Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585

November 10, 2021

The Honorable Joyce L. Connery
Chair, Defense Nuclear Facilities Safety Board
625 Indiana NW, Suite 700
Washington, DC 20004

Dear Chair Connery:

The Department of Energy's National Nuclear Security Administration (DOE/NNSA) is responding on behalf of the Secretary of Energy to your letter dated August 26 regarding concerns identified during a Defense Nuclear Facilities Safety Board (DNFSB) staff review of the safety basis for the Radioactive Waste Facilities (RWF) at the Nevada National Security Site (NNSS). The letter established a 90-day reporting requirement, which asks what actions have been taken or are planned to be taken by the NNSA Nevada Field Office (NFO) to confirm that the site contractor, Mission Support and Test Services, LLC (MSTS), is submitting high quality safety basis documents, updating the safety basis documents when required, and ensuring that the identified technical issues in the RWF safety basis are addressed.

Enclosed is the NNSA/NFO report that addresses the safety questions posed in the Board's August 26 letter. As explained in the enclosed report, NNSA/NFO was working with MSTS to address the DNFSB's concerns prior to receiving the request to address the quality and timeliness of NNSS safety basis documents. MSTS has already implemented several corrective actions to improve the quality of NNSS safety basis document submittals. MSTS is adequately and consistently controlling the hazards associated with the NNSS RWF waste management activities.

NNSA appreciates the Board's perspectives and looks forward to continuing positive interactions with you and your staff. As desired, NNSA will brief the Board on the attached responses to your questions and on the ongoing RWF safety basis upgrades.

If you have any questions, please contact Dr. David Bowman, NNSA/NFO Manager, at (702) 295-3211.

Sincerely,

Jill Hruby

Enclosure

Enclosure - Department of Energy Response to DNFSB Letter and Staff Report,
Nevada National Security Site Radioactive Waste Facilities Safety Basis

Members of the Defense Nuclear Facilities Safety Board (DNFSB or Board) staff recently completed a review of the Nevada National Security Site (NNSS) Radioactive Waste Facilities (RWF) safety basis to assess the adequacy of the safety analysis and determine if the safety basis identified appropriate controls to protect workers and the public. The DNFSB review results are documented in DNFSB Staff Report, *Nevada National Security Site Radioactive Waste Facilities Safety Basis Review,* dated June 2, 2021.

The NNSS RWF includes the Area 3 Radioactive Waste Management Site (RWMS) and the Area 5 Radioactive Waste Management Complex. The Area 3 RWMS consists of five waste disposal cells that are (infrequently) used to dispose of low-level radioactive waste generated within the state of Nevada. The Area 5 RWMC consists of waste disposal cells that are used to dispose of low-level and mixed low-level radioactive waste. The RWMC Transuranic (TRU) Pad Cover Building is permitted to accept and stage NNSS-generated TRU waste pending shipment to the Waste Isolation Pilot Plant (WIPP) for disposal. Currently, the only TRU waste staged within the TRU Pad Cover Building consists of two internally contaminated explosion-proof spheres and several safety-significant primary target chambers from the Joint Actinide Shock Physics Experimental Research (JASPER) Facility. Other than the limited staging of these TRU waste containers, there are no other TRU waste activities authorized at the RWMC.

To prepare for the review, the DNFSB staff conducted an onsite scoping review on June 19, 2019, with personnel from the National Nuclear Security Administration Nevada Field Office (NNSA/NFO) and NNSS Management and Operating contractor, Mission Support and Test Services, LLC (MSTS). The DNFSB staffs review initially focused on TRU waste accident scenarios identified in the RWF Documented Safety Analysis (DSA). Due to concerns with some of TRU waste accident scenarios, the staff team expanded the scope of its review to the entire RWF DSA and associated Technical Safety Requirements (TSRs). During the expanded review, the staff identified several safety-related issues which, if they remain unaddressed, could potentially adversely impact workers and public health and safety.

The following safety-related issues were identified during the review and documented in the DNFSB Staff Report: (I) deficiencies in safety basis submittals and federal reviews; (2) continued delays in submitting a fully developed annual safety basis update; (3) lack of a required formal process for handling noncompliant waste; and (4) improper implementation of a specific administrative control.

In response to the Board's August 26, 2021, letter and associated reporting requirement, this enclosure addresses the following safety questions:

- What actions have been taken or are planned by the NNSA's Nevada Field Office to ensure that the site contractor is submitting high quality safety basis documents and updating the safety basis documents when required?

- What actions have been taken or are planned by the NNSA's Nevada Field Office to ensure that the identified technical issues in the RWF safety basis are addressed?

