

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 27, 1994

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director

**COPIES:** Board Members

**FROM:** Steven Stokes

**SUBJECT:** Report on Pilot Transuranic Waste  
Retrieval/Characterization at the Hanford Site

- 1. Purpose:** This report documents DNFSB staff review of the Pilot Transuranic Waste Retrieval/Characterization effort at the Hanford Site on June 29, 1994, July 13, 1994, and July 21, 1994. These reviews were conducted by Steven Stokes, Dermot Winters, Farid Bamdad, and Paul Gubanc.
- 2. Summary:** The Pilot Transuranic Waste Retrieval/Characterization project at the Hanford Site is currently anticipated to begin on July 18, 1994. Staff review of the Final Safety Analysis Report revealed that the most hazardous event with onsite consequences is a potential hydrogen explosion with possibility of a fatality or serious injury to the worker. Based on interviews with Westinghouse Hanford Company representatives there are no direct mitigative devices to protect workers from a potential hydrogen explosion. Rather, a great deal of reliance has been placed on the viability of vent clips, catalyst packs, and visual inspection of drums to prevent injuries to workers. It is not clear to the DNFSB Staff that visual inspections are sufficient to detect conditions which could result in a hydrogen explosion.

The Operational Readiness Review (ORR) conducted by the Department of Energy-Richland Operations (DOE-RL) was not sufficiently performance based and did not meet requirements for order compliance as outlined in DOE Order 5480.31, *Startup and Restart of Nuclear Facilities*. Operators were not observed by the ORR team performing those tasks specifically required to safely complete the retrieval of TRU wastes. Verification of compliance with DOE Orders was conducted only in an indirect manner. Additionally, the indirect verification process did not involve the use of any particular standard compatible with other DOE Order compliance reviews.

- 3. Background:** Transuranic (TRU) wastes have been emplaced in a retrievable configuration in Hanford's burial grounds since 1970. Retrievable storage configurations have varied since 1970, from dumping drums directly into a trench to a configuration consisting of an above grade asphalt pad with drums placed in modules, entombed in plastic, and then covered with a plywood shell and an earthen cover approximately four feet thick. This pilot retrieval activity, planned to begin on July 28, 1994, will remove 138 drums from the latter configuration.

TRU wastes buried at the Hanford Site came from a variety of onsite and offsite generators; primarily the Plutonium Finishing Plant. Satisfactory waste characterization data to meet both Resource Conservation and Recovery Act (RCRA) and Waste Isolation Pilot Plant (WIPP) certification requirements does not exist. However, the limited characterization data available does suggest that more is known about radionuclide inventories within a particular drum than about its hazardous material content. The drums contain a variety of waste forms, including plutonium contaminated soils, process wastes, paper, plastic, or metal. Therefore, the purpose of the pilot retrieval/characterization is to gather information concerning the contents and condition of the drums. This information will be used to help prepare the RCRA Part B Permit and Final Safety Analysis Report (FSAR) for the Waste Receiving and Processing Module 1 (WRAP 1). WRAP 1, currently under construction, is scheduled to begin operations, as mandated in the Tri-Party Agreement, in September 1998. This facility is designed to open, characterize, and repackage roughly 37,000 drums of TRU waste for eventual WIPP disposal. The pilot retrieval activities, which can only be conducted during summer months, have been repeatedly delayed over the past two years, thereby, creating much more urgency to begin retrieval at this time.

#### 4. Discussion/Observations:

- a. Safety Assessment and Accident Analysis. The safety analysis prepared for this operation assumes a multiple-container rupture and fire initiated by a heavy equipment accident to be a maximum event for hazard categorization. Several other scenarios have also been identified as the limiting events for identification of the radiological risk to the public and the co-located workers. These risks have been compared to the Westinghouse Hanford Company (WHC) acceptance criteria, and found to be below the risk curves and, therefore, acceptable. The risk to the workers, however, was stated to have not been evaluated due to lack of Department of Energy or WHC acceptance criterion.

The most hazardous event identified by the Fault Tree Analysis with direct impact to worker safety in the FSAR is the potential hydrogen explosion. The FSAR states that the probability of this event is about  $3.0E-6$  per year with potential fatality or worker injury as its consequence.

The assumptions made for calculation of the probability of the accident are not technically justified due to lack of availability of related industry data. Although some test data are available and referenced in the FSAR, the applicability of the referenced data to the Hanford TRU Waste is not fully demonstrated. For example, the types of materials stored in the containers used in the tests has not been compared with that of the Hanford retrieval activities to establish applicability. Furthermore, no data have been developed to ascertain the long term viability of vent clips and catalyst packs, and no analysis has been performed to evaluate the amount of hydrogen generated in these drums to demonstrate proximity of hydrogen concentrations to the explosive limits. These data are particularly important in establishing the sensitivity of visual inspections in detecting

potentially explosive conditions. For example, a significant amount of reliance has been put on assuming that vent clips and catalyst packs will function properly and that in the event of their failure, a visual inspection would identify hydrogen accumulation in the drums. It is not clear in all cases, however, if the hydrogen generated in the drums, below that which could be detected by visual inspection, would not lead to an explosion upon movement of the drums in the event that an ignition is generated inside the drums.

