DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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April 10, 1995

Mr. Mark Whitaker, EH-9
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Whitaker:

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

Sincerely,

George W. Cunningham
Technical Director

Enclosures (8)

95-0002171

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 28, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Ralph Arcaro, Technical Staff

SUBJECT: Hanford Systems Engineering Review, October 24 - 27, 1994

1. **Purpose:** This report provides comments on the systems engineering efforts at the Hanford Site. These observations were made during a site visit conducted by the Defense Nuclear Facilities Safety Board (DNFSB) staff members Ralph Arcaro, Andrew Stadnik, Dermot Winters, Richard Tontodonato, and David Lowe.

2. **Summary:** The systems engineering efforts to support the Tank Waste Remediation System (TWRS) at Hanford continue to improve. The Department of Energy-Richland Operations Office (DOE-RL) is continuing to develop its TWRS-level standard for the implementation of systems engineering. More detailed functions and requirements are continuing to be identified and presented by the systems engineering organization. The incorporation of these activities at the project level is planned in the Implementation Plan for Recommendation 92-4 and has not yet occurred. Some of the systems engineering effort has been espoused by operations and those responsible for supporting National Enviromental Policy Act (NEPA) documentation as indicated by a united position on current operational and future needs for waste tanks. However, work remains to be done to ensure current activities are integrated so that they fulfill the requirements identified by the systems engineering effort. DOE's first formal systems engineering review of the TWRS, the Systems Requirements Review, is scheduled to be complete in January 1995.

3. **Background:** DOE submitted its Implementation Plan for Board Recommendation 92-4 in March 1994. The Board accepted the Plan in its letter of June 2, 1994, pending incorporation of comments provided in the letter and its attachment. The primary issues detailed in the letter were the lack of influence of systems engineering on the projects and the lack of an independent critical design review of the Multi-functional Waste Tank Facility (MWTF) and follow-on projects. At the time of the DNFSB staff visit, the revised Implementation Plan was in the final stages of review. The Implementation Plan was submitted to the Board on November 7, 1994.

4. Discussion/Observations:

a. Tank Waste Remediation System:

1. Systems Requirements Review: The systems engineering development of the Tank Waste Remediation System continues. A team sponsored by DOE Headquarters will conduct a Systems Requirement Review of the high level requirements of the Tank Waste Remediation System starting the week of October 31, 1994. This review, using the basic principles of MIL-STD-1521B, is intended to "identify and verify the traceability and compatibility of functions and requirements to higher-level functions and to the TWRS mission and performance goals and objectives...." The review will, in part, focus on the uncertainty associated with the high level functions and requirements of the system and the actions taken to mitigate, understand, or eliminate the uncertainty. Where design activities continue, the review team will evaluate the level of risk associated with progressing with design. The final report of the Systems Requirements Review is scheduled to be completed by January 31, 1995.

2. Policy Document: The TWRS Policy Document, the standard by which systems engineering is implemented within TWRS, continues to evolve. It is expected that the standard will be finalized by December 1994. The DNFSB staff has reviewed this document and considers it a viable means by which to ensure the tenets of systems engineering are implemented into the TWRS projects.

3. Path Forward: The relatively near-term path forward for the TWRS, specifically the MWTF, is to build two new tanks in West Area to meet operational needs. By September 1995, additional information will be gathered to make a decision on the number of new tanks required in the East Area. To support this decision, the Westinghouse Hanford Company (WHC) Tank Farms Upgrades Organization has identified ten technical tasks that will provide needed information to the systems engineering effort to reduce the uncertainty associated with building additional tanks and operating the existing tank farms. These tasks include determining waste dilution requirements, assessing evaporator performance, analyzing waste segregation requirements, and estimating operational risk. These tasks will be completed by March 31, 1995.

b. Environmental Impact Statement: Following the last DNFSB review trip, it was reported that the development of the draft Environmental Impact Statement (EIS) for safe interim storage of Hanford tank wastes was not well coordinated with the actions of those personnel responsible for operating the tank farms or those developing a systems

engineering approach to the design for new tanks. These groups had not agreed upon the technical basis for the decision on how many new tanks were required. Follow-on discussions with those responsible for developing the EIS indicate that the coordination among the three groups has improved. The expected Final EIS (FEIS) preferred alternative is consistent with the TWRS path forward and the operational needs of the Tank Farms. Much of the coordination among the groups was precipitated by the significant amount of comments received on the draft EIS during its comment period. Major changes to the EIS will reportedly include:

1) Expanding the scope of the FEIS to include actions required to mitigate safety concerns associated with all Watchlist Tanks;

2) Considering several more alternatives associated with storage, safety issue mitigation, and inter-area transfer; and

3) Changing the preferred alternative. The preferred alternative of the FEIS will be to build two new tanks in West Area, a Cross-site Transfer Line, and an Initial Tank Retrieval System. The preferred alternative is supported by the systems engineering analysis performed to date.

Incorporation of the above changes will delay issuance of the Final EIS until April 1995. The Record of Decision is expected to be submitted in June 1995. At the time of the DNFSB staff review, the impact of this delay had not yet been factored into the schedule for the construction of the new tanks.

c. Pretreatment Process Test: WHC is preparing to conduct a pretreatment process test in double-shell tanks 241-AZ-101 and -102 in early 1997. WHC personnel stated that this test is intended to evaluate use of mixer pumps to resuspend sludges in neutralized first-cycle PUREX wastes, assess the effectiveness of simple sludge washing, and demonstrate blending of sludge from two different tanks.

It is not clear that WHC and DOE-RL have adequately evaluated whether pursuing this project is still appropriate within the current TWRS framework. This test was originally intended both to demonstrate double-shell tank sludge retrieval and to provide initial feed for the Hanford Waste Vitrification Plant. The test does not appear in the TWRS Integrated Technology Plan, and does not appear to directly support the principal near-term decisions which must be made to define the basic approach to retrieve and pretreat Hanford tank wastes.

Since the process test was conceived, construction of the high-level waste vitrification plant has been delayed, and the scope of remediation has expanded from 28 double-shell tanks to all 177 tanks at Hanford, encompassing a much wider variety of wastes.

Neutralized first-cycle PUREX sludge is expected to be relatively easy to retrieve and blend using current mixer pump technology, and the operations to be tested have already been demonstrated using similar wastes in tanks at the West Valley Demonstration Project and the Savannah River Site. As noted in the DOE Office of Environmental Management (DOE-EM) report *Independent Engineering Review of the Hanford Waste Vitrification System* (DOE/EM-0056P, October 1991), other wastes will present different and more difficult retrieval problems. It appears there is relatively little to be gained by the process test.

5. **Future Staff Actions:** The DNFSB staff will concentrate near-term follow-up reviews of the systems engineering at Hanford on the outcome of the Systems Requirements Review. Future reviews will also focus on project level management to determine if the projects have embraced the systems engineering approach and understand the commitments of the 92-4 Implementation Plan. Site visits scheduled for December will focus on near-term projects such as the Cross-site Transfer Line and the Tank C-106 Retrieval.