Safety Question 1 - What actions have been taken or are planned by the NNSA's Nevada Field Office to ensure that the site contractor is submitting high quality safety basis documents and updating the safety basis documents when required?

NNSA/NFO was working with MSTS to address the Board's concerns prior to receiving the Board's request to address the quality and timeliness ofNNSS safety basis documents. As documented in the DNFSB's Staff Report, *Nevada National Security Site Radioactive Waste Facilities Safety Basis Review,* dated June 2, 2021, MSTS has already implemented several corrective actions to improve the quality ofNNSS safety basis document submittals.

Safety Basis Quality and Improvement - Based on NNSA/NFO performance feedback and self-assessment data, MSTS has undertaken substantive actions to improve the quality of safety basis documents. When these documents do not meet expectations, formal issues management processes are invoked to ensure causes are understood and actions identified to address causes and prevent reoccurrence. The primary focus areas have been on processes/procedures, facility and program integration, and staffing.

Safety basis development governing procedures have been revised to institutionalize lessons learned and best practices. Several examples include the formalization of an originator and reviewer checklist, comment resolution improvement requirements, and improved integration between the safety basis development team and stakeholders, such as facility, program, laboratory and NFO personnel.

As mentioned in the DNFSB staff report, MSTS has been transitioning from reliance on a sub-contracting strategy to developing an MSTS in-house safety basis development capability. Staff augmentation and tactical task order contracts have been implemented to support surges in product development, as well as unique expertise needs. Direct hires have mostly involved recent college graduates due to the general shortage in senior safety analysts, although several senior analysts have been hired as well. To augment training and ensure continued and robust growth, the junior analysts are paired with senior analysts. Over the last year, several safety basis change notices developed by the junior analysts have been reviewed and approved by NNSA/NFO with few significant issues being identified.

Foundational analysis improvements have also been completed to support upgraded safety bases. MSTS recently developed and gained approval of a site-specific option 3 dispersion analysis protocol in accordance with DOE-STD-3009-2014, *Preparation ofNonreactor Nuclear Facility Documented Safety Analysis,* and DOE-HDBK-1224-2018, *Hazard and Accident Analysis Handbook.* The development, review, and approval of the protocol was coordinated with NNSA/NFO, NNSA Office of Safety (NA-51), and DOE Office of Nuclear Safety Basis and Facility Design (AU-31). Due to experimentation requiring high explosives to be mated to special nuclear material and the uncertainty in existing literature for explosive dispersals, MSTS desired to better understand and, more importantly, defend modeling methodologies for near-

field dispersion. MSTS partnered with Sandia National Laboratories and developed a seminal technical report invoking high-fidelity particle physics models to justify the near-field dispersion models and parameters. This work was also coordinated with NNSNNFO, NA-51, and AU-31.

The NNSNNFO Manager meets with the MSTS corporate directors during their periodic board meetings. The NNSNNFO Manager also has monthly calls with corporate board members from Honeywell and Huntington Ingalls Industries (HII). Nuclear safety basis work is always a topic of discussion in these meetings. Following discussions with the corporate board members about the timeliness and quality of the safety basis documents, HII provided additional personnel to support NNSS safety basis analysis and document development. At the last meeting of the corporate board on September 15, 2021, the NNSNNFO Manager conveyed the positive trend, but emphasized the need for sustained improvement.

In general, a positive performance trend in safety basis quality has been observed, although continued maturation is still in progress.

Timely Periodic Safety Basis Reviews - MSTS is currently upgrading all five NNSS nuclear facility safety basis documents. The following is a summary of each upgrade effort:

- The Device Assembly Facility (DAF) DSA is being revised in accordance with DOE-STD-3009-2014. A 90 percent draft DSNTSR has been completed and formally submitted to NNSNNFO for review and comment. The draft documents have also been transmitted to the DNFSB staff for preliminary review. The hazards and accident analyses have been revised extensively from the previous draft to ensure NNSNNFO, DNFSB, National Weapons Laboratory, and MSTS comments were adequately addressed and integrated into the DSA/TSR. An external independent review of the TSRs was completed and a joint hazards analysis review was held among the stakeholder personnel (facility, program, and laboratory).

- The JASPER Facility DSA is being revised in accordance with DOE-STD-1228-2019, *Preparation of Documented Safety Analysis for Hazard Categ01y 3 DOE Nuclear Facilities.* A 90 percent draft DSNTSR has been completed and formally submitted to NNSNNFO for review and comment.

