Key Factors in Successful Execution of the LANL 3,706 m^3 TRU Waste Campaign – 14086

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ABSTRACT

The Los Alamos National Laboratory (LANL) is currently in the final stage of the highly successful campaign to disposition 3,706 m^3 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 combustible and dispersible non-combustible TRU waste that was stored above ground on October 1, 2011. Newly-generated TRU waste that is received at the facility is also being shipped during this period. The management system that was implemented to ensure successful delivery of the 3,706 m^3 campaign within budget and ahead of schedule is described. The foundation of the campaign was consistent and constant attention to health and safety of workers and compliance with all applicable environmental, safety, and security requirements so that everyone goes home safe to their families and to ensure that a safety or compliance incident does not significantly impact completion of scheduled work. An integrated project management schedule for all container remediation, characterization, and shipping activities was developed based on a “Solution Package” approach of grouping waste streams with similar issues together for processing. This included close coordination with the DOE Carlsbad Field Office and its contractor that performs characterization of TRU waste containers at LANL. Inventories of containers that have issues in common were compiled into about 15 waste categories and about 75 "Solution Packages" that identified all of the activities needed to disposition the entire inventory of TRU waste in storage. Activities with long durations such as permitting, nuclear safety, and criticality safety in the Solution Packages were identified and initiated early so that they were complete when needed. Required commodities such as drums, standard waste boxes, and pipe overpack containers were identified and tracked to ensure they were available when needed. Facilities and readiness were phased to bring needed facilities and their associated level of readiness up in an integrated manner. Detailed metrics were developed by week, month and quarter at the start of the campaign for drum and box volumes to be remediated at each remediation facility, drum venting, material-at-risk removed, total volume removed, and shipments to the Waste Isolation Pilot Plant (WIPP). The project management schedule was updated each week with progress, details of the activities to be performed, and new forecast through the end of the campaign. A weekly review was conducted at which each manager responsible for a key element of the campaign discussed with senior management any issues and their resolution, progress the previous week, and plans for the upcoming month. The integration of all activities and constant communication within all of the organizations is leading to successful completion of this campaign.

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INTRODUCTION

A large wildfire called the Las Conchas Fire burned large areas near LANL in 2011, and this fire heightened public concern for TRU waste stored above ground at LANL. New Mexico Governor Susana Martinez requested that the Department of Energy (DOE) National Nuclear Security Administration (NNSA) accelerate removal of above-ground TRU waste stored at LANL's TA-54 Area G waste management facility. 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 above ground storage at Area G on October 1, 2011. This was defined as 3,706 m^3 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 m^3, fiberglass-reinforced plywood (FRP) boxes of various sizes (some as large as 57 m^3 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.

Table I presents a summary of the inventory of containers included in the 3,706 m^3 TRU waste campaign at the start of the campaign. Drums made 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 made up only about 10% of the number and 15% of the activity, they made up 75% of the volume of containers in the campaign. Most of the boxes are fiberglass-reinforced plywood (FRP) boxes that do not qualify for WIPP disposal and are too large to be shipped to WIPP.

TABLE I. TRU waste containers in the 3,706 m^3 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. 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 and project plan to disposition the 3,706 m^3 of TRU waste before June 30, 2014, was described at the WM2013 Conference [2]. Figure 1 summarizes the plan and status of the campaign as of December 29, 2013, in terms of the cumulative volume of TRU waste removed from LANL under the 3,706 m^3 campaign project plan. The commitment to the NMED in the Framework Agreement reflected removal of 800 m^3 by the end of the fourth quarter (Q4) of FY 2012, an additional 1,800 m^3 (cumulative total of 2,600 m^3) by the end of FY 2013, and the remaining 1,106 m^3 of the total 3,706 m^3 before the end of the third quarter of FY 2014. The plan at the start of the campaign is reflected by the dashed black line in the figure. The blue line shows actual performance through December 29, 2013 (total of 3,054 m^3 removed as compared to a total of 3,008 m^3 in the plan at the start of the campaign). The green line shows performance through the end of the campaign that is forecast based on the current schedule (total of 3,706 m^3 forecast before the end of the third quarter of FY 2014). All 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.

