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ACCELERATION OF LOS ALAMOS NATIONAL LABORATORY TRANSURANIC WASTE DISPOSITION

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ABSTRACT

One of Los Alamos National Laboratory's (LANL's) most significant risks is the site's inventory of transuranic waste retrievably stored above and below-ground in Technical Area (TA) 54 Area G, particularly the dispersible high-activity waste stored above-ground in deteriorating facilities. The high activity waste represents approximately 50% (by activity) of the total 292,000 PE-Ci inventory remaining to be disposed.

The transuranic waste inventory includes contact-handled and remote-handled waste packaged in drums, boxes, and oversized containers which are retrievably stored both above and below-ground. Although currently managed as transuranic waste, some of the inventory is low-level waste that can be disposed onsite or at approved offsite facilities.

Dispositioning the transuranic waste inventory requires retrieval of the containers from above and below- ground storage, examination and repackaging or remediation as necessary, characterization, certification and loading for shipment to the Waste Isolation Pilot Plant in Carlsbad New Mexico, all in accordance with well-defined requirements and controls. Although operations are established to process and characterize the lower-activity contact-handled transuranic waste containers, LANL does not currently have the capability to repack high activity contact-handled transuranic waste containers (> 56 PE-Ci) or to process oversized containers with activity levels over 0.52 PE-Ci. Operational issues and compliance requirements have resulted in less than optimal processing capabilities for lower activity contact-handled transuranic waste containers, limiting preparation and reducing dependability of shipments to the Waste Isolation Pilot Plant.

Since becoming the Los Alamos National Laboratory contractor in June 2006, Los Alamos National Security (LANS) L.L.C. has developed a comprehensive, integrated plan to effectively and efficiently disposition the transuranic waste inventory, working in concert with the Department of Energy Los Alamos Site Office, Carlsbad Field Office and the Department of Energy Headquarters. Rather than simply processing containers as retrieved, the plan places priority on efficient curie disposition, a direct correlation to reducing risk. Key elements of the approach include balancing inventory and operational risks, tailoring methods to meet requirements, optimizing existing facilities, equipment and staff, and incorporating best practices from other Department of Energy sites. With sufficient funding this will enable LANL to ship the above-ground high activity contact-handled transuranic waste offsite by the end of Fiscal Year (FY) 2007 and to disposition the remaining above- and below-ground contact-handled and remote-handled transuranic waste inventory by December 2010.

Nearly 70% of the contact-handled transuranic waste containers, including the high activity waste, require processing and repackaging before characterization and certification for shipment to the Waste Isolation Pilot Plant. LANL is employing a balanced risk approach that accomplishes significant long-term risk reduction by accepting short-term increased facility operations risk under well-developed and justified interim controls. Reviews of facility conditions and additional analyses show that the Waste Characterization, Reduction and Repackaging Facility and the Radioassay and Nondestructive Testing Facility are the most appropriate facilities to safely remediate, repackage, and ship lower activity and the remaining high activity drums. Updated safety documentation supporting limited Hazard Category 2 operations in these facilities has been developed. Once approved, limited-term operations to process the high activity drums can begin in early 2007, building upon the experience base established performing Hazard Category 3 operations processing lower activity waste in these facilities.

LANL is also implementing a series of actions to improve and sustain operations for processing contact-handled transuranic waste inventory. Building 412 Decontamination and Volume Reduction Facility and Dome 231

Permacon will be reconfigured to remediate and repackage oversized containers. Actions are underway to stage the inventory in a manner that facilitates handling and processing, and builds a backlog at key process steps to improve efficiency and minimize the impact of operational slowdown elsewhere in the process. Several initiatives will improve safety and strengthen disciplined operations and compliance with established requirements.

Retrieval is a critical element in dispositioning the below-ground contact-handled and remote-handled transuranic waste inventory and will be subcontracted to a firm(s) with the experience and specialized capability to retrieve the contact-handled and remote-handled inventories. Performance specifications will consider likely container integrity issues and anticipated challenges recovering the waste from storage in pits, trenches, and lined shafts. Such an approach is one of several designed to avoid or mitigate risks associated with handling and dispositioning the transuranic waste.

