RH-TRU WASTE INVENTORY CHARACTERIZATION BY AK AND PROPOSED WIPP RH-TRU WASTE CHARACTERIZATION OBJECTIVES

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ABSTRACT

The U.S. Department of Energy (DOE)-Carlsbad Field Office (CBFO) has developed draft documentation to present the proposed Waste Isolation Pilot Plant (WIPP) remote-handled (RH-) transuranic (TRU) waste characterization program to its regulators, the U.S. Environmental Protection Agency and the New Mexico Environment Department. Compliance with Title 40, Code of Federal Regulations, Parts 191 and 194; the WIPP Land Withdrawal Act (PL 102-579); and the WIPP Hazardous Waste Facility Permit, as well as the Certificates of Compliance for the 72-B and 10-160B Casks, requires that specific waste parameter limits be imposed on DOE sites disposing of TRU waste at WIPP. The DOE-CBFO must control the sites' compliance with the limits by specifying allowable characterization methods. As with the established WIPP contact-handled TRU waste characterization program, the DOE-CBFO has proposed a Remote-Handled TRU Waste Acceptance Criteria (RH-WAC) document consolidating the requirements from various regulatory drivers and proposed allowable characterization methods. These criteria are consistent with the recommendation of a recent National Academy Sciences/National Research Council to develop an RH-TRU waste characterization approach that removes current self-imposed requirements that lack a legal or safety basis.

As proposed in the draft RH-WAC and other preliminary documents, the DOE-CBFO RH-TRU waste characterization program proposes the use of acceptable knowledge (AK) as the primary method for obtaining required characterization information. The use of AK involves applying knowledge of the waste in light of the materials or processes used to generate the waste. Documentation, records, or processes providing information about various attributes of a waste stream, such as chemical, physical, and radiological properties, may be used as AK and may be applied to individual waste containers either independently or in conjunction with radiography, visual examination, assay, and other sampling and analytical data. RH-TRU waste cannot be shipped to WIPP on the basis of AK alone if documentation demonstrating that all of the prescribed limits in the RH-WAC are met is not available, discrepancies exist among AK source documents describing the same waste stream and the most conservative assumptions regarding those documents indicates that a limit will not be met, or all required data are not available for a given waste stream.

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) issued a certification (1) of DOE-CBFO compliance with the radioactive waste disposal requirements and criteria found in Title 40 Code of Federal Regulations Part 191 (40 CFR 191) (2) and 40 CFR 194 (3), respectively. This certification allows DOE to ship and dispose of TRU waste at WIPP with certain limitations. One of those limitations is that the DOE cannot receive or dispose of RH-TRU waste until such time as the DOE presents a waste characterization program for RH-TRU waste. As such, WIPP is currently authorized only for the disposal of contact-handled (CH-) TRU waste.

The required characterization of CH-TRU waste is contained in the Waste Isolation Pilot Plant Waste Acceptance Criteria (CH-WAC) (4), which compiles applicable requirements from several higher-tier documents, including the WIPP operational safety requirements, transportation requirements for packaging licensed by the U.S. Nuclear Regulatory Commission (NRC), WIPP Land Withdrawal Act (5), WIPP Hazardous Waste Facility Permit (HWFP) (6), and 40 CFR Parts 191/194 compliance certification decision (1). The CH-WAC refers to the Waste Analysis Plan (CH-WAP) of the current WIPP HWFP (6) for the required characterization protocol to be used in the determination of physical and chemical properties of the CH-TRU waste.

Prior to RH-TRU waste disposal at the WIPP, the characterization requirements of 20 NMAC 4.1.500 (7) (incorporating 40 CFR 264.13) must be specified for RH-TRU waste in an application by the DOE-CBFO for modification of the WIPP HWFP, which must be approved by the New Mexico Environment Department (NMED). In addition, the DOE-CBFO must present a process for the characterization of RH-TRU waste for WIPP disposal to the EPA with notification of the planned change at WIPP. To this end, the DOE-CBFO has developed draft documentation to be used to present the proposed WIPP RH-TRU waste characterization program to the EPA and the NMED. As with the established WIPP CH-TRU waste characterization program, the DOE-CBFO has proposed a Remote-Handled TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant (RH-WAC) (8) document consolidating the various regulatory requirements and proposed allowable characterization methods. This proposed RH-TRU waste characterization program relies on acceptable knowledge (AK) as the primary method for obtaining required characterization information.

