

## **EXPERIENCE FROM TWO SMALL QUANTITY RH-TRU WASTE SITES IN NAVIGATING THROUGH AN EVOLVING REGULATORY LANDSCAPE**

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### **ABSTRACT**

Two small quantity transuranic (TRU) waste generator sites have gained considerable experience in navigating through a changing regulatory landscape in their efforts to remove the TRU waste from their sites and proceed with site remediation. The Battelle Columbus Laboratories Decommissioning Project (BCLDP) has the objectives of decontaminating nuclear research buildings and associated grounds and remediating to a level of residual contamination allowing future use without radiological restrictions. As directed by Congress, BCLDP must complete decontamination and decommissioning activities by the end of Fiscal Year (FY) 2006. This schedule requires the containerization of all TRU waste in 2002. BCLDP will generate a total of approximately 27 cubic meters ( $\text{m}^3$ ) of remote-handled (RH) TRU waste. Similarly, the Energy Technology Engineering Center (ETEC) is scheduled to close in 2006 pursuant to an agreement between the U.S. Department of Energy (DOE) and Boeing Canoga Park, the management and operating contractor for ETEC. ETEC had 11.0  $\text{m}^3$  of RH-TRU and contact-handled (CH) TRU waste in storage, with the requirement to remove this waste in 2002 in order to meet their site closure schedule.

The individual milestones for BCLDP and ETEC necessitated the establishment of site-specific programs to direct packaging and characterization of RH-TRU waste before the regulatory framework for the WIPP disposal of RH-TRU waste is finalized. The lack of large infrastructure for characterization activities, as well as the expedited schedules needed to meet regulatory milestones, provided both challenges and opportunities that are unique to small quantity sites. Both sites have developed unique programs for waste characterization based on the same premise, which directs comprehensive waste data collection efforts such that additional characterization will not be required following the finalization of the WIPP RH-TRU waste program requirements.

This paper details the BCLDP program evolution in terms of strategy, innovative solutions to waste characterization, and development of alternative transportation options. Preliminary indications from various regulatory and oversight agencies and professional organizations are that the BCLDP RH-TRU waste characterization program is the “model WIPP certification

program” and will satisfy anticipated regulatory expectations. This paper also summarizes how BCLDP lessons learned and their development of new resources were applied to the RH-TRU waste characterization and disposition program at ETEC.

## BACKGROUND

The Battelle Memorial Institute (BMI) performed atomic energy research and development for the U.S. Department of Energy (DOE) and its predecessor agencies. As a result, 15 buildings at BMI's Columbus King Avenue facility and West Jefferson North campus were radioactively contaminated. The Battelle Columbus Laboratories Decommissioning Project (BCLDP) is an initiative of BMI and the DOE-Columbus Environmental Management Project (CEMP) to decontaminate and decommission these buildings and associated grounds and to remediate the buildings and grounds to levels of residual contamination allowing future use without radiological restrictions. The decontamination and decommissioning (D&D) of West Jefferson North Buildings JN-1 and JN-4 will generate a total of approximately 27 cubic meters ( $\text{m}^3$ ) of transuranic (TRU) waste. As such, the BCLDP is considered a “small quantity site.” As directed by Congress, the BCLDP must complete D&D activities by the end of Fiscal Year (FY) 2006. This schedule requires that all TRU waste be containerized by 2002. Approximately 125 55-gallon drums of remote-handled (RH) TRU waste and approximately 9 55-gallon drums of contact-handled (CH) TRU waste comprise the entire BCLDP TRU waste inventory. The 2006 BCLDP site closure deadline requires the off-site shipment of all TRU waste by 2004.

Similarly, the Energy Technology Engineering Center (ETEC), located near Canoga Park, California, is scheduled to close in 2006 pursuant to an agreement between the DOE and Boeing Canoga Park, the management and operating contractor for ETEC. ETEC, which is also a small quantity site, had 11.0  $\text{m}^3$  of TRU waste in storage. Removal of all of the ETEC TRU waste in 2002 is a requirement for meeting this closure date. These two sites, as well as other small quantity TRU waste sites, occupy a challenging position within the DOE complex of sites characterizing TRU waste for disposal.

