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**DEFENSE NUCLEAR FACILITIES
SAFETY BOARD**

Washington, DC 20004-2901



October 21, 2020

The Honorable Dan Brouillette
Secretary of Energy
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Secretary Brouillette:

The Defense Nuclear Facilities Safety Board reviewed the revised safety basis for the Transuranic Waste Facility at Los Alamos National Laboratory. We have determined that all open safety items listed in the enclosure to our November 9, 2017, letter to the Administrator of the National Nuclear Security Administration can be closed. However during our review, we identified that the safety basis does not adequately analyze the hazards associated with energetic chemical reactions involving transuranic waste. As a result, additional controls may be needed to prevent or mitigate this type of hazard.

The enclosed staff report contains additional detail regarding our assessment of the Transuranic Waste Facility safety basis and is provided for your information. Our concern with energetic chemical reactions involving transuranic waste is not unique to the Transuranic Waste Facility and is applicable to other facilities at the laboratory. This issue is described further in Technical Report 46, *Potential Energetic Chemical Reaction Events Involving Transuranic Waste at Los Alamos National Laboratory*, which the Board provided to you on September 24, 2020.

Yours truly,

Thomas A Summers

Thomas A. Summers
Acting Chairman

Enclosure

c: Mr. Michael Weis
Mr. Joe Olencz

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

May 11, 2020

Follow-Up Review of the Safety Basis for the Transuranic Waste Facility at Los Alamos National Laboratory

Summary. Members of the Defense Nuclear Facilities Safety Board's (Board) staff performed a follow-up review of the safety basis for the Transuranic Waste Facility (TWF) at Los Alamos National Laboratory (LANL) [1, 2]. This review had two main objectives: (1) review the latest version of the TWF safety basis to assess the adequacy of controls used to protect workers and the public from a variety of accident scenarios, and (2) evaluate whether the safety basis addresses previously identified safety items listed in the enclosure to the Board's letter to the Administrator of the National Nuclear Security Administration (NNSA) dated November 9, 2017 [3]. The staff team conducted onsite discussions with personnel from the TWF management and operating contractor, Triad National Security, LLC (Triad), and the NNSA Los Alamos Field Office during the week of November 18, 2019.

Based on its review, the Board's staff team concluded that all open safety items previously identified [3 – 5] can be closed. However, LANL facility safety bases, including TWF, do not adequately analyze the hazards associated with energetic chemical reactions involving transuranic waste. As a result, Triad has not performed a rigorous analysis to determine whether additional controls to prevent or mitigate this type of hazard are needed. The Board described this issue in Technical Report 46, *Potential Energetic Chemical Reaction Events Involving Transuranic Waste at Los Alamos National Laboratory* [6].

Background. TWF is a hazard category 2 nuclear facility designed for storage, characterization, and intra-site shipping of newly generated transuranic waste. Its mission is to temporarily store and characterize transuranic and transuranic mixed waste in preparation for shipment to the Waste Isolation Pilot Plant. TWF can store and stage up to 1,240 drum equivalents [1]. TWF began operations in late 2017 and received its first shipment of transuranic waste on October 11, 2017. Figure 1 shows an aerial view of the facility.



Figure 1. *Aerial View of TWF*

Members of the Board's staff have followed the development of the TWF safety basis throughout design, construction, and operations. Over the last eight years, the Board has transmitted three letters to NNSA detailing safety issues and observations at TWF [3 – 5].

Newly Identified Safety Item: Energetic Chemical Reaction Hazards. As part of a broader review effort, the Board's staff team reviewed how LANL transuranic waste storage, handling, and processing facilities analyzed energetic chemical reaction events. This review identified that LANL facility safety bases, including TWF, do not adequately analyze the hazards associated with energetic chemical reactions involving transuranic waste. As a result, Triad has not performed a rigorous analysis to determine whether additional controls to prevent or mitigate an energetic chemical reaction are needed. The Board captured this issue in Technical Report 46, and it is not described further in this report.

Previously Identified Safety Items. The enclosure to the Board letter dated November 9, 2017, listed five open safety items. A description and the current status of each item is listed below.

Facility Worker Safety Analysis: Forklift Tine Puncture (Status: Closed)—Previous Board letters [3, 4] identified that the TWF hazard analysis may underestimate the potential radiological dose consequences to a facility worker from a forklift tine puncture of a pipe overpack container. The current documented safety analysis (DSA) may still underestimate the radiological dose consequences to the facility worker from this event. TWF relies on the administrative control, “Hazardous Materials Protection Program—Spotter,” to reduce the likelihood of a forklift tine puncturing a waste container. In the DSA, this control is not elevated to a specific administrative control (SAC), which would have an increased level of rigor compared to an administrative control.

A forklift tine puncture of a pipe-overpack container is not a unique hazard to TWF. DOE could address this safety item in its upcoming revision to DOE Standard 5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities* [7]. Accordingly, the Board's staff concludes that this TWF-specific safety item can be closed but it will monitor the implementation of this administrative control to ensure its effectiveness. The Board's staff will also follow up with DOE headquarters to determine if more guidance is needed in the upcoming revision to DOE Standard 5506.

