DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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December 1, 1999

The Honorable Carolyn L. Huntoon
Assistant Secretary for
Environmental Management
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0113

Dear Dr. Huntoon:

During the past several years, the staff of the Defense Nuclear Facilities Safety Board (Board) has monitored decommissioning work performed by Bechtel Hanford Incorporated (BHI). The staff has found persistent weaknesses in BHI work planning in the areas of hazard identification and analysis. The recent discovery of a larger-than-expected quantity of dispersible plutonium in the process hood of the Hanford 233-S Plutonium Concentration Facility (233-S Facility) exemplifies the deficiencies in hazard characterization for BHI decommissioning work. A staff report summarizing these issues is enclosed for your information.

BHI is taking action to evaluate the impact of the increased quantity of dispersible plutonium now believed present in the 233-S Facility, and to identify appropriate changes in hazard analysis and safety controls. However, the Board is concerned that a comprehensive, accurate hazard identification was not completed earlier in this project. Delay in identifying hazards and appropriate safety controls could have adverse effects on this project and on other BHI decommissioning projects as well. Therefore, pursuant to 42 U.S.C.§ 2286b(d), the Board requests that the Department of Energy (DOE) provide, within 60 days of receipt of this letter, a document describing (1) actions to be taken by BHI to correct and improve procedures for identifying and characterizing hazards early in the decommissioning process, thus more effectively minimizing risks to workers and the public; (2) measures to be taken by BHI to ensure that sampling and analysis activities are conducted in a safe and timely manner to support the development of safety documentation and the identification of necessary compensatory measures during planning for decommissioning activities; and (3) the status and path forward for implementation of the disposition requirements of DOE Order 430.1A, *Life Cycle Asset Management,* at defense nuclear facilities.

If you have comments or questions on this matter, please do not hesitate to contact me.

Sincerely,

John T. Conway
Chairman

c: The Honorable David Michaels
Mr. Keith A. Kline
Mr. Mark B.Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

November 10, 1999

MEMORANDUM FOR: G. W. Cunningham, Technical Director
J. K. Fortenberry, Deputy Technical Director

COPIES: Board Members

FROM: J. W. Troan

SUBJECT: Hazard Identification at Hanford 233-S Plutonium Concentration Facility

The staff of the Defense Nuclear Facilities Safety Board (Board) has been monitoring work performed at the Hanford 233-S Plutonium Concentration Facility (233-S Facility) by Bechtel Hanford Incorporated (BHI), the environmental restoration contractor for the Hanford Site. The staff has made three visits to the facility since November 1997, reviewed safety documentation, and monitored Readiness Assessments and work at the 233-S Facility.

The staff has previously reviewed and commented on other BHI deactivation activities. On June 18, 1997, the Board sent a letter to the Department of Energy (DOE) forwarding staff reports describing deficiencies in work planning and conduct of operations at the N-Basin. The staff has identified persistent weaknesses in BHI work planning in the areas of hazard identification and analysis.

Background. The 233-S Facility was built in 1955 to further concentrate the plutonium nitrate solution produced by the Reduction Oxidation Plant at Hanford. The 233-S Facility houses a solvent extraction line enclosed in a four-story process hood. In the early 1960s, the facility experienced a fire. It was repaired and restarted, but was shut down in 1967. It was subsequently added to the DOE Surplus Facility Management Program as a retired facility, and is currently classified as a Category 2 Nuclear Facility.

Some amount of decontamination and characterization has been done in the past. The removal action currently under way began in the mid-1990s following the identification of building degradation and the corresponding increased risk of a spread of contamination. The removal action includes dismantlement and disposal of highly contaminated process systems, decontamination and/or stabilization, and demolition and disposal of the facility. BHI made plans in 1996 to decontaminate and dismantle the facility and is now conducting the work. Work started in the less-contaminated areas of the facility and has now begun in the more highly contaminated process hood. According to BHI's current schedule, the 233-S Facility project will be completed in fiscal year 2003.

Discussion. BHI's planning, work control procedures, and practices for decommissioning activities need to be improved to fully meet the intent of an Integrated Safety Management (ISM) System. Although BHI's work control processes incorporate a number of solid concepts, they are deficient in several of the core functional areas of ISM. These deficiencies have led to the development of safety and authorization basis documents that fail to fully characterize the radiological hazards present, as well as to a reduced reliance on engineered controls for conducting decommissioning work. Examples of these deficiencies are discussed below.

Hazard Identification and Analysis—BHI has not adequately identified and characterized the radiological hazard at the 233-S Facility. While the total plutonium loading in the process hood has been measured by nondestructive assay (NDA) to be approximately 1.5 kilograms, the quantity that exists as surface contamination is not well understood. The surface contamination contributes significantly to the consequences of postulated accidents, such as dropping of equipment and fire. The BHI analysis for one such accident, a fire in the process hood, nonconservatively assumed that only 11 grams of plutonium is available for release, despite the fact that historical NDA data indicate there could be approximately 230 grams of plutonium surface contamination in the process hood. As further evidence of the nonconservatism of the BHI assumption, a single sample obtained on September 10, 1999, from the floor of the process hood was estimated to contain 15 to 20 grams of plutonium-239. This finding led BHI to reevaluate the facility's authorization basis using a new estimate for material at risk. Furthermore, applicable task instructions and the formal ALARA (as low as reasonably achievable) review will be revised as necessary, and planning for future work activities associated with the process hood will be reevaluated. Work activities at the 233-S Facility will resume following DOE's approval of the safety evaluation.

