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## Environment, Safety, Health Directorate

## WM-SVS: Waste Management Services

## Administrative Procedure

# Radioactive Waste Management

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## Table of Contents

## 1.0 INTRODUCTION

The purpose of this procedure is to provide requirements for Radioactive Waste Management. This document is managed and owned by the Environment, Safety, and Health Associate Directorate and provides instructions on applying the requirements.

### 1.1 Purpose

This procedure summarizes the requirements in Los Alamos National Laboratory (LANL) procedure P151-1, LANL Packaging and Transportation Program Procedure; Department of Energy (DOE) Order 435.1, "Radioactive Waste Management" and the associated manual, DOE Manual 435.1-1, *Radioactive Waste Management Manual* (collectively referred to as DOE O/M 435); and DOE Order 458.1, "Radiation Protection of the Public and the Environment," Section 4.k.

### 1.2 Scope

The Waste Management Division (WM) provides radioactive waste planning, characterization, reporting, and disposal services in support of LANL's radiation and environmental protection missions.

Radioactive waste may also potentially be characterized as mixed waste. Mixed waste contains both radioactive and hazardous components as defined by the Atomic Energy Act of 1954 (as amended) and Title 40 Code of Federal Regulations (CFR) §261, "Identification and Listing of Hazardous Waste." Consequently, users of this Functional Series Document (FSD) must also follow the guidance in ADESH-AP-TOOL-111, Waste Characterization, to ensure their waste characterization process complies with the hazardous waste characterization requirements in Title 40 CFR §262.11, "Hazardous Waste Determination," and LANL's Hazardous Waste Facility Permit. This FSD will also help users make transportation determinations in accordance with the Department of Transportation requirements in Title 49 CFR §173, "Shippers–General Requirements for Shipments and Packages."

### 1.3 Applicability

This procedure applies to any LANL employee, contractor, or subcontractor who has been identified as a waste generator.

**Note:** Treatment and storage facility (TSF) workers become "waste generators" when activities at the TSF (e.g., repackaging, sorting, and segregation) lead to the generation of regulated waste or trigger re-characterization of the waste stream.

## 2.0 PRECAUTIONS AND LIMITATIONS

This procedure cannot establish new requirements; it may only summarize the requirements in federal/state statutes/regulations/permits, DOE orders, and authorized Laboratory policies.

## 3.0 RADIOACTIVE WASTE MANAGEMENT REQUIREMENTS

Low-level waste (LLW), mixed low-level waste (MLLW), transuranic waste (TRU), and transuranic mixed waste (TRM) must meet waste package certification requirements before the waste is packaged, shipped, and disposed. Generators of radioactive waste have two options in meeting the waste package certification requirements. For either option the waste generator must make a request via e-mail to WCO@lanl.gov to arrange for waste package certification.

- For radioactive waste destined to the Nevada National Security Site (NNSS), the waste generator must follow the requirements outlined in the LANL Off-Site Waste: Nevada National Security Site procedures.
- For wastes destined to a non-NNSS facility, the waste generator may also follow the requirements outlined in the LANL Off-Site Waste: Nevada National Security Site procedures (recommended), or WM can perform an evaluation of each waste stream to ensure waste characterization, packaging, shipment, and disposal are compliant with applicable regulations and waste acceptance criteria.

While carrying out their radioactive waste management duties, waste generators and waste management coordinators (WMCs) must reference the appropriate Functional Series Documents (FSDs) as directed in the waste-type sections below. The FSDs support the requirements for each waste type addressed in DOE O/M 435.