The Waste Isolation Pilot Plant (WIPP) is the disposal destination for the TRU waste from BCLDP and ETEC. After negotiating several complex milestones, including the resolution of legal challenges, TRU waste shipments from DOE sites to the WIPP began in 1999. More than 97 percent (by volume) of the TRU waste inventory at the sites destined for permanent disposal at WIPP is CH-TRU waste. While aggressive cleanup goals exist for small RH-TRU waste sites such as BCLDP and ETEC, site closure milestones and state agreements established for large TRU waste generator sites, plus the requirement to fill the pipeline for waste movement to WIPP, dictate a higher profile for the large sites. With the reality of a primarily CH-TRU waste inventory and the high profile closure goals for large sites, the focus of the WIPP TRU waste program is on the shipment of CH-TRU waste.

Although the development of the RH-TRU waste program is applicable to a very small portion of the DOE inventory, progress is being made. An RH-TRU waste transportation system has been established using the RH-TRU 72-B Waste Shipping Package (72-B Cask), which has been licensed by the U.S. Nuclear Regulatory Commission (NRC) for the transport of RH-TRU waste (1). With the regulatory approvals required for transportation in place, fabrication of the

72-B Cask fleet is underway. The regulatory processes required to authorize the WIPP disposal of RH-TRU waste, however, are still being finalized. The DOE-Carlsbad Field Office (CBFO) is currently in the process of proposing a program for the characterization of RH-TRU waste destined for permanent disposal at the WIPP. Characterization requirements that are specific to RH-TRU waste are currently being finalized by the DOE-CBFO to meet U.S. Environmental Protection Agency (EPA) characterization objectives per Title 40, Code of Federal Regulations (CFR), Section 194.24 (40 CFR 194.24) (2) and the WIPP Land Withdrawal Act (3). Similarly, an RH-TRU waste characterization program designed to meet Resource Conservation and Recovery Act (RCRA) characterization objectives is under review by the New Mexico Environment Department (NMED). The DOE-CBFO proposed this program as part of a request to modify the existing Hazardous Waste Facility Permit (the "Permit") issued for WIPP (4), which currently allows the characterization and disposal of only CH-TRU waste at WIPP. The Permit Modification Request for RH-TRU waste characterization and disposal is currently under consideration by the NMED.

The small quantity sites must reconcile their goals and milestones with this larger picture, the current focus of which is the CH-TRU waste program at the large sites. The individual RH-TRU waste characterization programs at BCLDP and ETEC demonstrate that small quantity sites can develop local solutions that are flexible and adaptable to changing requirements, while tracking the overall WIPP TRU waste program progress. The individual milestones for BCLDP and ETEC necessitated the establishment of site-specific programs to direct packaging and characterization of TRU waste years before the regulatory framework for the shipment and disposal of RH-TRU waste is finalized. The current EPA compliance certification decision for WIPP (2) precludes the WIPP disposal of RH-TRU waste until an adequate characterization program can be demonstrated. The DOE-CBFO submitted an application to the EPA requesting the certification of WIPP for the permanent disposal of RH-TRU waste in December 2002. In July 2002, a similar proposal for the RH-TRU waste characterization program was submitted in a request by the DOE-CBFO to the NMED for the modification of the existing WIPP Permit (4).

## OVERVIEW OF BCLDP RH-TRU WASTE CHARACTERIZATION PROGRAM

Table I summarizes the proposed characterization objectives for the WIPP RH-TRU waste characterization program.