- The NNSS On-site Transportation Safety Document (OTSD) is being revised in accordance with DOE O 460. ID, *Hazardous Materials Packaging and Transportation Safety,* and DOE O 461.2, *Onsite Packaging and Transfer of Materials of National Security Interest.* A 90 percent draft OTSD/TSR is scheduled for submittal to NNSNNFO for review and comment in December 2021. In addition to ensuring the transportation safe harbor DSA development methodology is met, MSTS is also incorporating appropriate elements from DOE-STD-3009-2014 to ensure adequate rigor in the hazards and accident analyses and improve general consistency across all NNSS safety basis documents.

- The U1a Complex DSA is being revised in accordance with DOE-STD-3009-94, Change Notice 3, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility*

Documented Safety Analyses, to reflect annual update expectations. A 90 percent draft DSA/TSR has been completed and formally submitted to NNSA/NFO for review and comment. The next major revision of the U1a Complex DSA will be developed in accordance with DOE-STD-3009-2014 and incorporate major modifications consisting of the Ula.03 Testbed project and the U1a Complex Enhancement Projects/Enhanced Capabilities for Subcritical Experiments (UCEP/ECSE). The Preliminary Safety and Design Results for UCEP/ECSE was submitted as a draft Preliminary DSA (PDSA) to NNSA/NFO for review and comment in September 2019. The final UCEP/ECSE PDSA is scheduled for submittal to NNSA/NFO for review and approval in October 2021. The draft PDSA for the Ula.03Testbed will be submitted to NNSA/NFO for review and comment in December 2021.

- The Area 3&5 RWF DSA was revised in accordance with DOE-STD-3009-94, Change Notice 3, to incorporate annual update expectations and changes necessary to resolve outstanding Potential Inadequacies in the Safety Analysis involving the hazards and accident analyses. The revision also included consistency changes in accordance with DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities,* and other improvements based on previous DNFSB and NNSA/NFO feedback. A 90 percent draft DSA/TSR has been completed and formally submitted to NNSA/NFO for review and comment.

The NNSS safety basis upgrades required the reevaluation of the hazard analysis and control derivation consistent with the appropriate safe harbor methodology and lessons learned. Legacy problematic issues and inconsistencies have been identified and eliminated from the documents. New dispersion analyses have been completed for all NNSS hazard category 2 nuclear facilities/activities. While the upgrades are tedious and time consuming, many are nearing completion, as described above. The safe harbor methodology upgrades and associated safety basis revisions will directly address the concerns raised by the DNFSB associated with periodic reviews, including a holistic review of the hazards analysis. The safety basis updates represent a significant improvement for the NNSS and support NFO's goal of making the Site a leader in the complex relative to methodology upgrades.

Annual Update Timeliness - DSA Annual Updates for all NNSS nuclear facilities have either been submitted to NNSA/NFO for review and comment (at the 90 percent phase) or are in the final development phase pending MSTS internal review prior to submittal to NNSA/NFO for review and approval.

Safety Question 2 - What actions have been taken or are planned by the NNSA's Nevada Field Office to ensure that the identified technical issues in the RWF safety basis are addressed?

The Area 3&5 RWF DSA was recently revised to incorporate annual update expectations and address previously identified technical issues. The revision also included consistency changes in accordance with DOE-STD-5506-2007, *Preparation of Safety Basis Documents for Transuranic (TRU) Waste Facilities,* and other changes necessary to resolve outstanding Potential

Inadequacies in the Safety Analysis involving the hazards and accident analyses. A 90 percent draft version of the RWF DSA/TSR has been completed and formally submitted to NNSA/NFO for review and comment. Furthermore, at the recommendation ofNA-51, NFO will be requesting the M&O to evaluate the DSA to identify any gaps that need to be addressed from the implementation ofDOE-STD-5506-2021. This evaluation will fmther support addressing the DNFSB's concerns with the DSA.

Development of the Area 3&5 RWF Safety Basis - NNSA/NFO is responsible for both the operation and regulation of the Area 3&5 RWF, including review and approval of the facility's safety basis documents. After receipt of the DNFSB Staff Report, *Nevada National Security Site Radioactive Waste Facilities Safety Basis Review,* NNSA/NFO worked with MSTS to ensure the identified technical issues were understood and would be addressed in the next annual update of the RWF safety basis. The NNSA/NFO Safety Basis Review Team (SBRT) has maintained awareness of contractor development efforts as necessary to keep abreast of issues that arise during safety basis development and provide necessary guidance to resolve issues in the development approach.

