

ATTACHMENT C4

TRU MIXED WASTE CHARACTERIZATION USING
ACCEPTABLE KNOWLEDGE

Waste Isolation Pilot Plant
Hazardous Waste Permit
July 14, 2011

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2 TRU MIXED WASTE CHARACTERIZATION USING
3 ACCEPTABLE KNOWLEDGE

4 C4-1 Introduction

5 The Resource Conservation and Recovery Act (**RCRA**) regulations codified in 40 CFR Parts
6 260 through 265, 268, and 270, and the New Mexico Hazardous Waste Management
7 Regulations in 20.4.1 NMAC Subparts 100 through 600, Subpart 800, and Subpart 900,
8 authorize the use of acceptable knowledge (**AK**) in appropriate circumstances by waste
9 generators, or treatment, storage, or disposal facilities to characterize hazardous waste.
10 Acceptable knowledge is described in *Waste Analysis: EPA Guidance Manual for Facilities That*
11 *Generate, Treat, Store and Dispose of Hazardous Waste* (EPA, 1994). Acceptable knowledge,
12 as an alternative to sampling and analysis, can be used to meet all or part of the waste
13 characterization requirements under the RCRA (EPA, 1994).

14 EPA's 1994 Waste Analysis Guidance Manual broadly defines the term "acceptable knowledge"
15 to include process knowledge, whereby detailed information on the wastes is obtained from
16 existing published or documented waste analysis data or studies conducted on hazardous
17 waste generated by processes similar to that which generated the waste; facility records of
18 analysis performed before the effective date of RCRA; and waste analysis data obtained from
19 generators of similar wastes that send their wastes off-site for treatment, storage, or disposal
20 (EPA, 1994). If a generator/storage site determines that AK alone is insufficient to accurately
21 characterize a waste, the site may use radiography and/or visual examination, headspace gas
22 sampling and analysis, and homogeneous waste sampling and analysis (specified in Permit
23 Attachment C1) to complete the waste characterization process and satisfy the requirements of
24 the Waste Analysis Plan (**WAP**) specified in Permit Attachment C. Acceptable knowledge is
25 used in TRU mixed waste characterization activities in five ways:

- 26
- To delineate TRU mixed waste streams
 - 27 • To assess whether TRU mixed wastes comply with the applicable requirements of the
28 Treatment, Storage, and Disposal Facility Waste Acceptance Criteria (**TSDF-WAC**)
 - 29 • To assess whether TRU mixed wastes exhibit a hazardous characteristic (20.4.1.200
30 NMAC, incorporating 40 CFR §261 Subpart C)
 - 31 • To assess whether TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating
32 40 CFR §261 Subpart D)
 - 33 • To estimate waste material parameter weights

34 Sampling and analysis may be performed to augment the characterization of wastes based on
35 acceptable knowledge when an AK Sufficiency Determination has not been requested by the
36 generator/storage site or, if requested, has not been granted by the U.S. Department of Energy
37 (**DOE**) (see Section C4-3d). Sampling and analysis consists of radiography, visual examination,
38 headspace gas, and homogeneous waste sampling and analysis. TRU mixed waste streams

1 shall undergo applicable provisions of the acceptable knowledge process prior to management,
2 storage, or disposal by the Permittees at WIPP.

3 C4-2 Acceptable Knowledge Documentation

4 The Permittees shall obtain from each DOE TRU mixed waste generator/storage site (**site**) a
5 logical sequence of acceptable knowledge information that progresses from general facility
6 information (TRU Mixed Waste Management Program Information) to more detailed waste-
7 specific information (TRU Mixed Waste Stream Information). Traceability of acceptable
8 knowledge information for a selected container in the audited Waste Summary Category
9 Group(s) will be examined during DOE's audit of a site (Section C4-3g). The consistent
10 presentation of acceptable knowledge documentation among sites in auditable records¹ will
11 allow DOE to verify the completeness and adequacy of acceptable knowledge for TRU mixed
12 waste characterization during the audit process. The Permittees shall require sites to implement
13 the acceptable knowledge process as specified in this Permit to characterize TRU mixed wastes
14 and obtain sufficient waste characterization data to demonstrate compliance with the Permit.
15 The New Mexico Environment Department (**NMED**) may independently validate the
16 implementation of and compliance with applicable provisions of the WAP at each
17 generator/storage site by participation in the Audit and Surveillance Program (Permit
18 Attachment C6). DOE shall provide NMED with current audit schedules and notify NMED in
19 writing no later than thirty (30) calendar days prior to each audit. NMED may choose to
20 accompany DOE on any audit of the WAP implementation.

21 The following sections include the information the Permittees will require for each site to
22 characterize TRU mixed waste using acceptable knowledge. Because waste generating
23 processes are site-specific, sites shall, as necessary, augment the required acceptable
24 knowledge records with additional supporting information (see Section C4-2c, Additional
25 Acceptable Knowledge Information). If the required information is not available for a particular
26 waste stream, the waste stream will not be eligible for an AK Sufficiency Determination as
27 specified in Section C4-3d.

28 C4-2a Required TRU Mixed Waste Management Program Information

29 TRU mixed waste management program information shall clearly define waste categorization
30 schemes and terminology, provide a breakdown of the types and quantities of TRU mixed waste
31 that are generated and stored at the site, and describe how waste is tracked and managed at
32 the site, including historical and current operations. Information related to TRU mixed waste
33 certification procedures and the types of documentation (e.g., waste profile forms) used to
34 summarize acceptable knowledge shall also be provided. The following information shall be
35 included as part of the acceptable knowledge written record:

- 36 • Map of the site with the areas and facilities involved in TRU mixed waste generation,
37 treatment, and storage identified

¹ "Auditable records" mean those records which allow the Permittees to conduct a systematic assessment, analysis, and evaluation of the Permittees compliance with the WAP and this Permit.