Table I. Proposed RH-TRU Waste Characterization Objectives

Parameter	Proposed Characterization Objective
Defense Waste Determination	Determine if waste was generated by atomic energy defense activities.
TRU Waste Determination	Determine if waste contains 100 nanocuries or more of TRU isotopes per gram of waste material.
Remote-Handled Waste Determination	Confirm that the surface dose rate for a container is greater than 0.2 roentgen equivalent man per hour (rem/hr) and less than 1,000 rem/hr. Identify if the container surface dose rate is greater than 1,000 rem/hr.
Activity Determination	Confirm that the total activity of emplaced RH-TRU waste is less than 5.1 million curies, 23 curies per liter per RH-TRU waste canister.
Residual Liquids	Confirm absence of residual liquids (e.g., free water) in the disposed inventory.
EPA and RCRA Physical and Chemical Properties	Determine waste material parameters in order to account for quantities of metals and cellulose, plastics, and rubber in the disposed inventory. Determine hazardous waste numbers.

Reference: (5)

These requirements have not been finalized, and the BCLDP RH-TRU waste characterization program, thus, was designed with extensive documentation and oversight. The program conservatively requires the collection of waste data, including complete audio and videotape records of 100 percent of waste packaging, such that upon completion of waste packaging, comprehensive data records exist from which to demonstrate compliance with final WIPP RH-TRU waste characterization requirements. In addition, a rigorous quality assurance program is applied to all aspects of the implementation of the characterization program. As of November 2002, the BCLDP RH-TRU waste characterization program has been implemented for the packaging of 125 55-gallon drums of RH-TRU waste.

Because of its early development and implementation, the BCLDP RH-TRU waste characterization program has influenced the development of the proposed WIPP RH-TRU waste characterization program, as well as the characterization approaches considered by other RH-TRU waste sites. This influence is due, in part, to the active interface that the BCLDP established with the DOE-CBFO at the onset of the program development in October 1997. The initial interface, which provided forums for discussions on how to build an RH-TRU waste characterization and certification program, resulted in the DOE-CBFO approval of an RH-TRU waste certification strategy for BCLDP. During the BCLDP development of the characterization program according to the certification strategy, the BCLDP continued its dialogue with DOE-CBFO. This second phase of interface consisted of annual BCLDP formal transmittals to

the DOE-CBFO reporting on current program approaches and progress, BCLDP invitations to DOE-CBFO to attend internal assessments of the developing program, regular BCLDP participation in RH-TRU waste program teleconferences/meetings organized by DOE-CBFO, and BCLDP review of DOE-CBFO proposed RH-TRU waste characterization program documents. In addition, at regular intervals, updates of the BCLDP TRU waste characterization program progress were presented in public and professional forums. The result of the program development strategy is that the BCLDP RH-TRU waste characterization program has provided a baseline for WIPP RH-TRU waste characterization program development and lessons for consideration by other sites with RH-TRU waste inventory destined for WIPP disposal.

### **KEY BCLDP RH-TRU WASTE CHARACTERIZATION PROGRAM ELEMENTS**

Several BCLDP RH-TRU waste characterization program elements have been considered in the development of the WIPP RH-TRU waste characterization program, including the following:

- The use of acceptable knowledge (AK) as the primary characterization method. AK also is used to establish that the waste was generated by atomic energy defense activities.
- Key data are collected by applying the AK process in combination with visual examination (VE) during packaging. AK and VE during packaging are used to determine EPA hazardous waste numbers, confirm absence of liquids, and to quantify metals and cellulose, plastics, and rubber (CPR).
- Radiological characterization is accomplished by combining the AK process with a dose-to-curie conversion methodology, which includes the use of computer modeling and limited direct analysis. AK, computer modeling, and limited direct analysis are used to make TRU and activity determinations. Direct surveys are used to measure surface dose rates to determine if the waste is remote-handled.

These characterization methods were selected by BCLDP because they are appropriate to the specific waste inventory. The method implementation under the BCLDP characterization program provides conservative data points from which waste compliance with characterization objectives may be determined.

### **Acceptable Knowledge as the Primary Characterization Method**

The use of AK refers to applying knowledge of the waste in light of the materials or processes used to generate the waste. The BCLDP uses AK as the primary method of waste characterization. The AK process was the first element of the BCLDP RH-TRU waste characterization program to be established. The BCLDP has followed a logical sequence of AK development that progressed from documenting the description of historical facility operations and TRU waste stream descriptions to confirming the AK information during TRU waste packaging operations. The TRU waste stream descriptions developed using historical facility operation and waste generation information are confirmed during the VE process used in packaging TRU waste into 55-gallon drums. The historical AK information and the active process of refining this information provide the baseline method for meeting waste

characterization objectives in the BCLDP program. However, while AK provides the baseline, a second confirmatory method (e.g., VE or dose-to-curie conversion) is essential to the collection of reliable and useable data.