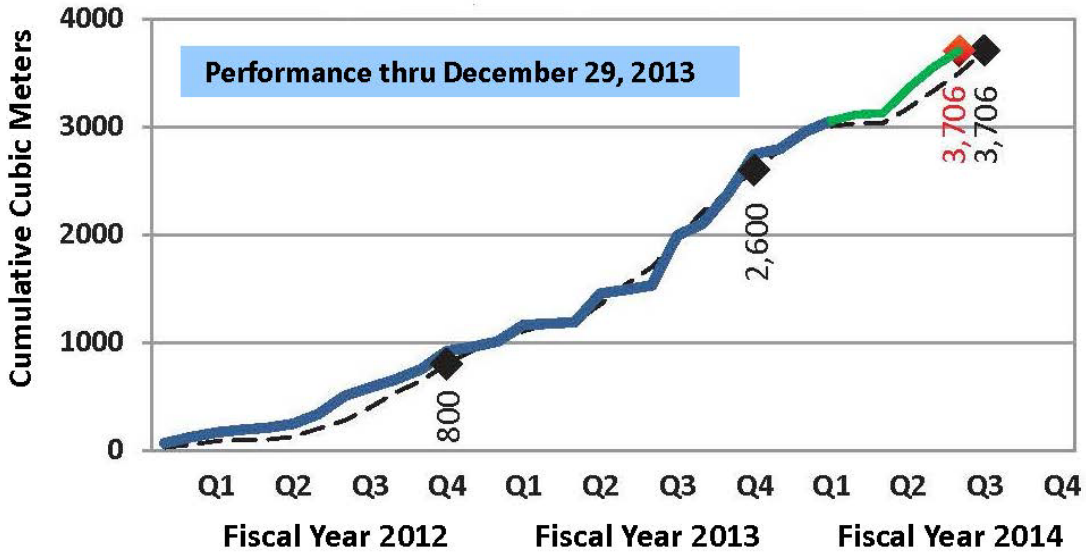

Fig. 1. Removal of TRU Waste Volumes in 3,706 m^3 campaign

Figure 2 presents the status as of December 29, 2013, of the volume of containers in the 3,706 campaign by process stage. These process stages consist of Remediation, Characterization, Certification to the WIPP Waste Acceptance Criteria and placed into the WIPP Data System (WDS), and Removed or Shipped from LANL. As of December 29, 2013, 82% of the total volume of containers in the 3,706 Campaign had been shipped. Because most of the original containers in the 3,706 campaign must be remediated or repackaged and the time required for this stage, remediation is the most critical stage in the processing of containers for removal from the LANL site. Eleven percent of the total volume of containers in the 3,706 Campaign are currently in remediation or in the queue for remediation. Once containers are remediated, their processing through characterization, certification, WDS, and shipping is generally straight-forward and without significant issues.

Fig. 2. Status of 3,706 m^3 Campaign by Process Stage

Newly-generated TRU waste is also being characterized and shipped as it is received, and a total of approximately 225 m^3 of newly-generated TRU waste was shipped in FY 2013. Small quantities of cemented TRU waste that is not part of the 3,706 m^3 campaign are also being shipped. In total, LANL shipped 3,074 m^3 of TRU waste in the two fiscal years since the 3,706 m^3 campaign was initiated, and 2,039 m^3 in FY 2013 alone. This may be compared to an average of approximately 750 m^3 per year over the five years before the 3,706 m^3 campaign began.

KEY FACTORS IN GREATLY IMPROVED PERFORMANCE

Key factors in achieving this level of performance include a strong focus on safety and compliance; organizational changes to establish sub-projects for critical elements of the campaign and to integrate facility operations; upgraded waste container remediation, characterization, and shipping capabilities; development of an integrated and detailed project management schedule; extended work shifts for container remediation; constant attention to potential issues and progress; and constant communication within all of the organizations involved in processing and disposition of the LANL TRU waste.

Worker Health & Safety and Compliance

The foundation of the 3,706 m^3 TRU waste campaign was constant attention to the health and safety of workers and strict compliance with all applicable environmental, safety, and security requirements. These requirements include all nuclear safety requirements. This ensured that all workers went home safe to their families at night, and also that safety and compliance did not significantly impact scheduled work. The necessary level of performance would not have been achieved if previous safety issues had carried on through the 3,706 m^3 campaign.

This included active participation of a Worker Safety and Security Team, behavior- based safety observations by most employees, increased observations of work activities and engagement of workers by managers, monthly safety meetings of all personnel, and a daily “Start Safe” message

that was available by phone and e-mail. An effort was made to keep the message and approach fresh so that workers did not become complacent about safety, and that workers maintained focus on their work and potential hazards of the work. Reviews were conducted on a weekly basis of injury and illness cases, actions to prevent recurrence, worker radiation exposure doses, and radiation protection observations.

The result of these efforts was greatly reduced recordable injuries and restricted work schedules, and the few recordable injuries that occurred during the 3,706 m^3 campaign were not serious injuries. Individual maximum radiation doses to workers were also maintained below the goal.