The National Research Council, organized by the National Academy of Sciences to provide services to the federal government, convened a committee of experts to advise the DOE on the operation of WIPP. The committee was asked to provide recommendations on two issues: (1) a research agenda to enhance confidence in the long-term performance of WIPP; and (2) increasing the throughput, efficiency, and cost-benefit without compromising safety of the National TRU Program for characterizing, certifying, packaging, and shipping waste to WIPP (9). In its interim report, the committee provided the DOE with recommendations (9). With the proposal of AK as the primary characterization method, the WIPP is implementing a recommendation of this committee to eliminate many of the current self-imposed requirements lacking a legal or safety basis.

This paper considers currently available DOE RH-TRU waste inventory data with respect to the characterization of RH-TRU waste using AK. The majority of RH-TRU waste sites are establishing or initiating characterization plans in order to comply with consent orders or agreements that impose schedules for removing RH-TRU waste from the sites. This planning process is key to the successful optimization of the WIPP operational activities in that delays can be avoided if sites are poised to ship RH-TRU waste to WIPP once regulatory compliance is achieved and health and safety standards are met. The planned potential uses of AK to characterize the unique waste streams comprising the DOE RH-TRU waste inventory are detailed by this paper.

PROPOSED RH-TRU WASTE CHARACTERIZATION PROGRAM

The proposed WIPP RH-TRU waste characterization program implements a *performance-driven approach* to waste characterization incorporating a uniform set of characterization objectives that must be met by each generator/storage site and a set of methods that may be used to satisfy each objective (10). The proposed program is data quality objective (DQO)-based and relies on the AK process as the primary waste characterization method, resulting in the compilation of all information needed to safely manage, store, and dispose of RH-TRU waste. The compiled information will satisfy the developed DQOs, providing sufficient information to determine hazardous waste numbers, physical waste form, absence of prohibited items, and necessary radiological information. This process balances the requirements for providing definitive characterization data on waste streams with those circumstances where sampling and analysis is not feasible and/or necessary given the particular data needs. Other allowable methods that may be used to supplement the AK process are radiography, visual examination, and radioassay.

The RH-TRU Waste AK Process

The AK process involves applying knowledge of the characteristics of the waste using available information concerning materials or processes used to generate the waste and/or data and results from prior testing activities. AK information may include records providing information about various attributes of waste streams, such as chemical, physical, and radiological properties; administrative, procurement, and quality controls associated with the processes generating the waste; past sampling and analytical data; previously generated assay records; material inputs to the waste generating process; and other data that can support characterization.

The AK characterization process is applied on a waste stream basis and, as previously stated, may be supplemented with sampling and measurement programs. A waste stream is defined in the WIPP HWFP (6) as waste material generated from a single process or activity or as multiple containers with similar physical, chemical, or radiological characteristics. The proposed program establishes specific requirements for determining when the AK process can be used as the sole characterization technique for each characterization objective. In cases where the AK process alone cannot be used to meet characterization requirements, additional testing using radiography, visual examination, and/or assay of containers that are representative of the waste stream is required. In cases where the AK process is used as the sole characterization technique for determining the physical form, the absence of prohibited items, or the radionuclide composition and quantities, the AK information must be confirmed through testing using radiography, visual

examination, and/or assay of containers that are representative of the waste stream. Waste cannot be shipped to WIPP on the basis of AK characterization alone if all required information is not available for a given waste stream, if documentation demonstrating that all limits are met is not available, or if discrepancies exist among information describing the same waste stream and the most conservative assumptions regarding those documents indicates that a limit will not be met.

The draft RH-WAC (8) summarizes proposed waste characterization data needs, including transportation-related requirements specified in Safety Analysis Reports approved by the Nuclear Regulatory Commission for the 72-B and 10-160B shipping casks, and specifies how well the data must be known. Table I presents a summary of RH-TRU waste characterization parameters and associated limits that can be met primarily by the use of the AK characterization process. The proposed RH-WAC also specifies methods of compliance for each waste acceptance criterion.