### **Visual Examination during Packaging for Key Data Collection**

The combination of AK and VE during packaging is used to (1) determine the absence of prohibited items, including free liquids; (2) estimate physical waste parameters, including weight percentages of metals and CPR; and (3) assign EPA hazardous waste codes. The BCLDP AK/VE process results in the documentation necessary to present a defensible and auditable record from which to certify the characterization for each TRU waste stream destined for disposal at WIPP.

BCLDP visually examines the contents of every waste container as it is generated to confirm the physical content as characterized during the AK process. BCLDP documents the examination on audio and videotape and on waste inventory packaging logs. In addition, two VE experts independently perform the confirmation of AK characterization by observing the packaging of waste items into a 55-gallon drum. As previously stated, the primary objective of the BCLDP program is to ensure that the resulting confirmation documentation is sufficient to meet the developing RH-TRU waste program requirements.

In addition to documenting every item placed in each container, the BCLDP uses an audio and videotape system during waste packaging to meet the WIPP requirements for visually examining and documenting the physical contents. The videotape system involves the use of one stationary camera and one remote camera. The BCLDP Waste Certification Official reviews the video tapes and waste inventory packaging logs. The system creates an audio and videotape record that can be easily reviewed if any questions arise about a container or a specific waste item in a container. The videotape will allow for future visual re-inspection of packaged items, if necessary, and minimize personnel exposure associated with re-handling of waste materials.

### **Dose-to-Curie Conversion for Radiological Characterization**

AK combined with computer modeling and/or assay results is used to determine the isotopic content of waste. For the purposes of radiological characterization, BCLDP RH-TRU wastes are classified as two waste populations based on whether the waste was contaminated by the isotopes associated with routine operations in the laboratory (Standard Isotope Mix) or another mix of isotopes associated with non-routine activities or processes. The Standard Isotope Mix is determined for waste materials from specific facility areas through the use of AK combined with software modeling. For any waste population that cannot be included in the Standard Isotope Mix, radiological characterization is accomplished by AK combined with direct waste analysis.

The general process for using *AK combined with software modeling* to characterize the radiological content of a waste container as the Standard Isotope Mix is as follows:

1. The Standard Isotope Mix is a combination of isotopes measured in 69 representative samples and modeled using ORIGEN2.1.
2. A known quantity of the Standard Isotope Mix is modeled by computer model, QAD-CGGP-A, for a 55-gallon drum.
3. The computer model (QAD-CGGP-A) produces a measured dose rate for a modeled 55-gallon drum of a given weight at a specified measurement point.
4. The external gamma dose rate and weight of an actual waste drum are measured.
5. The measured dose rate is compared to that of a known activity for the modeled drum.
6. By setting the ratios of dose-to-activity equal for the waste drum and the modeled drum, the total activity within the waste drum is calculated.
7. The total activity within the waste drum is then divided into constituent isotopes by multiplying the total activity by the isotopic ratios established by the Standard Isotope Mix.

*AK combined with direct analysis* is used to determine the radiological characterization for any waste stream that cannot be included in the Standard Isotope Mix. In this case, radiological characterization is based on direct sampling and data ratioed from sampling and/or modeling based on AK. AK is combined with radiological measurements collected on a sampling basis to determine a waste stream total activity.

The assignment of either the Standard Isotope Mix or another mix is verified through confirmatory testing as required by 40 CFR 194.22(b). The BCLDP confirmatory testing process includes a sampling plan that defines the applicability of any sampling data collected for other purposes and the collection of additional samples as necessary to ensure that smear samples are collected from locations that are representative of the waste population. The results of the evaluation of radiological characterization are documented in an AK confirmation report.

