Independent Assessment of the Transuranic Waste All-Hazards Planning Basis at the Los Alamos National Laboratory

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Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms

AHS	All-Hazards Survey
CAPARS	Computer-aided Protective Action Recommendation System
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
EPHA	Emergency Planning Hazards Assessment
EPZ	Emergency Planning Zone
LANL	Los Alamos National Laboratory
NA-LA	National Nuclear Security Administration Los Alamos Field Office
PA	Protective Action
PAC	Protective Action Criteria
SAFE-PA	Safeguards Planning and Analysis
TA	Technical Area
Triad	Triad National Security, LLC
TRU	Transuranic

INDEPENDENT ASSESSMENT OF THE TRANSURANIC WASTE ALL-HAZARDS PLANNING BASIS AT THE LOS ALAMOS NATIONAL LABORATORY

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of the all-hazards planning basis for transuranic (TRU) waste operations at the Los Alamos National Laboratory (LANL) during January 2023. This assessment evaluated the effectiveness of both the National Nuclear Security Administration Los Alamos Field Office (NA-LA) and its management and operating contractor, Triad National Security, LLC (Triad), in developing and maintaining the all-hazards planning basis for TRU waste operations. The all-hazards planning basis includes development and maintenance of an all-hazards survey and an emergency planning hazards assessment (EPHA). DOE Order 151.1D, *Comprehensive Emergency Management System*, identifies requirements for the all-hazards planning basis, and the associated emergency management guide provides guidance for implementing the requirements. EA focused primarily on hazard identification and screening and the documented analysis for supporting the development of response plans, emergency action levels, predetermined protective actions, and sizing of the emergency planning zone. EA also evaluated the utility of the EPHA as a reference for a consequence assessment team when conducting dispersion modeling of analyzed release scenarios.

EA identified the following strengths:

- Triad has developed procedures that are accurate, complete, and compliant. The procedures define adequate processes for effectively implementing the all-hazards planning basis requirements of DOE Order 151.1D.
- Triad has prepared, and NA-LA has approved, all-hazards surveys for LANL facilities where TRU waste is generated, stored, and packaged for shipping that effectively implement the applicable requirements of DOE Order 151.1D.
- Triad has prepared, and NA-LA has approved, EPHAs for facilities where TRU waste is generated, stored, and packaged for shipping that effectively implement the applicable requirements of DOE Order 151.1D. The EPHAs are technically accurate and provide information to support the development of response plans, emergency action levels, predetermined protective actions, protective action recommendations, and sizing of the emergency planning zone. In addition, the EPHAs provide the data, methods, and assumptions needed for a consequence assessment team to replicate the analysis in response to an incident.

In summary, no deficiencies were identified during this assessment. NA-LA and Triad have developed a technically sound all-hazards planning basis for TRU waste operations that meets DOE requirements to support the development of response plans, emergency action levels, predetermined protective actions, and sizing of the emergency planning zone. Additionally, the LANL EPHAs are established using standardized modeling input parameters that are applied consistently across the site, and the EPHAs provide pertinent information to support incident analysis by a consequence assessment team.

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the all-hazards planning basis for transuranic (TRU) waste operations at the Los Alamos National Laboratory (LANL). The all-hazards planning basis includes development and maintenance of all-hazards surveys (AHSs) and emergency planning hazards assessments (EPHAs). EA conducted this assessment as part of a series of assessments of the TRU waste all-hazards planning basis for sites that make shipments to DOE's Waste Isolation Pilot Plant. EA conducted the assessment during January 2023 in accordance with the *Plan for the Independent Assessment of the Transuranic Waste All-Hazards Planning Basis at the Los Alamos National Laboratory, January 2023-April 2023*.

The National Nuclear Security Administration Los Alamos Field Office (NA-LA) and its management and operating contractor, Triad National Security, LLC (Triad), are responsible for the development of the all-hazards planning basis for TRU waste operations. The all-hazards planning basis is used to develop response plans, emergency action levels (EALs), predetermined protective actions (PAs) or PA recommendations, and the emergency planning zone (EPZ). EA's assessment evaluated the effectiveness of both NA-LA and Triad in developing and maintaining the all-hazards planning basis for TRU waste operations at various LANL facilities.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, and opportunities for improvement" as defined in the order.

As identified in the assessment plan, this assessment considered requirements related to DOE Order 151.1D, *Comprehensive Emergency Management System.* EA also used section 4.2, *All Hazards Planning Basis*, of Criteria and Review Approach Document 33-09, Rev. 0, *DOE O 151.1D Emergency Management Program*. EA also considered the guidance provided in DOE Guide 151.1-1B, *Comprehensive Emergency Management System Guide.*

EA examined key documents, such as Triad's procedures for developing and maintaining AHSs and EPHAs, the AHS and EPHA for facilities where TRU waste is generated or stored, the documented safety analysis (DSA) for the reviewed facilities, and other relevant programmatic documentation supporting the preparation of the all-hazards planning basis. EA visited LANL waste facilities and interviewed key personnel responsible for TRU waste operations and the development of all-hazards planning basis documents, including Area G operations personnel. The members of the assessment team, the Quality Review Board, and the EA management personnel responsible for this assessment are listed in Appendix A.

