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Shipments of Mixed Transuranic Waste  
from Los Alamos National Laboratory to  
the Waste Isolation Pilot Plant

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Submitted to: Waste Management '97 Conference  
Tucson, Arizona  
March 2-7, 1997

MASTER

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**Key Regulatory Drivers Affecting Shipments of Mixed Transuranic Waste from  
Los Alamos National Laboratory to the Waste Isolation Pilot Plant**

by

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**ABSTRACT**

A number of key regulatory drivers affect the nature, scope, and timing of Los Alamos National Laboratory's (LANL's) plans for mixed transuranic (MTRU) waste shipments to the Waste Isolation Pilot Plant (WIPP), which are planned to commence as soon as possible following WIPP's currently anticipated November, 1997 opening date. This paper provides an overview of some of the key drivers at LANL, particularly emphasizing those associated with the hazardous waste component of LANL's MTRU waste (MTRU, like any mixed waste, contains both a radioactive and a hazardous waste component). The key drivers discussed here derive from the federal Resource Conservation and Recovery Act (RCRA) and its amendments, including the Federal Facility Compliance Act (FFCAct), and from the New Mexico Hazardous Waste Act (NMHWA).

These statutory provisions are enforced through three major mechanisms: facility RCRA permits; the New Mexico Hazardous Waste Management Regulations, set forth in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1; and compliance orders issued to enforce these requirements. General requirements in all three categories will apply to MTRU waste management and characterization activities at both WIPP and LANL. In addition, LANL is subject to facility-specific requirements in its RCRA hazardous waste facility permit, permit conditions as currently proposed in RCRA Part B permit applications presently being reviewed by the New Mexico Environment Department (NMED), and facility-specific compliance orders related to MTRU waste management. Likewise, permitting- and compliance-related requirements specific to WIPP indirectly affect LANL's characterization, packaging, record-keeping, and transportation requirements for MTRU waste.

LANL must comply with this evolving set of regulatory requirements to begin shipments of MTRU waste to WIPP in a timely fashion. Additionally, LANL and the Department of Energy must work continuously with the regulatory agencies and the public in order to manage their compliance responsibilities as proactively as possible.

## INTRODUCTION

This paper discusses regulatory requirements, including federal and state laws and regulations, and Department of Energy (DOE) requirements as they apply to the management of the Los Alamos National Laboratory's (LANL's) transuranic waste (TRU) inventory. It focuses specifically on LANL's key requirements as a generation and storage facility for mixed transuranic (MTRU) waste as defined by the Resource Conservation and Recovery Act (RCRA).

The LANL TRU waste universe intended for transfer to the Waste Isolation Pilot Plant (WIPP) includes both newly-generated wastes and historical ("legacy") waste streams currently maintained in interim storage, as well as some legacy wastes intended for retrieval from under earthen cover. Other legacy TRU wastes historically had been placed on-site in ways constituting disposal. Some of these may or may not eventually be retrieved for transfer to WIPP. Current LANL TRU waste management practices are focused on retrieval, interim storage, characterization/certification, transportation, and ultimate disposal at WIPP (see Table 1).

As with all types of wastes, these waste management practices have different regulatory requirements which apply at each stage in the TRU waste life cycle. TRU wastes may receive some form of physical and/or chemical processing during one or more stages of this life cycle to facilitate safer, more efficient, or more cost-effective management, or to meet certain internal or external regulatory requirements. Such practices may or may not be defined as "treatment" under RCRA, but if so, may trigger additional statutory, regulatory, and compliance-driven requirements, as will be discussed subsequently in this paper.

As with all mixed wastes, different requirements are applicable to the radioactive and hazardous components of TRU waste. The radioactive component of MTRU waste is regulated by the DOE for management and disposal, and by the Department of Transportation and the Nuclear Regulatory Commission for transportation on public roads. At LANL, management of TRU waste has been directed toward storing and preparing the waste for eventual shipment to and disposal at the Waste Isolation Pilot Plant located near Carlsbad, New Mexico. The WIPP facility has been identified for disposal of defense-related TRU waste, and Title 40 of the Code of Federal Regulations (40 CFR), Parts 191 and 194 were promulgated to regulate disposal at WIPP. WIPP imposes additional requirements (WIPP Waste Acceptance Criteria, i.e., WIPP WAC) that must be met by TRU wastes intended for disposal at that facility. DOE Order 5820.2B defines DOE requirements for managing radioactive waste, including TRU, and is being implemented at both WIPP and LANL. They will be discussed subsequently in this paper.