Based on the initial DNFSB Staff's review of the FSAR, review of the procedures and discussions with the WHC representatives, it appeared that there are no preventive or mitigative systems to protect the workers from a potential hydrogen explosion during retrieval of the TRU waste drums at Hanford. Additionally, based on reviews of other TRU retrieval activities within the DOE complex, a more conservative approach, which includes the use of mitigative measures, is considered at other sites to protect workers during retrieval activities, i.e. use of drum piercing devices.

Based on follow-up conversations with DOE-RL and WHC Staff, some mitigative measures are being initiated to address worker safety. Foremost among these are the use of hold points at strategic times in the operation and refresher training for crane operators, riggers, and solid waste personnel. The incorporation of hold points into existing procedures, however, is not planned. Rather, they will be incorporated into the plan-of-the-day. It is not clear to the DNFSB Staff that this method of modifying operations is sufficiently rigorous to satisfy formal conduct of operations requirements in DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities, Chapter XVI, Operations Procedures*.

However, these considerations for worker safety issues do not address the fundamental issue of drum explosivity. For example, WHC has identified technical data demonstrating that the first ten drums to be retrieved will not explode due to the placement of vermiculite packing within the drum. Unfortunately, similar data does not exist for the remaining drums. Therefore, the use of holdpoints to allow for a more detailed visual inspection does not make a significant contribution to resolving safety concerns associated with potential for vent clip catalyst pack failure or explosivity.

b. Department of Energy Operational Readiness Review (ORR).

The Department of Energy ORR was conducted by the Department of Energy-Richland Operations Office (DOE-RL) after startup authority was delegated by Department of Energy-Headquarters (EM-30) to the Manager, DOE-RL, on August 30, 1993. DOE-RL's initial ORR was conducted in January 1994. However, it was terminated prior to completion due to the lack of proper preparation by WHC. A second DOE-RL ORR was conducted from June 13-17, 1994, with a list of prestart items forwarded to WHC for correction. Neither of these ORRs was conducted in full compliance with DOE Order 5480.31, *Startup And Restart of Nuclear Facilities*. Instead, a comparison was made

between the criteria and review approaches developed and the 20 core requirements of DOE Order 5480.31. The results of this comparison revealed the existing approach compared favorably with the 20 core requirements, with the exception of order compliance. The final ORR report was not complete when the DNFSB Staff conducted its review on July 13, 1994, and based on discussion with the ORR team leader, arrangements to resolve prestart findings had not yet been made.

- (1) Lack of performance based review. ORR team members indicated to DNFSB staff that they assumed operators involved in the pilot retrieval were properly qualified and had the ability to perform the activities necessary for safe retrieval if they are currently certified for their particular jobs. For example, because a qualified crane operator works routinely with this equipment, the ORR team felt it was reasonable to assume that he/she could perform the tasks necessary to remove drums safely. Similar arguments were presented for each craft involved in the pilot retrieval activity. This approach is in direct conflict with the current DOE Standard, DOE-STD-3006-93, *Planning and Conduct of Operational Readiness Reviews (ORR)*, which states, "The DOE ORR should place significant emphasis on the effectiveness of the contractor's preparations through actual demonstrations of normal operations, abnormal events, emergency drills, etc.." Normal operation of TRU retrieval activities were not observed, such as, installation of bracing, unique to the TRU retrieval project. Additionally, the criteria and review approach used to conduct the ORR states that mock-up training will be observed to determine the qualification level of operations personnel, supervisors, and managers. Although this training was conducted, it was completed prior to the ORR, and it is not clear to the DNFSB Staff whether ORR team members observed these activities or if the personnel participating in mock-up training are the same individuals who will be participating in the actual retrieval operations.

DOE-RL, as part of their approval to commence retrieval operations, has required WHC to perform an emergency drill. The drill will be observed by the ORR team and WHC management. Retrieval operations will be allowed to continue only if the conduct of the drill is acceptable to WHC management and the ORR team.

- (2) Order Compliance. The assessment of DOE Orders and the verification that all non-conformances have been identified was not performed (core requirement 7, attachment 2, DOE Order 5480.31). Based on the approach taken by DOE-RL, the ORR was designed to be an "indirect" measure of TRU retrieval compliance with DOE Orders. Based on interviews with the ORR team leader, it appears selected order requirements were reviewed, but no standard was used to perform this review (i.e., DP-AP-202, or the existing 90-2 implementation plan guidance). The DNFSB Staff believes that this approach is not sufficient to meet this core requirement of DOE Order 5480.31.

5. **Future Staff Actions:** The DNFSB Staff will pay particular attention to the resolution of findings associated with the Pilot Transuranic Waste Retrieval/Characterization Operational Readiness Review. The Staff will also observe retrieval activities to assess WHC's and DOE's ability to conduct these operations in accordance with established procedures and safety limits.