### 3.1 Waste Generation Planning

DOE Manual 435.1-1 includes the following requirement: “Prior to waste generation, planning shall be performed to address the entire life cycle for all transuranic/low-level waste streams.” This planning includes waste minimization strategy evaluation and beginning the waste stream profile process. The waste generator will coordinate with the WMC and radiation control technicians prior to generating the waste. Waste generation planning also includes the following:

- **Quality Assurance Program:** Each organization owning a waste storage area or waste staging area must implement a quality assurance program compliant with DOE Order 414.1D, “Quality Assurance.”
- **Documentation:** Required documentation includes a listing of waste records and specification of how records are protected and retained, the retention period, and how documents are maintained for retrievability and auditability.
- **Planning New Radioactive Waste Streams:** All waste generators that anticipate generating a new waste stream should review the new R&D and new operations waste stream planning FSD and implement its requirements. This FSD also applies to proposed new research and development laboratory (R&D) projects or proposed significant modifications to existing waste streams. The waste minimization provisions in this FSD must be implemented wherever practicable.
- **Removing Waste from Radiological Areas:** Before radioactive waste can be removed from a radiological control area, it must meet the release criteria in LANL procedure P121, Radiation Protection. The Green is Clean (GIC) program is designed to reduce the generation of

radioactive LLW through a waste segregation and verification program based on acceptable knowledge (AK) and screening. Waste generators in radiological control areas segregate clean waste from radiologically contaminated waste and place waste determined to be nonradioactive in GIC containers. Contact Green-is-Clean to arrange for this service.

- **Waste Forecasting:** To access treatment, storage, or disposal facilities (TSDFs), the waste generator must provide volume projections for waste transfers to each TSDF for radioactive waste disposition. Any waste generator failing to provide the requested waste forecasting information in a timely manner may be prohibited from transferring waste to the applicable facility.

### 3.2 Radioactive Waste Management Basis Information

Radioactive-waste-generating facilities must submit radioactive waste management basis (RWMB) information with the RWMB form. Contact the Waste Certification Program (WCP) for guidance.

- WMCs must register LLW staging and storage areas and transuranic (TRU) waste storage areas with the WM, on behave of generators who own these areas.
- The generating facility must implement and document the inspection schedule for staging and storage areas.
- Radioactive waste generators must ensure their waste is certified for storage and shipment in concurrence with the WMC.
- Unless a formal agreement is in place with DOE, facilities that intend to store radioactive waste for longer than 1 year must submit a modified RWMB to request a storage extension for the waste as specified in LANL procedure P409, Section 3.4.3.

### 3.3 Waste Certification and Protection

Waste certification and protection is the process of ensuring that

- the initial characterization methods are adequate (waste generator organizations mischaracterizing waste will be charged for any remediation work required to bring the waste, the site, and/or the facility into compliance with governing regulations);

**Note:** Acceptable characterization approaches include defensible AK and/or physical/chemical/radiological analysis.

- waste packages meet the WAC of the intended TSDF, including waste package certification consistent with the NNSS WAC;
- access to the storage area is controlled such that waste containers are protected from tampering, unauthorized waste addition or removal, and the elements;
- waste containers are adequate to protect the waste against external sources of contamination over the expected storage period; and
- the process for linking waste characterization documentation to specific containers guarantees that the documentation and the information on the containers match;

- during storage;
- when the responsibility for physical control of the waste is transferred; or
- when the waste is shipped.

The following practices are essential to ensuring waste certification and protection requirements are met:

- development of accurate and complete waste documentation;
- adequate container labeling;
- a communications system that ensures personnel consistently understand the status of waste containers and container transfers; and
- quality controls to validate the container tracking system.

For the purposes of DOE Manual 435.1, Chapter IV, Section J, WMCs ensure radioactive waste containers meet the acceptance requirements for waste being transferred into on-site radioactive waste staging or storage areas. WMCs are responsible for reporting to management when a facility's physical structure or operation does not enable them to stage or store radioactive waste. When radioactive waste is readied for shipment to a TSDF, WAC certification activities are completed by the LANL WCO.