Table I. RH-TRU Waste Acceptance Criteria Proposed for Characterization by AK

Proposed Waste Attribute	Proposed Waste Acceptance Criterion
Filter vents (RH-TRU 72-B and 10-160B)	Each waste payload container and any sealed secondary containers greater than 4 liters in size overpacked in the payload container must have one or more filter vents. Filter vents are optional on metal secondary containers containing solid inorganic waste only.
Payload container description/weight (RH-TRU 72-B)	• RH-TRU waste canister shall be Department of Transportation (DOT) Type A or equivalent and meet requirements of the RH-TRU 72-B Cask SAR. • Weight of loaded RH-TRU waste canister must not exceed: (1) 5,250 pounds (lbs.) when direct loaded or (2) 5,980 lbs. when loaded in three 55-gallon drums or 30-gallon drums prior to placement in the canister. Higher weight limits (compliant with maximum allowable transportation weight limit) will be allowed upon appropriate testing.
Payload container description/weight (10-160B)	• Payload containers (55-gallon drums) shall be DOT Type A or equivalent and meet requirements of the 10-160B Cask SAR. • Weight of contents, shoring, secondary containers, and optional shield insert must not exceed 14,500 lbs.
Payload container condition (RH-TRU 72-B and 10-160B)	Payload container shall be in good condition.
Payload container identification (RH-TRU 72-B and 10-160B)	Payload containers shall have a unique identification number.
Secondary containers (10-160B)	Secondary containers or components must be shored to prevent movement during accident conditions.
Sharp or heavy objects (RH-TRU 72-B and 10-160B)	Sharp or heavy objects in the waste shall be blocked, braced, or suitably packaged as necessary to provide puncture protection for the payload container packaging these objects.
Residual liquids (RH-TRU 72-B and 10-160B)	Aggregate amount of residual liquid <1 volume percent of payload container.

Proposed Waste Attribute	Proposed Waste Acceptance Criterion
Compressed gases (RH-TRU 72-B and 10-160B)	Compressed gases are prohibited.
Sealed containers (RH-TRU 72-B and 10-160B)	Sealed containers >4 liters are prohibited except for metal containers packaging solid inorganic waste.
Waste form (RH-TRU 72-B and 10-160B)	The waste form must be assigned to the S3000, S4000, or S5000 summary category groups.
Waste type and content code (RH-TRU 72-B)	Must meet content code description in the Remote-Handled Transuranic Content Codes (RH-TRUCON) document.
Waste type and content code (10-160B)	Must meet content code description in 10-160B SAR.
Flammable volatile organic compounds (VOCs) (RH-TRU 72-B and 10-160B)	≤500 parts per million (ppm) total flammable VOCs in the payload container headspace.
Hazardous waste codes (RH-TRU 72-B and 10-160B)	Hazardous wastes are limited to those having hazardous waste codes listed in Attachment O of the WIPP Hazardous Waste Facility Permit.
Polychlorinated biphenyls (PCBs) (RH-TRU 72-B and 10-160B)	PCBs <50 ppm.
Explosives (RH-TRU 72-B and 10-160B)	Explosives are prohibited.
Corrosives (RH-TRU 72-B and 10-160B)	Corrosives are prohibited.
Ignitables (RH-TRU 72-B and 10-160B)	Ignitables are prohibited.
Reactives (RH-TRU 72-B and 10-160B)	Reactives are prohibited.
Pyrophorics (RH-TRU 72-B and 10-160B)	<1% radionuclide pyrophorics by weight of the payload container. Non-radionuclide pyrophorics are prohibited.

