DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
(202) 694-7000

March 7, 2003

The Honorable Linton Brooks
Acting Administrator
of the National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0701

Dear Ambassador Brooks:

The staff of the Defense Nuclear Facilities Safety Board (Board) has reviewed the status of flood mitigation measures following the Cerro Grande wildfire at Los Alamos National Laboratory (LANL). The wildfire, which occurred in summer 2000, increased soil hydrophobicity and led to a much greater potential for flooding at LANL. As discussed in the enclosure to this letter, recovery of the severely burned areas has been very slow because of drought conditions at Los Alamos. In addition, it has not been possible to validate and refine hydrological modeling of the potential for flooding because of limited rainfall, so the risk of flooding remains only partially understood. It is the Board's understanding that Cerro Grande funding for hydrologic modeling expires in fiscal year 2003.

Defense nuclear facilities at Technical Area 18 (TA-18) are protected by a flood retention structure designed and built under emergency conditions. This structure apparently will be needed longer than expected because a return to prefire conditions will take more than the typically observed 3 to 5 years. The structure will probably be needed until the relocation of the TA-18 mission is essentially complete. The Board understands that the Department of Energy has not yet received a report on material and construction quality assurance for the flood retention structure. The need for test results on the properties of the concrete of the flood retention structure was identified earlier in a Board letter dated November 5, 2001.

It is important that hydrologic modeling be completed to confirm the adequacy of design assumptions for the TA-18 flood retention structure, as well as to ensure that other flooding risks are no greater than currently understood. It is also important that the Department of Energy confirm the adequacy of the flood retention structure. Therefore, pursuant to 42 U.S.C. § 2286b(d), the Board requests within 90 days of receipt of this letter, a report that documents:

- Plans for continued hydrologic modeling beyond fiscal year 2003 until the modeling is validated following additional significant precipitation.

- Actions the Department of Energy will take to assure the adequacy of the flood retention structure for as long as needed to protect defense nuclear facilities.

Sincerely,

John T. Conway
Chairman

c: The Honorable Jessie Hill Roberson
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

February 27, 2003

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: D. Ralston

SUBJECT: Flood Mitigation at Los Alamos National Laboratory Following the Cerro Grande Wildfire

The staff of the Defense Nuclear Facilities Safety Board (Board) recently reviewed the status of flood mitigation measures at Los Alamos National Laboratory (LANL). Staff members A. Jordan, A. Hadjian, B. Jones, and D. Ralston and outside expert P. Rizzo participated in the review.

The Cerro Grande wildfire in May 2000 severely burned thousands of acres of Department of Energy (DOE) property and surrounding hill slopes. The fire decreased vegetation and increased soil hydrophobicity in burned areas, and greatly increased runoff potential and the risk of flooding. To protect Technical Area 18 (TA-18) from increased storm flows in Pajarito Canyon, DOE contracted with the U.S. Army Corps of Engineers to build a flood retention structure (FRS) upstream of TA-18. The FRS was constructed of roller-compacted concrete to a height of 72 ft above the streambed, and was completed in August 2000. The FRS was designed to retain the volume of a 6-hour, 100-year storm and drain within 96 hours.

After the fire, LANL modified existing hydrologic models of the laboratory to account for changes in runoff characteristics of the land surface, but runoff increased much more than the initial estimates. On June 28, 2000, a small rainfall of 0.69 inches in Pajarito Canyon, predicted by the models to yield a peak flow of 11 cubic feet per second (cfs) at TA-18, actually produced a peak flow of 150 ±30 cfs. The model input parameters were adjusted again so that the results matched this observed flow, and these changes were incorporated into the design of the FRS.

In the 2 years since the Cerro Grande fire, Los Alamos has experienced severe drought conditions. During the drought, there have been no significant storms or stream flows in Pajarito Canyon to augment the event of June 28, 2000, used for model calibration. Without additional data for model evaluation, the input parameters cannot be validated or refined. The hydrologic models are highly sensitive to the input parameters describing the condition of the watershed, so without additional field data, the estimates of storm flows at TA-18 remain highly uncertain.

Another consequence of 2 years of drought is that recovery of the severely burned areas has been very slow. Precipitation spurs growth of vegetation, washes away ash and debris, and breaks down the hydrophobic layer of soil that limits infiltration. Work crews have raked,

seeded, and watered burned areas on LANL property to aid recovery, but the most severely burned watersheds are upstream on U.S. Forest Service property and have seen little or no recovery work. Changes in infiltration characteristics can be monitored in the field, but thus far the field investigations of recovery have been very limited.

Because of the drought, runoff from severely burned watersheds is unlikely to return to prefire conditions within the typically observed 3 to 5 years. To protect TA-18 from a continuing flood risk, the FRS will likely be needed for longer than initially thought. An extended life span for the FRS makes an upcoming Corps of Engineers report to DOE on material and construction quality assurance for the FRS even more critical. Although the FRS was constructed in the summer of 2000 and data should have been available in late 2001, this report will not be completed until March 2003. The report is particularly critical since it will provide data on the strength of the roller-compacted concrete used in the FRS. The need for such a report was discussed in a Board letter dated November 5, 2001. Test results for unconfined compressive strength at 1 year, direct shear strength at 1 year, and density are particularly important to understand the structural margin of safety for the FRS. Data on the potential for alkali reactivity associated with the aggregate used in the FRS are also of interest, particularly if the life of the FRS were to be as long as about 20 years.

Because of the slow recovery of the watersheds and because removal of the FRS will be a major, expensive undertaking, the FRS will be part of the safety basis for TA-18 for the foreseeable future, perhaps until the relocation of the TA-18 mission is complete. Effective implementation of inspection and maintenance plans will be an essential component of the TA-18 safety basis.

LANL continues to assess the risk of flooding by updating the hydrologic models with the changing watershed conditions. The modeling group is currently funded as part of the Cerro Grande recovery efforts, but those funds expire in fiscal year (FY) 2003. While the plan is to shift the responsibility for flood modeling to the hydrology group at LANL, DOE does not yet have a plan for funding of the work for FY 2004 and beyond. Substantial uncertainty remains in the models because of the lack of field data and the slow watershed recovery.