## **INFLUENCE ON WIPP RH-TRU WASTE CHARACTERIZATION PROGRAM DEVELOPMENT AND OTHER SITE RH-TRU WASTE CHARACTERIZATION PROGRAMS**

Based on the success of BCLDP data collection performed using AK combined with VE during packaging, the baseline approach for the WIPP RH-TRU waste characterization program evolved to:

- Rely on auditable AK records as the primary waste characterization method
- Include the process of performing VE during packaging in combination with AK as a method for the collection of key data.

Based on the success of BCLDP application of AK information to estimate radiological parameters by the dose-to-curie methodology, the WIPP RH-TRU waste characterization program baseline approach evolved to specifically describe "Dose-to-Curie Conversion" as an

allowable compliance method for the estimation of activity, including the use of ORIGEN2.1 in computer modeling.

BCLDP's procedures for the development of RH-TRU waste AK have provided general guidance for similar AK development at ETEC. ETEC developed a comprehensive procedure for the collection, evaluation, and documentation of AK information. The resulting AK record provides information that is of sufficient type, quality, and quantity with which to characterize the ETEC TRU waste streams. Multiple procedures or source records were used to determine and corroborate most characterization parameters. In most cases, VE during repackaging has been used to supplement the AK record. The AK record includes physical, chemical, and radiological sampling and analysis results that were obtained under NQA-1 and an ongoing ISO 9001 compliant program. As the ETEC TRU waste inventory is smaller and of a different type and origin than the BCLDP inventory, the ETEC TRU waste characterization program has some significant differences. For example, the ETEC waste has a large volume of historical, waste-specific AK documentation, is lower in specific activity, and contains a homogeneous component that enabled some characterization by direct sampling. As with the BCLDP program, the ETEC program was designed to apply a characterization process that is appropriate for the specific waste inventory. The application of the AK process is based on the same premise used by BCLDP, which directs the collection of comprehensive waste data such that additional characterization will be minimized following the finalization of the WIPP RH-TRU Waste Program requirements. While additional data may be required for certification for WIPP disposal (depending upon final Permit requirements), the available AK is adequate for the characterization of the ETEC waste for shipment, and was determined to be acceptable for receipt and TRU waste management at Hanford. As dictated by the aggressive site closure milestones, off-site shipment of the waste was ETEC's primary concern.

## **BCLDP RH-TRU WASTE TRANSPORTATION PROGRAM**

The initial approach for RH-TRU waste transportation to WIPP was to use the 72-B Cask. The 72-B Cask, a Type B packaging certified by the NRC, is designed to transport one RH-TRU waste canister, either directly loaded with waste or overpacking three 55-gallon drums (1).

As a contingency plan, and to expedite RH-TRU waste shipments off-site by the end of 2002, BCLDP investigated the 10-160B Cask as an alternative transportation option. The 10-160B Cask, pictured in Figure 1, is designed to transport 10 55-gallon drums. The 10-160B Cask was originally intended for use by the utility market as a Type B low-level waste transportation cask. In 2000, the BCLDP led an initiative to prepare an application to the NRC requesting an amendment to the 10-160B Cask Certificate of Compliance (C of C) to change the allowable contents to include RH-TRU waste generated by the DOE. In February 2001, the NRC issued Revision 6 of the C of C authorizing the transport of RH-TRU waste from BCLDP in the 10-160B Cask.





**Fig. 1. 10-160B Cask**

While the application for authorization of the 10-160B Cask for the shipment of BCLDP RH-TRU waste was under review by the NRC, the BCLDP prompted mock demonstrations of the 10-160B Cask at the BCLDP facility and at the RH Bay at the WIPP facility. The demonstration conducted at the BCLDP facility successfully showed that the 10-160B Cask could be loaded using remote-handling equipment. The objectives of the demonstration conducted at the WIPP facility included unloading the cask using existing equipment and facilities at the WIPP RH Bay, removing the cask from the transportation trailer, and using the Hot Cell in the WIPP RH Bay as the preferred alternative for cask unloading and overpacking of three 55-gallon drums in a WIPP disposal canister. This demonstration successfully met its objectives. The persistence of the BCLDP in securing the allowed use of the 10-160B Cask provided an immediate transportation option for its waste.

