This section does not apply to the CCP.

C6-4 Audit Conduct

During audit interviews or audit meetings, CCP or DOE approved laboratory personnel may be advised of deficiencies identified within their areas of responsibility to establish a clear understanding of the identified condition.

The personnel will be given the opportunity to correct any deficiency that can be corrected during the audit period.

When a deficiency is identified by the DOE audit team, a CAR is issued to the CCP. The CCP reviews the CAR which is used to evaluate the extent and cause of the deficiency, and submits an approved response to the Permittees indicating remedial actions and actions taken to preclude recurrence. If these responses to the CAR are acceptable, DOE communicates the acceptance to the CCP.

The CCP completes the remedial actions and actions to preclude recurrence and requests DOE to close the CAR. Following the completion of corrective actions, the Permittees may schedule and perform a verification visit to assure that corrective actions have been completed and are effective.

The corrective action response includes a discussion of the investigation performed to determine the extent and impact of the deficiency, a description of the remedial actions taken, determination of root cause, and action taken to preclude recurrence.

The CCP responds to any deficiencies and observations within thirty (30) days of receipt of any CARs and indicates the corrective action taken or to be taken. If the corrective action has not been completed, the response indicates the expected date the

action will be completed. CARs applicable to WAP requirements are resolved prior to waste shipment.

C7 TRU WASTE CONFIRMATION

Introduction

This section of the QAPjP describes the actions that the Permittees will take to approve and accept waste for and disposal at the WIPP, including waste confirmation activities. Discussion of the Permittees' actions that are relevant to CCP will be included here. The Permittees demonstrate compliance with the WIPP-WAP by ensuring that the waste characterization processes performed by CCP produce data compliant with the WIPP-WAP and through the waste screening and verification processes. Verification occurs at three levels: 1) the data generation level, 2) the project level, and 3) the Permittee level. The Permittees also examine a representative subpopulation of waste prior to shipment to confirm that the waste contains no ignitable, corrosive, or reactive waste; and that assigned EPA Hazardous Waste Numbers are allowed by the WIPP RCRA Permit. The waste confirmation activities described herein occur prior to shipment of the waste from the CCP to WIPP.

C7-1 Permittee Confirmation of TRU Mixed Waste

This section does not apply to CCP.

C7-1a Permittee Confirmation of a Representative Subpopulation of the Waste

The Permittees will confirm that the waste contains no ignitable, corrosive, or reactive waste through radiography or the use of VE of a statistically representative subpopulation of the waste. Prior to shipment to WIPP, waste confirmation will be performed on randomly selected containers from each CH- and RH-TRU waste stream shipment.

C7-1b Radiography Methods Requirements

This section describes the portion of the Permittees' confirmation program that applies to CCP.

For containers that have been characterized using radiography by CCP in accordance with the method in Section C1-3, the Permittees may perform confirmation by review of CCP's radiography audio/video recordings.

When confirmation is performed by review of audio/video recorded scans produced by CCP as specified in Section C1-3, independent observations will be performed on two waste containers per shipment or two containers per day, whichever is less frequent.

C7-1c Visual Examination Methods Requirements

This section describes the portion of the Permittees' confirmation program that applies to CCP.

VE may also be used as a waste confirmation method by the Permittees. VE shall be conducted by the Permittees in accordance with written standard operating procedures to describe the contents of a waste container. Visual examination shall be conducted to identify and describe all waste items, packaging materials, and waste material parameters. VE may be used by the Permittees to examine a statistically representative subpopulation of the waste certified for shipment to WIPP to confirm that the waste contains no ignitable, corrosive, or reactive waste. This is achieved by confirming that the waste contains no liquid in excess of TSDF-WAC limits or compressed gases, and that the physical form of the waste matches the waste stream description documented on the WSPF. During packaging, the waste container contents are directly examined by trained personnel. This form of waste confirmation may be performed by the Permittees at the waste generator/storage site. VE may be documented on video and audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. When VE is performed using a second operator, each operator performing the VE shall observe for themselves the waste being placed in the waste container or the contents within the examined waste container when waste is not removed. The results of all VE shall be documented on data forms.

In order to keep radiation doses as low as reasonably achievable, the Permittees may use their own trained VE operators to perform VE for waste confirmation by reviewing CCP VE data, which includes VE data forms, waste packaging records, and may also include audit/video media. If the Permittees perform waste confirmation by review of video media, the video record of the VE must be sufficiently complete for the Permittees to confirm the Waste Matrix Code and waste stream description, and verify the waste contains no liquid in excess of TSDF-WAC limits or compressed gases. CCP VE video/audio media subject to review by the Permittees shall meet the following minimum requirements:

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

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

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

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

The Permittees may also use their own trained VE operators to perform VE for waste confirmation by reviewing VE data forms or packaging logs prepared by the generator during their packaging of the waste. To be acceptable, the CCP VE data must be signed by two CCP personnel who witnessed the packaging of the waste and must provide sufficient information for the Permittees to determine that the waste container contents match the waste stream description on the WSPF and the waste contains no liquid in excess of TSDF-WAC limits or compressed gases. The Permittees will document their review of CCP VE data on Permittee VE data forms. CCP VE forms or packaging records subject to review by the Permittees shall meet the following minimum requirements:

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

- The data forms or packaging records shall contain an inventory of waste items in sufficient detail that a trained Permittee VE operator can identify the associated waste material parameters.

