

John T. Conway, Chairman  
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## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

625 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004  
(202) 208-6400



December 11, 1996

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

Dear Mr. Alm:

Members of the Defense Nuclear Facilities Safety Board (Board) staff recently reviewed various tritium activities at the Mound Site, including the site's response to an accidental tritium release to the environment. A common issue identified throughout the review was that the tritium expertise in both the engineering and operations groups is apparently eroding. Improving this situation will require aggressive actions to retain or attract the expertise needed to deal adequately with the technical issues that may arise during the final two years of tritium operations. This problem may be exacerbated with the arrival of a new maintenance and operations contractor in April 1997.

The report is provided for your review and use. If you need any additional information on this matter, please let me know.

Sincerely,

A handwritten signature in cursive script, appearing to read "John T. Conway".

John T. Conway  
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

# DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 29, 1996

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

**COPIES:** Board Members

**FROM:** Matthew B. Moury

**SUBJECT:** Review of Tritium Activities at the Mound Plant,  
October 22-24, 1996

## 1. Purpose

This report documents a visit made to the Mound Plant by Defense Nuclear Facilities Safety Board (Board) staff members M. Moury, S. Krahn, and W. Yeniscavich during October 22-24, 1996. The purpose of this visit was to review the occurrence of a tritium inventory discrepancy and the status of the special unload program. The staff also observed the plant's response to an accidental tritium release to the environment.

## 2. Summary

Overall, the staff members are concerned that the level of technical expertise available to complete the remaining tritium operations will not be adequate to deal with technical issues that may arise. The following additional comments summarize the findings from the review:

- Inventory Discrepancy—The early stages of the investigation of the inventory discrepancy are nearing completion. The preliminary conclusion is that the missing tritium is present as holdup in the processing system in Room R-108 of the Semi-Works and Research (SW/R) Complex. Although to date the Board's staff members have found no problems with the technical conclusions reached by the Department of Energy (DOE) and the contractor (EG&G), it appears that the remaining tritium operators and technical personnel at Mound do not fully recall lessons learned from a similar incident in 1985.
- Special Unload—When questioned, the Mound personnel could not say whether any tritium reservoirs presently scheduled for unloading at Mound had exceeded their design lifetime. The Mound individual with this knowledge had retired, and the site had to resort to calling the national laboratories for the information, even though they had been given that information in March 1996. It was determined that six reservoirs have exceeded their specified design lifetimes. Mound personnel agreed that these reservoirs should have priority in the unload schedule.

- **Tritium Release**—The actual amount of tritium released was not significant from an off-site dose standpoint; however, Mound's difficulty in isolating the cause of the leak is of concern. The decision makers in the Emergency Operations Center (EOC) received virtually no engineering technical support in the early hours of the event, and the operators' lack of knowledge about the leaking system delayed isolating the source for approximately 8 hours.

### 3. Background

The tritium inventory discrepancy was first noted on October 10, 1996, as part of a semiannual inventory. Although the actual quantity of material involved remains classified, it was significant enough to require a formal investigation to determine whether the loss was due to theft, an environmental release, an accounting error, or a holdup in the system. On October 21, 1996, EG&G curtailed all tritium operations until they could determine the cause of the discrepancy.

The special unload project consists of the removal of tritium from over 500 special reservoirs that have been removed from the active stockpile. Approximately one-half of the units remain to be unloaded over the next year. The tritium recovered from the units is sent to the Savannah River Site.

The tritium release event occurred during the second day of the staff's review. The staff observed the actions taken by DOE and EG&G to deal with the occurrence.

### 4. Discussion

**Inventory Discrepancy.** The investigation into the inventory discrepancy began immediately after it was identified. Three teams were formed: an EG&G team to perform the technical investigation, a DOE Ohio Field Office team to coordinate the investigations, and a DOE Headquarters (DOE-HQ) team (DOE Anomaly Resolution Team [DART]) to investigate the physical and personnel security and material control and accountability aspects of the occurrence.

The preliminary conclusion of the investigation is that the missing material is present as holdup in the processing train within Room R-108 of the SW/R complex. This room processes gases from several sources, including the special unload gloveboxes; its purpose is to purify the gas by stripping away contaminants such as water vapor, ammonia, nitrogen, and helium. EG&G believes that the tritium is present as tritiated water or tritiated ammonia on various processing beds. DOE determined that theft or diversion of the missing tritium is not a credible possibility, and there is no indication that the material was released to the environment or the building.

The 1985 occurrence of a tritium inventory discrepancy appears to share several important features with the recent event. A significant ramp-up in tritium processing preceded each

occurrence, and in each case the gas was of much higher tritium concentration than that most recently processed through the room. In the 1985 incident, the tritium was trapped in the system as tritiated water and tritiated ammonia. The 1985 report states that "these mechanisms cannot be eliminated, but their effect can be reduced . . . predictors are being developed to calculate tritium holdup . . . for use in inventory evaluation." It appears that the remaining tritium operators and technical personnel at Mound do not fully recall lessons learned and corrective actions from this incident.

**Special Unload.** The concern raised by the Board staff in November 1995 regarding potential auto-ignition of special unload units at room temperature has not yet been resolved by DOE or Sandia National Laboratory (SNL). The SNL report on the special ignition tests conducted to resolve the auto-ignition issue, along with a presentation to the Board staff, is expected in November 1996. Approximately half the units have been unloaded; however, maintenance of the workforce required to complete the unloading as scheduled by September 1997 is in jeopardy. Discussions with DOE and EG&G have revealed that many of the tritium operators may leave early to pursue other career opportunities, and that efforts to provide incentives for them to stay until the work is completed have collapsed.

A review of the reservoir inventory at Mound for other safety concerns revealed six reservoirs with expired lifetimes. The Mound personnel had to call the national laboratories to make this determination. The Board staff later found that the national laboratories had provided the information to Mound in March 1996, and the site had been directed at that time to expedite the off-loading of expired reservoirs. However, the responsible Mound engineer had subsequently retired. The expired reservoirs are in secondary containment, which will help mitigate the consequences of a leak should one occur.

**Tritium Release.** The actual amount of tritium released was not significant from an off-site dose standpoint (the probable final amount was 50–70 curies [Ci]); however, Mound's difficulty in isolating the cause of the leak is of concern. The decision makers in the EOC received virtually no engineering technical support in the early hours of the occurrence. It was not until about an hour into the occurrence that the Safety Analysis Report for the applicable building was placed into use (and then only by one senior decision maker). Detailed drawings of the affected system were not available until more than an hour later. Still, at this point, no engineering or technical support was evident in the EOC. This is in strong contrast with environmental technical support, which was clearly in evidence and aggressive in nature throughout the occurrence.

This occurrence also raises questions about the remaining tritium technical expertise at the site. It was not until 4–5 hours into the occurrence that system experts were called in from home to try to combat the leak. Lack of familiarity with the leaking system delayed isolating the leak for approximately 8 hours.

## **5. Future Staff Actions**

The staff will follow the resolution of the tritium inventory discrepancy and the auto-ignition tests for the special unload.