To ensure the integrity of the radioactive waste is maintained during staging and storage, WMCs verify:

- the waste characterization documentation is accurate and complete;
- the waste meets the WAC for the on-site radioactive waste staging or storage area;
- the waste container is adequate to protect the waste against external sources of contamination while in storage;
- waste containers are closed and sealed in accordance with manufacturer's instructions before shipment;
- measuring and test equipment used to close the container and/or obtain weights of the container or waste meet the requirements of LANL procedure P330-2, Control and Calibration of Measuring and Test Equipment (M&TE); and
- nonconforming items and/or processes are reported to the responsible line manager and nonconformance coordinator.

### 3.4 Stabilization

When practical, radioactive waste shall be generated to minimize volume and in a manner that provides a stable waste form. Radioactive wastes shall not react with other wastes or the packaging during storage, shipping, handling, and disposal. Chemical stability and compatibility shall be demonstrated to ensure that no reactions occur and significant quantities of harmful gases, vapors, liquids, or explosive conditions and compounds are not generated (specifically when different waste

forms are combined in a single waste container). For waste compatibility determinations refer to ASESH-AP-TOOL-115 (Rev. 0), Waste Compatibility Determinations.

### 3.5 Waste Container Loading Configuration Requirements

LLW waste packages destined to the NNSS shall be filled and loaded in accordance with LANL procedure WM-PROG-QP-204, Low-Level Waste Packaging Oversight of Waste for Disposal at the Nevada National Security Site (NNSS).

MLLW waste packages destined to the NNSS shall be filled and loaded in accordance with LANL procedure WM-PROG-QP-208, Mixed Low Level Waste Packaging Oversight of Waste for Disposal at the Nevada National Security Site (NNSS). For radioactive waste destined to a TSDFs other than NNSS, WM must be consulted for guidance.

For all LANL waste package configurations, be sure, at a minimum, to complete the following steps:

- Verify the package maximum gross weight;
- Ensure that the package is not overloaded;
- Verify that the waste designated for loading is compatible with the package;
- Verify that the physical configuration of the loading mechanism will not damage the package;
- Verify that the waste and the package are certified for disposition at the disposal facility; and
- Verify the package is free from nonconforming waste items.

### 3.6 Staging and Storage

#### *3.6.1 LLW Staging*

Safe and secure staging of LLW is required per LANL procedure P409. Stage LLW in a location and manner that minimizes worker exposure and protects the integrity of the waste and waste package for the expected time of storage. The seal date (also known as the rad start date) begins when the final container for the waste has been filled and sealed. The staging seal date must then be included on the container and that information must be updated in WCATS. LLW can be accumulated in its final container at the point of generation when waste activities are under the control of the generator or inside a staging area. Accumulation means the collection or generation of waste items into the final container inside a staging area until filled and sealed prior to shipment from the staging area. Accumulation points outside of staging areas do **not** have to be registered. There is no set limit to the time waste can be accumulated in its final container as long as this done in a timely manner, given the circumstances of the waste-generating process. Waste streams should be evaluated by the generator annually, for disposition or continued accumulation, as a best management practice.

#### *3.6.2 General Staging and Storage Requirements*

- Before waste can be accepted by a storage area or TSF, the waste must be characterized as summarized in the Waste Characterization FSD.

- Radioactive waste in staging and storage must not be readily capable of detonation, explosive decomposition, reaction at anticipated pressures and temperatures, or explosive reaction with water. Pyrophoric materials must be treated, prepared, and packaged to be nonflammable before storage.
- If inventory limits are required by the storage/staging area, the facility must ensure they are not exceeded.
- LLW may be staged for no more than 90 days pending transport to a LLW storage area or TSDF.
- Waste packages cannot be stored for longer than 1 year. If storage must exceed this limit, the facility must re-submit its RWMB and request a storage extension by following the process outlined in LANL procedure P409.
- Waste with no disposal path may be stored for longer than 1 year only with an approved No Path Package from WM for each waste stream.
- Monthly inspections of staging and storage areas are required with the radioactive waste staging area monthly inspection form or radioactive waste storage area monthly inspection form, as appropriate.

