LA-UR-02-463

Approved for public release; distribution is unlimited.

c.1

Title: Characterization Optimization for the National TRU Waste System

Author(s): G. Basabilvazo and Sue Countiss
U.S. Department of Energy
Carlsbad Field Office

David Moody, Stephanie Jennings and Sheila Lott
Los Alamos National Laboratory
Carlsbad Operations

Submitted to: SPECTRUM 2002. Ninth Biennial International Conference on Nuclear and Hazardous Waste Management
Reno, Nevada
August 4-8, 2002

Los Alamos
NATIONAL LABORATORY

CHARACTERIZATION OPTIMIZATION FOR THE NATIONAL TRU WASTE SYSTEM

G.Basabilvazo, S.Countiss
U.S. Department of Energy Carlsbad Field Office
4021 National Parks Highway
Carlsbad, NM 88221

D. Moody, S. Jennings, S Lott
Los Alamos National Laboratory-Carlsbad Operations
115 North Main
Carlsbad, NM 88220

INTRODUCTION

On March 26, 1999, the Waste Isolation Pilot Plant (WIPP) received its first shipment of transuranic (TRU) waste. On November 26, 1999, the Hazardous Waste Facility Permit (HWFP) to receive mixed TRU waste at WIPP became effective. Having achieved these two milestones, facilitating and supporting the characterization, transportation, and disposal of TRU waste became the major challenges for the National TRU Waste Program.

Significant challenges still remain in the scientific, engineering, regulatory, and political areas that need to be addressed. The National TRU Waste System Optimization Project (1) has been established to identify, develop, and implement cost-effective system optimization strategies that address those significant challenges. Fundamental to these challenges is the balancing and prioritization of potential regulatory changes with potential technological solutions. This paper describes some of the efforts to optimize (to make as functional as possible) characterization activities for TRU waste.

Description of TRU Waste Flow in the Current National TRU Waste System

The national TRU waste system is extensive and complex. In simple terms it can be viewed as systems in series directing flow of TRU wastes from waste generator/storage sites to WIPP.

The TRU waste system is seen in Figure 1 as a large waste stream system connecting the movement of waste from each of four summary waste streams at a TRU waste site to the WIPP repository. The depicted waste levels in each summary category are roughly proportional to waste stream quantities in the inventories at the Rocky Flats Environmental Technology Site (RFETS).

Each step that in some way regulates waste flow—such as a characterization and certification step—is depicted as a "block" in the diagram. Note that the blocks for each individual waste stream are arranged in series rather than in parallel and are not necessarily in a particular sequence. Thus each block provides a potential barrier to TRU waste shipment and disposition at WIPP even if all the others are completely functional. Optimizing the waste stream flow involves opening each block completely in an interactive, balanced manner (through critical path analysis) for summary waste streams, or eliminating the block if its purpose is determined to be unnecessary (i.e., has no safety or compliance basis).

RH TRU waste has not been shipped to WIPP to date; however, the RH TRU waste permit request and EPA notification process are being prepared.

