

Project Plan, Status, and Lessons Learned for the LANL 3,706 m³ TRU Waste Campaign – 13085

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ABSTRACT

The Los Alamos National Laboratory (LANL) is currently engaged in a campaign to disposition 3,706 m³ of transuranic (TRU) waste stored above grade at its Technical Area 54 (TA-54) Area G waste management facility before June 30, 2014. This campaign includes complete removal of all non-cemented above-grade TRU waste that was in storage on October 1, 2011, and is defined as 3,706 m³ of material. TRU waste containers were placed into storage up to 40 years ago, and most of the older containers must be remediated to address compliance issues before the waste can be characterized, certified as meeting the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC), and shipped for disposition. More than half of the remaining TRU waste volume stored above grade is contained within oversize boxes that contain waste items that must be repackaged or size reduced. Facilities and major types of equipment needed to remediate and characterize the TRU waste inventory include two additional oversize box processing lines that are being brought into service as Nuclear Hazard Category III facilities in fiscal year (FY) 2013. Multiple work shifts are scheduled for most remediation lines in FY 2013. An integrated risk-based project management schedule for all disposition activities has been developed that is based on a "Solution Package" approach. Inventories of containers that have issues in common were compiled into about 15 waste categories and about 75 "Solution Packages" that identify all of the activities needed to disposition the inventory of TRU waste in storage. Scheduled activities include all precursor activities to begin remediation, remediation processing, characterization and certification to the WIPP WAC, and shipping of containers to WIPP. Other industrial processing practices that have been adopted to improve efficiency include staging of containers for remediation, characterization, and shipping; establishment of a transportation center; and load management practices for transportation payloads. Progress and accomplishments during FY 2012 are reviewed, and plans for FY 2013 are presented in some detail. Lessons learned on adoption of industrial processing practices are also discussed.

INTRODUCTION

A large wildfire called the Las Conchas Fire burned more than 61,000 hectares (150,000 acres) south and west of LANL during June and July of 2011. The fire came within about 6 kilometers (3.5 miles) of LANL's TA-54 Area G waste management facility, and heightened public concern for TRU waste stored above grade at LANL. New Mexico Governor Susana Martinez requested that the Department of Energy (DOE) National Nuclear Security Administration (NNSA) accelerate removal of above-grade TRU waste stored at LANL. On January 5, 2012, the DOE/NNSA and State of New Mexico Environment Department (NMED) announced a "Framework Agreement" for realignment of environmental priorities at LANL [1]. Under the agreement, LANL will complete removal no later than June 30, 2014, of all non-cemented above-grade TRU waste that was in storage at Area G on October 1, 2011. This was defined as 3,706 m³ of TRU waste material. The DOE/NNSA also agreed to complete removal of all newly-generated TRU waste received at Area G during FY 2012 and 2013 by no later than December 31, 2014, and to complete removal of above-grade cemented TRU waste in an efficient and effective manner.

The LANL TRU waste inventory is composed of a variety of waste forms (debris, sludges, cemented wastes, contaminated metal items, soils, etc.) and a variety of container sizes. Container sizes include 55 gallon drums, 30 gallon drums, drums overpacked into 85 gallon or 100 gallon drums, standard waste boxes (SWBs) with a capacity of 1.89 m³, fiberglass-reinforced plywood (FRP) boxes of various sizes (some as large as 57 m³ in volume each), metal boxes of various sizes, and metal spheres up to about 1.8 m (6 feet) in diameter. Most TRU waste containers stored above grade at Area G are inside large fabric covered storage domes (Figure 1).



Fig. 1. TRU waste containers stored at Area G

Table I presents a summary of the inventory of containers included in the 3,706 m³ TRU waste campaign at the start of the campaign. Drums make up about 90% of the total number of containers and about 85% of the radioactivity as expressed in plutonium-239 equivalent curies (PE-Ci). Although boxes and SWBs make up only about 10% of the number and 15% of the activity, they make up 75% of the volume of containers in the campaign.

