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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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December 13, 1994

The Honorable Thomas P. Grumbly
Assistant Secretary for Environmental Management
Department of Energy
Washington, DC 20585

Dear Mr. Grumbly:

A Defense Nuclear Facilities Safety Board (Board) staff review team visited the Hanford Site on October 24-27, 1994, and focused on the program to characterize Hanford's high-level radioactive waste storage tanks. Our staff has advised that the program is in difficulty. Major delays in procuring sampling equipment and repeated problems with the equipment currently available are seriously delaying the program. A new characterization strategy is being developed. However, from what the Board's staff has learned to date, it cannot be determined if the program will provide the information required by the safety program, or how the longer-term needs of the Tank Waste Remediation System will be supported.

The Board is concerned over what appears to be a badly faltering program. The Department of Energy is requested to provide the Board a briefing as soon as it can be arranged regarding:

1. The problems being encountered and why.
2. The planned path forward.

The enclosed report is a synopsis of the observations made during the staff review, and is forwarded for your consideration in developing the briefing. Mr. D. Lowe or Mr. R. Tontodonato of the Board's staff will be available to provide any additional information you may require.

Sincerely,

John T. Conway
Chairman

c: Mr. Mark Whitaker, EH-6

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 17, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Richard E. Tontodonato, Technical Staff

SUBJECT: Trip Report - Review of Hanford Site High-Level Waste Tank Safety and Characterization, October 24-27, 1994

1. **Purpose:** This trip report documents a visit by DNFSB staff members (Ralph Arcaro, David Lowe, Richard Tontodonato and Dermot Winters) to the Hanford Site on October 24-27, 1994, to review progress toward implementing DNFSB Recommendation 93-5 regarding characterization of high-level tank waste and resolution of waste tank safety issues.
2. **Summary:** The Westinghouse Hanford Company (WHC) has concluded that the high-level waste tank characterization program is so far behind schedule that either a large increase in resources or a new strategy requiring much less sampling and analysis will be needed to meet the goals of Recommendation 93-5. The Department of Energy Richland Operations Office (DOE-RL) is considering a new characterization strategy, but the technical adequacy of this new strategy has not been demonstrated.
3. **Background:** Characterizing the tank wastes is key to resolving high-level waste tank safety issues at the Hanford Site. On July 19, 1993, the Board issued Recommendation 93-5, which addresses the need for the Department of Energy (DOE) to undertake a comprehensive reexamination and restructuring of the characterization effort. The recommendation sets goals of two years for completing safety-related sampling and analysis for watch list tanks and three years for other tanks. The Board accepted DOE's Implementation Plan on March 25, 1994, and members of the DNFSB staff have visited the Hanford Site five times since November 1993 to review implementation of Recommendation 93-5. This review was conducted as a follow-up to the previous reviews.
4. **Discussion:** Discussions among the DNFSB technical staff, DOE-RL, WHC, and Pacific Northwest Laboratory personnel on October 24-27, 1994, are summarized below:
 - a. Recommendation 93-5 Implementation:
 1. **Strategy:** The current WHC strategy is to obtain two core samples per tank, and to only obtain more if laboratory analysis of those samples indicates the tank is close to a safety limit. A firm technical basis for the sampling program is still not defined,

but WHC is continuing to work on improving implementation of the Data Quality Objectives (DQO) process. Ultimately, the DQO process will define how historical information, monitoring, and sampling will be integrated to characterize each tank at Hanford. However, it is not clear when this goal will be achieved.

DOE-RL is proposing a new strategy that is intended to accelerate safety-related characterization by eliminating unnecessary sampling. The fundamental feature of this new strategy is that characterization will be considered complete once a tank can be declared "conditionally safe", i.e., safe but requiring monitoring to ensure the waste remains in a safe configuration. Discussions with DOE-RL and WHC management indicate that the primary advantage expected from this strategy is the possible elimination of a significant number of core samples. The strategy will rely primarily on vapor and surface samples to determine the tanks' safety status. The DNFSB staff believes the following issues will require resolution before this strategy is technically defensible and deemed acceptable:

- (a) A technically defensible safety analysis showing that the information gained from vapor and surface samples is sufficient to determine a tank's safety status has not been performed. It is not clear that DOE-RL plans to ensure that such an analysis is conducted prior to adopting the new strategy.
 - (b) Monitoring requirements for tanks that are only designated conditionally safe have not been defined.
2. Core sampling status: All readiness evaluations for the first rotary mode core sampling truck have been completed, and sampling of tank 241-BY-106 was expected to begin the week of the DNFSB staff visit. The sampling event was subsequently delayed by high winds and failure of an electrical generator needed to operate the system, and did not begin until the week of November 14, 1994.