Upon completion of the LANL Transuranic Waste Disposition Project, the inventory of contact-handled and remote-handled transuranic waste will have been shipped to the Waste Isolation Pilot Plant and the associated low-level and mixed wastes disposed at approved onsite or offsite facilities. Doing so will eliminate a major risk to the environment, surrounding communities and the workforce two years earlier than the current baseline.

INTRODUCTION

The inventory of legacy transuranic waste is considered one of LANL's most significant risks to the public and the environment. Although not the largest inventory in the Department of Energy complex, its activity levels, location and storage conditions make it a key priority for disposal. The transuranic waste is currently maintained in safe storage; however, that storage is close to offsite receptors and is vulnerable to external threats, especially fires.

LANL's transuranic waste inventory includes waste generated before 1999 – legacy waste -- and waste generated since that date. This waste is stored above and below-ground in a variety of containers, including drums, standard waste boxes, oversized boxes and corrugated metal pipes as shown in Figure 1.

The original legacy inventory totaled 6905 m^3, with an estimated plutonium-equivalent curie (PE-Ci) content of 219,000 curies in both contact-handled and remote-handled transuranic waste forms.

The LANL transuranic waste inventory includes 940 m^3 generated since 1999, representing about 30,000 PE-Ci. An additional 850 m^3 (nearly 59,000 PE-Ci) is projected to be generated through 2011.

At the end of FY2006, 913 m^3 (11,950 PE-Ci) of the transuranic inventory had been shipped to the Waste Isolation Pilot Plant for disposal. This represents 10% of the inventory by volume but less than 5% by activity.

Nearly a quarter of the current above-ground inventory, by activity, is high activity waste (>56 PE-Ci) that is the focus of an accelerated disposition campaign. Although less than 5% of the inventory by volume, this waste represents the majority of the dispersible material at risk in LANL's TA-54 Area G. Early shipment and disposal of this waste will significantly reduce overall risk to the LANL environment, nearby communities and workforce.

Accelerated processing of the high activity transuranic waste must also take into account the as-is condition of the available facilities and resources. The LANL transuranic waste processing facilities were constructed in accordance with nuclear facility design and operating requirements that predated the requirements outlined in 10CFR830, Nuclear Safety Management, and 10CFR835, Occupational Radiation Protection. Consequently, effective transuranic waste operations at LANL must rely on balanced risk and risk-informed decision approaches in which the risk of a significant release due to a likely external event such as fire is considered in concert with the risk of processing the waste in the existing facilities with appropriate controls and compensatory measures.