Proposed Waste Attribute	Proposed Waste Acceptance Criterion
Hydrogen gas concentration and total gas generation (RH-TRU 72-B and 10-160B)	May use testing or analysis/AK: Decay heat within each payload container ≤ limit in RH-TRU Waste Shipping Package SAR for applicable content code.* *The limit applies to the calculated decay heat value plus its associated propagated error expressed as one standard deviation.
Waste compatibility (RH-TRU 72-B and 10-160B)	Incompatible chemicals or materials are prohibited.
Radiation dose rate for hypothetical accident conditions (including neutron contribution) (RH-TRU 72-B)	<1 rem/hr at 1 meter from the shipping cask based on hypothetical accident scenario limits (sum of partial fractions for radionuclides [value/limit]) provided in Table 12-1 of the RH-TRU 72-B SAR, Appendix 1.3.7. Radionuclides are limited to those in Table 12-1 of Appendix 1.3.7 of RH-TRU 72-B SAR. ≤10 mrem/hr at 1 meter from shipping cask surface
Pu-239 fissile gram equivalent (FGE) (RH-TRU 72-B)	≤325 FGE per 72-B Cask* ≤325 FGE per RH-TRU waste canister* * These limits apply to the calculated FGE value plus its associated propagated error expressed as one standard deviation.
Fissile materials (10-160B)	Not to exceed mass limits of 10 CFR 71.53.
Pu-239 equivalent activity (RH-TRU 72-B)	≤80 Pu-239 equivalent curies (PE-Ci)/RH-TRU waste canister if waste is direct loaded. ≤240 PE-Ci/RH-TRU waste canister if waste is loaded into three 30-gallon or 55-gallon drums prior to placement in the RH-TRU waste canister.
TRU alpha activity concentration (RH-TRU 72-B and 10-160B)	>100 nCi/g of alpha-emitting TRU isotopes with half-lives >20 years. This limit applies to the calculated TRU alpha concentration without its associated propagated error.
Radionuclide activity (RH-TRU 72-B)	≤23 curies per liter (Ci/L) averaged over the volume of the RH-TRU waste canister. Curie content in each payload container will be reported for tracking total repository curie inventory.
Radionuclide activity (10-160B)	≤20 curies of plutonium content for the 10-160B cask. Quantity of radioactive material not to exceed 2,000 times Type A quantity. Curie content in each payload container will be reported for tracking total repository curie inventory.

Proposed Waste Attribute	Proposed Waste Acceptance Criterion
Decay heat (RH-TRU 72-B)	≤50 watts/RH-TRU 72-B cask* ≤ Decay heat limit per payload container, as specified in applicable content code* * These limits apply to the calculated decay heat value plus its associated error expressed as one standard deviation.
Decay heat (10-160B)	≤100 watts/10-160B cask* ≤ Decay heat limit per payload container, as specified in applicable content code* * These limits apply to the calculated decay heat value plus its associated error expressed as one standard deviation.
Waste origin	Must be generated from defense-related activities.

Reference: (8)

If the AK process is used as the sole characterization method, it is proposed that testing (i.e., in the form of radiography, visual examination, and/or assay) be performed on an identified number of containers selected at random from those comprising the waste stream. The appropriate testing method will be selected based on the characterization objective(s) to be confirmed, properties of the waste stream, and operational constraints. To ensure that data generation is conducted in a technically correct manner, generator/storage site personnel will be required to validate the testing data in accordance with established site procedures, including independent review and signature release of all AK confirmation testing data. The validated results of the testing are reconciled with the AK characterization to determine whether the AK information supports the RH-TRU waste DQOs and whether a sufficient level of agreement exists between the two data sets to confirm the AK characterization data. Only AK information that has been confirmed is considered valid for waste characterization.

In order to ensure that the AK process is implemented consistently by generator/storage sites characterizing RH-TRU waste for WIPP disposal, the RH-TRU waste characterization program proposes to impose the required use of a standardized AK procedure by all sites. The use of this procedure will standardize the identification, compilation, confirmation, and documentation of AK for RH-TRU waste as required to meet the proposed characterization DQOs. The procedure may also standardize the implementation controls (i.e., governing procedures, personnel training, and documentation protocol associated with the compilation and use of records/data) applied to the AK process. By implementing a standard AK procedure, the national TRU program will develop high quality waste characterization information, consistently apply AK package development, and achieve a superior AK process. This standard AK procedure will ensure that the documentation records generated or evaluated during the AK process qualify as quality assurance records in accordance with the DOE-CBFO Quality Assurance Program Document (QAPD) (11).

The proposed WIPP RH-TRU waste characterization program requires generator/storage sites to undergo certification audits prior to shipping RH-TRU waste to WIPP. The site implementation

of the proposed standard AK procedure as part of the characterization program will be audited under the proposed WIPP RH-TRU waste characterization program. The audit process will evaluate whether a site is maintaining the standard AK procedure under configuration control and records management as directed by site-specific procedure(s).

RH-TRU WASTE INVENTORY

The DOE complex is currently storing 2,245.7 cubic meters (m^3) of RH-TRU waste at various locations across the U.S., with an additional 1,781.6 m^3 of RH-TRU waste projected for future generation. Table II presents the site locations of the stored RH-TRU waste and of the RH-TRU waste projected for future generation by these sites.