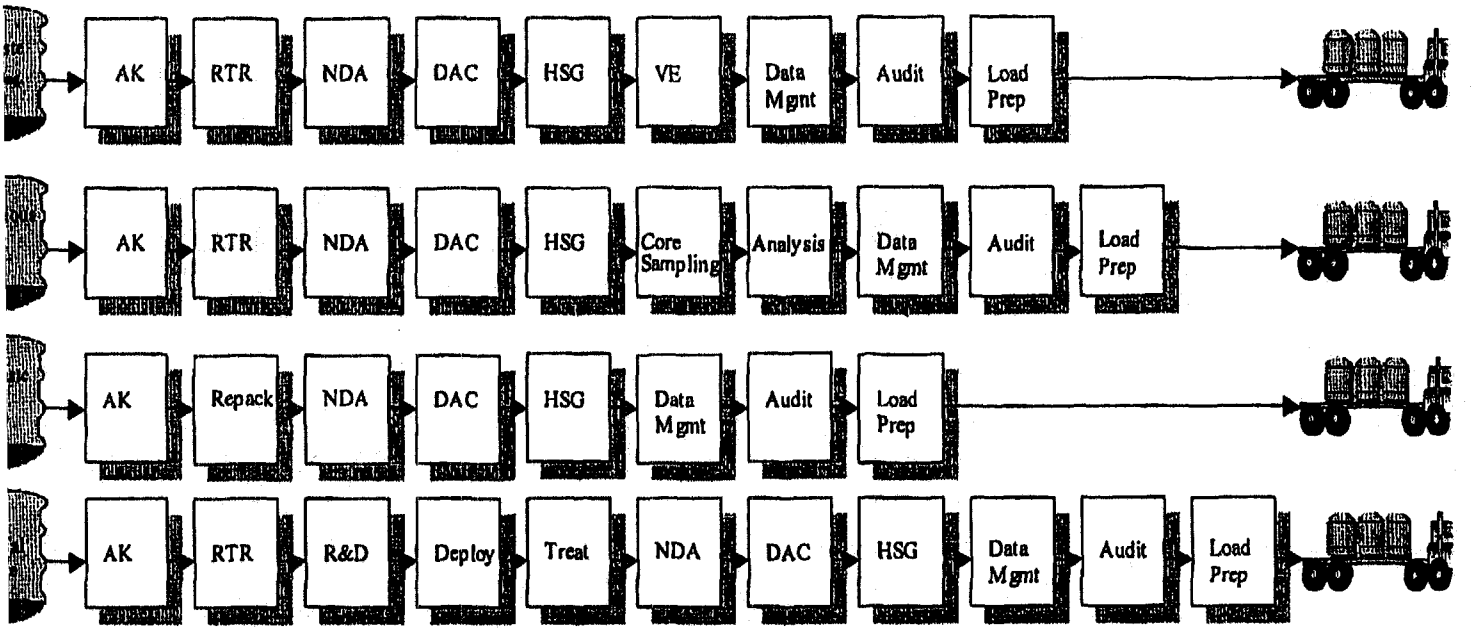

Figure 1. Conceptual Diagram of Current Contact-Handled (CH) Waste Flow Between TRU Waste Sites and WIPP

Optimized TRU Waste Flow with Characterization Confirmed at WIPP

The goal of the Optimization Project is to increase the operational efficiencies of the national TRU waste system to allow faster, less costly disposal of TRU waste at WIPP while maintaining safety. Each characterization activity depicted in Figure 1 is being addressed: acceptable knowledge, radiography, nondestructive assay, headspace gas sampling and analysis, visual examination, data management, and coring and analysis.

Acceptable Knowledge (AK): The first step in characterizing and certifying TRU waste for disposal at WIPP is to evaluate process knowledge and assemble the AK documentation. The

proposed end state is a performance-driven, streamlined, and standardized AK process across the national TRU waste system (all 23 sites) for both CH and RH TRU waste. The plan to standardize AK requirements involves developing AK documentation, testing it at several SQSs, and then implementing it at the other SQSs and ultimately at the LQSs.

Radiography: The WIPP HWFP codified the use of radiography by requiring that it be performed on all drums of legacy TRU waste as a confirmation of AK. Radiography without the requirement for container-specific material parameter weights (MPW) estimates is the proposed end state. It will be necessary to show that there is no impact on the performance assessment. A request for HWFP modification will be submitted to the NMED to remove the container-specific estimate of MPW as a requirement.

A radiography system for hot-cell operations to support RH TRU waste characterization for waste streams with insufficient AK is also needed.

Nondestructive Assay (NDA): NDA is performed on all CH TRU waste containers—legacy and newly generated—with systems that have passed the Performance Demonstration Program (PDP) and have been audited and certified for each waste form to be disposed at WIPP.

The primary objective is to ensure that NDA requirements for CH TRU waste are based on valid technical or safety-related justifications. Existing quality data from any waste containers (such as safeguards data that already exist on large numbers of drums at RFETS) and using historical data where appropriate should ensure that the requirements are met. This performance-driven

approach meets the safety requirements of transportation and repository operations and provides the necessary information for the WIPP performance assessment.

Another NDA objective is to provide the necessary NDA capability for assay of large packages so that repackaging is minimized across the complex, and the proposed end states described above are also applicable to the establishment of a remote-handled (RH) TRU waste NDA program.

Headspace Gas (HSG) Sampling and Analysis: HSG sampling and analysis of volatile organic compounds (VOC) on all TRU waste drums was originally required by the HWFP, but has recently been modified to allow statistical sampling of thermally treated wastes because VOCs will be driven off by the thermal process.

The proposed end state is a performance-driven approach for directly measuring VOC levels in the WIPP repository and for measuring overall repository emissions. This proposal requires direct monitoring only of VOCs in the WIPP repository and eliminates the need for costly HSG sampling of each drum destined for WIPP. CH TRU waste transportation requirements for hydrogen and other flammable gases will be met through AK and verified. An HWFP modification will be submitted to NMED to install VOC monitoring systems to directly measure the actual parameters of interest in the WIPP repository.

Visual Examination: The WIPP HWFP currently requires that a statistically selected number of TRU waste containers be opened and visually inspected to confirm both the physical form of the

CONCLUSION

Optimization is a dynamic continuing process improvement. The overarching goal of the Optimization Project is to increase National TRU Waste System efficiencies sufficiently to enable the NTP to dispose of the legacy TRU waste 10 years early—and saving the nation an approximate $7B. It is essential that waste characterization activities efficiently and cost effectively help the CBFO to achieve its vision of removing all TRU waste from DOE closure sites, to dispose all legacy TRU waste from DOE TRU waste sites with an ongoing nuclear mission, and to certify all newly generated TRU waste as it is generated.

Reference:

1. National TRU Waste System Optimization Plan, Draft, DOE/CBFO-Second Draft-3201, December 2001