TABLE I. TRU waste containers in the 3,706 m³ campaign

Type of Container	# of Containers	Volume (m ³)	Activity (PE-Ci)
Drums	4,033	905	34,733
Boxes and SWBs	462	2,801	6,352
Totals	4,495	3,706	41,085

LANL began segregating and storing TRU waste more than 40 years ago, and most of the older containers of all types have issues that require the containers to be remediated or repackaged before the containers can be characterized for shipment to WIPP. Issues include items that are prohibited at WIPP (such as free liquids, aerosol cans, and sealed containers greater than 4 L in size), unvented containers, containers that exceed activity or fissile gram equivalent (FGE) limits at WIPP, and containers that do not qualify for WIPP disposal. At present, only 55 gallon drums and SWBs can be shipped from LANL to WIPP, and TRU waste in other size containers must be repackaged into 55 gallon drums and SWBs. Very few (below 1%) of the newly-generated TRU waste containers have issues and those containers go directly to WIPP characterization and certification by the Central Characterization Project (CCP) at LANL.

The LANL strategy over the past several years has been to develop and implement additional remediation, characterization, and shipping capabilities that are necessary to disposition the LANL TRU waste inventory [2]. This has included additional processing lines as well as upgrades in the nuclear safety basis for the capabilities to handle waste with higher PE-Ci content or material at risk (MAR). LANL has also greatly improved availability of TRU waste disposition processes through systems upgrades, strict conduct of operations, greater emphasis on preventative maintenance, and maintaining spare parts on hand for critical equipment [3].

As noted, most of the older TRU waste containers must be remediated before characterization for WIPP certification can begin, and remediation was a severe bottleneck to disposition in the past because only one facility was available to repackage drums and it had very low PE-Ci limits. That facility was first upgraded to process a group of drums with up to 300 PE-Ci, and has now been upgraded to handle drums up to 800 PE-Ci. Two additional process lines were established for drum remediation within Area G. One of those was converted to box processing in 2011 and was upgraded for higher PE-Ci boxes in 2012. The second drum remediation line at Area G was converted to box processing in 2012, also with the capability for higher PE-Ci boxes. A new box processing facility for very large boxes has been constructed and will be operational in the second quarter of FY 2013. A drum venting capability was also installed and became operational during 2012.

The need for additional characterization capabilities was also identified and these have also been implemented. Characterization and certification of TRU waste containers for shipping to WIPP is conducted at LANL by the CCP, which is a program provided under contract to the DOE

Carlsbad Field Office (CBFO) through Nuclear Waste Partnership, LLC. The CCP services consist of acceptable knowledge (AK) compilation and reporting, data generation, project level validation and verification, records management, and document control. Characterization equipment operated by CCP and its subcontractors at LANL consists of nondestructive examination (NDE) using real-time radiography (RTR) units and a high-energy RTR unit, nondestructive assay (NDA) using High Efficiency Neutron Counter (HENC) units and a SuperHENC unit, and headspace gas sampling (HSG) and analysis, including SUMMA[®] sampling.

The CCP coordinates and supports audits by the EPA and the CBFO to maintain certification of the TRU waste characterization and certification program, including audits for new or refurbished characterization equipment. When requested by LANL, the CCP also conducts pre-screening of containers to assist in determining remediation requirements for specific containers.

PROJECT PLAN FOR 3,706 m³ CAMPAIGN

The five core functions of Integrated Safety Management provide the foundation for all work performed at LANL. These consist of:

1. Define the scope of work;
2. Identify and analyze hazards associated with the work;
3. Develop and implement hazard controls;
4. Perform work within controls; and
5. Provide feedback and continuous improvement.

These functions are used to ensure better performance in both safety and security, and a similar approach was also used in developing the plan for TRU waste disposition by addressing “container issues” rather than hazards.

Issues have been identified for almost all containers of TRU waste in storage at Area G that require specific types of remediation processing before the containers can undergo characterization for WIPP certification. The activities required to complete processing for containers with a specific type of issue make up what we have called a “Solution Package.” The inventory of waste containers within major TRU waste categories was segregated into lists of containers that have issues in common so that the containers with the same type of issue are processed as a group. A total of 40 Solution Packages have been developed to address the range of issues among the containers in the 3,706 m³ campaign inventory.

A detailed project management schedule was developed for the 3,706 m³ campaign based on the use of the Solution Package approach. The activities scheduled within each Solution Package include precursor activities for remediation of waste containers, the remediation or repackaging processing activities, and the characterization, certification, and shipping activities that follow remediation processing. Precursor activities include any needed facility modifications or

equipment upgrades, procedure changes, nuclear safety basis changes, permitting changes, and drum venting. It is particularly important to identify required safety basis and permitting activities well in advance because of the time required to develop and gain approval of these changes.