Table II. Stored and Projected Volumes of RH-TRU Waste By Site

Site Name	RH-TRU Waste Volume (m^3)		
	Stored	Projected	Total
Oak Ridge National Laboratory (ORNL)	1,342.0	911.5	2,253.5
Hanford	200.0	700.0	900.0
West Valley Demonstration Project (WVDP) [a]	467.0	12.0	479.0
Los Alamos National Laboratory (LANL) [b]	99.4	24.1	123.5
Idaho National Engineering and Environmental Laboratory (INEEL)	85.0	0.0	85.0
Argonne National Laboratory-East (ANL-E)	1.0	76.0	77.0
Argonne National Laboratory-West (ANL-W)	24.1	30.4	54.5
Sandia National Laboratories (SNL) [b]	1.4	24.1	25.5
Battelle Columbus Laboratories (BCL)	0.0	20.8	20.8
General Electric-Vallecitos Nuclear Center (GE-VNC) [a]	11.8	0.0	11.8
Knolls Atomic Power Laboratory (KAPL)	3.7	6.8	10.5
Energy Technology Engineering Center (ETEC)	8.7	0.0	8.7
Bettis Atomic Power Laboratory (BAPL)	3.0	0.0	3.0
TOTAL [b]	2,245.7	1,781.6	4,027.3

[a]Waste may not be of defense origin. Compliance with WIPP Land Withdrawal Act requirement will need to be demonstrated prior to disposal at WIPP (does not impact transportation).
[b]All SNL RH-TRU waste will be shipped from SNL to LANL. SNL total volume of 25.5 m^3 is included in the LANL total waste volume.
Reference: (9)

Typical RH-TRU waste streams include solid inorganic and organic materials (e.g., generated by decontamination and decommissioning activities), cemented inorganic process solids, and solidified aqueous waste. At many generator/storage sites, the final waste forms comprising the RH-TRU waste inventory are yet to be determined. For shipment to and disposal at WIPP, the RH-TRU waste forms must be packaged into either 55-gallon drums or RH-TRU canisters. RH-TRU waste may be stored at some sites in configurations that are not currently shippable (e.g., stored in casks or retrievably stored in containers underground). Such waste will require repackaging prior to shipment and disposal at WIPP. For this waste, an opportunity exists for the comprehensive collection of AK characterization information that is confirmed using visual examination of the waste as it is packaged. This process may be easily documented (e.g., on video/audiotape or on waste inventory sheets). Waste streams identified to date at the RH-TRU

waste sites and status of final waste packaging configurations (for shipment to WIPP) are summarized in Table III.

Table III. RH-TRU Waste Streams and Packaging Status

Site	Anticipated Waste Stream(s)	Status of Final Packaging Configuration(s)	Can AK Process be Applied During Waste Packaging?
ANL-E	Solid organic and inorganic waste	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes
ANL-W	Waste steams not yet defined	Waste is currently stored in 1,350 silos. Waste will require packaging into final configurations once retrieved from storage.	Yes
BCL	• Solidified Organic Waste • Cemented Inorganic Process Solids • Solid Organic Waste • Solid Inorganic Waste	74 55-gallon drums (as of October 2001), about 50% of projected total RH-TRU waste volume, have been packaged under approved site procedures for verification of AK through visual examination during the loading of drums as observed by two independent examiners. Remaining waste packaging is planned using the same protocol.	Yes
BAPL	Waste steams not yet defined	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes
ETEC	• Solid organic and inorganic waste • Solidified organic process waste	Waste is currently stored as follows: • 29 55-gallon drums have been packaged (no plans to repackage). • 1 30-gallon drum (to be repackaged). • 1 B-25 box (to be repackaged). • 1 3,000-gallon tank (waste to be retrieved and packaged).	 No Yes Yes Yes
GE-VNC	Waste steams not yet defined	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes

Site	Anticipated Waste Stream(s)	Status of Final Packaging Configuration(s)	Can AK Process be Applied During Waste Packaging?
Hanford	• Homogeneous solid inorganic waste • Solid organic and inorganic waste • Additional waste streams may be identified as waste is retrieved (e.g., cemented K Basin organic process solids, solid organic and inorganic waste from tank farm or Pu-extraction vitrification studies)	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes
INEEL	• Solid inorganic waste • Solid organic and inorganic waste	Waste is currently stored as follows: • 30-gallon drums (650 drums of debris waste 20 drums of non-debris waste) (no plans to repackage, rather drums may be overpacked in 55-gallon drums or RH-TRU canisters) • 27 Hot Fuel Examination Facility inserts (to be repackaged) • Lead-lined 55-gallon drums of debris and homogeneous waste (275 drums of debris waste, 410 drums of non-debris waste) (to be repackaged)	 No Yes Yes
KAPL	Waste steams not yet defined	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes
LANL	Solid organic and inorganic waste	17 RH-TRU canisters have been packaged under approved site-specific procedures requiring the documentation of the process (i.e., information may be qualified as part of the AK process)	No
ORNL	• Solidified aqueous waste • Solid organic and inorganic waste	RH-TRU wastes are stored in various on-site tank systems. Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes

Site	Anticipated Waste Stream(s)	Status of Final Packaging Configuration(s)	Can AK Process be Applied During Waste Packaging?
SNL	Waste steams not yet defined	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes
WVDP	Waste steams not yet defined	Waste will require packaging into final configurations. Final packaging configurations not yet defined.	Yes

Reference: (12)

As shown in Table III, the majority of RH-TRU waste generator/storage sites that have identified waste streams have yet to package the waste into its final configuration for shipment to the WIPP. As such, the majority of the RH-TRU waste inventory will be packaged under the proposed WIPP RH-TRU waste characterization program using the AK process to the extent practical. Although the WIPP RH-TRU waste characterization program is not yet final, the RH-TRU waste inventory at LANL and BCL has been packaged under site-specific programs using approved procedures that required the collection of either AK information or information that may be qualified as AK. For the RH-TRU waste inventory that has been packaged in a shippable configuration, but not under an approved site-specific program, and is not planned for repackaging, the contents must be determined. Any available related AK information used to characterize such waste must be verified through confirmatory testing, as proposed by the WIPP RH-TRU waste characterization program.

PROPOSED SITE CHARACTERIZATION PROGRAMS

The RH-TRU waste sites that have identified waste streams (ANL-E, BCL, ETEC, Hanford, INEEL, LANL, and ORNL) have also identified potential uses of the AK process. In addition, other sites (e.g., ANL-W) have planned characterization programs, including the AK process, to be implemented when waste streams are finalized. Sites may opt to test their waste instead of employing a characterization plan that employs the AK process only. For example, sites such as the Idaho National Engineering and Environmental Laboratory propose the extensive use of AK in radiological characterization, while other sites, including Argonne National Laboratory-West, plan to supplement AK using a suite of nondestructive assay methods. As another example, the Battelle Columbus Laboratories propose the use of AK for the determination of RCRA characteristics, while the Oak Ridge National Laboratory plans to supplement AK using analytical chemistry.

ANL-E

The first shipments of RH-TRU waste from ANL-E are slated to begin in FY2003. During 2000, ANL-E conducted a five-month study to collect AK (12). As a result of this effort, ANL-E published an AK Summary Report incorporating AK for two of its waste streams: AE-RH-D-N, ANL-E RH nonmixed debris; and AE-RH-D-M, ANL-E RH mixed debris. The report addresses

information required under the CH-TRU waste program, including waste stream generating process, time of generation, and waste stream volume; defense relationship; applicable RCRA hazardous waste numbers; physical form; and identification of contaminant radionuclides. However, it does not provide data to meet all of the proposed requirements of RH-WAC, such as radionuclide quantities, packaging configurations, and hydrogen gas concentrations. Also, no content codes exist for ANL-E RH-TRU waste as of July 2001 (12).

ANL-W

Approximately one-third of the ANL-W waste may have historical information that may qualify for use in the AK process. This potential AK does not support the radiological characterization of the ANL-W RH-TRU waste. As such, ANL-W plans to supplement the AK process using a suite of nondestructive assay methods to characterize waste.

BCL

The BCL has developed an RH-TRU waste characterization program using the guidance provided by the evolving WIPP RH-TRU waste characterization program. As such, the BCL characterization program uses primarily AK and visual examination during waste packaging to characterize RH-TRU waste. These methods are used to estimate physical waste parameters, including weight percentages of metals, cellulosics, plastics, and rubber in the waste, and to determine the absence of prohibited items, including free liquids. AK combined with computer modeling is used to estimate radiological waste parameters, including total activity on a waste container basis, for the majority of BCL RH-TRU waste. AK combined with direct analysis is used to characterize radiological parameters for a small population of the RH-TRU waste generated by the BCL. All characterization based on AK is verified. The extensive use of AK by BCL is consistent with the proposed WIPP RH-TRU waste characterization objectives.

