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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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June 3, 1999

Mr. Richard French
U.S. Department of Energy
P.O. Box 550, MSIN: A6-54
Richland, WA 99352

Mr. Anthony Umek
Fluor Daniel Hanford, Inc.
P.O. Box 1000, MSIN: S7-40
Richland, WA 99352

Ms. Mary Delozier
Lockheed Martin Hanford Corporation
P.O. Box 1500, MSIN: R2-50
Richland, WA 99352



Dear Messrs. French, Umek, and Ms. Delozier:

Re: Washington State Department of Ecology Concerns/Request for Information
Associated with Double Shell Tank SY-101

The Washington State Department of Ecology (Ecology) recognizes that tank SY-101 presents the most serious safety concern on-site at this time, an opinion that was also echoed by attendees during the close-out session of the Tank Advisory Panel (TAP) on April 14, 1999.

Ecology strongly supported the convening of the TAP in April 1999 and anticipates the U.S. Department of Energy (USDOE) will continue to fully utilize the expertise associated with the TAP to review safety issues associated with tank SY-101 and to follow the advice provided by the TAP.

Ecology strongly recommends immediate attention regarding the concerns summarized below:

- "Rising" crust level
- "Downward" growth of lower crust layers
- Retention of flammable gas mixtures
- Failure of the mixer pump to mitigate the safety issues associated with tank SY-101
- Lack of a final plan related to the "safe" release of trapped gases

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- Impact of tank temperature rise
- Increased tank corrosion potential
- Color change in lower crust layers when upper crust layers are disturbed
- On-site and off-site accident risk analysis
- Critical path schedule for meeting the September 1999, tank SY-101 pumping schedule
- Chemical characterization of waste

These same concerns/issues are further elaborated in the enclosure, "Attachment A", and are accompanied by requests for additional information.

Ecology wants to clearly emphasize that the issues associated with SY-101 are considered very serious. It is strongly recommended that all necessary actions be taken to preclude or mitigate the occurrence of an unsafe event that may adversely impact public health or the environment. Ecology is prepared to take any steps necessary, including enforcement, to mitigate or preclude such an event.

Ecology appreciates the informative presentations given addressing this issue and looks forward to future presentations and to working closely with you in addressing these concerns.

Thanks in advance for your diligent attention to this important matter. Please advise Mr. Casey Ruud as to the USDOE point of contact for the pending information request issues. Mr. Ruud can be reached at (509) 736-3022.

Sincerely,



Antonio Valero, TWRS Storage Project Manager
Nuclear Waste Program

AV:sb

Enclosure

cc: Dana Bryson, USDOE
Maureen Hunemuller, USDOE
Keith Klein, USDOE
Mark Ramsay, USDOE
Mike Owens, EPA
Merilyn Reeves, HAB
Mary Lou Blazek, OOE
Administrative Record: SY-101

ATTACHMENT A

List of Concerns relating to the SY-101 Double Shell Tank (DST)

- 1) Ecology is very concerned about the rising crust level. Based on recent USDOE information, the crust is approximately seven (7) feet thick and continues to grow above and below the liquid level. The rising crust level has decreased the vapor space (headspace) beneath the tank dome to approximately 70% of what it was prior to the installation of the mixer pump (7/4/93). Vapors in the headspace are now closer to the lower explosive limit (LEL). Based on this information, Ecology requests that USDOE provide the following:
 - an estimate of when double containment of the tank will be breached,
 - an estimate of when the surface of the waste completely eliminates the dome space (i.e., when the tank is full of waste and the only option is for waste to exit the tank through the numerous risers), and
 - an estimate of exit pathways once the tank is full.

- 2) Lower crust layers continue to grow downward beneath the liquid level. This could interfere with the mixer pump operation if the 'foamy' layer reaches the pump intakes. Please provide Ecology the following:
 - an estimate of the time frame at which this may occur if the waste continues in its current operating mode,
 - an estimate of the impacts to tank conditions should operation of the mixer pump be adversely impacted,
 - an estimate of the length of time before the conditions within the tank might lead to a rollover event, and
 - an estimate of the amount of gas that might be released during such a rollover event.

- 3) Flammable gas mixtures continue to be retained within the lower two (2) crust layers (approx. 7,800 cubic feet based on the RGS data and 5,120 cubic feet based on VFI data). Fuel and oxidizers (hydrogen and nitrous oxide) are present in these lower layers and, if released rapidly from these layers increase the risk of explosion inside SY-101. Please provide Ecology the following information:
 - an estimate of amount of gas retained within this layer,
 - an estimate of the probability that pumping would disrupt this layer and lead to gas release
 - an estimate of the amount of gas that could be released once the overlying crust structure is fractured.