#### **INFLUENCE ON WIPP RH-TRU WASTE TRANSPORTATION PROGRAM DEVELOPMENT AND OTHER SITE RH-TRU WASTE TRANSPORTATION PLANS**

Based on the effective demonstration of the 10-160B Cask as an alternative by BCLDP, the WIPP RH-TRU waste program baseline approach proposes the permitting of the receipt and handling of the 10-160B Cask at WIPP. Inclusion of this component in the proposed WIPP RH-TRU waste program allows other sites to consider the 10-160B Cask as a transportation option for TRU waste destined for WIPP disposal.

Following the successful NRC application authorizing the transport of BCLDP RH-TRU waste in the 10-160B Cask, the DOE Oakland Operations Office and ETEC initiated the preparation of

an application to the NRC to qualify additional TRU waste payloads as authorized contents for the 10-160B Cask. This application, which described additional RH- and CH-TRU waste contents from ETEC, the Missouri University Research Reactor, Lawrence Livermore National Laboratory, and BCLDP, was submitted for NRC review in June 2002. The application proposed the option for mixing multiple content codes in a single payload, thus enhancing payload efficiency and minimizing the number of shipments required. In October 2002, the NRC issued a revision of the 10-160B C of C authorizing RH-TRU and CH-TRU waste payloads from these sites (5). As such, the BCLDP's development of an alternative transportation resource has expanded the options available to other RH-TRU waste site programs.

## **INTERIM STORAGE PROPOSAL**

In order to meet the site closure schedule, it became necessary for BCLDP to ship TRU waste to a temporary storage location prior to shipment to WIPP for final disposal. To this end, the DOE-Ohio Field Office and the DOE-CBFO jointly purchased a 10-160B Cask in November 2001, and then pursued site approval for shipment to the DOE Hanford site located in the State of Washington. The BCLDP was previously certified by the site as a generator/shipper of low-level waste (LLW) for Hanford disposal. In 2002, in accordance with the site waste acceptance criteria, Hanford approved the BCLDP as a generator/shipper of TRU waste for interim storage at Hanford. The BCLDP has initiated a plan to transport its RH-TRU waste inventory in the 10-160B Cask to the Hanford site for subsequent shipment to WIPP.

The Hanford site has a shielded storage area and a high bay with equipment capable of unloading/loading the 10-160B Cask. In 2001, the BCLDP developed an implementing procedure, in cooperation with Hanford and Duratek, to unload/load the 10-160B Cask and facilitated a dry-run demonstration of that procedure. Operational readiness review demonstrations were completed at BCLDP and Hanford in 2002. These demonstrations were followed by the successful 10-160B Cask transport and receipt of LLW from BCLDP to Hanford.

A memorandum of agreement (MOA) supporting these RH-TRU waste shipments was approved by the DOE-Ohio Field Office, DOE-CBFO, and DOE-Richland. BCLDP plans to use a 10-160B Cask shipping campaign, which will transport the entire inventory of RH-TRU waste to Hanford for interim storage. The shipping campaign will use the DOE-owned cask and a second cask to be leased by the BCLDP. The simultaneous use of two casks will reduce the number of state notifications and contracting costs required for loading of the casks. The two cask shipping campaign also reduces the time required for the crane setup used at Hanford for 10-160B Cask unloading operations. The first shipment of RH-TRU waste from the BCL West Jefferson site to Hanford for interim storage took place in December 2002.

## **INFLUENCE ON OTHER SITE RH-TRU WASTE REMOVAL STRATEGIES**

ETEC had also been aggressively pursuing the intersite transfer of its TRU waste inventory to a large DOE site for interim storage and ultimate certification for WIPP disposal, in parallel with the BCLDP effort. This path forward was examined in detail as part of the DOE's Environmental Management Integration Program, and ultimately led to the identification of

Hanford as the optimal interim storage site. ETEC is also an approved generator/shipper for LLW disposal at Hanford. DOE-Oakland (the DOE Operations Office responsible for ETEC) lent its support to the MOA process initiated by DOE-Ohio for waste transfer to Hanford, and committed to the use of the 10-160B Cask at the time of its acquisition. ETEC was also approved in 2002 as a generator/shipper of TRU waste to Hanford for interim storage.