Other DOE Orders, standards, and regulations pertaining to LANL's management of the radioactive components of TRU waste prior to WIPP shipment address industrial safety, nuclear facility operations, quality assurance, and radioactive waste management. They include, for example, 10 CFR 830 (Quality Assurance Requirements); DOE Order

5400.5 (Radiation Protection of the Public and the Environment); DOE Order 5480.19 (Conduct of Operations Requirements for DOE Facilities); DOE Order 6430.1A (General Design Criteria); DOE Order 5480.28 (Natural Phenomena Hazards Mitigation for Department of Energy Facilities); DOE Order 5480.7A (Fire Protection); DOE Order 5480.4 (Environmental Protection, Safety and Health Protection Standards); DOE Order 5484.1 (Environmental Protection, Safety and Health Protection Information Reporting Requirements); DOE Order 5480.23 (Nuclear Safety Analysis Reports); DOE Order 5480.11 (Radiation Protection for Occupational Workers); and DOE Order 5480.2A (Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities). These DOE Orders, standards, and regulations will not be discussed further in this paper.

LANL estimates that about 95% of its TRU wastes are mixed TRU wastes, i.e., they also contain a hazardous waste component. The hazardous waste component of mixed waste is subject to regulation under the federal RCRA (42 USC 6901), as well as the New Mexico Hazardous Waste Act (NMHWA). The State of New Mexico has been delegated authority to implement RCRA requirements in lieu of the federal program. The applicable New Mexico regulations are found in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, (20 NMAC 4.1), as revised November 1, 1995, which adopt, with a few minor exceptions, the requirements of 40 CFR, Parts 260-265, 268, and 270. Included are requirements for waste characterization, documentation, container labeling, waste storage, monitoring and inspections, emergency preparedness, treatment, and ultimate disposal of the hazardous waste component of MTRU waste.

Other RCRA requirements and drivers for the management of the LANL MTRU inventory stem from ongoing permitting actions addressing these requirements, or orders addressing former or continuing violations of RCRA or NMHWA mixed waste requirements. The two key compliance orders are an October, 1995 Federal Facility Compliance Order (FFCO), issued unilaterally to LANL by the State of New Mexico Environment Department (NMED) to enforce requirements of the 1992 Federal Facility Compliance Act (FFCA); and a December, 1993 Consent Agreement (CA) related to the retrieval of legacy MTRU waste currently stored at LANL. These permitting actions and compliance orders will be discussed in the following sections of this paper.

Many other non-RCRA requirements and drivers for the management of the LANL MTRU inventory likewise may apply to the waste management practices in Table 1 at each stage in the TRU waste life cycle. Non-DOE non-RCRA requirements and drivers include requirements of the Clean Air and Water Acts and their state equivalents; the Toxic Substances Control Act; the Occupational Safety and Health Act; National Fire Protection Association standards (including life safety code, lightning protection, fire protection, and electrical code requirements); International Commission on Radiological Protection guidelines and criteria; American National Standards Institute standards and guidelines; and the National Environmental Policy Act, among others. These other laws, standards, and regulations will not be discussed further in this paper.

## **DISCUSSION OF KEY DRIVERS**

### **DOE Order 5820.2B: Management of the Radioactive Component of TRU Waste**

Radioactive wastes at DOE facilities, including the radioactive waste component of LANL's MTRU wastes, must be managed in accordance with DOE Order 5820.2B. Site-specific management requirements are found in the Los Alamos National Laboratory Waste Acceptance Criteria (LANL WAC). For transuranic waste, the LANL WAC requirements generally mirror the requirements of the WIPP WAC. Generators fulfill these requirements through their waste management practices and document these activities on specific forms that are used by LANL waste management groups to further store, treat, ship, and/or dispose of the waste, as necessary. The specific forms and management practices for TRU waste are found in the LANL WAC and the LANL TRU Waste Certification Plan (LANL 1996).

### **Unilateral Federal Facility Compliance Order: Treatment of MTRU to LDR**

Key among the RCRA and NMHWA requirements pertaining to the storage and ultimate disposal of the hazardous waste component of LANL's MTRU waste are the land disposal restrictions (LDR) established by the 1984 Hazardous and Solid Waste Amendments to RCRA, which greatly restrict the land disposal of hazardous waste without treatment (see 40 CFR, Part 268). The Federal Facility Compliance Act of 1992 mandated that federal facilities, including DOE facilities, prepare site treatment plans (STP) for developing and using treatment technologies to treat those mixed wastes stored in violation of LDR requirements, and provided a timetable for preparation of the plans. By October, 1995, states were required to enter into agreements with affected facilities for the working-off of facility wastes, or were required to issue a unilateral order mandating time frames for treatment of the wastes to meet LDR requirements.