ETEC

ETEC has developed a site-specific AK procedure, "TRU Waste Acceptable Knowledge Documentation Procedure" EID-04710, and prepared AK Summary Reports describing its RH-TRU waste streams. ETEC's AK procedure is designed to provide all information available to meet the AK requirements of Attachment B4 of the WIPP WAP (6) and the CH-WAC (4), although ETEC has also considered the proposed AK process requirements for the RH-TRU waste program during data collection. ETEC may use AK information developed under its program to meet transportation requirements for shipment to a DOE-designated TRU central characterization site for subsequent WIPP certification. Boeing Canoga Park is assembling the available information on the ETEC RH-TRU waste streams for two primary purposes: (1) documenting characterization requirements that ETEC has satisfied for off-site transportation and identifying any shipping requirements for which additional characterization is required; and (2) providing comprehensive AK documentation to the receiving site to which the waste may be shipped. If a modification to the WIPP HWFP that allows WIPP to accept RH-TRU waste based strictly on AK is approved, final AK documentation of the ETEC RH-TRU waste may be performed at Boeing Canoga Park under additional DOE guidance.

Hanford

Hanford is not scheduled to begin shipment of RH-TRU waste to WIPP until FY 2013 (12). Hanford plans to observe the AK process implementation at other sites following the finalization of the WIPP RH-TRU waste characterization program and determine if the characterization approach is appropriate for the inventory.

INEEL

INEEL is in the process of implementing the AK process for a defined population of approximately 617 drums of RH-TRU waste received from Argonne National Laboratory-East (ANL-E). The AK collected during this effort related to the radionuclide content of the drums will be verified through the peer review process. The AK data package compilation and related calculations performed to characterize radiological parameters of RH-TRU waste containers stored at INEEL will meet the requirements of NUREG-1297, Peer Review, as required by 40 CFR 194.22(b) (13). The peer review verification of this AK data package will be limited to a review of methodology and data associated with RH-TRU waste drums that demonstrate the determination of the following characterization objectives:

- To determine the total curies of the RH-TRU waste
- To determine the individual activity of radionuclides and the TRU alpha activity of the RH-TRU waste
- To determine activity level of the RH-TRU waste
- To determine the surface dose rate of the packaged RH-TRU waste.

LANL

The 17 RH-TRU canisters packaged to date at LANL contain three 55-gallon drums holding several one-gallon cans, which directly package the waste. During packaging, LANL performed assay, analytical chemistry, and radiography on each one-gallon can. This process was documented under the LANL QA program and with the assumption that the WIPP CH-TRU waste characterization program requirements would be applied to RH-TRU waste. The measurements performed by LANL on the one-gallon cans exceed currently proposed requirements of the WIPP RH-TRU waste program. The measurement data should be of sufficient quality (i.e., as required by the CH-TRU waste program) that its use in the proposed AK process for RH-TRU waste characterization will be compliant.

ORNL

ORNL plans to use sampling and analysis to characterize all RH-TRU waste. The data collected during the sampling and analysis process will be qualified as AK information under the proposed WIPP RH-TRU waste characterization program.

CONCLUSION

AK provides a valuable means to characterize RH-TRU waste. Both the New Mexico Hazardous Waste Act requirements and the EPA TRU waste disposal requirements can be satisfied by using knowledge of the waste instead of opening containers to verify waste characterization parameters that can be determined without standard sampling and analysis programs. A benefit to workers will be realized, as there will be reduced risk of exposure from traditional laboratory protocols. Moreover, using the AK process to meet the regulatory requirements will hasten the removal of RH-TRU waste from the accessible environment and place it in the WIPP repository for safe disposal. Many RH-TRU waste generating sites are already beginning to comply with proposed RH-TRU requirements using the AK process and other supplementary methods to develop the waste characterization information summarized in the RH-WAC. BCL, INEEL, LANL, and other RH-TRU waste generators are designing their programs to confirm AK using peer review and/or additional measurements, in accordance with the proposed program and the requirements of 40 CFR 194.22(b).

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