Facility Worker Safety Analysis: Radiolysis-Driven Drum Deflagration (Status: Closed)—Previous Board letters [3, 4] identified issues associated with the consequences and controls for accidents involving a deflagration in the headspace of a transuranic waste drum. Such issues are not unique to TWF and stem from the lack of clear guidance in DOE Standard 5506-2007 regarding analyzing and controlling deflagration and other over-pressurization events. Accordingly, the Board's staff will close this TWF-specific issue and address it as part of the DOE Standard 5506 revision process and through its broader review effort regarding energetic chemical reactions documented in Technical Report 46.

Fire Suppression System Freeze Protection (Status: Closed)—The enclosure to the Board's 2014 letter on TWF [4] identified concerns with the freeze protection strategy for the

fire suppression system. Specifically, the fire suppression system relied upon non-safety-related components to perform a credited alarm and notification function.

The revised TWF safety basis uses an improved approach to ensure the adequacy of the freeze protection strategy. The revised Technical Safety Requirements (TSR) documentation [2] requires operators to perform routine surveillances from September through April to verify that the above-ground fire water supply line and water tank do not approach freezing temperatures. The TSRs also outline a number of actions operators must take if the system approaches freezing temperatures. The staff team considers the revised approach adequate and that this safety item is closed.

Combustible Loading Separation Distances (Status: Closed)—As documented in the TWF DSA [1], the combustible loading separation distance control is used “to mitigate the effects of an ordinary combustibles fire by reducing the heat flux such that transuranic waste drums do not experience seal failure. This control also prevents other combustibles from becoming involved in an incipient fire.” During its 2017 review, the Board’s staff identified non-conservatisms in the combustible loading separation distance calculation that may cause it to underestimate the separation distances needed for this control to perform its safety function.

The revised TWF DSA re-designated the fire suppression system as a safety significant control. This represents a significant improvement in the safety controls relied upon at TWF and is consistent with the hierarchy of hazard controls outlined in DOE Standard 3009 [8, 9]. The hierarchy of controls states that engineered controls (such as the fire suppression system) are preferred over administrative controls (such as the combustible loading separation distance SAC) when addressing hazardous material release events.

The DSA still lists the combustible loading separation distance as a credited control and relies on a calculation with non-conservatisms in the underlying supporting analysis. However, because TWF restored its fire suppression system to safety significant, the Board’s staff concludes that there is sufficient safety margin to mitigate the effects of a fire. Accordingly, the Board’s staff considers this safety item closed.

Fire Induced Structure Collapse (Status: Closed)—During its 2017 review, the Board’s staff identified that the TWF hazard analyses did not consider a large fire in a single waste storage building followed by a structural collapse. The staff reviewed the control set used in the current DSA and determined that it is adequate to prevent or mitigate this type of accident. These controls include the safety significant fire suppression system, a transient combustible loading limit of 35 pounds, and noncombustible exterior walls and roofs.

Conclusion. The Board’s staff team concludes that the previously identified safety items documented in several Board letters [3 – 5] can be closed. However, the Board’s staff team identified that the TWF safety basis did not adequately analyze the hazards associated with energetic chemical reactions involving transuranic waste. Consequently, Triad has not performed a rigorous analysis to determine whether additional controls are needed to prevent or mitigate an energetic chemical reaction event. The Board captured issues associated with energetic chemical reactions involving transuranic waste at LANL in Technical Report 46.

References

- [1] Los Alamos National Laboratory, *Transuranic Waste Facility (TWF) Documented Safety Analysis*, DSA-TWF-001-R2.3, October 30, 2018.
- [2] Los Alamos National Laboratory, *Technical Safety Requirements for Transuranic Waste Facility (TWF)*, TSR-TWF-002, Rev. 2.3, October 30, 2018.
- [3] Defense Nuclear Facilities Safety Board, *Transuranic Waste Facility Documented Safety Analysis Development Review*, Letter to National Nuclear Security Administration with Enclosure, November 9, 2017.
- [4] Defense Nuclear Facilities Safety Board, *Critical Decision 3 Project Letter*, Letter to National Nuclear Security Administration with Enclosure, August 7, 2014.
- [5] Defense Nuclear Facilities Safety Board, *Critical Decision 2 Project Letter*, Letter to National Nuclear Security Administration with Enclosure, June 11, 2012.
- [6] Defense Nuclear Facilities Safety Board, *Potential Energetic Chemical Reaction Events Involving Transuranic Waste at Los Alamos National Laboratory*, Technical Report DNFSB/Tech-46, September 2020.
- [7] Department of Energy, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities*, DOE-STD-5506-2007, April 2007.
- [8] Department of Energy, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, DOE-STD-3009-94, Change Notice 3, Washington, DC, March 2006.
- [9] Department of Energy, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, DOE-STD-3009-2014, November 2014.