Characterization activities scheduled in each Solution Package consist of NDE in either the RTR or HE-RTR, NDA in either the HENC or SuperHENC, flammable gas analysis, and sampling of solids for hazardous waste constituent analysis where needed. Where needed, prescreening of containers by CCP is also scheduled. This approach ensures that remediation, characterization, and shipping activities are aligned in the schedule. The Los Alamos Site Office and LANL personnel worked closely with the CBFO and CCP personnel on development of the duration of activities for characterization, certification, and shipping in the schedule.

A primary focus of the project plan is to maximize operational time in the remediation facilities by making sure that everything is in place to begin processing of containers in a Solution Package as scheduled and by minimizing downtime between Solution Packages. Multiple work shifts are also scheduled for remediation facilities during FY 2013. Work at each of the remediation facilities is scheduled so that processing for the next Solution Package begins as soon as processing for the Solution Package in progress is completed. Processing of the next category of waste for a facility is scheduled as soon as the last Solution Package for a category of waste is completed. Solution Packages are each assigned to an individual who defines the detailed scope and processing, and “manages” the containers that make up the Solution Package through processing from remediation to shipping. Detailed Solution Package Scope Definition documents are being prepared well before the start of processing of each Solution Package to define precursor activities as described above and to forecast commodities (such as drums, SWBs, and pipe overpack containers) that will be required. Documents have been completed for 33 of the 40 Solution Packages in the 3,706 m³ campaign at this time.

Figure 2 summarizes the cumulative volume of TRU waste to be removed from LANL under the 3,706 m³ campaign project plan. Volumes represent the volume of the original containers; where repackaging of a container results in additional daughters then all daughters must be shipped before the parent volume is credited. The commitment to the NMED reflects removal of 800 m³ by the end of the fourth quarter (Q4) of FY 2012, an additional 1,800 m³ (cumulative total of 2,600 m³) by the end of FY 2013, and the remaining 1,106 m³ of the total 3,706 m³ before the end of the third quarter of FY 2014. This plan at the beginning of FY 2012 is reflected by the dashed black line in the figure. The blue line shows actual performance through the end of December 2012 (total of 1,165 m³ removed). The green line shows performance through the end of the campaign that is forecast based on the current schedule (total of 3,117 m³ forecast at the end of FY 2013 as compared to 2,600 m³ in the original plan). Improvements that have been implemented and planned to achieve this level of performance are discussed below.

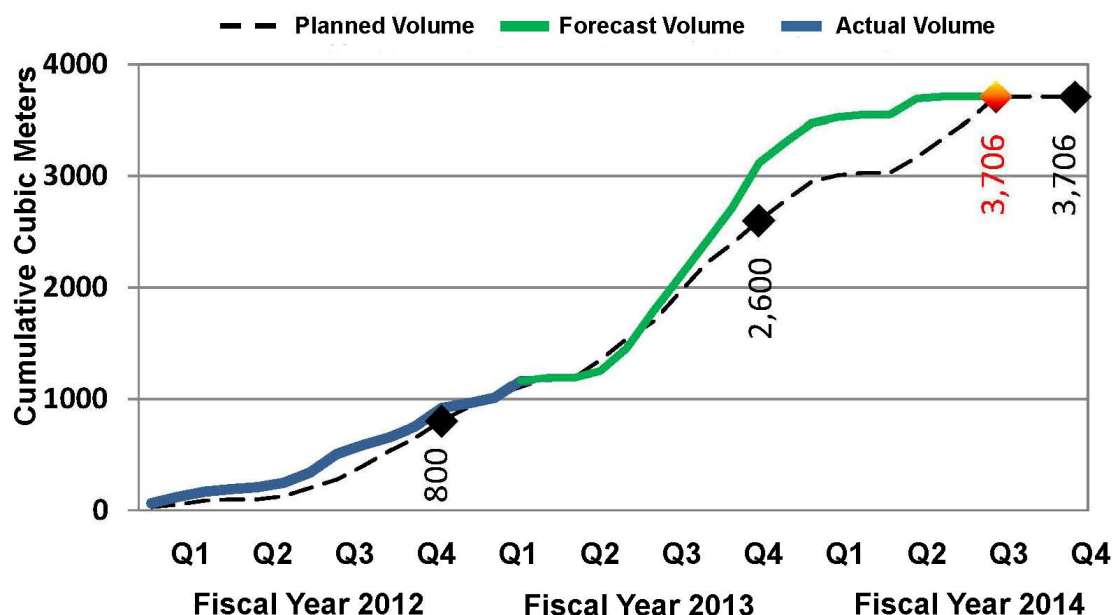


Fig. 2. Removal of TRU Waste Volumes in 3,706 m³ campaign

Continuous Improvement to Create Efficiencies and Accelerate Schedule

We believe that a strong safety culture leads to strong performance, and we have implemented a number of initiatives with a goal of zero accidents that have greatly reduced recordable injuries and lost time incidents. These include:

- A growing Behavior Based Safety observation program in which workers observe other workers for safe work practices;
- Increased management involvement in the field by a Management Observation and Verification Program;
- Increased management support for a very active and effective Worker Safety and Security Team; and
- Monthly all-hands safety meetings to discuss safety issues and actions that are being taken to address them, lessons learned, injury statistics, and specific information on accidents.

These initiatives contributed to completion of 294 days and 900,000 work hours without a lost time accident in the LANL TRU Program.

Early in the 3,706 campaign, a new warehouse approach was implemented to organize storage of TRU waste containers by Solution Package and create staging areas for waste containers to feed containers into specific process units for remediation, characterization, and shipping. Storing containers by Solution Package results in movement of containers only when they are being processed and largely eliminates unnecessary movement of containers to reach containers needed for processing. Emphasis is placed on ensuring that sufficient containers are staged near

processing units to eliminate process teams waiting for containers. After characterization is complete, containers are staged in a storage dome so that they can be readily organized into payload assemblies for transport to the RANT Facility where payload assembly and loading into TRUPACT-II shipping containers (Nuclear Regulatory Commission Type B casks) is conducted.

The CCP continues to expand characterization capabilities to increase efficiency, redundancy, and to help to minimize the repackaging required. The capabilities of the SuperHENC and one of the HENC units were expanded this past year to include higher density waste in SWBs and lead-lined drums respectively. The CCP is currently working with CBFO and the Environmental Protection Agency (EPA) to develop the *In Situ* Object Counting System (ISOCS™) as a certified characterization system at LANL to allow for characterization and certification of TRU waste packaged in Standard Large Box 2 (SLB2) containers. A capability to repackage FRP boxes into SLB2 containers rather than SWBs would significantly reduce the amount of size reduction that would be required for large items such as gloveboxes that are contained within FRP boxes. Use of the ISOCS™ system for prescreening could also help identify oversize boxes that do not have TRU waste levels of contamination before repackaging of the boxes.

A transportation center has been established in an area adjacent to the RANT Facility, and LANL is working with CCP to pre-stage shipping containers and trailers at the transportation center to minimize “just in time” shipping from LANL to WIPP. Coordination with CBFO on TRUPACT-II trailers has also been improved.

Improved load management practices have been implemented at the RANT Facility that allow LANL to pre-stage payload assemblies to increase shipping capabilities. Changes include use of an electric trailer jockey to minimize flammable materials within the facility, a nuclear safety basis change to allow increased MAR within the facility, and developing a permit modification to the RANT hazardous waste facility permit to request an increase in the permitted storage capacity. The goal is to establish a capability to stage two or three shipments to WIPP.

Performance Metrics

Performance reports on the 3,706 m³ campaign are submitted quarterly to the NMED and the public. Performance metrics have been developed for TRU waste volume removed from LANL and for risk reduction by removal of MAR from the site. Metrics have also been developed that focus on the Solution Package concept to reinforce completing processing of all containers in a Solution Package before beginning processing of containers in the next Solution Package. Performance is measured based on decrementing parent container inventory only after all daughter containers that resulted from the parent are shipped. This has resulted in an improved inventory accounting system for TRU waste containers.

LASO and the CBFO have established performance metrics that are shared by LANL and WIPP

contractors. This has resulted in improved teamwork by the contractors.

CURRENT STATUS

LANL has established new records for its number of shipments to WIPP during each of the past four years, as shown in Figure 3, and completed a total of 59 more shipments in FY 2012 than in the previous year. Also noteworthy is the fact that LANL completed its 1,000th shipment to WIPP in June 2012. More than 300 shipments from LANL to WIPP are projected in FY 2013, which will be another large increase to the total of 230 shipments completed during FY 2012.