- 1 • Facility mission description as related to TRU mixed waste generation and
2 management (e.g., nuclear weapons research may involve metallurgy, radiochemistry,
3 and nuclear physics operations that result in specific waste streams)
- 4 • Description of the operations that generate TRU mixed waste at the site (e.g.,
5 plutonium recovery, weapons design, or weapons fabrication)
- 6 • Waste identification or categorization schemes used at the facility (e.g., item
7 description codes, content codes)
- 8 • Types and quantities of TRU mixed waste generated, including historical generation
9 through future projections
- 10 • Correlation of waste streams generated from the same building and process, as
11 appropriate (e.g., sludge, combustibles, metals, and glass)
- 12 • Waste certification procedures for retrievably stored and newly generated wastes to be
13 sent to the WIPP facility

14 C4-2b Required TRU Mixed Waste Stream Information

15 Sites may use acceptable knowledge to delineate site-specific waste streams. For each TRU
16 mixed waste stream, the Permittees shall require sites to compile all process information and
17 data that support the acceptable knowledge used to characterize that waste stream. The type
18 and quantity of supporting documentation will vary by waste stream, depending on the process
19 generating the waste and site-specific requirements imposed by the Permittees. At a minimum,
20 the waste process information shall include the following written information:

- 21 • Area(s) and/or building(s) from which the waste stream was or is generated
- 22 • Waste stream volume and time period of generation (e.g., 100 standard waste boxes
23 of retrievable stored waste generated from June 1977 through December 1977)
- 24 • Waste generating process described for each building (e.g., batch waste stream
25 generated during decommissioning operations of glove boxes), including processes
26 associated with U134 waste generation, if applicable.
- 27 • Documentation regarding how the site has historically managed the waste, including
28 the historical regulatory status of the waste (i.e., TRU mixed versus TRU non-mixed
29 waste)
- 30 • Process flow diagrams (e.g., a diagram illustrating glove boxes from a specific building
31 to a size reduction facility to a container storage area). In the case of
32 research/development, analytical laboratory waste, or other similar processes where
33 process flow diagrams cannot be created, a description of the waste generating
34 processes, rather than a formal process flow diagram, may be included if this
35 modification is justified and the justification is placed in the auditable record

- 1 • Material inputs or other information that identifies the chemical content of the waste
2 stream and the physical waste form (e.g., glove box materials and chemicals handled
3 during glove box operations; events or processes that may have modified the chemical
4 or physical properties of the waste stream after generation; data obtained through
5 visual examination of newly generated waste that later undergoes radiography;
6 information demonstrating neutralization of U134 [hydrofluoric acid] and waste
7 compatibility)

8 The acceptable knowledge written record shall include a summary that identifies all sources of
9 waste characterization information used to delineate the waste stream. The basis and rationale
10 for delineating each waste stream, based on the parameters of interest, shall be clearly
11 summarized and traceable to referenced documents. Assumptions made in delineating each
12 waste stream also shall be identified and justified. If discrepancies exist between required
13 information, then sites may consider applying all hazardous waste numbers indicated by the
14 information to the subject waste stream, but must assess and evaluate the information to
15 determine the appropriate hazardous waste numbers consistent with RCRA requirements. The
16 Permittees shall obtain from each site, at a minimum, procedures that comply with the following
17 acceptable knowledge requirements:

- 18 • Procedures for identifying and assigning the physical waste form of the waste
- 19 • Procedures for delineating waste streams and assigning Waste Matrix Codes
- 20 • Procedures for resolving inconsistencies in acceptable knowledge documentation
- 21 • Procedures for headspace gas sampling and analysis, visual examination and/or
22 radiography, and homogeneous waste sampling and analysis, if applicable
- 23 • For newly generated waste, procedures describing process controls used to ensure
24 prohibited items (specified in the WAP, Permit Attachment C) are documented and
25 managed
- 26 • Procedures to ensure radiography and visual examination include a list of prohibited
27 items that the operator shall verify are not present in each container (e.g., liquid
28 exceeding TSDF-WAC limits, corrosives, ignitables, reactives, and incompatible
29 wastes)
- 30 • Procedures to document how changes to Waste Matrix Codes, waste stream
31 assignment, and associated Environmental Protection Agency (**EPA**) hazardous waste
32 numbers based on material composition are documented for any waste
- 33 • Procedures that ensure the assignment of EPA hazardous waste numbers is
34 appropriate, consistent with RCRA requirements, and considers site historical waste
35 management
- 36 • Procedures for estimating waste material parameter weights

1 C4-2c Additional Acceptable Knowledge Information

2 The generator/storage sites shall obtain additional acceptable knowledge information. Sites
3 shall collect information as appropriate to augment required information and provide any other
4 information obtained to further delineate waste streams. Adequacy of this information shall be
5 assessed by DOE during audits (Section C4-3g). Sites will use this information to compile the
6 acceptable knowledge written record.