The primary EPHAs evaluated in this assessment are associated with the LANL facilities that perform the most significant operations for storing, characterizing, processing, and preparing TRU waste for offsite

shipment, including: the Low-Level Waste Treatment Facility and Radioactive Liquid Waste Treatment Facility; the Radioassay and Nondestructive Testing Facility; the Technical Area (TA)-54, Area G Site; the TA-55 Plutonium Facility; the TA-03 Chemistry and Metallurgy Research Facility; and the TA-63 Transuranic Waste Facility.

There were no previous findings for follow-up addressed during this assessment.

3.0 RESULTS

3.1 Procedures

This portion of the assessment determined whether Triad procedures provide clear and appropriate guidance for developing, documenting, and maintaining AHSs and EPHAs, including identifying roles and responsibilities for review and approval. The AHS and EPHA procedures apply to all hazards at the site, including TRU waste.

AHSs and EPHAs for LANL facilities are prepared by the Safeguards Planning and Analysis (SAFE-PA) group, which is within the LANL Safeguards Division and is responsible for preparing both emergency management and vulnerability assessment analyses. Triad has an adequate set of program documents for developing and maintaining a technically based emergency management program that meets all DOE requirements. Collectively, Triad procedures ERO-EPIP-352, *All-Hazards Survey Procedure*; ERO-EPIP-295, *Emergency Planning Hazards Assessment Process*; and ERO-EPIP-255, *Hazard Survey Maintenance*, implement the applicable technical and administrative requirements and provide guidance for the development of predetermined PAs. The procedures are compliant with DOE Order 151.1D and provide guidance for developing, documenting, and maintaining AHSs and EPHAs, including identifying roles and responsibilities for review and approval.

The LANL AHS development and maintenance procedures, ERO-EPIP-352 and ERO-EPIP-255, provide a systematic process for identifying, recording, and screening facility hazards. The procedures provide adequate guidance on identifying and estimating hazardous material release scenarios, both manmade and those associated with natural phenomena, in terms of type, quantity, and form of radioactive and other hazardous materials. The procedures clearly describe the hazardous materials screening process and its application to the hazardous materials in a facility for AHS and EPHA development. The hazardous materials screening process requires the identification of all hazardous materials (e.g., radiological, chemical, explosives, hazardous biological agents and toxins) in a facility for a qualitative assessment based on DOE screening criteria.

The LANL EPHA development and maintenance procedure, ERO-EPIP-295, provides accurate and complete guidance for preparing an EPHA that defines the provisions of the emergency management hazardous materials program, as required by DOE Order 151.1D. The procedure requires a quantitative analysis of all hazardous materials identified for further analysis in the AHS; provides correct criteria for excluding hazardous materials from further analysis in the EPHA; identifies receptors of interest for consequence projections; provides source term determination instructions that effectively establish conservative material-at-risk quantities; and provides standardized modeling parameters for the models commonly used at LANL. In addition, the procedure appropriately defines conservative and average meteorological conditions and includes PA guides for both radioactive and chemical hazardous materials. Finally, the procedure effectively describes the establishment of a spectrum of potential emergency incident scenarios for analysis in the EPHA.

The AHS and EPHA development and maintenance procedures appropriately require the involvement of facility management and suitable technical experts in developing, reviewing, and approving AHSs and EPHAs. Specifically, the procedures appropriately require review and approval of AHSs and EPHAs by the applicable Facility/Project Manager or designated representative, the Emergency Management Technical Editor, SAFE-PA peer team members, Emergency Preparedness deployed staff, the SAFE-PA Group Leader, the Safeguards Division Leader, and others as deemed necessary (e.g., NA-LA point of contact) before submittal to NA-LA for review and approval.

Furthermore, the procedures have adequate maintenance provisions that require AHSs and EPHAs to be reviewed after any update to the facility's safety basis documents and updated prior to significant changes to the facility/site operations or to hazardous material inventories, but not less than every three years as required by DOE Order 151.1D, att. 4, sec. 2, par. o.

Procedures Conclusions

LANL has prepared procedures that are compliant with DOE Order 151.1D and provide accurate guidance for developing, documenting, and maintaining the all-hazards planning basis.

3.2 All-Hazards Survey

This portion of the assessment determined whether the AHSs prepared by Triad and approved by NA-LA identify all hazards applicable to TRU waste operations and establish the appropriate input for the planning basis of the emergency management program.