DOE and LANL submitted a Proposed Site Treatment Plan (PSTP) to the New Mexico Environment Department (NMED) in March 1995. Portions of LANL's PSTP were incorporated into the final STP issued by NMED as part of its October 1995 unilateral FFCO. However, for LANL's MTRU, the STP mandated that DOE and LANL develop treatment technologies by June 30, 1999. This schedule was not based on the assumption that WIPP will be a disposal option for LANL's MTRU waste, or that DOE will receive a variance from LDR treatment standards for land disposal of MTRU waste to be disposed at WIPP. The FFCO does not allow for decisions on treatment of MTRU to be deferred until after WIPP became operational, as was proposed in the PSTP.

On September 23, 1996, the President signed the FY 1997 Defense Authorization Bill, which contained amendments to the 1992 WIPP Land Withdrawal Act. Under this legislation, MTRU designated for disposal at WIPP by the Secretary of Energy is declared to be exempt from the LDR treatment standards and the land disposal prohibition. The impacts of this legislation on LANL's STP and FFCO requirements for MTRU treatment are being evaluated at present by all affected entities.

## **WIPP WAC: Requirements for Transportation to and Disposal of Transuranic Waste at WIPP**

WIPP is currently scheduled to open for receipt of waste in November 1997. The WIPP Waste Acceptance Criteria serve as the primary directive for assuring the safe handling, transportation, and disposal of TRU waste generated at DOE sites. The WIPP WAC address fulfillment of WIPP's operational safety and performance assessment criteria, compliance with RCRA requirements, preparation of waste packages that meet all transportation technical requirements prior to acceptance for disposal at WIPP, and summarize the transportation requirements for shipping transuranic waste.

Preparation of both non-RCRA TRU and MTRU waste for final disposal at WIPP includes characterizing the waste to meet the requirements of the Transuranic Waste Characterization Quality Assurance Program Plan (QAPP) (DOE 1995) and certifying waste containers to the WIPP WAC and the *Transuranic Package Transporter-II Authorized Methods for Payload Control* (TRAMPAC) (NRC 1994). The QAPP requirements are based on characterization through nondestructive testing, including radiography and radioassay, and chemical sampling and analysis of homogeneous waste forms. The QAPP establishes the performance-based requirements for TRU waste characterization to meet the data quality objectives (DQOs) associated with WIPP compliance programs, including the RCRA general waste analysis requirements under 40 CFR 264, the RCRA land disposal restrictions under 40 CFR 268 and the performance assessment under 40 CFR Parts 191 and 194.

To comply with the WIPP WAC, QAPP, and TRAMPAC, LANL, as an individual generator site, must prepare site-specific documentation including: a transuranic waste certification plan, a transuranic waste characterization quality assurance project plan, and a site-specific TRAMPAC document. Each generator site must also prepare a quality assurance plan (or plans) that documents the quality assurance program(s). Quality affecting processes must be documented and controlled using procedures that meet the quality assurance requirements of the *Quality Assurance Program Description* (QAPD) (DOE 1994) and additional quality assurance requirements that are found in the QAPP.

### **LANL-Specific Requirement: Consent Agreement for Retrieval and RCRA-Compliant Storage of MTRU in Pads 1, 2, and 4; the Transuranic Waste Inspectable Storage Project (TWISP)**

Since approximately 1970, in accordance with Atomic Energy Act requirements, fiberglass-reinforced plywood crates and metal drums containing solid-form TRU waste were stored on earthen-covered Storage Pads 1, 2, and 4 at LANL Technical Area 54. This storage practice continued until the RCRA and NMHWA requirements for visually inspectable storage became applicable to LANL's MTRU waste. Many of the containers stored on Pads 1, 2, and 4, however, contain MTRU, and the pads were included as storage units in LANL's interim status mixed waste RCRA Part A permit application of January, 1991. In January, 1993, the NMED issued Compliance Orders NMHWA 93-01,

-02, -03, and -04 to DOE and LANL. These required, among other conditions, that the wastes stored on Pads 1, 2, and 4 be retrieved, in response to the discovery in early 1992 that some containers stored on the pads exhibited corrosion and had the potential to leak.

The Transuranic Waste Inspectable Storage Project (TWISP) was developed as part of the December, 1993 Consent Agreement with NMED that resolved these Compliance Orders. The project's purpose is to retrieve the containers from Pads 1, 2, and 4; overpack any damaged containers; vent and install gas filters on containers; and by 2003, complete placement of all retrieved containers into inspectable configurations, in compliance with current RCRA and NMHWA requirements for storage of hazardous waste.