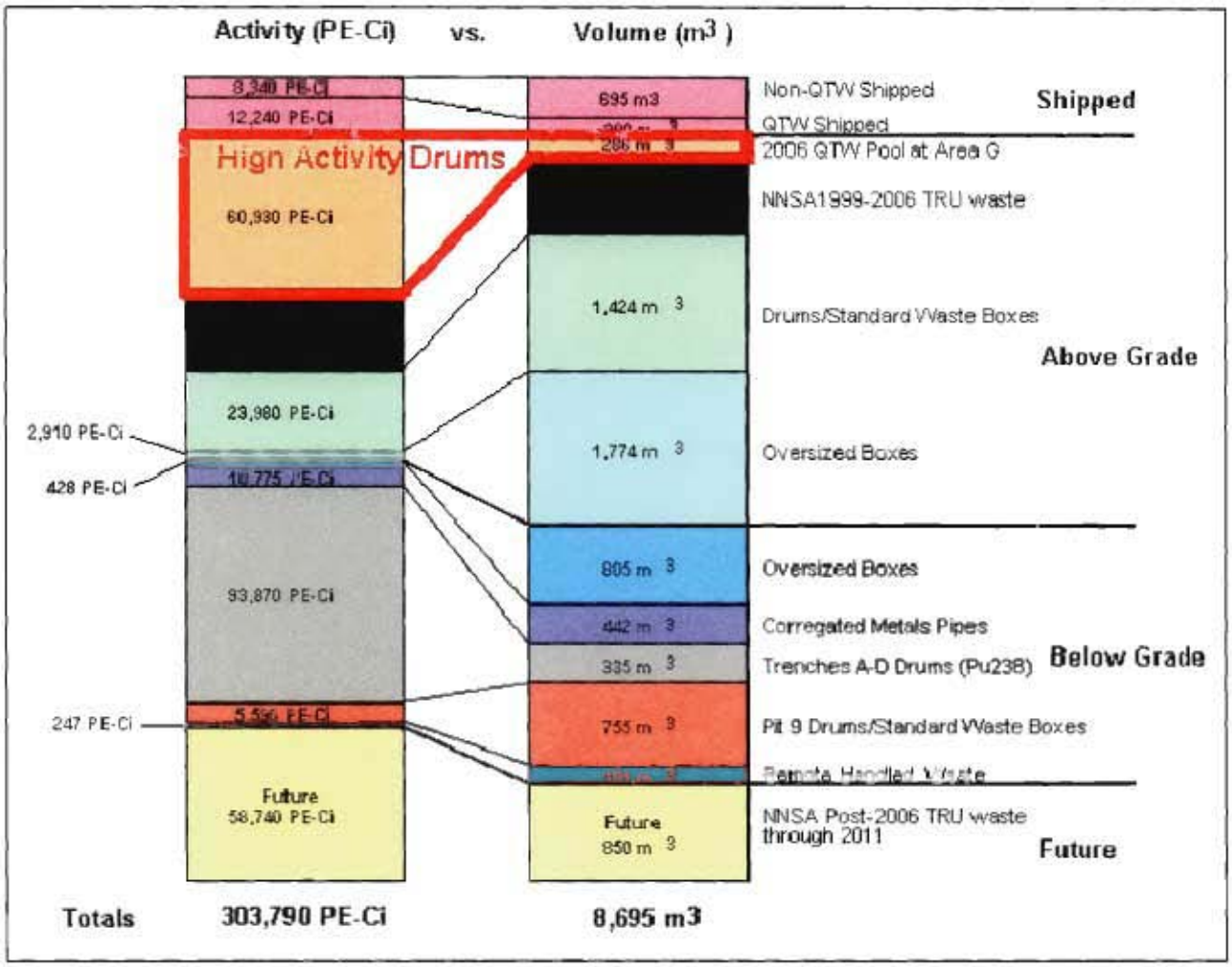

Fig. 1. Transuranic Waste Inventory

OBJECTIVES AND COMMITMENTS

The objective of the LANL Transuranic Waste Disposition Project is to ship the transuranic waste inventory to the Waste Isolation Pilot Plant as quickly, safely, and efficiently as possible. LANL's commitment to the Department of Energy is to complete this effort by the end of 2010, enabling final environmental cleanup and closure of TA-54 Area G by 2013.

The principal near-term commitment for the program is to complete the shipment of 44,658 PE-Ci of dispersible high activity waste from TA-54 Area G. LANL is committed to disposition the remainder of 32,596 PE-Ci by the end of FY2007.

A second near-term commitment is to disposition 16 canisters of remote-handled transuranic waste to the Waste Isolation Pilot Plant in FY2007.

Several program-level strategies are critical to achieving both the near-term and lifecycle program objectives:

- Fully integrate the disposition of newly-generated transuranic waste from ongoing LANL operations with the disposition of legacy waste to enable all transuranic waste to be processed and dispositioned in a cost-effective manner.

- Incorporate successful practices demonstrated elsewhere to accelerate processing and disposition of LANL transuranic waste (e.g. sequencing retrieval and characterization production processes), to strengthen conduct of operations, and to improve operational reliability.

- Implement a project management system fully compliant with the Department of Energy Order 413.3, with special focus on full compliance with LANL's Department of Energy-approved earned value management system.