The actions being taken by BHI should lead to appropriate changes in hazard analysis and safety controls for work in the process hood. However, the staff is concerned that the process that led to the inadequate identification of hazards could have more significant adverse effects later in this project, as well as in other BHI decommissioning projects. Consequently, the staff believes BHI's approach to hazard identification needs to be improved to ensure that quantities of hazardous materials and associated conditions are conservatively identified early in the decommissioning project. Such early identification of hazards is essential if risks to workers and the public are to be identified and eliminated or mitigated sooner and more effectively.

Hazard identification and analysis at the activity level are also in need of improvement. In general, the procedures and practices currently used by BHI are not adequate to ensure proper hazard identification and accurate analysis. The process lacks rigor; does not routinely involve the use of a coordinated, integrated team approach; and does not comprehensively apply a graded approach to ensure that higher-hazard activities receive an appropriately rigorous evaluation. An Activity Hazard Analysis form is used as part of the work planning process; it is typically completed after a work package has been assembled, instead of being used in a manner that would allow the work to be adapted to the identified hazards. This form provides a routine listing of potential hazards and a short listing of controls for each hazard item checked. Although effort is being made to involve workers early in the preparation of work packages and

to obtain their input on potential hazards, this involvement does not always occur. BHI's activity-level ISM process could be significantly improved through better use of an integrated team approach to ensure earlier worker involvement. The process could also be improved, when appropriate, through the adoption of techniques described by the American Institute of Chemical Engineers in *Guidelines for Hazard Evaluation Procedures*, or by the U.S. Department of Labor, Occupational Safety and Health Administration, in OSHA 3071, *Job Hazard Analysis*.

Development and Implementation of Controls—The accident analysis for a fire in the process hood relied on a single sample taken in the process hood. Although the correction of this mistake had no immediate impact on the overall hazard categorization of the facility, the fire's radiological consequences may have been underestimated. Consequently, the controls implemented to prevent a fire or mitigate the resultant spread of contamination may be inadequate. Furthermore, given the latest information regarding the higher-than-expected contamination on the floor of the process hood, the work required to decontaminate and dismantle the facility safely will likely become more complex. The technical approach for decontamination and dismantlement work will probably need to be revisited.

Although some controls are identified through the Activity Hazard Analysis form, the inadequacies previously noted hinder the development and implementation of adequate controls to protect workers. Of particular concern is the process used to identify controls associated with radiological hazards. Activity-level radiological planning is accomplished independently of the remainder of the work planning process. The resulting radiological controls may not be consistent with work package requirements and may not be well reasoned. The staff noted that radiological controls, such as the need to take surveys, were sometimes not well integrated within the work package.

Limitations in BHI's planning process appear to be addressed by the work supervisor, who is relied upon to plan work and control hazards on a real-time basis. The process also relies on workers to react appropriately to newly discovered hazards not identified in the work planning process. This approach leaves little time for the development and implementation of engineered controls for emergent hazards. Consequently, there may be a greater reliance on administrative controls and personal protective equipment, in turn exposing workers to unnecessary or undue risk.

Feedback and Continuous Improvement—The process for feedback and continuous improvement in the Environmental Restoration Project at Hanford requires improvement. Deficiencies in the oversight provided by the DOE Richland Operations Office (DOE-RL) Office for Environmental Restoration (OER) have previously been noted by the Board in letters and staff reports dating back to 1994. On the basis of observation of the Operational Readiness Review (ORR) for the 233-S Facility in 1998 and the most recent Readiness Assessment (RA), the staff believes OER's oversight remains in need of improvement. The 1998 ORR identified the need for improvment in the oversight provided by DOE-RL senior line management. Deficiencies in OER's oversight were again the subject of a finding of the RA completed in April 1999.

Use of Standards—The provisions of DOE Order 430.1A, *Life Cycle Asset Management* (LCAM), approved on October 14, 1998, have not been formally incorporated into the BHI contract. There were no plans to do so at the time of the staff's last on-site review, but DOE personnel indicated that a contract modification to include the revised LCAM Order would be considered. Recent attempts by DOE-RL to incorporate this Order in BHI's contract have been discontinued. The revised LCAM Order provides new requirements for dispositioning of contaminated facilities; calls for applying the guidelines contained in and referenced by DOE-STD-1120-98, *Integration of Environment, Safety and Health into Facility Disposition Activities*; and includes a contractor requirements document. Both DOE-RL and BHI believe they are meeting the intent of this Order using performance measures, but the staff believes incorporation of the Order in BHI's contract would be more effective in ensuring its adequate implementation.