- 4). Lack of a final plan to create a safe release of the trapped gases. Addition of too great a quantity of water could cause a large release of gas into the tank headspace. Please provide Ecology the following:

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- a schedule and details for the planned mechanical mitigation instrument (arm) or any other crust disturbance and /or gas release events
 - updates via written documentation of these events
 - a description of the procedure for adding water to SY-101 following the first transfer of waste as well as an explanation of the effects on the crust and trapped gases.
- 5) The tank temperature has increased by about 3 to 5 degrees Fahrenheit since October 1996 and appears to continue to rise. Higher tank temperature has caused reduced running times for the mixer pump (from 25 minutes to 20 minutes). Ecology is concerned both because the higher temperature presents a greater safety hazard and the higher tank temperature can cause accelerated corrosion. Please provide the following to Ecology:
- a description of the causes for increased temperature within SY-101,
 - a description of the impacts of temperature rise within SY-101,
 - an assessment of the extent the impacts identified above have upon the integrity of the tank and the safe long-term storage of the waste,
 - an assessment of what activities/steps USDOE will take to assess the impacts of increased temperature upon SY-101,
 - a schedule when these activities will take place,
 - a description of how removal of waste from the tank will mitigate this increased temperature, and
 - the steps USDOE will take to prevent this problem from re-occurring at SY-101.
- 6) Ecology is concerned about an increased potential for corrosion of the tank wall at the crust interface zone. Page 28 (table A-3) of the June 1996 *DST Remaining Useful Life Estimates report (WHC-SD-WM-ER-585)* indicates SY-101 has more chloride than other DSTs (4,580-ppm). Page 16 of the same report implies that there may be concern for accelerated corrosion near the waste surface interface in most DSTs if the pH drops below 11. The report indicates that ammonia and chlorides have not been adequately factored into the existing waste chemistry composition specifications. The report recommended experiments be conducted to reflect actual DST service conditions and should also include the effects of the simultaneous presence of chloride and ammonia in the waste liquid on the corrosion of the tank wall adjacent to the waste surface. Please provide Ecology with the following information:
- a description of what work has been done at SY-101 to assess the impact of increased ammonia and chloride upon tank integrity, and
 - if this work has not been done, provide a description of what activities will be done and a schedule for those activities.
- 7) Ecology is concerned about the color change observed in the lower crust layers when the upper layer is disturbed. The latest video(s) indicate the lower layer flowing up past the upper crust is a rusty brown color. Earlier videos indicated the same lower layer was green. Considering the presence of an oxidizing layer, elevated tank temperature, and the limited contact zone along the tank wall, the potential exists for accelerated (perhaps rapid) corrosion and/or changes in waste composition to occur in SY-101. Please provide Ecology with the following:

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- an explanation for the observed changes in waste color,
 - a plan describing the activities USDOE will conducted to determine the chemical composition of this layer,
 - a plan describing how these changes will be observed with time, and
 - a schedule for implementation of these plans.
- 8) Ecology is concerned about an accident potential and its risks for both onsite and offsite exposure. Please provide Ecology with:
- a detailed description of the accident risk analysis completed for this activity,
 - an identification of the amount of radioactive exposure (rem) USDOE is willing to accept for both off-site and on-site exposures, and
 - an identification of the technical justification for the selection of these numbers.
- 9) Ecology is concerned with the USDOE statement in the TAP meeting proceedings during April, 1999 that the ". . . mixer pump continues to mitigate the buoyant displacement of gas release events." Perhaps the buoyant displacement gas (rollover) events have been alleviated for the short-term; however, more gas is being retained with time and this increased gas retention represents an increase in the threat of a flammable gas release. Please note that an earlier question identified the presence of a 'foamy' layer that appears to be undergoing chemical changes. Although the crust may also retain additional flammable gas, it appears that substantial gas is being retained below the less-permeable portions of the crust. Therefore, please provide Ecology with the following:
- the technical justification that increased gas retention in tank SY-10 decreases the likelihood of having a buoyant displacement event,
 - an analysis of the amount of gas that can be retained under the crust in SY-101 before the structure of the crust is breached and flammable gas released, and
 - the safety hazards associated with increased gas retention beneath the crust.
- 10) Ecology has reviewed the schedule currently projected for October 1999, which removes waste from SY-101, dilutes it with equal amounts of water and places the diluted waste in SY-102. Ecology, however, was not able to determine which activities are critical for the completion of this activity. Ecology has also observed in past activities that management of a critical path schedule has been inadequate and has been directly responsible for the failure of the desired activities to take place within the necessary timeframe. Therefore, please provide Ecology the following:
- A critical path schedule for the removal of waste from SY-101. This schedule must clearly identify the activity required, the current delivery date, any flexibility (or 'float') for this activity and an identification of the confidence that USDOE has that this activity will be completed within the desired timeframe.
 - A description of what steps USDOE is taking to maintain direct and detailed oversight of the critical path schedule.
- 11) During past discussions with USDOE, Ecology has expressed concerns regarding the inability of

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USDOE to adequately describe the chemical phenomenology that ultimately lead to the serious flammable gas safety issues associated with tank waste storage. Ecology has also agreed with members of the Tank Advisory Panel (TAP) in pointing out the lack of technical justification in basing its determination of flammable gas safety hazards solely upon the specific gravity of the waste. Therefore, please provide Ecology the following:

- a description of the process USDOE will use to improve the understanding of chemical phenomenology as it relates to the flammable gas safety hazard,
- a description of the chemical analyses that will be used to understand the chemical processes and phenomenology that have lead to the serious safety hazards associated with SY-101,
- a schedule identifying when these analyses will be done and how this data will be incorporated into understanding the site-wide flammable gas safety issue, and
- justification which will mitigate the occurrence of similar concerns at waste transfer recipient tanks (SY-102).

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