7 All additional specific, relevant acceptable knowledge documentation assembled and used in
8 the acceptable knowledge process, whether it supports or contradicts any required acceptable
9 knowledge documentation, shall be identified and an explanation provided for its use (e.g.,
10 identification of a toxicity characteristic). Additional documentation may be used to further
11 document the rationale for the hazardous characterization results. The collection and use of
12 additional information shall be assessed by DOE during site audits to ensure that hazardous
13 waste characterization is supported, as necessary, by such information. Similar to required
14 information, if discrepancies exist between additional information and the required information,
15 then sites may consider applying all hazardous waste numbers indicated by the additional
16 information to the subject waste stream, but must assess and evaluate the information to
17 determine the appropriate hazardous waste numbers consistent with RCRA requirements. All
18 information considered must be documented and placed in the auditable record, including
19 applicable discrepancy resolution documentation.

20 Additional acceptable knowledge documentation includes, but is not limited to, the following
21 information:

- 22 • Process design documents (e.g., Title II Design)
- 23 • Standard operating procedures that may include a list of raw materials or reagents, a
24 description of the process or experiment generating the waste, and a description of
25 wastes generated and how the wastes are managed at the point of generation
- 26 • Preliminary and final safety analysis reports and technical safety requirements
- 27 • Waste packaging records
- 28 • Test plans or research project reports that describe reagents and other raw materials
29 used in experiments
- 30 • Site databases (e.g., chemical inventory database for Superfund Amendments and
31 Reauthorization Act Title III requirements)
- 32 • Information from site personnel (e.g., documented interviews)
- 33 • Standard industry documents (e.g., vendor information)
- 34 • Analytical data relevant to the waste stream, including results from fingerprint
35 analyses, spot checks, routine verification sampling, or other processes that collect
36 information pertinent to the waste stream. This may also include new information

1 which augments required information (e.g., visual examination not performed in
2 compliance with the WAP, radiography screening for prohibited items)

- 3 • Material Safety Data Sheets, product labels, or other product package information
- 4 • Sampling and analysis data from comparable or surrogate waste streams (e.g.,
5 equivalent nonradioactive materials)
- 6 • Laboratory notebooks that detail the research processes and raw materials used in an
7 experiment

8 For waste containers that belong to LANL sealed sources waste streams, these containers do
9 not require headspace gas sampling and analysis if the following information is part of the AK
10 documentation:

- 11 • Documentation that the waste container contents meet the definition of sealed sources
12 per 10 CFR §30.4 and 10 CFR §835.2 (effective January 1, 2004).
- 13 • Documentation of the certification of the sealed sources as U.S. Department of
14 Transportation Special Form Class 7 (Radioactive) Material per 49 CFR §173.403
15 (effective October 1, 2003).
- 16 • Documentation of contamination survey results that validate the integrity of each
17 sealed source per 10 CFR §34.27 (effective January 1, 2004).
- 18 • AK documentation does not indicate the use of VOCs or VOC-bearing materials as
19 constituents of the sealed sources.
- 20 • The outer casing of each sealed source must be of a non-VOC bearing material, which
21 must be verified at the time of packaging.
- 22 • AK Documentation shall also include but shall not be limited to, as available and as
23 necessary to determine the hazardous constituents associated with sealed sources,
24 the following: source manufacturer's sales catalogues, original purchase records,
25 source manufacturer's fabrication documents, source manufacturer's drawings, source
26 manufacturer's fuel capture assembly reports, source manufacturer's operational
27 procedures for cleanliness requirements, source manufacturer's shipping documents,
28 source manufacturer's welding records, transuranic batch material records, and
29 information from national databases (e.g., NMMSS). All of this information may not and
30 need not be available for each source, but sufficient information must be included in
31 the auditable record to derive an adequate understanding of source construction and
32 history to ensure that no VOCs are present in association with the sealed source itself
33 that would render the source hazardous. If AK data indicate that assignment of a
34 hazardous waste number related to organic materials is required in association with a
35 source, this specific source will be assigned to a separate waste stream and that
36 waste stream will be subject to representative headspace gas sampling unless a
37 separate AK Sufficiency Determination is approved by DOE for the waste stream.

1 C4-3 Acceptable Knowledge Training, Procedures and Other Requirements

2 The Permittees shall require consistency among sites in using acceptable knowledge
3 information to characterize TRU mixed waste by the use of the following: 1) compiling the
4 required and additional acceptable knowledge documentation in an auditable record, 2) auditing
5 acceptable knowledge records, and 3) WSPF approval and waste confirmation. This section
6 specifies qualification and training requirements, describes each phase of the process, specifies
7 the procedures that the Permittees shall require all sites to develop to implement the
8 requirements for using acceptable knowledge, and specifies data quality requirements for
9 acceptable knowledge.

10 C4-3a Qualifications and Training Requirements

11 Site personnel responsible for compiling acceptable knowledge, assessing acceptable
12 knowledge, and resolving discrepancies associated with acceptable knowledge shall be
13 qualified and trained in the following areas at a minimum:

- 14 • WIPP WAP in Permit Attachment C and the TSDF-WAC specified in this permit
- 15 • State and Federal RCRA regulations associated with solid and hazardous waste
16 characterization
- 17 • Discrepancy resolution and reporting processes
- 18 • Site-specific procedures associated with waste characterization using acceptable
19 knowledge

20 C4-3b Acceptable Knowledge Assembly and Compilation

21 The Permittees shall obtain from sites acceptable knowledge procedures which require
22 consistent application of the acceptable knowledge process and requirements. Site-specific
23 acceptable knowledge procedures shall address the following:

- 24 • Sites shall prepare and implement a written procedure outlining the specific
25 methodology used to assemble acceptable knowledge records, including the origin of
26 the documentation, how it will be used, and any limitations associated with the
27 information (e.g., identify the purpose and scope of a study that included limited
28 sampling and analysis data).
- 29 • Sites shall develop and implement a written procedure to compile the required
30 acceptable knowledge record.
- 31 • Sites shall develop and implement a written procedure that ensures unacceptable
32 wastes (e.g., reactive, ignitable, corrosive) are identified and segregated from TRU
33 mixed waste populations sent to WIPP.
- 34 • Sites shall prepare and implement a written procedure to evaluate acceptable
35 knowledge and resolve discrepancies. For example, if different sources of information
36 indicate different hazardous wastes are present, then sites shall include all sources of
37 information in its records and may choose to either conservatively assign hazardous

1 waste numbers or assign only those numbers deemed appropriate and consistent with
2 RCRA requirements. All information used to justify assignment of hazardous waste
3 numbers must be placed in the auditable record. Further, the assignment of hazardous
4 waste numbers shall be tracked in the auditable record to all required documentation.

- 5 • Sites shall prepare and implement a written procedure to identify hazardous wastes
6 and assign the appropriate hazardous waste numbers to each waste stream. The
7 following are minimum baseline requirements/standards that site-specific procedures
8 shall include to ensure comparable and consistent characterization of hazardous
9 waste:

10 – Compile all of the required information in an auditable record.

11 – Review the compiled information and delineate waste streams. Delineation of
12 waste streams must comply with the definition in Permit Attachment C, Section C-
13 0a, and justify combining waste historically managed separately as TRU mixed and
14 TRU non-mixed waste streams into a single waste stream.

15 – Review the compiled information to determine if the waste stream is compliant with
16 the TSDF-WAC.

17 – Review the required information to determine if the waste is listed under 20.4.1.200
18 NMAC (incorporating 40 CFR §261), Subpart D. Assign all listed hazardous waste
19 numbers unless the sites choose to justify an alternative assignment and
20 document the justification in the auditable record.

21 – Review the required information to determine if the waste exhibits a hazardous
22 characteristic or may contain hazardous constituents included in the toxicity
23 characteristics specified in 20.4.1.200 NMAC (incorporating 40 CFR §261),
24 Subpart C. If a toxicity characteristic contaminant is identified and is not included
25 as a listed waste, sites may evaluate available data and assign the toxicity
26 characteristic hazardous waste number consistent with RCRA requirements. All
27 data examined to reach the hazardous waste number determination must be
28 placed in the auditable record and must present a clear justification for the
29 hazardous waste number analyses.

30 – Review the compiled information to provide an estimate of material parameter
31 weights for each container to be stored or disposed of at WIPP.

32 For newly generated wastes, procedures shall be developed and implemented to
33 characterize hazardous waste using acceptable knowledge prior to packaging the
34 waste.

- 35 • Sites shall ensure that results of audits of the TRU mixed waste characterization
36 programs at the site are available in the records.

- 37 • Sites shall identify all process controls (implemented to ensure that the waste contains
38 no prohibited items and to control hazardous waste content and/or physical form) that
39 may have been applied to retrievably stored waste and/or may presently be applied to
40 newly generated waste. Process controls are applied at the time of waste

1 generation/packaging to control waste content, whereas any activities performed after
2 waste generation/packaging to identify prohibited items, hazardous waste content, or
3 physical form are waste characterization activities, not process controls. The AK
4 record must contain specific process controls and supporting documentation
5 identifying when these process controls are used to control waste content. See Permit
6 Attachment C, Section C-2 for programmatic requirements related to process controls.

7 C4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste
8 Stream

9 Figure C4-1 provides an overview of the process for assembling acceptable knowledge
10 documentation into an auditable record. The first step is to assemble all of the required
11 acceptable knowledge information and any additional information regarding the materials and
12 processes that generate a specific waste stream. The Permittees shall require the sites to
13 implement procedures which comply with the following criteria to establish acceptable
14 knowledge records:

- 15 • Acceptable knowledge information shall be compiled in an auditable record, including
16 a road map for all applicable information.
- 17 • The overview of the facility and TRU mixed waste management operations in the
18 context of the facility's mission shall be correlated to specific waste stream information.
- 19 • Correlations between waste streams, with regard to time of generation, waste
20 generating processes, and site-specific facilities shall be clearly described. For newly
21 generated wastes, the rate and quantity of waste to be generated shall be defined.
- 22 • A reference list shall be provided that identifies documents, databases, Quality
23 Assurance protocols, and other sources of information that support the acceptable
24 knowledge information.

25 Container inventories for TRU mixed waste currently in retrievable storage shall be delineated
26 into waste streams by correlating the container identification to all of the required acceptable
27 knowledge information and any additional acceptable knowledge information.

28 C4-3d AK Sufficiency Determination Request Contents

29 Generator/storage sites may submit an AK Sufficiency Determination Request (**Determination**
30 **Request**) to meet all or part of the waste characterization requirements. The Determination
31 Request shall include, at a minimum:

- 32 • Identification of the scenario for which the approval is sought (Permit Attachment C,
33 Section C-0b).
- 34 • A complete AK Summary that addresses the following technical requirements:
 - 35 – Executive Summary;

