

ENGINEERING CHANGE NOTICE

Page 1 of 45

1. ECN 193532

Proj. ECN

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. TS Vail, Systems Engineering, R1-43, 3-2092		4. Date 3/16/93
	5. Project Title/No./Work Order No. Tank Farms Criticality Safety	6. Bldg./Sys./Fac. No. 2750E/D188	7. Impact Level 1ESQ
8. Document Numbers Changed by this ECM (includes sheet no. and rev.) WHC-SD-WM-JCO-001 REV0		9. Related ECM No(s). none	10. Related PO No. N/A
11a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 11b) <input checked="" type="checkbox"/> No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. N/A	11c. Modification Work Complete N/A _____ Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) N/A _____ Cog. Engineer Signature & Date

12. Description of Change
 Amendment 1 provides justification to emergency pump 241-T-101, on page 9.



13a. Justification (mark one)	Criteria Change <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>
As-Found <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

13b. Justification Details
 The amendment provides the justification and approval to emergency pump 241-T-101.

14. Distribution (include name, MSIN, and no. of copies)
 See distribution coversheet on page 2 of this ECN.

RELEASE STAMP
OFFICIAL RELEASE BY WHC 63 DATE MAR 25 1993 sta #4

ENGINEERING CHANGE NOTICE

Page 2 of 5

1. ECN (use no. from pg. 1)

193532

15. Design Verification Required <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	16. Cost Impact <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">ENGINEERING</td> <td style="width: 50%; text-align: center;">CONSTRUCTION</td> </tr> <tr> <td>Additional <input type="checkbox"/> \$</td> <td>Additional <input type="checkbox"/> \$</td> </tr> <tr> <td>Savings <input type="checkbox"/> \$</td> <td>Savings <input type="checkbox"/> \$</td> </tr> </table>	ENGINEERING	CONSTRUCTION	Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	17. Schedule Impact (days) Improvement <input type="checkbox"/> Delay <input type="checkbox"/>
ENGINEERING	CONSTRUCTION							
Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$							
Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$							

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	<input type="checkbox"/>	Seismic/Stress Analysis	<input type="checkbox"/>	Tank Calibration Manual	<input type="checkbox"/>
Functional Design Criteria	<input type="checkbox"/>	Stress/Design Report	<input type="checkbox"/>	Health Physics Procedure	<input type="checkbox"/>
Operating Specification	<input type="checkbox"/>	Interface Control Drawing	<input type="checkbox"/>	Spares Multiple Unit Listing	<input type="checkbox"/>
Criticality Specification	<input type="checkbox"/>	Calibration Procedure	<input type="checkbox"/>	Test Procedures/Specification	<input type="checkbox"/>
Conceptual Design Report	<input type="checkbox"/>	Installation Procedure	<input type="checkbox"/>	Component Index	<input type="checkbox"/>
Equipment Spec.	<input type="checkbox"/>	Maintenance Procedure	<input type="checkbox"/>	ASME Coded Item	<input type="checkbox"/>
Const. Spec.	<input type="checkbox"/>	Engineering Procedure	<input type="checkbox"/>	Human Factor Consideration	<input type="checkbox"/>
Procurement Spec.	<input type="checkbox"/>	Operating Instruction	<input type="checkbox"/>	Computer Software	<input type="checkbox"/>
Vendor Information	<input type="checkbox"/>	Operating Procedure	<input type="checkbox"/>	Electric Circuit Schedule	<input type="checkbox"/>
OM Manual	<input type="checkbox"/>	Operational Safety Requirement	<input type="checkbox"/>	ICRS Procedure	<input type="checkbox"/>
FSAR/SAR	<input type="checkbox"/>	IEFD Drawing	<input type="checkbox"/>	Process Control Manual/Plan	<input type="checkbox"/>
Safety Equipment List	<input type="checkbox"/>	Cell Arrangement Drawing	<input type="checkbox"/>	Process Flow Chart	<input type="checkbox"/>
Radiation Work Permit	<input type="checkbox"/>	Essential Material Specification	<input type="checkbox"/>	Purchase Requisition	<input type="checkbox"/>
Environmental Impact Statement	<input type="checkbox"/>	Fac. Proc. Samp. Schedule	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Report	<input type="checkbox"/>	Inspection Plan	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Permit	<input type="checkbox"/>	Inventory Adjustment Request	<input type="checkbox"/>		<input type="checkbox"/>