- Provide performance transparency to the Department of Energy and stakeholders through regular, structured communications. Strategies to communicate progress and issues must consider not only the interface between LANL and the National Nuclear Security Administration Los Alamos Site Office, but also between LANL and its stakeholders.

A key element in successfully executing this program is an effective partnership between the principal participants – the Department of Energy (both the Los Alamos Site Office and Headquarters), LANL, Carlsbad Field Office and its contractor, Washington TRU Solutions Central Characterization Project. The respective responsibilities and accountabilities of these parties are sufficiently inter-related that full alignment is required for the LANL Transuranic Waste Disposition Project objectives to be achieved.

SCOPE

The scope of the LANL Transuranic Waste Disposition Project is to dispose of the remaining 6900 m^3 of legacy transuranic waste, coordinated with the disposal of an estimated 1800 m^3 of waste generated by ongoing operations between 1999 and the completion of the LANL TRU Waste Disposition Project in 2010. This waste inventory can be viewed from four perspectives: primary waste type, storage location, container type, and activity level. Each has direct influence on the approach to executing the work scope and the required handling and processing steps as outlined below.

As shown in Figure 1, over 98% of the transuranic waste inventory by volume is contact-handled waste, with the inventory of remote-handled waste totaling 101 m^3. The contact-handled transuranic waste includes the high activity waste targeted for accelerated shipments to the Waste Isolation Pilot Plant. As of October 2006, 32,596 PE-Ci remain to be shipped to meet the high activity risk reduction objective and 325 drums of the high activity waste remain in above-ground storage.

Nearly two-thirds of the existing inventory (by volume) is stored above-ground in domes and open areas in Area G as shown in Figure 2.

The remainder of the contact-handled transuranic waste inventory is below-ground in Pit 9 (drums and boxes), in four trenches (A-D), and above Pit 29 in Area G – all requiring retrieval before the waste can be characterized, certified, and shipped to the Waste Isolation Pilot Plant. Typically, the waste pits and trenches are constructed with asphalt flooring and curbs and have been backfilled with crushed tuff.

The remote-handled transuranic waste is all located below ground in 54 lined shafts dispersed through TA-54 Area G. The remote-handled inventory also includes five hot cell liners from the Chemical and Metallurgy Research Facility.

A total of 505 m^3 is waste in drums and boxes stored above-ground and in trenches that will require Hazard Category 2 level facilities or controls. Another 4183 m^3 requires Hazard Category 3 controls, including about half the over-sized boxes. The remaining 4373 m^3 -- packaged in drums, the rest of the over-sized boxes, and all the corrugated metal pipes -- can be processed in radiological facilities. The remote-handled transuranic waste contains less than 0.1% of the total transuranic activity. About one-third of the waste that can be processed in radiological facilities is currently packaged in oversized containers and will require further processing and repackaging before it can be shipped to the Waste Isolation Pilot Plant. An estimated 70% of the higher activity containers will require repackaging or processing to remove prohibited items.