Organizational Changes

Changes were implemented in the LANL TRU waste program to establish organizational units with responsibility for detailed planning of container remediation, box remediation, drum remediation, and movement of containers through remediation, characterization, and shipping. Personnel with detailed knowledge of discrete items in TRU waste containers were assigned to support container remediation. Nuclear safety basis and conduct of operations were also integrated into the Facility Operations Director organization, which resulted in shared responsibility and compliance accountability. Although these changes were made before the start of the 3,706 m^3 campaign, the benefits of the changes were clearly evident during the period of highest performance of the campaign.

LANL also contracted with top notch subcontractors for remediation, implementing a nuclear safety Basis for Interim Operations, assay of containers for pre-screening and shipment of low-level waste, and support for remediation planning.

Upgraded Container Remediation, Characterization, and Shipping Capabilities

The LANL strategy over the past several years was to develop and implement additional remediation, characterization, and shipping capabilities that are necessary to disposition the LANL TRU waste inventory [3]. This 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].

Remediation. 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 was then 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 was constructed and became operational in early 2013. Figure 3 shows a photograph of an FRP box being remediated in this

boxline. A drum venting capability was also installed and became operational during 2012. A graded approach to readiness was utilized in the upgrade process, and this made a big difference in bringing the upgraded capabilities on line.

Fig. 3. Remediation of FRP Box in Dome 375 Boxline

The type of operation employed in box remediation was also modified to include decontamination and surface-contaminated object characterization techniques into an integrated production operation [4]. This allowed decontamination of a number of FRP boxes to less than TRU waste levels of contamination and disposition of the boxes without size reduction and repackaging of the waste items into SWBs. Approximately 360 m^3 of waste less than TRU levels of contamination was shipped for offsite treatment and disposal in FY 2013. This approach was more efficient in terms of time required to remediate a box, the number of daughter SWB containers generated and characterized, worker radiation exposures, and shipments to WIPP. A number of corrugated metal boxes were also remediated by cutting corners from the boxes so that they could be placed into ten-drum overpack containers for shipping the containers to WIPP.

Characterization. The need for additional characterization capabilities was also identified and these were also 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. Both the SuperHENC and HE-RTR units were implemented near the start of the 3,706 m^3 TRU waste campaign. The CCP also completed demonstration and auditing of the *In*

Situ Object Counting System (ISOCS™) as a certified characterization system at LANL for drums and SWBs.

Shipping. A second overhead crane was installed in the LANL facility at which drums and SWBs are loaded into TRUPACT-II casks for shipping TRU waste to WIPP. Figure 4 shows a photograph of the new crane being installed. The old crane was also refurbished to provide redundant crane capability at the facility. A transportation center for parking of multiple trucks and trailers with TRUPACT-II casks was constructed to provide additional space for staging of these vehicles. A project is now being implemented to provide a capability at LANL to load standard large box 2 (SLB2) containers into the TRUPACT-III casks for shipments to WIPP.

Fig. 4. Installation of Second Crane for TRUPACT-II Loading

Integrated Project Management Schedule

"Solution Package" Approach. 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 LANL has named 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 were developed to address the range of issues among the containers in the 3,706 m^3 campaign inventory.
A detailed project management schedule was developed for the 3,706 m^3 campaign based on 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 was 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. The support for the campaign by the CCP and DOE managers has been outstanding.

Multiple Work Shifts. Multiple work shifts were implemented at the container remediation facilities during FY 2013, and these operations will continue until remediation of both drums and boxes that are part of the 3,706 m^3 campaign is complete. These work shifts include use of 24 hour operations at one of the drum remediation facilities and one of the box remediation facilities.

Performance Metrics. The detailed project management schedule for the 3,706 m^3 campaign included monthly and quarterly goals for volume of waste removed, box and drum remediation volumes, shipments from LANL to WIPP, and remediation goals at each of the drum and box remediation facilities. Performance in these metrics was reviewed at a weekly TRU Program Review, and issues and actions to address issues and performance were discussed. Charts were also reviewed weekly on total MAR received and removed, drum and SWB remediation daughters generated, containers in the WIPP Data System, weekly average plutonium-239 fissile gram equivalents (FGE) in the WDS, and drums and SWBs that required re-work after characterization was performed. Figure 5 shows current TRU campaign status from one of the weekly TRU Program Reviews.

The project management schedule and forecast to completion were updated on a weekly basis to reflect actual performance from the previous week. Anticipation of issues by the project managers and timely actions to address issues that might impact performance were critical to achieving the high performance that is demonstrated in the 3,706 m^3 TRU waste campaign. Performing weekly reviews required constant attention to issues and performance.