ETEC faced some additional regulatory challenges for moving its TRU waste. One was the Waste Management Programmatic Environmental Impact Statement Record of Decision (ROD), directing waste transport only to WIPP. That was resolved by the preparation and approval of an amendment to the ROD for the transfer of both the ETEC and BCLDP TRU waste to Hanford for storage prior to planned disposal at WIPP. A second challenge was the presence of an aqueous sludge as one component of an ETEC RH waste stream which contains regulated quantities of polychlorinated biphenyls (PCBs). Liquids cannot be shipped in the approved TRU shipping packages, while the Environmental Protection Agency's (EPA's) Toxic Substance Control Act (TSCA) regulations prohibit the solidification of PCB liquids to avoid incineration. An EPA enforcement discretion letter was prepared and approved through the DOE that allowed solidification for transportation to Hanford. After receiving other required approvals, all of the ETEC TRU waste was shipped to Hanford in two leased 10-160B Casks in December 2002.

Based on the shipment strategy developed by BCLDP, the DOE-CBFO is considering the use of the 10-160B Cask for other TRU waste generator sites, for both CH- and RH-TRU waste. In addition to the successful use of the 10-160B Cask for the ETEC CH- and RH-TRU waste transfer to Hanford, other sites that have been considered are the Missouri University Research Reactor, Lawrence Livermore National Laboratory, Argonne National Laboratory-East, and Idaho National Engineering and Environmental Laboratory.

## **SUMMARY**

The lack of large infrastructures for certification program development, as well as the expedited schedules needed to meet regulatory milestones, provides both challenges and opportunities that are unique to small quantity sites. In addition, sites with RH-TRU waste inventory destined for WIPP disposal do not have final WIPP acceptance criteria to guide waste characterization program development at this time. Although challenged as small quantity RH-TRU waste sites, BCLDP and ETEC have taken the lead in demonstrating to the DOE TRU waste complex how local efforts aligned with a global program can successfully meet aggressive waste management goals and come up with innovative solutions to waste characterization and transportation.

The BCLDP RH-TRU waste characterization program was designed to generate a comprehensive data set from which compliance with any final WIPP acceptance criteria may be met, and has been embraced by the DOE. Since the initiation of its development in 1998, the program has been tested against multiple characterization objectives proposed during the finalization of the WIPP requirements. The data collected under the BCLDP program have been sufficient to demonstrate compliance in accordance with each set of characterization objectives proposed to date. In some cases, the BCLDP available data exceeded the data needs required to meet proposed characterization objectives. During this process, the BCLDP TRU waste characterization program has evolved in terms of program strategy, innovative solutions to waste

characterization, and development of alternative transportation options. Preliminary indications from various regulatory and oversight agencies and professional organizations are that the BCLDP RH-TRU waste characterization program is the “model WIPP certification program” and will satisfy anticipated regulatory expectations. The concept was successfully tested with the acceptance of a 10-160B Cask shipment of BCLDP RH-TRU waste at Hanford for interim storage.

The BCLDP has paved a path forward for other small quantity TRU waste sites faced with similar challenges, in particular, that of expedited schedules needed to meet regulatory milestones. The application of BCLDP lessons learned in tailoring an RH-TRU waste program is evident in the case of ETEC. The ETEC waste characterization program has several differences, based on different types of inventory, a different historical knowledge base, and a different initial disposal strategy (intersite transfer), but was constructed with similar rigor. The intent of the ETEC program is also to minimize any requirements for additional characterization when the WIPP RH-TRU Waste Permit modification is approved. ETEC followed the lead of BCLDP in planning for the use of the 10-160B Cask for TRU waste shipments, and was provided a shipping opportunity in December 2002. That resulted in the successful transfer of the entire ETEC TRU waste inventory to the Hanford site.

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