Wastes generated prior to the applicability of RCRA and NMHWA requirements to LANL's MTRU waste were not characterized with these requirements in mind at the time of their placement in the pads. As a result, it is not yet confirmed which individual containers are TRU and which are MTRU, although LANL estimates as much as 95% may be MTRU. Therefore, all waste retrieved from the pads will be managed as MTRU until additional characterization information becomes available. Currently generated TRU waste streams, on the other hand, are identified as TRU or MTRU through application of acceptable knowledge for waste characterization and are managed according to their respective designations.

#### **Laboratory Specific Requirement: TWISP RCRA Permit and Waste Analysis Plan**

A RCRA Part B Permit Application was submitted to NMED on September 30, 1993, to modify the existing LANL Hazardous Waste Facility Permit of 1989 as required by 20 NMAC 4.1, Subpart IX. The proposed modification was necessary to permit the TWISP activities involving mixed waste storage, in order to comply with the December 10, 1993 Consent Agreement between NMED, DOE, and the University of California (management and operating contractor for LANL). The TWISP permit modifications were conditionally approved by NMED on May 11, 1994, allowing the project to proceed as described in the application provided that a revised waste analysis plan and contingency plan would be submitted to NMED. The revised MTRU waste analysis plan (WAP) was submitted to NMED on March 31, 1995.

NMED's concern with the original WAP involved the need for additional waste characterization procedures to add to existing process knowledge regarding the retrievably stored MTRU waste streams. LANL's revised WAP incorporated procedures for documenting waste characterization as suggested by U.S. Environmental Protection Agency guidance and for confirming process knowledge through the use of real-time radiography, visual examination, head space gas analysis, and drum coring procedures as appropriate for each waste stream. NMED issued a Notice of Deficiency for the MTRU WAP on May 24, 1996, requesting more information. LANL's response of July 11, 1996, addressed specific questions about facility characterization procedures and incorporated references to WIPP waste certification procedures currently under



development by DOE and subject to approval by NMED through the WIPP RCRA permit approval process.

The LANL MTRU WAP directly authorizes waste characterization activities related to TWISP. It incorporates the TRU Mixed Waste Certification Plan for WIPP by reference and also contains other waste characterization conditions derived from the WIPP WAC and QAPP. Therefore, these LANL permit conditions will be directly applicable for the characterization and management of waste streams destined for final disposal at WIPP. The general waste management conditions of the TWISP permit modification, and the waste characterization conditions of the included MTRU WAP, will apply to the process of retrieving and characterizing the buried TRU mixed waste containers whether LANL's TRU mixed waste ultimately will be disposed of untreated at WIPP, or treated subject to LANL's STP as currently written. Many of the conditions of both WAPs and the general permit modification for TWISP will be incorporated in LANL site specific waste management and characterization procedures.

### **POSSIBLE CHANGES TO REQUIREMENTS IN THE FUTURE**

Changes to the requirements could come from a variety of sources. The WIPP WAC is periodically updated and DOE is actively engaged with the generators at all sites in identifying opportunities to bring added efficiencies to the process. LANL has evaluated LANL TRU waste against WIPP WAC criteria and identified a number of activities (such as matrix depletion and gas getter experiments) that could contribute to this effort.

40 CFR 194.24 (EPA, 1996) identifies analyses to be done in support of the WIPP compliance certification application to identify and assess the impact on WIPP's long term performance of those waste characteristics which influence the containment of waste in the disposal system. A partial analysis of waste components and characteristics has been conducted to determine which of these influence repository performance. The 40 CFR 194 analyses might therefore drive changes to waste characterization requirements, although analyses done to date do not indicate such changes.

The WIPP RCRA Part B Permit Application, including the WIPP WAP, the LANL TWISP permit modification, and subsequent permit applications for associated LANL waste characterization facilities that have included the LANL MTRU WAP, have not currently been formally approved by NMED. Although the permit approvals are moving forward with input and approval by both DOE and NMED, future changes may affect MTRU waste management and characterization practices.

As discussed previously, legislation passed in the 104th Congress to amend the 1992 Waste Isolation Pilot Plant Land Withdrawal Act (in the FY 1997 Defense Authorization Bill, Public Law 104-201; Craig, 1996), may accelerate the opening of WIPP for waste emplacement to as early as November, 1997 and may dramatically impact requirements to treat MTRU prior to emplacement at WIPP. Under this legislation, MTRU designated for disposal at WIPP by the Secretary of Energy is declared to be exempt from the LDR

treatment standards and the land disposal prohibition. The impacts of this legislation are being evaluated at present by all affected entities.