- 1 – Waste Stream Identification Summary, including a demonstration that the waste
2 stream has been properly delineated and meets the Permit definition of waste
3 stream (Permit Attachment C, Introduction);
- 4 – Mandatory Program Information (including, but not limited to, facility location and
5 description, mission, defense waste assessment, spent nuclear fuel and high-level
6 waste assessment, description of waste generating processes,
7 research/development [as necessary], facility support operations [as applicable],
8 types and quantities of TRU waste generated, correlation of waste streams to
9 buildings/processes, waste identification and categorization, physical form
10 identifiers);
- 11 – Mandatory Waste Stream Information (including, but not limited to, Area and
12 Building of Generation, waste stream volume/period of generation (including, for
13 newly generated waste, the rate and quantity of waste to be generated), waste
14 generating activities, types of waste generated, material input related to physical
15 form and identification of percentage of each waste material parameter in the
16 waste stream, chemical content information including hazardous constituents and
17 hazardous waste identification, prohibited item content (including documented
18 evidence that the waste meets the TSDF-WAC Permit Sections 2.3.3.1 through
19 2.3.3.10), waste packaging, presence of filter vents, number of layers of
20 confinement);
- 21 – Types of additional information gathered;
- 22 – Container specific data (if available and relevant); and
- 23 – A complete reference list including all mandatory and additional information.
- 24 • An AK roadmap (defined as a cross reference between mandatory programmatic and
25 mandatory waste stream information, with references supporting these requirements).
- 26 • A complete reference list including all mandatory and additional documentation.
- 27 • Additional relevant information for the required programmatic and waste stream data
28 addressed in the AK Summary, examples of which are presented in Permit Attachment
29 C4, Section C4-2c.
- 30 • Identification of any mandatory requirements supported only by upper tier documents
31 (i.e., there is insufficient supporting data).
- 32 • Description or other means of demonstrating that the AK process described in the
33 Permit was followed (for example, AK personnel were appropriately trained;
34 discrepancies were documented, etc).
- 35 • Information showing that the generator/storage site has developed a written procedure
36 for compiling the AK information and assigning hazardous waste numbers as required
37 in Permit Attachment C4-3b.

- 1 • Information showing that the generator/storage site has assessed the AK process
2 (e.g. internal audits, Permit Attachment C4-3b).

3 The Permittees shall evaluate the Determination Request for completeness and technical
4 adequacy as specified in Permit Attachment C.

5 C4-3e Requirements for Re-evaluating Acceptable Knowledge Information

6 Acceptable knowledge includes information regarding the physical form of the waste, the base
7 materials composing the waste, and the process that generates the waste. Waste sampling and
8 analysis (i.e., radiography or visual examination, headspace-gas sampling and analysis, and
9 homogeneous waste sampling and analysis) may be used to augment acceptable knowledge
10 information.

11 The Waste Stream Profile Form (**WSPF**) and Characterization Information Summary (including
12 the acceptable knowledge summary) will be reviewed by the Permittees for each waste stream
13 prior to DOE approval of the WSPF. The Permittees' review will ensure that the submitted AK
14 information was collected under procedures that ensure implementation of the WAP, provides
15 data sufficient to meet the DQOs in Section C-4a(1), and allow the Permittees to demonstrate
16 compliance with the waste analysis requirements of the Permit. A detailed discussion of the
17 Permittees' waste stream review and DOE's WSPF approval process is provided in Section C-
18 1d.

19 The Permittees shall require sites to establish procedures for reevaluating acceptable
20 knowledge if the results of waste confirmation indicate that the waste to be shipped does not
21 match the approved waste stream, or if data obtained from radiography or visual examination
22 for waste streams without an AK Sufficiency Determination exhibit this discrepancy. Site
23 procedures shall describe how the waste is reassigned, acceptable knowledge reevaluated, and
24 appropriate hazardous waste numbers assigned. If the reevaluation requires that the Waste
25 Matrix Code be changed for the waste stream or the waste does not match the approved waste
26 stream, the following minimum steps shall be taken to reevaluate acceptable knowledge:

- 27 • Review existing information based on the container identification number and
28 document all differences in hazardous waste number assignments
- 29 • If differences exist in the hazardous waste numbers that were assigned, reassess and
30 document all required acceptable knowledge information (Section C4-3b) associated
31 with the new designation
- 32 • Reassess and document all sampling and analytical data associated with the waste
- 33 • Verify and document that the reassigned Waste Matrix Code was generated within the
34 specified time period, area and buildings, waste generating process, and that the
35 process material inputs are consistent with the waste material parameters identified
36 during radiography or visual examination
- 37 • Record all changes to acceptable knowledge records

- If discrepancies exist in the acceptable knowledge information for the revised Waste Matrix Code, document the segregation of the affected portion of the waste stream, and define the actions necessary to fully characterize the waste

Potential toxicity characteristics for base materials that compose TRU mixed heterogeneous debris (S5000) waste may be determined without destructive sampling and analysis via acceptable knowledge. Sites will assign a Waste Matrix Code and waste stream to each container of waste using acceptable knowledge. Sites shall assign the toxicity characteristic hazardous waste numbers consistent with RCRA requirements. If a toxicity characteristic 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. Procedures shall describe how additions to hazardous waste numbers based on material composition are documented, as necessary (Section C4-3b).