MSTS prepared the RWF safety basis annual update in accordance with DOE-STD-3009-94, Change Notice 3, and DOE-STD-5506-2007, specifically to address proper accident progression scenarios; conservative inputs for the dispersion analysis; conservative assumption for the lung absorption input for different waste streams; and removal of any credit taken for safety management programs in the unmitigated analysis of accident scenarios.

The following is a list of issues identified in the DNFSB Staff Report and the resolution as currently incorporated in the 90 percent draft RWF DSA/TSR annual update submitted to NFO for review and comment:

- The RWF safety basis did not appropriately analyze the accident progression for different accident scenarios per DOE Standard 5506-2007. The revised analysis was revised to address DOE-STD-5506-2007 event progression for different accident scenarios.

- The dispersion analysis in the safety basis used input parameters that are non-conservative and inconsistent with modem DOE directives. A new dispersion analysis was developed for consistency with the recommendations in the HSS Safety Bulletin 2011-02, DOE-STD-3009-94, and DOE-STD-5506-2007.

- The safety basis did not distinguish between lung absorption Type S and lnng absorption Type M categorized waste at the RWF. The revised analysis incorporates the more bounding Type M lung absorption factor.

- The safety basis relied on a statistical methodology to determine the material at risk limits at the RWF, which is consistent with what is outlined in DOE-STD-5506-2007. The revised analysis assumes the containers involved in any scenario contain the maximum single container limit.

- The safety basis referenced a Hanford model to detetmine how much waste undergoes unconfined burning during a fire scenario. Tbe revised analysis evaluates the confined/unconfined split based on the accident progression consistent with DOE-STD-5506-2007.

- The safety basis relied on Safety Management Programs (SMPs) when determining the uncontrolled frequency estimates for specific types of accident initiators (e.g., human error, waste drum over-pressurization, and equipment failure). The analysis was revised to remove credit taken for SMPs in the uncontrolled case.

- The safety basis credited SMPs to reduce the potential dose consequences in some hazard scenarios. The analysis was revised to remove credit taken for SMPs.

- The safety basis inappropriately "double-counted" the presence of waste containers in some hazard scenarios. Controls are credited consistent with the guidance in DOE-STD-5506-2007. For example, in the unmitigated scenarios, Low-Level Waste (LLW) containers are not credited and TRU waste containers are credited as an initial condition for protecting the damage ratios, consistent with DOE-STD-5506-2007. No additional risk reduction is taken.

- The safety basis did not have a hazard analysis scenario for the over-pressurization of a low-level radioactive waste drum. Process Hazard Analysis scenarios evaluating overpressure events for LLW and TRU have been added to the analysis.

- The RWF TSR did not include a "bases" section for design features. Although DOE G-423.1-lB, *Implementation Guidefor Use in Developing Technical Safety Requirements,* does not contain a Bases section for design features, this will be evaluated for incorporation in the next annual update.

- Area 3&5 RWF lack a formal process for handling noncompliant waste. Currently, MSTS does not have a formal process for handling noncompliant waste at a receiving facility, as required by DOE directives. As a result, there are no requirements for taking immediate actions to ensure the safety of operators and workers in the field. The RWF safety basis relies on the NNSS Waste Acceptance Criteria (WAC) as a control to ensure that waste is compliant with DOE O 435.1, *Radioactive Waste Management.* Corrective actions are implemented based on violation of the WAC, however, MSTS intends to revise the RWF TSR to formally include a limiting condition for operation to establish a process for handling noncompliant waste containers.

Although not a technical issue in the RWF safety basis, the Board's August 26, 2021, letter included a concern involving implementation of the existing Protective Overburden Specific Administrative Control (SAC). The SAC requires a layer of soil (overburden) that covers the disposed low-level radioactive waste to be present at the RWMS in Area 3 during aircraft overflights. The control evaluation in the safety basis states that low altitude flights over Area 3 must be coordinated with the NNSS Operations Command Center. However, the existing implementing procedure for this SAC does not adequately describe this coordination effort.

MSTS intends to revise the implementing procedure and incorporate clear specifications for the coordination effort as necessary to ensure the credited safety function will be met.

NFO Review of the RWF Safety Basis - The NNSA/NFO SBRT is currently reviewing the 90 percent draft version of the RWF safety basis to ensure the identified technical issues have been properly addressed. The SBRT review is performed in accordance with DOE-STD-1104-2016, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents,* to ensure the RWF DSA and TSR have been developed in a manner that provides reasonable assurance of adequate protection of workers, the public, and the environment. The SBRT is cognizant of these technical issues and will ensure the issues are appropriately addressed in the final RWF safety basis prior to NNSA/NFO approval.