## CONCLUSION

The preceding discussion presented an overview of a specific subset of the myriad regulatory drivers impacting shipment of LANL's MTRU waste to WIPP. LANL must comply with its evolving set of regulatory requirements, and ensure that shipped wastes comply with WIPP's evolving set of regulatory requirements, in order to begin shipments of MTRU waste to WIPP in a timely fashion. Additionally, LANL and the Department of Energy must work continuously with the regulatory agencies and the public in order to manage their compliance responsibilities as proactively as possible. This becomes even more challenging as DOE and LANL proceed to sort out the as-yet undetermined impacts of the WIPP Land Withdrawal Act Amendments on the scope of LANL's TRU waste management program in succeeding years.

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- 40 CFR 194, "Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance With the 40 CFR Part 191 Disposal Regulations." *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.
- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.
- 40 CFR 268, "Land Disposal Restrictions." *Code of Federal Regulations*, Washington, D.C., Office of the Federal Register National Archives and Records Administration.
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- NMED, 1995. *Federal Facility Compliance Order (Los Alamos National Laboratory)*. (Also referred to as "FFCO-STP".) Issued by the State of New Mexico Environment Department on 4 October 1995. (The LANL STP Compliance Plan Volume and Background Volume are attached as "Exhibit A.")
- NRC. 1994. *Transuranic Package Transporter-II Authorized Methods for Payload Control (TRAMPAC)*, Appendix 1.3.7 of the *Safety Analysis Report for the*

*TRUPACT-II Shipping Package.* Docket 9218, Washington, D.C., U.S. Nuclear  
Regulatory Commission.

Table 1- Requirements and Drivers for TRU Waste Activities

RCRA/NMHTWA Waste Stream Requirements	Requirement Source	DOE Waste Stream Requirements	Requirement Source
Waste characterization to satisfy RCRA requirements for generation and storage.	New Mexico Administrative Code (20 NMAC 4.1): Subpart V, 264.13; Subpart VIII, 268.7; Subpart IX, 270.14 (b)(2).; LANL's RCRA Part B Permit Application Waste Analysis Plan (WAP) for mixed TRU (MTRU) waste	Characterization of TRU for shipment and disposal at WIPP.	WIPP WAC, rev.5, Transuranic Waste QAPP, and QAPD; LANL QAPJP, LANL Certification Plan. <sup>b</sup>
Retrieve TRU waste on Pads 1, 2, and 4 and place in inspectable storage required by 2003.	Consent Agreement with New Mexico Environment Department.	DOE national policy requires retrieval of this waste for shipment and disposal at WIPP.	Chang, L., 1995. "Guidance for Including Mixed Transuranic (TRU) Waste Information in the Proposed Site Treatment Plan (PSTP)," Memo from DOE/BM-331 dated 10 January 1995.
Venting of containers prior to storage.	TWISP RCRA Part B Permit Application, Waste Analysis Plan, March 31, 1995.	Venting is required for all containers to be shipped and disposed of at WIPP.	WIPP-WAC, rev.5; TRUPACT-II Safety Analysis Report (SAR).
MTRU waste certification program.	TWISP RCRA Part B Permit Application, Waste Analysis Plan, March 31, 1995.	Certification of TRU for shipment and disposal at WIPP.	WIPP WAC, rev.5, Transuranic Waste QAPP, and QAPD; LANL QAPJP, LANL Certification Plan. <sup>b</sup>
Treat MTRU to meet LDR requirements. Treatment technologies must be developed by 1999, a RCRA Permit App. to operate treatment units must be submitted in 1999, and treatment of all MTRU must be completed by 2010.	Federal Facility Compliance Order and Site Treatment Plan (FFCO-STP) issued by State of NM, October 1995. <sup>c</sup>	Pre-treatment: Size reduction, repackaging, sorting as necessary to meet WIPP WAC criteria, especially packaging requirements, in order to ship and dispose of these wastes at WIPP.	WIPP-WAC, rev.5; TRUPACT-II SAR; LANL TRAMPAC.

<sup>a</sup> Requirement to treat to LDR in FFCO-STP is explicitly independent of WIPP opening or accepting MTRU. By mandating that DOE/LANL "develop treatment technologies", the FFCO-STP implies on-site treatment at LANL; other options may require renegotiation with State of New Mexico.

<sup>b</sup> WIPP requirements are the same for both TRU and MTRU wastes.

<sup>c</sup> The applicability of LDR treatment standards to MTRU waste destined for shipment to WIPP is currently being reviewed. See discussion of Land Withdrawal Act Amendments in the body of this paper.