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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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January 19, 1995

Mr. Mark Whitaker, EH-6
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Whitaker:

Enclosed for your information and distribution are 13 Defense Nuclear Facilities Safety Board staff reports. The reports have been placed in our Public Reading Room.

Sincerely,

A handwritten signature in black ink, appearing to read "George W. Cunningham".
George W. Cunningham
Technical Director

Enclosures (13)

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 7, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director**COPIES:** Board Members**FROM:** Monique Helfrich**SUBJECT:** Meetings on Savannah River Site Low-Level Waste Disposal,
May 4-5, 1994.

1. **Purpose:** This report documents the observations of the Defense Nuclear Facilities Safety Board (DNFSB) staff (T. Arcano, M. Helfrich, D. Napolitano, M. Sautman, and S. Stokes) on low-level waste disposal at the Savannah River Site (SRS). These observations resulted from two video conferences held on May 4 and 5, 1994.
2. **Summary:** The overall management of the Savannah River Site low-level waste disposal area is not presently integrated. This makes it difficult to demonstrate that the cumulative impact of all facilities, past, present, and future, will meet the criteria of DOE Orders. In addition, the SRS E-Area Burial Grounds were not designed nor are they operated in accordance with the good practices identified in commercial standards. On a positive note, however, operation of the E-Area Vaults appears to meet or exceed commercial standards (e.g., 10 CFR 61 and associated NRC Branch Technical positions) with respect to release mitigation, infiltration prevention, and intruder protection.
3. **Background:** Historically, the SRS has used shallow land burial to dispose of low-level waste. The E-Area Burial Grounds, which have operated since 1953, have accumulated over 600,000 cubic meters of waste, excluding mixed waste, and have reached nearly 99 percent of their capacity. SRS has constructed the E-Area Vaults, a greater confinement disposal system, to replace the Burial Grounds.
4. **Discussion:** The following observations were made by the staff concerning low-level waste management at the Savannah River Site.
 - a. **System Integration** - DOE Order 5820.2A, *Radioactive Waste Management*, states that low-level waste (LLW) that has not been disposed of prior to the issuance of the Order (1988) shall be managed to meet the Order's radiological release and inadvertent intruder protection criteria. As interpreted by the DNFSB staff, this means that any additions to the waste inventory after 1988 shall not cause the entire disposal system to exceed the Order's performance objectives, and that any engineered modifications

necessary to meet this goal will be developed through the Performance Assessment required by the Order. For example, a burial ground may contain waste from both before and after 1988, and the combination of releases from these two waste streams might result in public doses above allowable limits if both are not accounted for. Thus, the DNFSB staff believes that it is logical and necessary to consider these two wastes as elements of the same system.

Based on this interpretation of the Order, there does not appear to be an integrated approach to the management of E-Area as a complete site. For example, the E-Area Vaults have an estimated twenty year service life, and are designed and will be operated so that their dose consequences to the public will meet the DOE performance objectives. Since these vaults have a finite life, there may be additional disposal facilities at SRS. Therefore, if releases from any of these new facilities share the same environmental pathway to the public, then the cumulative impact might exceed DOE performance objectives. SRS has recognized this potential problem, and has stated plans to integrate the estimated dose consequences of its future hazardous/mixed waste facility with those of the vaults. This however, still does not consider past waste, or other additional future wastes beyond the twenty year time-frame.

Furthermore, SRS does not have a good understanding of the quantities and types of low-level waste that may be generated by Decontamination and Decommissioning projects. It is not known if this waste will be acceptable for vault disposal, or if the disposal capacity of the Vaults will be large enough to handle the future demand.

- b. Performance Assessment - A Performance Assessment (PA) is a comprehensive report which estimates the dose consequences of low-level waste disposal. It is required by DOE Order 5820.2A, and is used not only to show compliance with public health and safety performance objectives but also to develop engineered modifications and waste acceptance criteria for the disposal site. The DNFSB staff believes that the performance objectives of DOE Order 5820.2A are not being used correctly in the PA for the Vaults. The PA for the Vaults uses the 25 mrem/yr criterion from all release pathways on a per radionuclide basis, as opposed to a facility basis as specified in the Order. There is no evidence to suggest that this method meets the 25 mrem/yr criterion for the aggregate of all radionuclides.

In addition, DOE-Savannah River is not complying with DOE Order 5820.2A, since it has not prepared a PA for the Burial Grounds. The lack of a PA for the Burial Grounds was recognized as a non-compliance issue in 1991, but no action, such as the generation of a Compliance Schedule Agreement (CSA), was taken. The Burial Grounds are planned to be closed under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act, and a Risk Assessment will be performed in place of a Performance Assessment. Since these regulations are not directly applicable to the disposition of purely radioactive wastes, it is not clear to the DNFSB staff if they can be used to appropriately define the complete closure program.