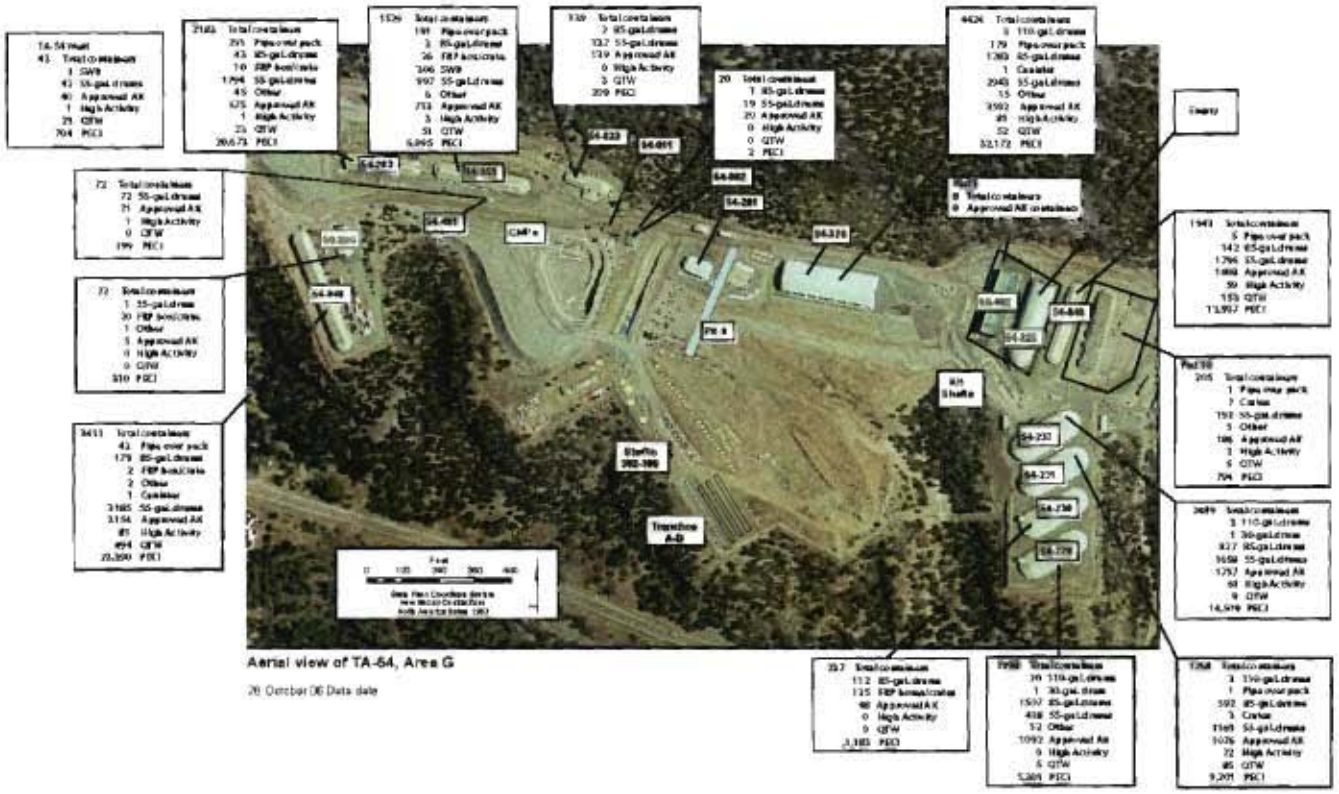

Fig. 2. Above and Below Ground Inventory and Location

TRU STRATEGIES AND INITIATIVES

The LANL inventories of contact-handled and remote-handled transuranic waste cannot all be dispositioned with the current capabilities, nor can key commitments to accelerate risk reduction and complete final environmental cleanup be achieved with the current operating strategies and production experience. A comprehensive and integrated set of new strategies and initiatives has been developed that will enable LANL too effectively and efficiently disposition the legacy and newly generated transuranic waste inventories within regulatory and the Waste Isolation Pilot Plant requirements. The strategies are integrated across the transuranic waste streams and also reflect key links with low-level and mixed low-level waste disposition paths and with plans to characterize and remediate TA-54 Area G in accordance with the Consent Order.

As with other relatively short-term, focused cleanup projects at Department of Energy sites, an effective balancing of risk, a tailoring of methods to meet requirements, optimizing existing facilities and equipment, and wise investment of funds necessary to get the job done are critical to overall success. The following approaches build upon the successful experience base in dealing with transuranic waste at other Department of Energy sites.

Accelerated Contact-Handled Above Grade Transuranic High Activity Waste Inventory Reduction

Dispositioning the inventory of high activity contact-handled transuranic waste, especially that stored above-ground, is the highest priority risk reduction activity for LANL. A total of 325 drums of high activity waste containing nearly 50,000 PE-Ci remain in the above-ground inventory. In addition to accelerating overall disposition of this material, LANL has committed to ship a total of 32,596 PE-Ci of dispersible high activity above-ground inventory to the Waste Isolation Pilot Plant before the end of 2007.