### *3.6.3 Signs and Labels*

- A sign for a waste staging or storage area must be posted indicating the Site ID number obtained when the site is registered.
- TSFs must register radioactive waste staging and storage areas that are managing waste generated by the TSF itself, and these areas must be posted with Waste Staging Area signs within the TSF generation areas (e.g., secondary waste generation, equipment disposal, etc.).
- TSFs do not require Waste Storage Area signs, but the waste in these areas must be included in the RWMB.
- Staging and storage areas must be evaluated by a radiological control technician (RTC). The radiation protection program must post signs in the areas, as appropriate.
- Signs to meet the requirements of LANL procedure P121, Chapter 7, must be posted. (The radiation protection program or your WMC may be contacted for radiation protection signs.)
- Before waste in a staging area will be accepted by a storage area or TSF, containers must be labeled (Refer to the LANL waste management labels guidance). Waste in storage areas must comply with the requirements in the LANL WAC for LLW packaging and labeling or TRU waste packaging and labeling.
- Before LLW waste with an added contaminant (non-hazardous) will be accepted by a storage area or TSF, containers must meet the packaging and labeling requirements summarized in the Asbestos-Containing Material, Polychlorinated Biphenyls (PCBs), or Beryllium FSDs, as appropriate.

## 3.7 Requirements for Specific Radioactive Waste Types

### *3.7.1 Low-Level Waste*

DOE O 435.1 formally defines low-level radioactive waste as radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e.(2) of the *Atomic Energy Act of 1954*, as amended), or naturally occurring radioactive material.

Primarily LLW generated at LANL is radioactive waste that contains less than 100 nCi/g of alpha-emitting transuranic radionuclides, with a half-life greater than 20 years.

- Follow the LLW staging and storage requirements summarized in section 3.6 of this procedure. Radioactive waste facilities must inspect their LLW waste staging and storage areas monthly with the radioactive waste staging area monthly inspection form or radioactive waste storage area monthly inspection form, respectively.
- Facilities that must store LLW in excess of 1 year must submit a modified RWMB to request a storage extension for the radiological component of the waste as specified in LANL procedure P409, Section 3.4.3.a.

### *3.7.2 Mixed Low-Level Waste*

MLLW is waste containing both LLW and a hazardous component as defined by the Atomic Energy Act of 1954 (as amended) and a Resource Conservation and Recovery Act (RCRA) constituent as identified in 40 CFR 261.

Because of its hazardous waste components, MLLW cannot be staged or stored solely in compliance with DOE O/M 435. Follow the requirements summarized in the functional series document (FSD) ADESH-TOOL-206, Hazardous Waste (General), as appropriate.

- Because of the hazardous waste component, MLLW containers must be inspected in accordance with requirements of the appropriate registered waste area described in the FSD listed above.
- Facilities that must store MLLW in excess of 1 year must:

  1. before the end of 1 year's MLLW storage, notify LANL's Site Treatment Plan point of contact to include the waste in LANL's Site Treatment Plan.

  2. submit a modified RWMB to request a storage extension for the radiological component of the waste as specified in LANL procedure P409, Section 3.4.3.a.

### *3.7.3 TRU Waste*

Radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:

- High-level radioactive waste;
- Waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations; or

- Waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

Follow the waste storage requirements summarized in section 3.6 of this procedure. Radioactive waste facilities must inspect their TRU waste storage areas monthly with the radioactive waste storage area monthly inspection form.

Facilities that must store TRU in excess of 1 year must submit a modified RWMB to request a storage extension for the radiological component of the waste as specified in LANL procedure P409, Section 3.4.3.a.

### *3.7.4 Mixed TRU Waste*

Mixed TRU waste (MTRU) is TRU determined to contain both a hazardous component subject to RCRA, as amended, and a radioactive component subject to the Atomic Energy Act of 1954, as amended.

Because of the hazardous waste component of MTRU, it cannot be accumulated in a staging area or stored in a radioactive waste storage area; use the ADESH-TOOL-206, Hazardous Waste (General), or the LANL TSF's FSD.