The Permittees shall require sites to use acceptable knowledge to identify spent solvents associated with each TRU mixed waste stream or waste stream lot. Headspace-gas data will be used to resolve the assignment of 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, sites shall assign 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 upper 90 percent confidence limit (**UCL₉₀**). The **UCL₉₀** for the mean concentration shall be compared to the program required quantitation limit (**PRQL**) for the constituent. If the **UCL₉₀** for the mean concentration exceeds the **PRQL**, sites shall reevaluate their acceptable knowledge information and determine the potential source of the constituent. Sites shall provide documentation 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 can not be identified, the appropriate spent solvent hazardous waste number will be conservatively applied to the waste stream. In the case of applicable toxicity characteristic VOCs and non-toxic F003 constituents, generator/storage sites may assess whether the head space gas concentration would render the waste non-hazardous for those characteristics and change the initial acceptable knowledge 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 characteristic waste or non-toxic constituent of an F003 waste is below regulatory levels, the hazardous waste number assigned initially by acceptable knowledge may be changed. Otherwise, if an F-listed waste constituent is detected, the appropriate hazardous waste number shall be 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 toxicity characteristic or non-toxic F003 wastes are present in excess of regulatory levels, then the site will either: 1) assign the applicable listed hazardous waste number to the entire waste stream, or 2) segregate the drums containing detectable concentrations of the solvent into a separate waste stream and assign applicable hazardous waste numbers. Each site shall document, justify, and consistently delineate waste streams and assign hazardous waste numbers as required in this permit and must consider all generator-

1 specific waste streams and hazardous waste number assignments. The site must also consider
2 site-specific permit requirements and other state-enforced agreements in this analysis.

3 To determine the mean concentration of solvent VOCs, all headspace-gas data or
4 homogeneous waste data for a waste stream or waste stream lot (i.e., the portion of the waste
5 stream that is characterized as a unit) will be used, including data qualified with a 'J' flag (i.e.,
6 less than the PRQL but greater than the method detection limit [MDL]) or qualified with a 'U' flag
7 (i.e., undetected). For data qualified with a 'U' flag, sites shall use one-half the MDL in
8 calculating the mean concentration. Because listed wastes are not defined based on
9 concentration, sites may not remove hazardous waste numbers assigned using acceptable
10 knowledge if hazardous constituents are not detected in the headspace gas or solids/soil
11 analysis.

12 TRU mixed headspace gases and homogeneous waste matrices may contain one or two
13 constituents (e.g., carbon tetrachloride and 1,1,1-trichloroethane) at concentrations that are
14 orders of magnitude higher than the other target analytes. In these cases, samples shall be
15 diluted to remain within the instrument calibration range for the elevated constituents. Sample
16 dilution results in elevated MDLs for the constituents with elevated concentrations. Only the
17 concentrations of detected constituents will be used to calculate the mean for the purpose of
18 assigning F-listed hazardous waste numbers. Because the presence or absence of F-listed
19 solvents can not be assigned based on the artificially high MDLs that are caused by sample
20 dilution, data flagged as 'U' and showing an elevated MDL will not be used in calculating the
21 mean concentration.

22 C4-3f Acceptable Knowledge Data Quality Requirements

23 The data quality objectives for sampling and analysis techniques are provided in Permit
24 Attachment C3. Analytical results will be used to augment the characterization of wastes based
25 on acceptable knowledge. To ensure that the acceptable knowledge process is consistently
26 applied, the Permittees shall require sites to comply with the data quality requirements for
27 acceptable knowledge documentation in Permit Attachment C3.

28 Each site shall address quality control by tracking its performance with regard to the use of
29 acceptable knowledge by: 1) assessing the frequency of inconsistencies among information,
30 and 2) documenting the results of waste discrepancies identified by the generator/storage site
31 during waste characterization or the Permittees during waste confirmation using radiography,
32 review of radiography audio/video recordings, visual examination, or review of visual
33 examination records. In addition, the acceptable knowledge process and waste stream
34 documentation shall be evaluated through internal assessments by generator/storage site
35 quality assurance organizations.

36 C4-3g Audits of Acceptable Knowledge

37 DOE will conduct an initial audit of each site prior to certifying the site for shipment of TRU
38 mixed waste to the WIPP facility. This initial audit will establish an approved baseline that will be
39 reassessed annually DOE. These audits will verify compliance with the requirements specified
40 in the WAP (Permit Attachment C). The audits will be used to verify compliance with the
41 compilation, application, and interpretation requirements of acceptable knowledge information
42 specified in this Permit at all sites, and to evaluate the completeness and defensibility of site-
43 specific acceptable knowledge documentation related to hazardous waste characterization.

1 Permit Attachment C6 gives a description of the overall audit program and a required checklist.
2 Figure C4-2 includes the primary steps associated with the audit process of acceptable
3 knowledge.

4 Site-specific audit plans will be prepared by DOE and provided to NMED, and will identify the
5 scope of the audit, requirements to be assessed, participating personnel, activities to be
6 audited, organizations to be notified, applicable documents, and schedule. Audits will be
7 performed in accordance with written procedures and site-specific checklists that will be
8 developed by DOE prior to the audit and provided to NMED. The site-specific audit checklists
9 will include items associated with the compilation and evaluation of the required acceptable
10 knowledge information as specified in the checklist required by Permit Attachment C6.

11 Audit checklists shall include Table B6-3 in Permit Attachment C6, and will include but not be
12 limited to the following elements for review during the audit:

- 13 • Documentation of the process used to compile, evaluate, and record acceptable
14 knowledge is available and implemented;
- 15 • Personnel qualifications and training are documented;
- 16 • All of the required acceptable knowledge documentation specified in Section C4-2 has
17 been compiled in an auditable record;
- 18 • All of the required procedures specified in C4-3 have been developed and
19 implemented, including but not limited to:
 - 20 – A procedure exists for assigning hazardous waste numbers to waste streams in
21 accordance with Section C4-3;
 - 22 – A procedure exists for resolving discrepancies in acceptable knowledge
23 documentation in accordance with Section C4-3; and
- 24 • Results of other audits of the TRU mixed waste characterization programs at the site
25 are available in site records.