Although the below-ground high activity waste does not represent the same risk as the dispersible high activity waste currently stored above ground, retrieving the below-ground waste will increase its risk profile. Processing

strategies used to accelerate the disposition of the above-ground high activity inventory will also be used as the below-ground inventory is retrieved.

Experience indicates that only 30% of the high activity drums can be sent directly through the Washington TRU Solutions Central Characterization Project characterization and certification process; the remainder will require processing to remove prohibited items and repackaging under Hazard Category 2 controls.

A critical element in the strategy to disposition the high activity drums is to accomplish significant long-term risk reduction by accepting a short-term increased facility operations risk with well-developed and justified interim controls. Based on careful review of the facility conditions of both the Waste Characterization, Reduction and Repackaging Facility and the Radioassay and Nondestructive Testing Facility and additional analyses, LANL has developed an approach in which the population of drums containing >56 PE-Ci will be processed in these facilities within a limited timeframe and with specific facility modifications and controls. Similarly, standard waste boxes containing up to 233 PE-Ci will be loaded in the Radioassay and Nondestructive Testing Facility for shipping under normal operating parameters. Higher-activity containers will be over-packed into standard waste boxes and loaded into TRUPACT-II's or HALFPACT's in a limited-term operation under the facility revised safety basis. This approach enables LANL to build on compliant operations by processing lower activity drums in the Waste Characterization, Reduction and Repackaging Facility and the Radioassay and Nondestructive Testing Facility, to support effectively processing the higher activity containers.

Increased Efficiencies Lead to Contact-Handled Transuranic Lower Activity Waste Inventory Reduction

In parallel with resolving issues that allow higher activity drums to be processed, LANL is taking steps to establish improved and sustainable operations for processing the remaining contact-handled transuranic waste inventory. Analyses of LANL process operations and benchmark studies from other Department of Energy transuranic waste operations show specific opportunities to increase throughput rates at several points in the overall process to retrieve, characterize, and ship transuranic waste to the Waste Isolation Pilot Plant. Improving throughput rates will accelerate the overall schedule and reduce costs to process each container.

LANL's goal is to dependably make four efficient shipments every week through repackaging improvements, drum management, enhanced integration with Washington TRU Solutions Central Characterization Project operations, selected safety basis improvements, reducing operations downtime and providing additional capacity in key areas.

Overall, LANL has pursued these key initiatives:

- Gain control over the inventory and beginning to stage it
- Improve throughput by increasing ability to remove prohibited items
- Transition to extended shift operations for key activities
- Simplifying on-site transportation of waste between areas
- Increase visibility and use of metrics to the workforce and our partners
- Emphasis on improving operational safety, disciplined operations and planning utilizing feedback.

A review of best practices at other Department of Energy sites has shown the value of staging the inventory in a manner that facilitates drum handling, designing the process flow to provide an effective backlog at key process steps, and resolving containers requiring non-routine handling off-line from routine process operations. As a first step, LANL has taken constructive action to gain control over the waste inventory records and improving their utility by beginning to:

- Prescreen all above ground waste containers to validate the project planning assumptions and quantify the exact number of drums requiring prohibited item remediation and repackaging
- Organize the above ground storage by waste profile and anticipated handling steps to facilitate retrieval and processing. This will enable efficient retrieval with fewer drum movements, grouping of drums containing like waste streams, and further facilitative segregation of high activity drums, drums that can be direct shipped, those that require liner pulling, etc. Additionally 20-drum blocks will be developed to optimize characterization throughput. Doing so will also facilitate staging container backlogs at primary processing steps so that a slow-down in one process step does not adversely impact other steps.

- Use knowledge of the waste types and containers to proactively map their disposition sequence and processing from retrieval to shipping rather than operating in a reactive, segmented manner.
- Work with Washington TRU Solutions Central Characterization Project and with the Carlsbad Field Office to improve all interface points and to identify additional opportunities to streamline operations.

