[DNFSB LETTERHEAD]

May 5, 1995

Dr. Victor H. Reis
Assistant Secretary for Defense Programs
Department of Energy
Washington, D.C. 20585

Dear Dr. Reis:

Staff members of the Defense Nuclear Facilities Safety Board (Board) visited the Savannah River Site tritium facilities and the Pantex Plant facilities to review storage and handling of tritium reservoirs. The results of these reviews indicated problems in storage, handling, and overall coordination of tritium activities.

The purpose of these visits was to review the ability of the facilities to safely manage the increasing number of tritium reservoirs being returned to the Department of Energy from the Department of Defense. In particular, the reviews focused on compensatory measures to be implemented with regard to expired reservoirs, i.e., reservoirs that have exceeded their limit life and have an increased probability of leaking. The results of these reviews identify potential safety issues with current work practices for safe storage and handling of tritium reservoirs, particularly with regard to the expired reservoirs. The enclosed reports provide a synopsis of the observations made during the reviews and are forwarded for your consideration.

Sincerely,

John T. Conway
Chairman

c:
Mr. Mark Whitaker, EH-9
Dr. Mario Fiori, Manager SR Operations Office
Mr. Gerald Johnson, Director Amarillo Area Office

Enclosures

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

March 23, 1995

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Michael J. Merritt

Subject: Savannah River Site (SRS), Review of Tritium Reservoir Storage and Handling, March 13-15, 1995

1. Purpose: This trip report documents a Board staff review of the storage and handling of tritium reservoirs at the Savannah River Site (SRS) Tritium Facilities. The visit included Board staff members Michael Merritt, Ronald Barton and William Yeniscavich during the period March 13-15, 1995.

2. Summary: The Board's staff conducted a review of tritium reservoir storage and handling at the SRS tritium facilities. Reservoirs that have exceeded their limit life (expired) have an increased potential for leaking due to increasing internal pressure and material degradation. Even though Westinghouse Savannah River Company (WSRC), the SRS contractor, has implemented measures to help protect the reservoirs and mitigate leaking reservoirs (handling procedures and leaking reservoir response drills), the staff believes that placing the highest risk reservoirs in secondary containment would be prudent. Shipping containers and other facility engineered barriers (e.g. glove boxes) are available for this purpose.

3. Background: Stockpile reduction and dismantlement have resulted in a large backlog of reservoirs that are being returned to SRS for unloading. During the last several months, the Sandia and Los Alamos National Laboratories (the design agencies for tritium reservoirs) have worked closely with the Albuquerque Operations Office, Savannah River Operations Office (SR), and WSRC to identify and prioritize unloading "high risk" reservoirs that have exceeded their limit life. There are several hundred of these reservoirs currently in storage at SRS and, based on the projected influx of reservoirs and the capacity to unload reservoirs, a large inventory of these reservoirs will remain for several years.

   Material degradation of the reservoirs occurs due to helium embrittlement. Embrittlement into the inner wall of the reservoirs is due to diffusion of deuterium and tritium into the walls and the buildup of helium due to tritium decay. The concentration distribution of these elements in the reservoir wall is calculated at WSRC using a finite-difference program and experimentally obtained data on solubilities and diffusivities. The predicted thickness of the brittle layer on the inside surface of field service reservoirs, at the end of stockpile life, is a maximum

of 0.020 inch. No confirmation of the calculated distributions is made by measurements on actual field exposed or shelf storage reservoirs. In addition, drop tests are being conducted at WSRC on virgin reservoirs and the results will be adjusted for the calculated brittle layer on the inner wall. The current storage of these reservoirs does not provide defense in depth for protection of workers and release to the environment. Reservoir leakage could result in worker exposure, environmental release and contamination of operating tritium facilities. For this reason, the staff believes that providing a secondary containment for high risk reservoirs is both prudent and achievable. Robust reservoir shipping containers (designed to contain a reservoir leak) are available and provide maximum protection from leaking reservoirs. Facility containments in Building 233-H (RTF) could also provide protection for workers and the environment.

4. Discussions/Observations: Based on increased concern for reservoir integrity, DOE/SRand WSRC have locally implemented DOE/Albuquerque's Reservoir Age Management Program (RAMP) at SRS Tritium Facilities. This program identifies and tracks individual reservoirs using the Automated Reservoir Management System (ARMS). This system is intended to ensure that reservoirs are unloaded in order of highest risk and to provide control for inventory limits for building 233-H (RTF). DOE/SR and WSRC stated that although the nominal unloading capacity in 233-H is 288 reservoirs per month, the actual number of RAMP reservoirs unloaded is only a fraction of the capacity. The RAMP unloading is constrained by various requirements including Department of Defense mission requirements, facility logistics, facility inventory limits and reservoir reuse requirements. WSRC is in the process of developing a formal guidance document to ensure optimization of reservoir unloading.

Reservoirs from retired weapons and active weapon component exchange are received in Building 234-H for unpackaging and transfer to storage. The majority of reservoirs are stored in the 217-H vault while awaiting unloading in Building 233-H. While in storage, the only barrier between the tritium and the workers and the environment is the integrity of the reservoir. Radiation monitors in the facilities provide retrospective indication of a leaking reservoir, and although personnel are trained to respond, identifying the source could be difficult and tritium release would continue until containment was established. The number of reservoirs in storage is expected to increase into 1996 and all expired reservoirs are not expected to be unloaded until 1998.

Handling of tritium reservoirs and response to abnormal situations at SRS tritium facilities are controlled by procedures. Staff observation of handling operations indicated compliance with the facility procedures and formality of operations. Minor inconsistencies between facility procedures were observed in the use of anti-contamination clothing. Review of emergency response procedures and a drill for a leaking reservoir revealed a lack of proficiency, lack of adherence to procedures, and procedure deficiencies. The procedural response to a leaking reservoir does

not provide the responders with sufficient guidance to contain a leaking reservoir in a timely manner. The response procedures are predicated on knowing the source of the tritium that cannot always be verified. Therefore, during the drill the shift manager instructions were in conflict with the response procedure and operator response was delayed unnecessarily. In addition, the WSRC critique of the drill failed to identify these deficiencies and primarily emphasized the positive aspects of the drill.

Due to the large number of tritium filled reservoirs being stored and handled by SRS facilities, and the increased potential for leaks, the staff believes that the use of secondary containments for the highest risk expired reservoirs would be feasible. Additional training and drills for facility personnel are needed to improve proficiency to respond to a leaking reservoir. These measures could reduce the consequence for this potential hazard. The staff also believes that helium distribution measurements could be made on selected reservoirs to confirm the calculated distributions and that field exposed reservoirs in the drop test program would more closely represent expired reservoirs.

5. Future Staff Actions: The staff will continue an integrated review of tritium storage and reservoir issues as well as review of reservoir storage and handling operations at the Pantex plant.