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer TS Vail see correspondence 9259447 (attached)	_____	PE	_____
Cog. Mgr. SD Godfrey see correspondence 9259447 (attached)	_____	QA	_____
QA <i>Leon Bond</i>	<u>3-14-93</u>	Safety	_____
Safety MN Islam see correspondence 9259447 (attached)	_____	Design	_____
Security	_____	Environ.	_____
Environ. <i>R.K. Opa</i>	<u>3-18-93</u>	Other	_____
Projects/Programs	_____		_____
Tank Waste Remediation System	_____		_____
Facilities Operations GL Dunford see correspondence 9259447 (attached)	_____	DEPARTMENT OF ENERGY	
Restoration & Remediation	_____	Signature or Letter No.	
Operations & Support Services	_____	PD Grimm see memorandum to EM-36 dated February 25, 1993 (attached) pg 485	_____
IRM	_____	ADDITIONAL	_____
Other SEAC, BK Horsager see correspondence 9259447 (attached)	_____		_____

Complete for all Types of Release

Purpose <input type="checkbox"/> Speech or Presentation <input type="checkbox"/> Full Paper (Check only one suffix) <input type="checkbox"/> Summary <input type="checkbox"/> Abstract <input type="checkbox"/> Visual Aid <input type="checkbox"/> Speakers Bureau <input type="checkbox"/> Poster Session <input type="checkbox"/> Videotape	<input type="checkbox"/> Reference <input checked="" type="checkbox"/> Technical Report <input type="checkbox"/> Thesis or Dissertation <input type="checkbox"/> Manual <input type="checkbox"/> Brochure/Flier <input type="checkbox"/> Software/Database <input type="checkbox"/> Controlled Document <input type="checkbox"/> Other	ID Number (include revision, volume, etc.) WHC-SD-WM-JCO-001 Rev. 1 List attachments. Date Release Required <p style="text-align: center;">3/25/93</p>
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Title Justification for Continued Operations Of Hanford High-Level Waste Tanks Resulting From The Criticality USQ, 492-CRITSAF	Unclassified Category UC	Impact Level 1 ES Q
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New or novel (patentable) subject matter? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has disclosure been submitted by WHC or other company? <input type="checkbox"/> No <input type="checkbox"/> Yes Disclosure No(s).	Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)
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Copyrights? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If "Yes", has written permission been granted? <input type="checkbox"/> No <input type="checkbox"/> Yes (Attach Permission)	Trademarks? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (Identify)
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Complete for Speech or Presentation

Title of Conference or Meeting	Group or Society Sponsoring
Date(s) of Conference or Meeting	City/State
Will proceedings be published? <input type="checkbox"/> Yes <input type="checkbox"/> No Will material be handed out? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Title of Journal	

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval
			Name (printed) Signature Date
Classification/Unclassified Controlled Nuclear Information	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TS Vail <i>Terry S. Vail</i> 3/18/93
Patent - General Counsel	<input checked="" type="checkbox"/> <i>KMB</i>	<input checked="" type="checkbox"/>	<i>per Feb 4 OGC letter</i>
Legal - General Counsel	<input checked="" type="checkbox"/> <i>KMB</i>	<input checked="" type="checkbox"/>	<i>per Feb 4 OGC letter</i>
Applied Technology/Export Controlled Information or International Program	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
WHC Program/Project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	DG Hamrick <i>DG Hamrick</i> 3/19/93
Communications	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
RL Program/Project	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>M. P. Ruck DOE-RL</i> 3/24/93
Publication Services	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>JO HUDSPETH for 2/24/93</i> 3/24/93
Other Program/Project	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Information conforms to all applicable requirements. The above information is certified to be correct.