26 Members of the audit team will be knowledgeable regarding the required acceptable knowledge
27 information, RCRA regulations and EPA guidance regarding the use of acceptable knowledge
28 for waste characterization, RCRA hazardous waste characterization, and the WAP requirements
29 (Permit Attachment C). Audit team members will be independent of all TRU mixed waste
30 management operations at the site being audited.

31 Auditors will evaluate acceptable knowledge documentation for at least one waste stream from
32 the Summary Category Group(s) being audited, and will audit acceptable knowledge traceability
33 for at least one container from the audited Summary Category Group(s). For these waste
34 streams, auditors will review all procedures and associated processes developed by the site for
35 documenting the process of compiling acceptable knowledge documentation; correlating
36 information to specific waste inventories; assigning hazardous waste numbers; and identifying,
37 resolving, and documenting discrepancies in acceptable knowledge records. The adequacy of
38 acceptable knowledge procedures and processes will be assessed and any deficiencies in
39 procedures documented in the audit report.

1 Auditors will review the acceptable knowledge documentation for selected waste streams for
2 logic, completeness, and defensibility. The criteria that will be used by auditors to evaluate the
3 logic and defensibility of the acceptable knowledge documentation include completeness and
4 traceability of the information, consistency of application of information, clarity of presentation,
5 degree of compliance with this Permit Attachment with regard to acceptable knowledge data,
6 nonconformance procedures, and oversight procedures. Auditors will evaluate compliance with
7 written site procedures for developing the acceptable knowledge record. A completeness review
8 will evaluate the availability of all required TRU mixed waste management program information
9 and TRU mixed waste stream information (Section C4-2). Records will be reviewed for
10 correlation to specific waste streams and the basis for characterizing hazardous waste. Auditors
11 will verify that sites include all required information and assigned appropriate hazardous waste
12 numbers as indicated by the acceptable knowledge records and consistent with RCRA
13 requirements. All deficiencies in the acceptable knowledge documentation will be included in the
14 audit report.

15 Auditors will verify and document that sites use administrative controls and follow written
16 procedures to characterize hazardous waste for newly-generated and retrievably stored wastes.
17 Procedures to document changes in acceptable knowledge documentation and changes to
18 hazardous waste number assignments to specific waste streams also will be evaluated for
19 compliance with the WAP (Permit Attachment C).

20 After the audit is complete, DOE will provide the site with preliminary results at a close-out
21 meeting. DOE will prepare a final audit report that includes all observations and findings
22 identified during the audit. Sites shall respond to all audit findings and identify corrective actions.
23 Audit results will be included in the final audit report (Permit Attachment C6). If acceptable
24 knowledge procedures do not exist, the required information is not available, or corrective
25 actions (i.e., CARs) are identified associated with acceptable knowledge compilation, and/or
26 hazardous waste characterization, the Permittees will not manage, store, or dispose TRU mixed
27 waste for the subject waste summary category. Management, storage, or disposal of the subject
28 waste summary category at WIPP will not resume until DOE find that all corrective actions have
29 been implemented and the site complies with all applicable requirements of the WAP.

30 DOE disseminates information regarding TRU mixed waste characterization requirements and
31 program status through the WIPP Home Page. The Permittees will use this web page to
32 disseminate information regarding TRU mixed waste streams, RCRA compliance, and
33 operational and programmatic issues, methods development, and waste characterization
34 information, including the application of acceptable knowledge. DOE is provided the required
35 waste characterization information prior to management, storage, or disposal of that waste at
36 WIPP and also will conduct audits at least annually. The Permittees will maintain an operating
37 record for review during regulatory agency audits. NMED may also review any information
38 relevant to the scope of the audit during site audits. DOE will notify NMED regarding any site's
39 failure to implement corrective actions associated with hazardous waste characterization as
40 specified in Parts 1 and 2 and Permit Attachment C3.