Second, LANL recognized the primary restricting factor in the overall throughput is the ability to process drums that require removal of prohibited items and took the following actions:

- Completed ventilation upgrades in the Waste Characterization, Reduction and Repackaging Facility in late FY2006 to support increased operational efficiency in that facility.
- Plans to utilize a walk-in glove box in the Waste Characterization, Reduction and Repackaging Facility to facilitate repackaging standard waste boxes.
- Developed additional capacity to remediate low-activity drums by using glove bags in Dome 231 Permacon in late FY2006. The facility is currently being used to repack drums with activity levels less than 0.52 PE-Ci containing homogeneous solid waste forms.
- Preparing to make modifications to the Dome 231 Permacon facility systems to also allow repackaging of drums containing debris waste less than 0.52 PE-Ci in the second quarter of FY2007.
- Reviewing the documented safety analysis to allow processing of Hazard Category 3 waste containers as a second phase of Dome 231 Permacon operations.

Third, LANL has begun transitioning to a 7 day per week operating schedule to improve the efficiency of operations and will target selected activities for backshift execution (e.g., equipment maintenance).

Fourth, the approach for on-site transportation has been changed dramatically to reduce cost (i.e. approximately 30 personnel reduced to less than 10) and eliminate unnecessary constraints that affect movement of material between areas. The safety basis revisions and clarification were completed in January and execution will begin in February of FY2007.

Fifth, LANL has increased the visibility and transparency of its operations, both to the Department of Energy and to its workforce. Metrics have been established for key steps in the process and will be tracked and posted in project offices and field locations. This is a key element supporting worker involvement in improving operations and commitment to objectives.

In addition to addressing the key pinch-point in processing the transuranic waste inventory, LANL has placed a great emphasis on the need to improve operational safety, disciplined operations and planning. Work control documentation is being reviewed to ensure proper flow down of requirements, to improve standardization of procedures, and to take advantage of the operational learning curve. More disciplined conduct of operation principles will be implemented. Clear line management responsibilities and accountabilities will be established throughout the LANL Transuranic Waste Disposition Project and its operations. Management involvement in the day-to-day operations, due diligence, and oversight will be strengthened. Work planning has changed from a rather lengthy plan-of-the-day approach to a more proactive plan-of-the-week. Historical records are being reviewed to identify vulnerable points that contribute to operations downtime and appropriate steps will be implemented.

Other initiatives are being pursued for future efficiency gains such as using HALFPACT shipping containers. The HALFPACTs can effectively be used to ship LANL's inventory of homogeneous solid drums which are weight limited. The ultimate goal of these initiatives is to ensure safe, predictable and compliant operations focused on improving the curie disposition efficiency and accelerated risk reduction to LANL workers and the public.

CONCLUSION

Upon completion of the LANL Transuranic Waste Disposition Project in 2010, all stored legacy transuranic waste will have been sent to the Waste Isolation Pilot for disposal. At that point, more than 134,000 PE-Ci stored in deteriorating facilities above ground, 110,000 PE-Ci stored below ground and an estimated 58,700 PE-Ci of newly generated waste will have been removed from LANL, eliminating a major risk to the environment, surrounding communities and workforce. That portion of the inventory managed as transuranic waste, but shown through characterization to be either low-level or mixed low-level waste, will have been disposed onsite, treated to meet

RCRA land disposal restriction requirements and disposed at the Nevada Test Site, or disposed at commercial facilities.

Access to the below-ground storage areas during and following retrieval will have been provided for sampling to support assessment of any residual contamination that may require remediation. Any backfilling of retrieval areas required for safety purposes will be coordinated with expected final remedial actions for TA-54 Area G (e.g., capping) so that future rework is not required.

LANL's transuranic waste strategy considers and will be fully coordinated with the environmental remediation end state for TA-54 Area G and the steps leading up to final area closure – characterization of any contamination, RCRA facility closure, and decontamination and decommissioning of the TA-54 Area G storage and processing facilities. Much of that work will be conducted in parallel with the disposition of the stored transuranic waste inventory.