<table style="width: 100%;"> <tr> <td style="width: 30%;">References Available to Intended Audience</td> <td style="width: 10%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>Transmit to DOE-HQ/Office of Scientific and Technical Information</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Author/Requestor (Printed/Signature)</td> <td colspan="2" style="text-align: right;">Date</td> </tr> <tr> <td>Terry S. Vail <i>Terry S. Vail</i></td> <td colspan="2"></td> </tr> <tr> <td>Intended Audience</td> <td colspan="2"></td> </tr> <tr> <td><input type="checkbox"/> Internal <input type="checkbox"/> Sponsor <input checked="" type="checkbox"/> External</td> <td colspan="2"></td> </tr> <tr> <td>Responsible Manager (Printed/Signature)</td> <td colspan="2" style="text-align: right;">Date</td> </tr> <tr> <td>Steve D. Godfrey <i>Steve D. Godfrey</i></td> <td colspan="2" style="text-align: right;">3-18-93</td> </tr> </table>	References Available to Intended Audience	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Transmit to DOE-HQ/Office of Scientific and Technical Information	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Author/Requestor (Printed/Signature)	Date		Terry S. Vail <i>Terry S. Vail</i>			Intended Audience			<input type="checkbox"/> Internal <input type="checkbox"/> Sponsor <input checked="" type="checkbox"/> External			Responsible Manager (Printed/Signature)	Date		Steve D. Godfrey <i>Steve D. Godfrey</i>	3-18-93		<p style="text-align: center;">INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP</p> <p>Stamp is required before release. Release is contingent upon resolution of mandatory comments.</p> <div style="text-align: center;">  </div>
References Available to Intended Audience	<input checked="" type="checkbox"/>	<input type="checkbox"/>																							
Transmit to DOE-HQ/Office of Scientific and Technical Information	<input type="checkbox"/>	<input checked="" type="checkbox"/>																							
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Responsible Manager (Printed/Signature)	Date																								
Steve D. Godfrey <i>Steve D. Godfrey</i>	3-18-93																								
Date Cancelled	Date Disapproved																								

SUPPORTING DOCUMENT

1. Total Pages **1311**

2. Title

Justification For Continued Operations of Hanford High-Level Waste Tanks Resulting From the Criticality USQ, 492-CRITSAF

3. Number

WHC-SD-WM-JCO-001

4. Rev No.

1

5. Key Words

Unreviewed Safety Questions, Criticality Safety, JCO, Double Shell Tanks, Single Shell Tanks, Aging Waste Tanks

6. Author

Name: TS Vail

Signature

Systems Engineering/N135A

Organization/Charge Code 7C200

APPROVED FOR PUBLIC RELEASE
KMB 3/25/93

7. Abstract

The issue of criticality safety in Hanford Tank Farms was declared an Unreviewed Safety Question (USQ) on April 30, 1992. This USQ was declared because the existing Safety Analysis Reports for the Single Shell Tanks, Double Shell Tank and Aging Waste Tanks state that a criticality is not credible. This conclusion may not be technically defensible for the full range of postulated tank constituent conditions. As a result of the USQ some tank farm operations were placed on administrative hold. The relaxation of these restricted operations require the approval of the Program Secretarial Officer (PSO). The technical justification to relax the operations with specified controls is delineated in the JCO. Revision 1 includes the justification to emergency pump 241-T-101.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

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Records removed per WHC Legal 3/25/93
DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

10. RELEASE STAMP

OFFICIAL RELEASE 63
BY WMS
DATE MAR 25 1993
Sta #4

9. Impact Level 1 ESQ

memorandum

ECN 193532 page 4

DATE: FEB 23 1993

REPLY TO
ATTN OF: EM-36

SUBJECT: Approval of Request for Emergency Pumping of Hanford High-Level Waste Tank 241-T-101

TO: Manager, DOE Richland Field Office

By memorandum dated December 30, 1992, you addressed the issue of emergency pumping of High-Level Waste (HLW) Tank 241-T-101. Tank 241-T-101 was declared to be an assumed leaking tank on October 4, 1992. Since this is currently a Watch List Tank covered by the ferrocyanide and criticality Unreviewed Safety Questions, authorization for non-routine activities is necessary and has been requested in your memorandum. My staff has reviewed the request and supporting documentation and concludes that it provides the technical justification and margin of safety to perform emergency pumping of assumed leaking single-shell Tank 241-T-101.

I understand the urgency behind the Tank 241-T-101 emergency pumping effort, especially the pending actions requested and/or promised the State of Washington Department of Ecology through the Tri-Party Agreement milestones. Therefore, I am approving the emergency pumping of Tank 241-T-101.

I understand that transferring waste from Tank 241-T-101 to Tank 241-SY-102 will result in less than a 2 percent total increase in the total Curie content of Tank 241-SY-102. I further understand that the waste addition will also have no significant effect on the overall chemical composition of the waste in Tank 241-SY-102. Therefore, pumping Tank 241-T-101 contents to Tank 241-SY-102 will not impact future pretreatment of Tank 241-SY-102 contents.