- The waste container identification number shall be recorded on the data forms or packaging records.

VE video media of containers which contain classified shapes shall be considered classified information. VE data forms will not contain classified information.

C7-2 Noncompliant Waste Identified During Waste Confirmation

This section describes the portion of the Permittees' confirmation program that applies to CCP.

If the Permittee identifies noncompliant waste during waste confirmation at a CCP site, (i.e., the waste does not match the waste stream description documented in the WSPF or there is liquid in excess of TSDF-WAC limits or compressed gases) the waste will not be shipped.

The DOE will suspend further shipments of the affected waste stream and issue a CAR to CCP. Shipments of affected waste streams will not resume until the CAR has been closed.

As part of the corrective action plan in response to the CAR, CCP will evaluate whether the waste characterization information documented in the CIS or WSPF for the waste stream must be updated because the results of waste confirmation for the waste stream indicated that the TRU waste being examined did not match the waste stream description. CCP will thoroughly evaluate the potential impacts on waste that has been shipped to WIPP. The DOE will evaluate the potential that prohibited items were shipped to WIPP and what remedial actions should occur, if any. The results of these evaluations will be provided to NMED before shipments of affected waste stream resume. If the CIS and/or WSPF requires revision, shipments of the affected waste stream shall not resume until the revised waste stream waste characterization information has been reviewed and approved by the DOE. If CCP certifies noncompliant waste at a site more than once during a running 90-day period, the DOE will suspend acceptance of CCP's waste from that CCP site until the DOE finds that all corrective actions have been implemented and the site complies with all applicable requirements of the WIPP-WAP.

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ACRONYMS AND ABBREVIATIONS

%	percent
%C	percent complete
AK	acceptable knowledge
ASTM	American Society for Testing and Materials
BDR	Batch Data Report
BFB	Bromofluorobenzene
BS	bachelor of science
°C	degrees Celsius
CBFO	Carlsbad Field Office
cc/s	cubic centimeters per second
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	contact handled
CIS	Characterization and Information Summary
COC	chain of custody
%D	percent difference
DA	data administrator
DAC	drum age criteria
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FID	flame ionization detector
FTIR	Fourier transfer infrared
g	gram
GC/MS	gas chromatography/mass spectrometry
Hg	mercury
HPLC	high pressure liquid chromatography
HWA	New Mexico Hazardous Waste Act
HWDU	Hazardous Waste Disposal Unit
HWFP	Hazardous Waste Facility Permit
ICP	instrument calibration procedure
ID	identification number
IDL	instrument detection limit
in.	inches
kV	kilovolts
l	liter
LCS	laboratory control sample
LDR	Land Disposal Restrictions
MDL	method detection limit
ml	milliliter
mm	millimeter

ACRONYMS AND ABBREVIATIONS (Continued)

mg/kg	milligram per kilogram
mg/L	milligram per Liter
nCi	nanocuries
NCR	nonconformance report
NDE	nondestructive examination
ng	nanogram
NIST	National Institute of Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OJT	on-the-job training
ORNL	Oak Ridge National Laboratory
OVA	organic vapor analyzer
PCB	polychlorinated biphenyls
PDP	Performance Demonstration Program
ppm	parts per million
ppmv	parts per million by volume
PRDL	program required detection limit
PRQL	program required quantitation limit
psig	pounds per square inch gauge
QA	quality assurance
QAO	quality assurance objective
QAPD	Quality Assurance Program Document
QAPjP	quality assurance project plan
QC	quality control
%R	percent recovery
RCRA	Resource Conservation and Recovery Act
RH	remote handled
RIDS	records inventory and disposition schedule
RPD	relative percent difference
%RSD	percent relative standard deviation
RTL	regulatory threshold limit
SOP	standard operating procedure
SOW	Statement of Work
SPC	statistical process control
SPM	site project manager
SRS	Savannah River Site
SVOCs	semivolatile organic compounds
SWB	standard waste box
TCLP	toxicity characteristic leaching procedure
TCO	transportation certification official
TDOP	ten-drum overpack
TIC	tentatively identified compound
TRU	transuranic
TRUCON	*TRUPACT-II Content (Code)*
TSDF-WAC	*Treatment, Storage, and Disposal Facility Waste Acceptance Criteria*

