

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 16, 1997

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: R. Tontodonato

SUBJECT: Review of Savannah River Site Waste Management Facilities,
June 9–11, 1997

This memorandum documents a visit by members of the staff of the Defense Nuclear Facilities Safety Board (Board) L. Jellett and R. Tontodonato to the Savannah River Site (SRS) on June 9–11, 1997. The purpose of this visit was to review implementation of Board Recommendation 96-1 at the In-Tank Precipitation (ITP) Facility, hydrogen retention in SRS high-level waste tanks, and operational problems at the Consolidated Incineration Facility (CIF).

Recommendation 96-1. Technical Safety Requirements being developed for ITP will impose safety-class and safety-significant reliability criteria on certain existing systems, structures, and components. Westinghouse Savannah River Company (WSRC) is performing backfit analyses to determine whether upgrades are needed to ensure that such equipment will function as assumed by the safety analysis. Six backfit analyses have been completed to date. Design deficiencies identified by the analyses include vulnerability to single failures, inadequate electrical design (particularly lack of redundant sources of power), inadequate protection against environmental conditions, and failure to meet modern quality assurance standards for procurement. WSRC responses include a mix of equipment upgrades and compensatory actions such as improved surveillance and new administrative controls. The Board's staff will evaluate these analyses to assess whether the WSRC methodology results in appropriate backfit decisions. The initial conclusions of the Board's staff are that there is little basis for the surveillance frequencies specified in the compensatory actions, and that the feasibility and merit of potential compensatory actions were not thoroughly evaluated in

some cases (e.g., performing functional testing of check valves instead of relying on periodic inspections and operator response to valve failure).

WSRC is evaluating the potential for hydrogen retention in ITP tanks. Tank data show that small hydrogen releases occur when the slurry pumps in Tank 48 are started. Future operations involving more waste and higher curie loadings could significantly increase the size of these releases. Laboratory studies have shown that simulated tetraphenylborate slurries can retain over 3.5 volume percent hydrogen. Release of such a quantity of hydrogen from a large volume of slurry would create a flammable atmosphere in the tank. WSRC is working to define additional authorization basis controls to prevent hazardous quantities of hydrogen from accumulating during full-scale ITP operations, without relying on continuous (or near-continuous) slurry pump operations. Continuous pump operations are not feasible using the existing pumps and power supplies.

The potential exists for ITP operations to become very complex if too many variables are factored into the determination of pump operating frequencies, especially when both hydrogen and benzene accumulation are considered. Using conservative values for some parameters (such as nitrate and nitrite concentrations) instead of recalculating the maximum allowable quiescent time for the precise tank conditions that exist at any given time could greatly simplify operations. It could also make operator compliance with the controls easier. Ideally, the authorization basis will identify a simple set of Limiting Conditions of Operation providing mixing frequencies for each major phase of the ITP process (e.g., precipitation, concentration, washing).

Hydrogen Retention in Other Waste Tanks. Hydrogen retention in non-ITP tanks is much less severe than at the Hanford Site because high-level waste at SRS contains only small quantities of organic compounds. Spontaneous gas release events have not been observed. However, a significant hydrogen release was observed in 1993 during slurry pump operations in Tank 51. WSRC plans to address the potential for induced releases by estimating the size of such releases and developing controls on ventilation, mixing frequency, and/or the intensity of agitation. Interim controls on waste-disturbing activities have been implemented to ensure that operations will remain safe while these investigations are pursued.

Consolidated Incineration Facility. Several operational problems have occurred at CIF since it started operating in late 1996. Significant events include a pump leak that contaminated a facility worker and a small fire involving waste boxes jammed in the feed unit for the rotary kiln. Corrective actions being taken by CIF management appear to address both the immediate problems and the broader implications of each incident adequately. However, an incident that occurred the day after the review by the Board's staff (spill of radiologically contaminated liquids due to an improper valve line-up) shows that conduct of operations at CIF needs further improvement.