- c. Site Suitability - The Savannah River site is a humid region which experiences average annual rates of precipitation and infiltration of 124 cm/yr, and 40 cm/yr respectively. The area is characterized by a shallow water table, nominally located 45-60 ft below the surface. Given seasonal variations and capillary fringes, the saturated zone can be nearly 35 ft from the surface. It is SRS' policy to maintain a 10 ft distance between the saturated zone and the bottom of its disposal units, a policy which limits the depth of disposal trenches.

The question of whether this distance is sufficient to achieve DOE's performance objectives is arguable. The Nuclear Regulatory Commission takes the position that in the limiting case, waste can be buried below the water table provided that diffusion is the dominate means of water transport, *i.e.*, the local hydraulic conductivity is on the order of 1×10^{-7} cm/s. In Savannah River's case, the hydrogeologic unit used for burial is a clay-to-silty sand. Its saturated hydraulic conductivity is approximately 1×10^{-4} cm/s. Thus, given the high rates of infiltration in the area, diffusion is not necessarily the primary means of transport. Additionally, the shallow depth of the water table at SRS does not provide the same mitigative protection as does the geology at more arid sites. Thus, in comparison to such sites, SRS may have to rely more heavily on engineered barriers and surface contouring to ensure the long-term performance of its disposal unit. The DNFSB staff believes that a systematic evaluation of site characteristics via the performance assessment process would develop the necessary technical information for decisions related to site suitability for shallow land burial.

d. Design and Operations

1. Burial Grounds - The Burial Grounds are shallow land burial operations which employ two types of trenches: a slit trench which is a long, narrow unit for remotely handled waste; and an engineered low-level trench (ELLT) for contact handled waste. The ELLT has a french drain, and its cover is mounded with a few feet of earth. The slit trench also has a french drain, but has flat earth, rather than mounded, covers. The lack of a mounded, multi-layered infiltration barrier, although interim, is not consistent with commercial practice. In addition, operations at the Burial Grounds do not meet commercial standards, which require segregation of wastes and the use of intruder barriers. In addition, waste packages are compacted in trenches which damages the integrity of the containers.

Currently, only one on-site generator, the Replacement Tritium Facility, has been certified to ship waste to the new E-Area Vaults. SRS management personnel stated that prior to being certified, all waste generated by the remaining 43 on-site generators will be shipped to the existing Burial Grounds for disposal or maintained at the generating facility pending shipment to the Burial Grounds. No uncertified wastes will be shipped off-site or disposed of in the E-Area Vaults. The schedule for certifying the on-site generators has fallen behind the schedule presented to the staff in February 1994. As of the May 4 and 5, 1994 meetings,

eight additional generators should have been certified. During the video-conference, SRS waste management personnel also stated that the end-date of the schedule would be met, i.e., all generators will be certified by March 1995.

During the February 1994 meeting, SRS waste management personnel indicated that the operation of the Burial Grounds would not extend past the summer of 1994. However, since uncertified waste generated prior to certification of the generator will be disposed of in the Burial Grounds, the Burial Grounds are now scheduled to operate until at least March 1995, and later if the waste certification schedule is not met.

2. E-Area Vaults - The design of the Vault system incorporates more defense in-depth principles than does that of the Burial Grounds. There are three types of Vaults: Low Activity Vaults for contact-handled waste; Non-Tritium Intermediate Level Vaults for remotely handled waste; and Tritium Vaults for tritium bearing materials. All three conform to American Concrete Institute Standards 349-85 and Site Specification 7096 for maximum resistance structures. All of the Vaults have internal and external drainage systems, designed to perform as an effective interim infiltration mitigation measure. The DNFSB staff believes that the E-Area Vaults will meet or exceed commercial standards, as specified in 10 CFR 61, with regard to release mitigation, infiltration prevention, and intruder protection.

- e. Closure - The full life-cycle of these disposal facilities has not yet been considered, since there is currently no formal closure plan for either the Vaults or Burial Grounds. A closure plan for the Burial Grounds is scheduled to be completed by 1999, as required by DOE Order 5820.2A. In contrast to the DOE Order requirements, 10 CFR 61.92(a)(9) states that "closure and stabilization measures as set forth in the approved site closure plan must be carried out as each disposal unit (e.g., each trench) is filled and covered." This requirement helps to minimize contact of water with waste during the operational period of the facility. For example, to achieve this objective, the Barnwell Low-Level Waste Facility, which is adjacent to SRS, closes its disposal units as they are covered.

While the Vaults do not have a final closure plan (one is currently being developed as part of the PA process), their interim drainage system essentially performs the same function as a cover during the operational period.

5. **Future Staff Actions:** Subsequent to the May 4 and 5, 1994 meetings, SRS waste management personnel, of their own volition, shut down disposal operations at the Burial Grounds, while its status with respect to compliance with the requirements of DOE Order 5820.2A is reviewed. Their major concern was the lack of an approved CSA for the

operation of the Burial Grounds without a PA. The staff is closely following the SRS efforts to resolve this issue, as well as reviewing the potential safety impacts associated with shutdown. The staff will also follow the development of the PA for the Vaults. Follow-up reviews are planned for June and July 1994.