Triad prepared, and NA-LA approved, AHSs consistent with DOE Order 151.1D and procedural requirements. Triad prepares AHSs for LANL facilities according to planning zones. The AHSs for planning zones with facilities that generate, store, and ship TRU waste to the Waste Isolation Pilot Plant include: EMD-HS-901, *AHA for LANL Zone 1*; EMD-HS-902*, AHA for LANL Zone 2*; EMD-HS-903*, AHA for LANL Zone 3*; and EMD-HS-905, *AHA for LANL Zone 5*.

The results of the AHSs are informative and technically sound, consistent with DOE guidance, and were prepared in accordance with the Triad AHS development and maintenance procedures, ERO-EPIP-352 and ERO-EPIP-255. Each AHS accurately describes the chemical and radiological hazards applicable to TRU waste operations. In addition, each AHS identifies and documents the generic types of potential emergency conditions and impacts to which TRU operations facilities may be exposed (e.g., fire, explosion, loss of confinement, natural phenomena, malevolent act, and external hazards). The hazardous materials and emergency conditions identified in each AHS are consistent with those identified in the facility DSA.

All-Hazards Survey Conclusions

Triad has effectively prepared, and NA-LA has approved, complete and accurate AHSs for TRU waste operations at LANL facilities where TRU waste is generated, stored, and packaged for shipping. The AHSs identify all applicable hazards, establish the planning basis for the emergency management program, and comply with DOE Order 151.1D requirements.

3.3 Emergency Planning Hazards Assessment

This portion of the assessment determined whether the LANL EPHAs define the provisions of the emergency management hazardous materials program and provide the basis for establishing a graded approach that meets the hazardous material program requirements in DOE Order 151.1D, att. 4, sec. 2.

Triad prepared, and NA-LA approved, EPHAs consistent with DOE Order 151.1D and procedural requirements for LANL facilities where TRU waste is generated, stored, and packaged for shipping. The reviewed EPHAs include analysis of a comprehensive set of accident scenarios that are consistent with facility operational activities and DSAs. The EPHAs contain a current, accurate compilation of hazardous material maximum quantities associated with TRU waste operations and the analysis of scenarios ranging from low consequence and high probability to high consequence and low probability. The EPHAs identify analyzed scenarios using short descriptive names with: (1) tabulated consequences for each scenario at identified receptor locations, (2) consequences versus distance under conservative and average dispersion conditions, and (3) distances at which the protective action criteria (PAC) and threshold of early lethality are projected to be exceeded at identified receptor locations. The source term for each scenario involving TRU waste was appropriately converted to an equivalent isotope to facilitate dispersion modeling calculations; for all scenarios, the source terms were converted into plutonium-239 equivalent regardless of the presence of plutonium-239 in the original inventory.

Triad detailed the source term conversion to plutonium-239 equivalent for each accident scenario evaluated in the EPHAs. Calculations use the appropriate PAC of 1 rem for radioactive material, as stated in the EPHA development procedure, ERO-EPIP-295. Consequences were calculated for receptors of interest using both HotSpot and Computer-aided Protective Action Recommendation System (CAPARS) dispersion-modeling programs (LANL is updating EPHAs using CAPARS instead of HotSpot) using modeling parameters outlined in ERO-EPIP-295. EPHAs appropriately use the results of dispersion modeling calculations, including the distance at which the PAC is projected to be exceeded and the consequences for receptors of interest under both conservative and average meteorological conditions. Calculations are made for the 95th and 50th percentile distances to the PAC, as well as the 95th and 50th percentile consequences for receptors of interest. Modeling parameters used in EPHA calculations are documented in the EPHAs and are consistent with guidance in ERO-EPIP-295.

EA determined that the LANL EPHA results are consistent with DOE guidance and are accurate and technically sound. Conservative assumptions are used, and the calculations are accurate based on EA's replication of a sample of scenarios presented in the EPHAs using the HotSpot and CAPARS dispersion-modeling programs. The EPHAs clearly identify the hazardous materials that were analyzed, how the results were formulated, and how the results relate to facility operations and configurations in a way that can be replicated and effectively used by LANL consequence assessment personnel during an Operational Emergency response. Triad has used the results of the EPHAs in developing response plans, EALs, PAs, and EPZ sizing for LANL EPHA facilities.

Emergency Planning Hazards Assessment Conclusions

Triad has prepared, and NA-LA has approved, EPHAs for TRU waste operations at LANL facilities that are technically accurate; effectively implement the requirements in DOE Order 151.1D; provide sufficient information to support EALs, PAs, and EPZ development; and provide necessary information for a consequence assessment team to replicate the analysis. Triad has used the results of the EPHAs in developing response plans, EALs, PAs, and EPZ sizing for LANL EPHA facilities.

4.0 BEST PRACTICES

No best practices were identified during this assessment.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 DEFICIENCIES

No deficiencies were identified during this assessment.

7.0 OPPORTUNITIES FOR IMPROVEMENT

No opportunities for improvement were identified during this assessment.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: January 25-26, 2023

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