Also, I understand that pumping of Tank 241-T-101 is considered to be a safe activity since:

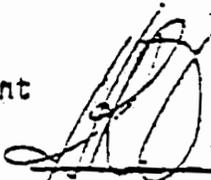
1. It is very likely that there is little or no ferrocyanide inside this tank. The tank had ferrocyanide added to it in 1953. The tank was then pumped or sluiced to a very low level (in 1954 and 1955) which should have removed the ferrocyanide from the tank. Also, the pH measured in the supernatant of this tank (13.3) is high enough that the ferrocyanide should have solubilized and moved out of this tank through cascade overflow (Tank 241-T-101 was the first tank in a cascade series and was cascaded for over 5 years).
2. Even if there is residual ferrocyanide in Tank 241-T-101, pumping of the tank will not increase the likelihood of a ferrocyanide reaction. This is because: (a) the pumping will not remove enough water to significantly change the substantial water content of the sludge, and (b) testing of the type of ferrocyanide that was put in this tank (U Plant flow-sheet material) has shown that this material will not sustain a propagating reaction, even if completely dry.

Tank 241-T-101 to fulfill the agreement with the State of Washington Department of Ecology and authorize the Office of Environmental Restoration and Waste Management to send the memorandum to the Department of Energy Richland Field Office.



Paul D. Grimm
Acting Assistant Secretary for Environmental
Restoration and Waste Management

Attachment

APPROVE: 

DISAPPROVE: _____

DATE: 2/24/93

Concurrence: _____

Eh-1 Blush 2/19/93 NS-1 Out Smith

cc w/attachment:

- Whitaker, DR-1
- Brush, EH-1
- E. Fygi, GC-1
- S. Blush, NS-1

JUSTIFICATION FOR CONTINUED OPERATION
OF HANFORD HIGH-LEVEL WASTE TANKS
RESULTING FROM THE CRITICALITY USQ, 492-CRITSAF

Background

The issue of criticality safety in Hanford Tank Farms was declared an Unreviewed Safety Question (USQ) on April 30, 1992. This USQ was declared because the existing Safety Analysis Reports (SARs) for the Single Shell, Double Shell, and Aging Waste Tanks state that a criticality is not credible. This conclusion may not be technically defensible for the full range of postulated tank constituent conditions. Questions regarding fissile material inventory and spatial distribution raise concerns that cannot be confirmed to be within the approved safety envelope defined in the current SAR. Therefore, in conjunction with the U.S. Department of Energy, Richland Field Office (RL) and U.S. Department of Energy, Headquarters (HQ), the contractor, as required by DOE 5480.21, 10.b (3), performed a safety evaluation and the resultant determination was that a USQ existed for criticality safety in High-Level Waste (HLW) Tanks.

The criticality USQ is a Priority 2 Waste Tank Safety Issue at the Hanford Site, on the basis that it affects only some of the necessary conditions that could lead to an uncontrolled release of radioactive waste (under extreme assumptions). As a Priority 2 Safety Issue, the prohibitions of the Wyden Amendment, which are only applicable to Priority 1 Safety Issues, do not apply.

The primary mission of the Tank Farms, to provide predictable waste storage capacity for generating facilities, can not be interrupted for an extended time without serious consequences.

Allowed Operations

This Justification for Continued Operation (JCO) identifies the following operations: (A) those operations which do not affect nuclear reactivity, and, therefore, do not affect criticality safety within the tank; (B) those operations which have negligible impact on nuclear reactivity, and, therefore, have negligible impact on criticality safety within the tank; and, (C) those operations which require further evaluation, and, as such, are placed on administrative hold until the evaluation data is submitted to, and approved by, RL.

Basis

The allowed operations set forth in this JCO can be conducted safely, even though most of the Hanford HLW Tanks contain more than the minimum critical mass of fissile material under optimum conditions within the waste.

For Plutonium (Pu) bearing waste to go critical, three conditions must occur. First, there must be sufficient mass; second, there must be sufficient concentration; and third, the shape must be favorable. For the waste

composition in the Tank Farms tanks, a criticality will not occur if the fissile material concentration is controlled to less than 3 grams per liter of solids. This is because the total mass of fissile material is distributed throughout the waste in a concentration less than that required for a criticality for any mass under any conditions of moderation or reflection (Reference SD-SQA-CSA-20108, "CSAR 79-007 Underground Waste Storage Tanks and Associated Equipment").