- Facilities that must store MTRU in excess of 1 year must:

  1. notify LANL's Site Treatment Plan point of contact to include the waste in LANL's Site Treatment Plan.

  2. submit a modified RWMB to request a storage extension for the radiological component of the waste as specified in LANL procedure P409, Section 3.4.3.a.

### *3.7.5 Liquid Low-Level Waste*

The FSD for radioactive liquid waste generation, certification, documentation, and shipment to TA-50 or TA-53 specifies the process from waste generation planning through final disposition.

- Follow the LLW staging and storage requirements summarized in section 3.6 of this procedure. Radioactive waste facilities must inspect their LLW waste staging and storage areas monthly using the radioactive waste staging area monthly inspection form or radioactive waste storage area monthly inspection form.
- Facilities that must store LLW in excess of 1 year must submit a modified RWMB to request a storage extension for the radiological component of the waste as specified in LANL procedure P409, Section 3.4.3.a.

### *3.7.6 Radioactive TSCA Waste (PCBs & Asbestos) or Beryllium-Contamination Radioactive Waste*

Radioactive waste that contains a substance regulated under the Toxic Substance Control Act (TSCA), most commonly PCBs, must be managed subject to DOE Manual 435.1-1 and TSCA. LLW or MLLW waste that contains PCBs, asbestos, or beryllium, must be managed subject to DOE Manual 435.1-1 and the NNSS WAC, in communication with the on-site WPC.

Use the following FSDs in addition to radioactive requirements:

- PCB storage FSD
- Asbestos FSD,
- Beryllium powder FSD.

For radioactive contaminated beryllium in other forms contact wco@lanl.gov.

## 4.0 DEFINITIONS AND ACRONYMS

See LANL *Definition of Terms*.

See LANL Acronym Master List.

## 5.0 RECORDS

Records generated by this document will be submitted for records management in accordance with P1020-1, Laboratory Records Management and if applicable, with the ADESH-AP-006, Records *Management Plan*. Records generated by implementation of this procedure are:

- radioactive waste staging area monthly inspection forms;
- radioactive waste storage area monthly inspection forms;
- radioactive waste management basis; and
- site registration form for radioactive waste storage/staging areas.

## 6.0 REFERENCES

- ADESH-TOOL-111.2, Waste Characterization
- ADESH TOOL-203.2, Beryllium Powder
- ADESH-TOOL-206, Hazardous Waste (General)
- ADESH-TOOL-500.2, New Mexico Special Waste: Asbestos without Hazardous Waste Contamination
- 40 CFR §261, "Identification and Listing of Hazardous Waste"
- 40 CFR §262.11, "Hazardous Waste Determination,"
- 49 CFR §173, "Shippers–General Requirements for Shipments and Packages"
- DOE O 414.1D, "Quality Assurance"
- DOE O 435.1, "Radioactive Waste Management"
- DOE M 435.1-1, *Radioactive Waste Management Manual*
- DOE O 458.1, "Radiation Protection of the Public and the Environment"
- ENV-RCRA-TOOL-109.0, New Process Waste Stream Planning
- LANL Off-Site Waste: Nevada National Security Site procedures

- P151-1, LANL Packaging and Transportation Program Procedure
- P330-2, Control and Calibration of Measuring and Test Equipment (M&TE)
- P409, LANL Waste Management
- P121, Radiation Protection
- WM-PROG-QP-204, Low-Level Waste Packaging Oversight of Waste for Disposal at the Nevada National Security Site (NNSS)
- WM-PROG-QP-208, Mixed Low Level Waste Packaging Oversight of Waste for Disposal at the Nevada National Security Site (NNSS)
- WM-TOOL-302.1, Radioactive PCB Accumulation Area Requirements

## 7.0 TRAINING

Personnel must be trained in accordance with the requirements in LANL procedure P409, LANL Waste Management, and course 23264, Waste Generation Overview. Additional training requirements may be facility specific.

## 8.0 ATTACHMENTS OR APPENDICES

N/A