ACRONYMS AND ABBREVIATIONS (Continued)

TWBIR	*Transuranic Waste Baseline Inventory Report*
UCL_{90}	upper 90 percent confidence limit
VE	visual examination
VOC	volatile organic compound
WAC	(WIPP) Waste Acceptance Criteria
WAP	Waste Analysis Plan
WDS	Waste Data System
WIPP	Waste Isolation Pilot Plant
WSPF	Waste Stream Profile Form
WWIS	WIPP Waste Information System

Attachment 1 – Implementing Procedures

Reference Number	Procedure Number	Procedure Title
Q2	CCP-QP-002	CCP Training and Qualification Plan
Q5	CCP-QP-005	CCP TRU Nonconforming Item Reporting and Control
Q8	CCP-QP-008	CCP Records Management
Q10	CCP-QP-010	CCP Document Preparation, Approval and Control
Q14	CCP-QP-014	CCP Quality Assurance Trend Analysis and Reporting
Q19	CCP-QP-019	CCP Quality Assurance Reporting to Management
Q28	CCP-QP-028	CCP Records Filing, Inventorying, Scheduling, and Dispositioning
T1	CCP-TP-001	CCP Project Level Data Validation and Verification
T2	CCP-TP-002	CCP Reconciliation of DQOs and Reporting Characterization Data
T3	CCP-TP-003	CCP Data Analysis for S3000, S4000, and S5000 Characterization
T5	CCP-TP-005	CCP Acceptable Knowledge Documentation
T6	CCP-TP-006	CCP Visual Examination Technique for Idaho National Laboratory (INL) Newly Generated TRU Waste Retrieved from Pits
T7	CCP-TP-007	CCP Single Sample Manifold Headspace Gas Sampling and Analysis Procedure
T28	CCP-TP-028	CCP Radiographic Test and Training Drum Construction
T30	CCP-TP-030	CCP CH TRU Waste Certification and WWIS/WDS Data Entry
T32	CCP-TP-032	CCP Single Sample Manifold Data Validation Procedure
T53	CCP-TP-053	CCP Standard Real-Time Radiography (RTR) Inspection Procedure
T56	CCP-TP-056	CCP HSG Performance Demonstration Plan

Attachment 1 – Implementing Procedures (Continued)

Reference Number	Procedure Number	Procedure Title
T69	CCP-TP-069	CCP Sealed Source Visual Examination and Packaging
T86	CCP-TP-086	CCP CH Packaging Payload Assembly
T93	CCP-TP-093	CCP Sampling of TRU Waste Containers
T106	CCP-TP-106	CCP Headspace Gas Sampling Batch Data Report Preparation
T113	CCP-TP-113	CCP Standard Contact-Handled Waste Visual Examination
T162	CCP-TP-162	CCP Random Selection of Containers for Solids and Headspace Gas Sampling and Analysis
T163	CCP-TP-163	CCP Evaluation of Waste Packaging Records for Visual Examination of Records
T173	CCP-TP-173	CCP Analysis of Gas Samples for VOCs by GC/FID
T175	CCP-TP-175	CCP Analysis of Gas Samples for VOCs by GC/MS
T176	CCP-TP-176	CCP Determination of Method Detection Limits for Gas Analysis
T177	CCP-TP-177	CCP Sample Receipt, Custody, and Storage
T178	CCP-TP-178	CCP SUMMA® Canister Cleaning
T179	CCP-TP-179	CCP Gas Transfer Manifold Systems and Sample Compositing
T180	CCP-TP-180	CCP Analytical Sample Management

Attachment 1 – Implementing Procedures (Continued)

Reference Number	Procedure Number	Procedure Title
T181	CCP-TP-181	CCP Determination of Mercury by CVAA for TRU Waste Characterization
T182	CCP-TP-182	CCP Determination of Metals by ICP-AES for TRU Waste Characterization
T183	CCP-TP-183	CCP Microwave Assisted Digestion of Homogeneous Solids and Soil/Gravel
T184	CCP-TP-184	CCP Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry
T185	CCP-TP-185	CCP Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry
T186	CCP-TP-186	CCP Determination of Nonhalogenated Volatile Organics by Gas Chromatography
T187	CCP-TP-187	CCP Sample Preparation for Semivolatile Organic Compounds
T188	CCP-TP-188	CCP Analytical Data Recording, Review, and Reporting
T500	CCP-TP-500	CCP Remote-Handled Waste Visual Examination
T508	CCP-TP-508	CCP RH Standard Real-Time Radiography Inspection Procedure
T510	CCP-TP-510	CCP Remote-Handled Radiography Test and Training Drum Requirements
T512	CCP-TP-512	CCP Remote-Handled Waste Sampling
T530	CCP-TP-530	CCP RH TRU Waste Certification and WWIS/WDS Data Entry