Communication

The old expression that the key to success in real estate is “location, location, location,” can be paraphrased to say that a key to success in project performance is “communication, communication, communication.” Communication and teamwork between the project elements in the 3,706 m^3 campaign have been excellent. This included communication with CCP and the DOE Carlsbad Field Office.

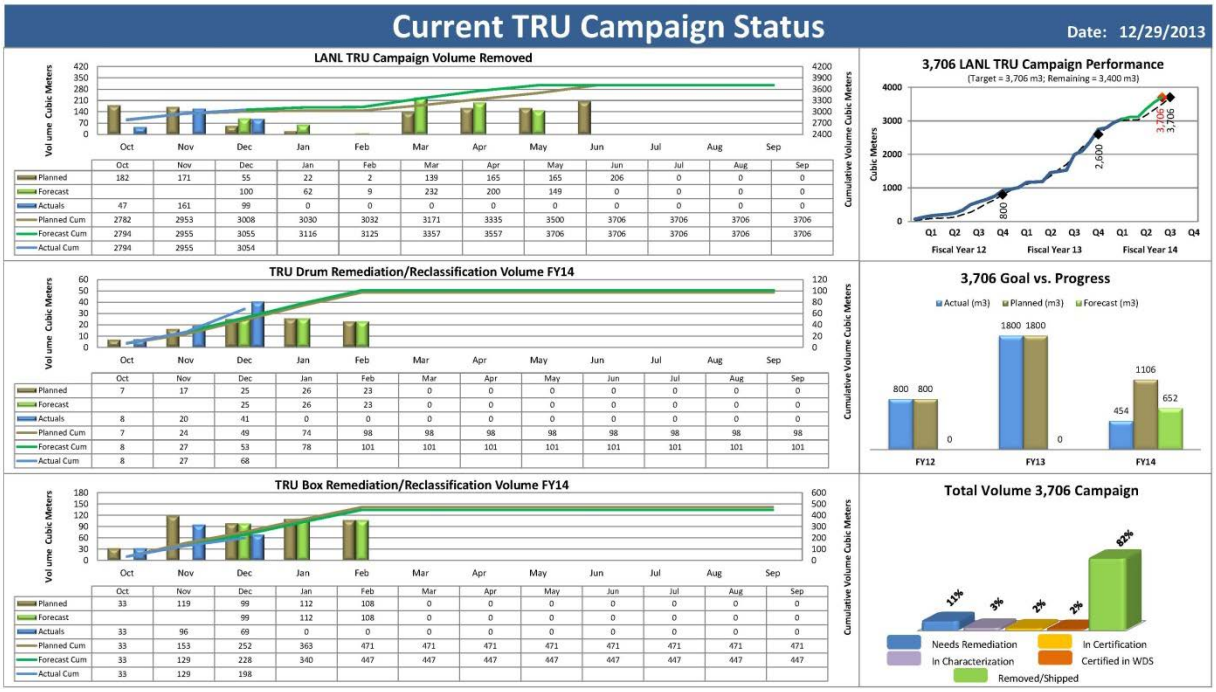

Fig. 5. Example TRU Program Review Metrics

LESSONS LEARNED

There are three areas where experience on the 3,706 m^3 campaign shows performance could have been better. Greater effort in improved assay capabilities early in the campaign would have improved performance. Problems with equipment such as the drum lift at the primary drum remediation facility indicates that an upgrade of that facility before the 3,706 m^3 campaign began would have improved performance. Performance on construction and upgrade of remediation boxlines was not as good as planned, and lessons learned from those projects is being applied to construction of the TRUPACT-III loading facility.

CONCLUSIONS

The Los Alamos National Laboratory is currently in the final stage of a campaign to disposition 3,706 m^3 of TRU waste stored at its TA-54 Area G waste management facility. Performance through the first two years of the campaign has been better than planned, with disposition of more than 900 m^3 in FY 2012 and more than 1,800 m^3 in FY 2013. With newly generated TRU waste and non-3,706 campaign cemented waste, total TRU waste disposition from LANL was more than 1,000 m^3 in FY 2012 and more than 2,000 m^3 in FY 2013, as compared to an average of approximately 750 m^3 in the five years before the campaign began. Key factors in achieving this level of performance include a strong focus on safety and compliance; organizational changes to establish sub-projects for critical elements of the campaign and to integrate facility operations; upgraded waste container remediation, characterization, and shipping capabilities; development of an integrated and detailed project management schedule; extended work shifts

for container remediation; constant attention to potential issues and progress; and constant communication within all of the organizations involved in processing and disposition of the LANL TRU waste. The integration of all activities and constant communication within all of the organizations is leading to successful completion of this campaign.

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