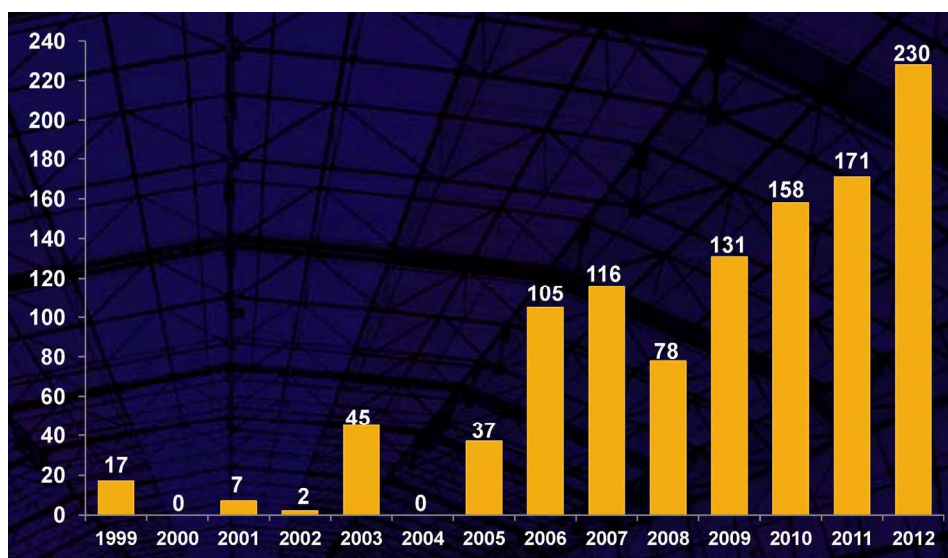


Fig. 3. LANL Shipments to WIPP by Fiscal Year

Figure 4 provides information on both the volume in m³ and MAR in PE-Ci that was removed from the LANL site during FY 2012. Both represent new records for LANL performance. About 90% of the total volume (920.1 m³ of the total of 1,035.5 m³) and 75% of the total MAR (23,075.2 PE-Ci of the total of 29,628.3 PE-Ci) that was shipped during the year was in containers from the 3,706 m³ campaign.

The shipped volume of 920 m³ is compared to a planned volume from the 3,706 m³ campaign of 800 m³ during FY 2012, and the 920 m³ makes up about 25% of the total volume in the 3,706 m³ campaign. Drums made up a total of 437 m³ (47%) of the containers that were shipped, and boxes/SWBs made up a total of 483 m³ (53%) of the containers that were shipped for disposition. A total of 843 m³ (92%) was shipped as TRU waste to WIPP and 77 m³ (8%) was composed of containers that assayed less than 100 nCi/g of alpha-emitting TRU isotopes with a half life longer than 20 years, were reclassified to mixed low level waste, and shipped to commercial treatment and disposal at the Nevada National Security Site.