The date by which the second and third rotary mode sampling trucks will be available has now slipped to June 1995. DOE's Recommendation 93-5 Implementation Plan committed to have these trucks available in September 1994. During the July 1994 staff visit to Hanford, WHC stated the trucks would be available by February 15, 1995, and March 15, 1995, respectively. WHC offered the same explanation for the delay as was provided during the July staff visit, namely that slippage resulted from defining the schedule better, and not from additional problems in procuring components and assembling the systems. During this visit, however, WHC personnel also stated that the exhausters for the rotary mode trucks had not been ordered until October 1994.

The push mode core sampling truck has successfully recovered one core sample from tank 241-SY-103, which undergoes periodic gas release events. The sampler containing the bottom-most segment from the tank was found to be pressurized when it was opened in the 222-S laboratory, spraying liquid wastes onto the hot cell wall. WHC subsequently decided that potential safety issues associated with transporting pressurized samplers to the laboratory required evaluation before further samples are taken from flammable gas watch list tanks. Because of this problem, a second core sample was not retrieved from 241-SY-103. WHC plans instead to sample tank 241-C-103, an organic watch list tank.

3. Sampling schedule: WHC submitted a tank sampling schedule for FY 1995-1996, based on current funding levels, to DOE-RL on September 26, 1994. This schedule was rejected by DOE-RL because it did not meet the schedules established in the implementation plan. Watch list tank sampling would not be completed until September 1997, and the remaining sampling would not be completed until October 1997, compared to the respective implementation plan commitments of October 1995 and October 1996. WHC personnel stated that the implementation plan could be met if sampling and laboratory operations were conducted 24 hours a day, seven days a week, but funding for this level of effort is not currently budgeted, and WHC is not requesting it. DOE-RL and WHC plan to discuss what is possible at various funding levels and decide upon a course of action by mid-December 1994, taking into account the results of the "alternative strategy" discussions. DOE-RL and WHC personnel believe that a revision to the 93-5 implementation plan will be needed.
 4. Administrative improvements: WHC has made significant improvements in the time required to prepare work packages for sampling operations. Work packages which previously took six weeks to prepare can now be done in less than three weeks. WHC is now working toward a goal of creating a backlog of ready-to-work packages to ensure workers are not idled due to a lack of approved work packages. This should result in improved worker productivity once core sampling operations begin in earnest.
- b. Temperature excursions in tank 241-C-106: WHC presented a new explanation for the temperature oscillations observed in tank 241-C-106 after the process test conducted earlier this year. In this test, the water additions that are used to control the waste temperature were halted until a significant portion of the waste surface was inadvertently exposed. Subsequent water additions caused the tank's central thermocouple tree to register a large (about 90°F) temperature increase followed by temperatures oscillating by up to 36°F on a roughly 24 hour cycle. Originally it was believed that the rapid water additions had caused surface sludge to fill in a water-filled chimney around the

thermocouple tree, causing the indicated temperature to rise without greatly affecting the bulk waste temperature. The oscillations were attributed to cyclic boiling and settling of sludge in the water chimney.

WHC personnel now believe that gross waste movement never occurred during or after the process test, and that only a very narrow gap surrounds the central thermocouple tree. A small bulk temperature increase during the process test led to formation of steam in the hottest part of the sludge, squeezing this gap closed and causing a large increase in the indicated temperature. The recorded temperature oscillations occurred once the waste had cooled enough to permit daily ambient temperature changes to cause the gap to open and close on a 24 hour cycle. This model is not yet documented. The staff further discussed the 241-C-106 process test in a video conference with DOE-EM, DOE-RL, and WHC on November 18, 1994.

5. **Future Staff Actions:** The DNFSB technical staff will continue to closely follow implementation of Recommendation 93-5. Near-term issues include the DOE-RL proposal to redefine the characterization program strategy and WHC's efforts to resume core sampling and develop an acceptable timetable for completing safety-related tank characterization.