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FIGURES

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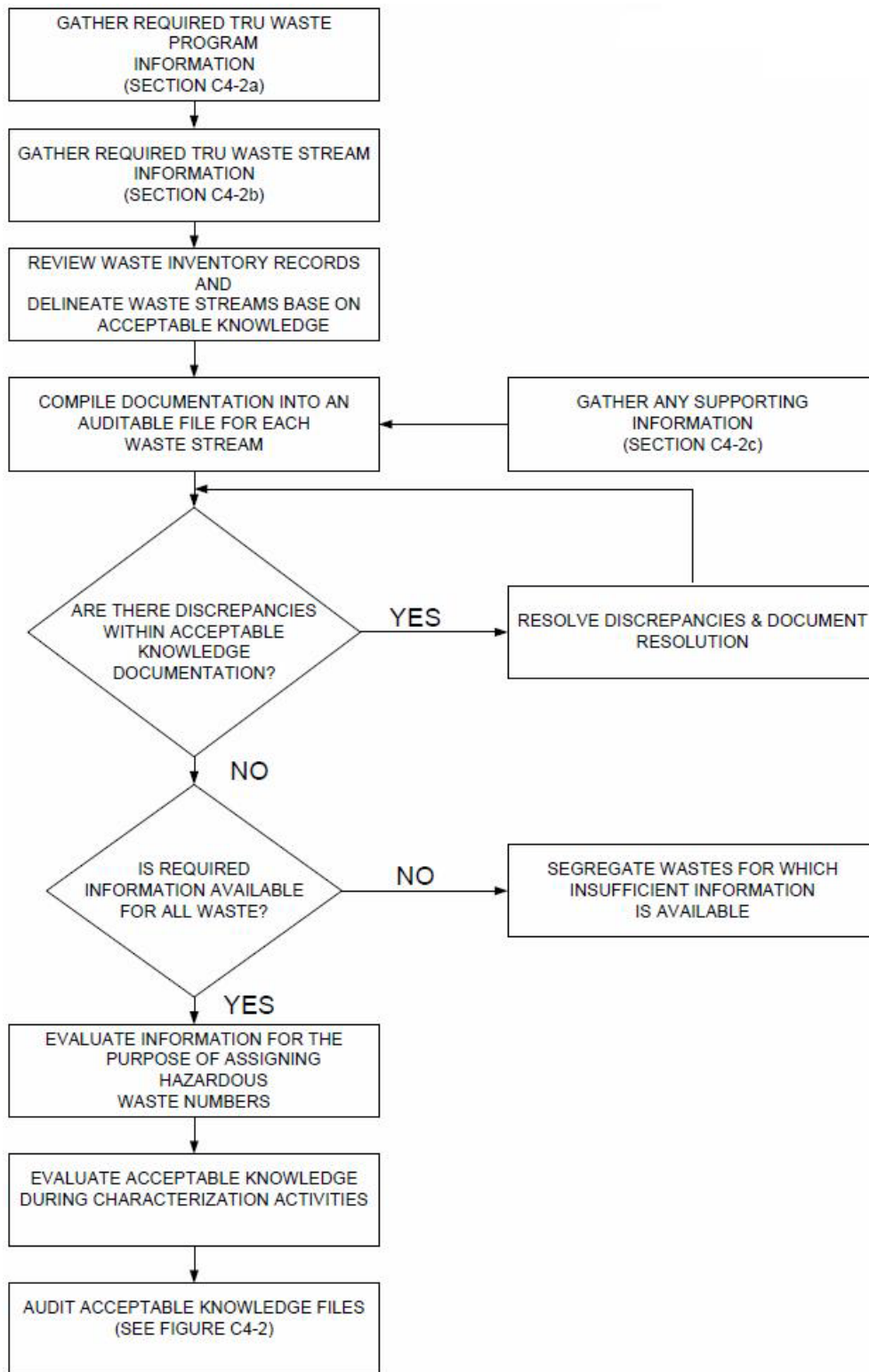


Figure C4-1
Compilation of Acceptable Knowledge Documentation

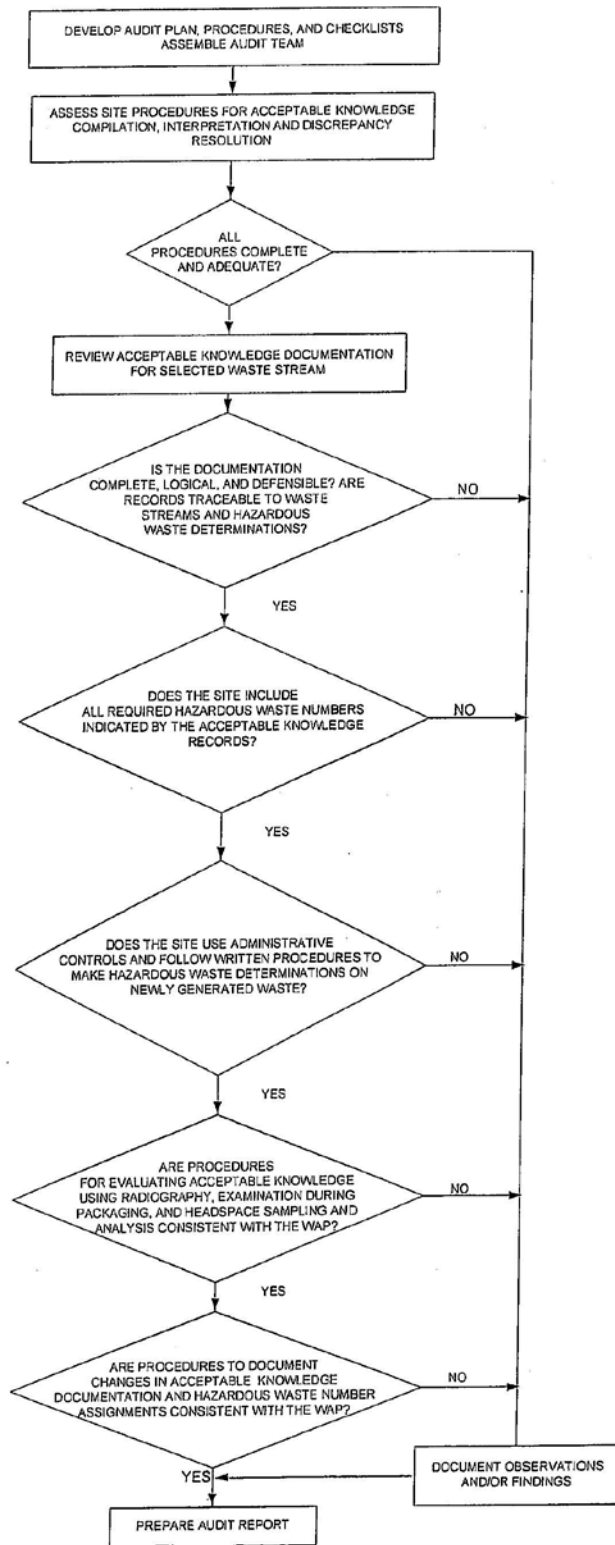


Figure C4-2
Acceptable Knowledge Auditing