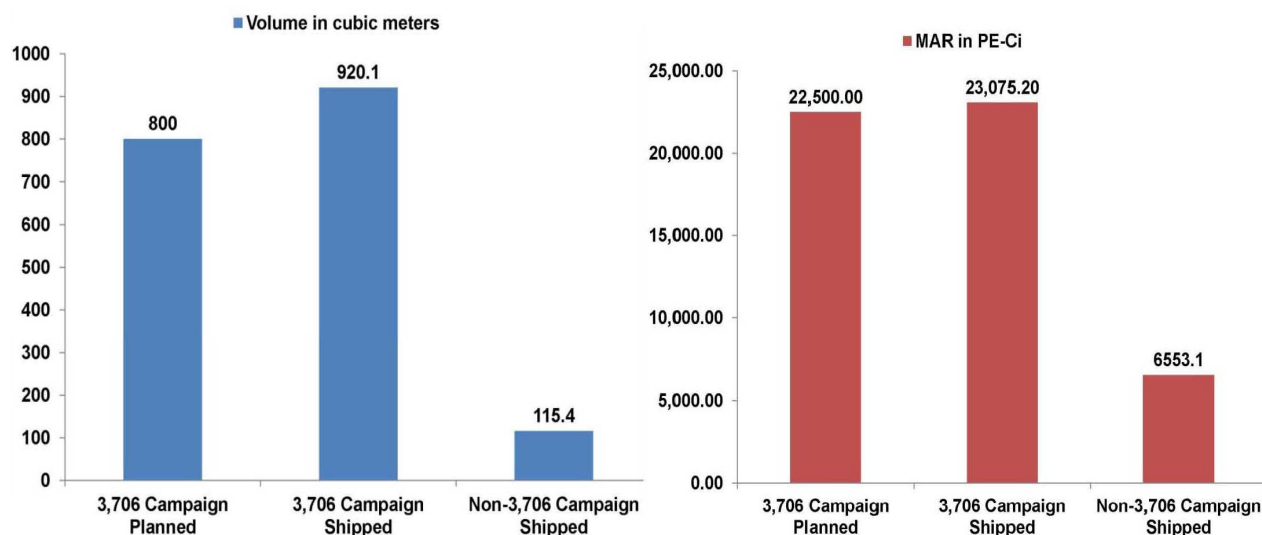


Fig. 4. Actual and Planned Volume and MAR of TRU Containers Shipped During FY 2012

The 23,075.2 PE-Ci MAR from the 3,706 campaign that was shipped during FY 2012 is compared to a planned MAR reduction of 22,500 PE-Ci, and makes up about 56% of the total MAR in the 3,706 campaign. This is a very substantial risk reduction for a date that is about 1/3 of the total campaign duration.

Containers that were not part of the 3,706 campaign inventory that were shipped during FY 2012 were newly-generated TRU waste containers received during FY 2012 and above-grade cemented containers. Both of these categories are also included in the Framework Agreement with the NMED.

Figure 5 presents detailed information on the status of drums in the 3,706 m³ campaign at the beginning of FY 2013. Drums made up a total volume of 905 m³ of the total volume of 3,706 m³ in the campaign. Almost half (48%) of the total volume of drums in the campaign were dispositioned (shipped) during FY 2012. Of the remaining, 31% of the volume of drums still requires remediation, and 21% of the volume of drums have completed remediation and are ready for characterization or in the characterization process. About 1/3 of this latter volume is ready for or in the characterization process, and about 2/3 of this volume has completed characterization or is already approved in the WIPP Waste Data System (WDS). After approval in the WDS, containers are scheduled for shipping to WIPP.

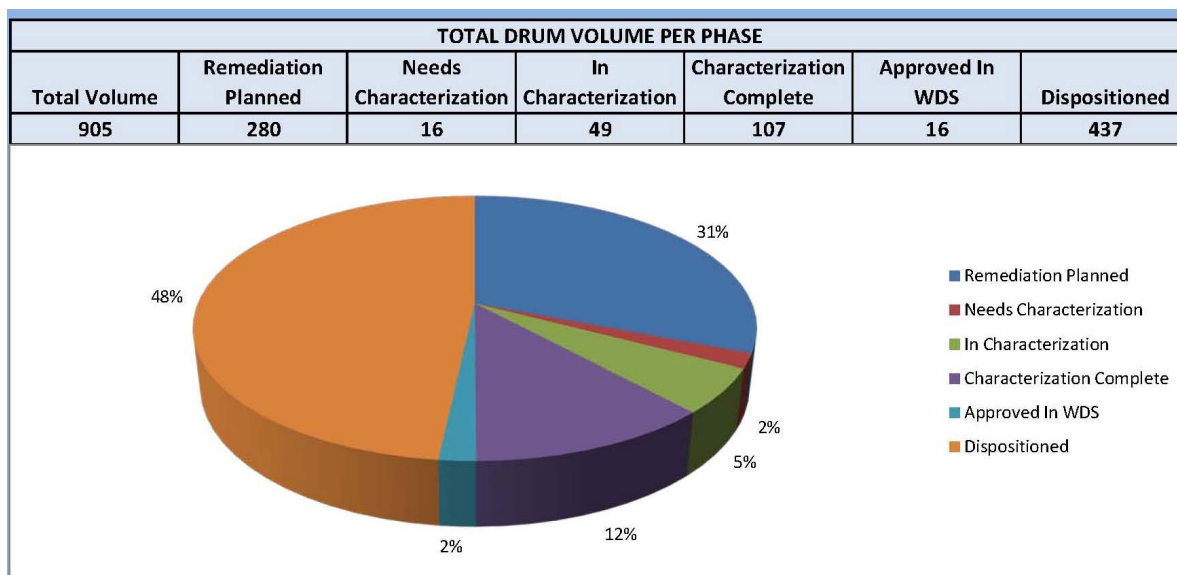


Fig. 5. Status of Drum Volume by Processing Phase

Figure 6 presents detailed information on the status of boxes in the 3,706 m³ campaign at the beginning of FY 2013. Although only a total of 462 containers, oversize boxes and SWBs make up a total volume of 2,801 m³ of the total volume of 3,706 m³ in the campaign. During FY 2012, 17% of the total volume of boxes in the campaign was shipped. Of the remaining, 79% of the volume of boxes still requires remediation, and only 4% of the volume of boxes have completed remediation and are ready for characterization or in the characterization process. Multiple work shifts are being implemented for oversize box remediation and disposition during FY 2013.

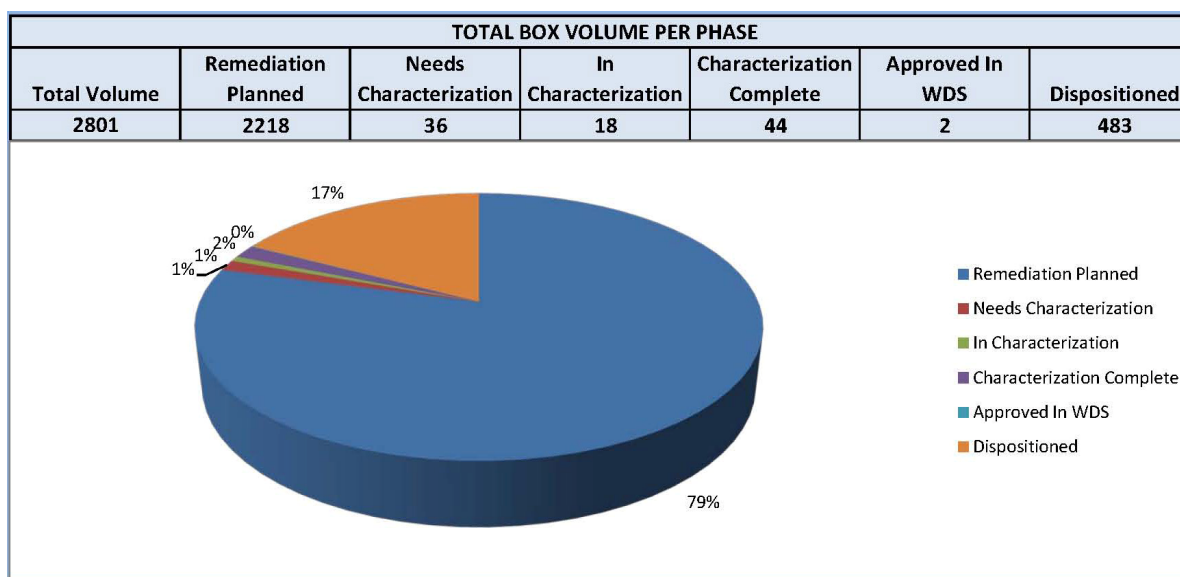


Fig. 6. Status of Box Volume by Processing Phase

LESSONS LEARNED

We have used feedback from completed Solution Packages in the 3,706 m³ campaign to refine estimates for Solution Packages that will be processed in the future for the parent-to-daughter ratio in repackaging of drums, commodities that will be required, and for shipping forecasts.

Remediation of oversize boxes was originally planned based primarily on size of the box. We are realigning this approach based on improved knowledge of box contents and experience in remediating small boxes. This will result in planned remediation based on the remediation method in addition to size of the containers. Remediation of oversize boxes will also be conducted by grouping containers based on their contents and processing these containers by group. Content groups will include (1) packaged debris; (2) pencil tanks; (3) transfer tunnels; (4) gloveboxes with no property-numbered equipment; and (5) gloveboxes with property-numbered equipment such as lathes.

CONCLUSIONS

Los Alamos National Laboratory has developed and is currently executing a detailed project plan to disposition 3,706 m³ of TRU waste stored above grade at its TA-54 Area G waste management facility before June 30, 2014. TRU waste containers were placed into storage up to 40 years ago, and most of the older containers must be remediated or repackaged before they can be characterized, certified as meeting the WIPP WAC, and shipped to WIPP. The project plan is based on detailed understanding of container issues, processing groups of waste containers with issues in common, and ensuring that all actions necessary to process a group of containers have been completed before processing of the group is scheduled to begin. Experience and lessons learned over the past several years have been incorporated into the project plan. Performance during the first 15 months of the 33-month campaign is better than planned at the beginning of the campaign, and LANL is confident that the campaign will be completed ahead of schedule.

REFERENCES

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