Hanford has rigorously controlled the fissile material concentrations and alkalinity in the Double-Shell Tanks (DST)s. The analytical results from core samples indicate the fissile material concentrations are at least an order of magnitude lower than the minimum critical concentration of 3 gram/liter. Additionally, the DST inventory tracking system records fissile material inventories in all DSTs at significantly below the total mass allowed by the Criticality Prevention Specification (CPS), even after conservative adjustments were made to account for measurement and sampling uncertainties.

The analysis of core samples taken from some of the Single Shell Tanks (SSTs) indicate a fissile material concentration of less than 0.20 grams per liter. The inactive status of the SSTs ensure that no additional fissile material will be discharged to these tanks.

Finally, sample results from DSTs show that the alkaline supernatant is non-transuranic (i.e., less than 100 nCi/gram), which means that any alkaline liquid transfers to the tanks will not result in additional precipitation of fissile material beyond that already contained in the transferring liquid. Dilute (i.e., much less than 3 grams per liter alkaline fissile solution) liquid additions per assumptions contained in Criticality Safety Evaluations (CSERs), should actually decrease the effective multiplication factor, and provide a negative effect on nuclear reactivity.

These facts provide reasonable assurance that a nuclear criticality within the tanks is remote, and, further, that the operations specified in this JCO can be performed with negligible or no impact to criticality safety.

ALLOWED OPERATIONS

- A. This section lists those HLW Tank operations which do not affect nuclear reactivity within the tanks:

Allowed Operation #1

Westinghouse Hanford Company (WHC) may perform tank farm surveillance activities in the dome space outside of the waste, such as liquid level monitoring, liquid observation well scans, temperature readings, dome surveys, dry well scans, tank vapor space monitoring, and installation and repair of monitoring equipment.

Justification

These activities do not affect nuclear reactivity because no movement of fissionable material occurs, and, therefore, mass and distribution of fissile material is not affected. These activities are required to ensure compliance with Operational Safety Requirements (OSRs), Operating Specifications Documents (OSDs), and to resolve Waste Tank safety issues.

Allowed Operation #2

For tank farm operations not affecting nuclear reactivity, and not listed above, WHC shall submit to RL a concise justification for the proposed operation. This justification shall be reviewed, approved, and attached as an amendment to this JCO prior to conduct of the proposed operation.

Justification

This RL review will independently verify that nuclear reactivity is not affected by an activity not anticipated during the preparation of Allowed Operation #1.

- B. This section lists those HLW Tank operations which have negligible impact on nuclear reactivity in the tanks, and, therefore, have negligible impact on criticality safety in the tanks:

Allowed Operation #3

WHC may operate and flush tank airlift circulators located in AZ, AY, and AW Tank Farms.

Justification

These operations have no impact on fissile mass and negligible impact on fissile distribution. Any accumulations or redistribution of fissile material that could have occurred, has already occurred; no other redistribution mechanism exists within the tank. Additionally, the fissile material inventory of these aforementioned tanks is well below the criticality prevention specification limit of 50 kilograms. Finally, the fissile material inventory in 101-AZ has been confirmed by core sample analytical data to be 16.8 kilograms plutonium versus an engineering estimate of 9.5 kilograms.

These airlift circulators have operated safely for many years within a conservative safety envelope. Continued operation of these airlift circulators in the AZ Tank Farms is required by current OSRs to maintain a safe heat distribution within the "aging waste" tanks.

Allowed Operation #4

WHC may perform tank contents sampling operations (push mode or rotary mode core sampling, auger, and supernatant, including bottle-on-a-string) in the waste tanks.

Justification

Nuclear reactivity is not appreciably impacted by sampling operations because the sample volume is so minute with comparison to the tank volume. For example, each core sample is one inch in diameter and consists of 244.5 ml/segment. Other sampling devices approximate the same volume of material displaced. In addition, these activities are necessary to ensure compliance with existing OSRs, OSDs, Part B Permit Applications, and to support the overall waste characterization program.

Allowed Operation #5

WHC may install monitoring equipment (e.g.-thermocouple trees) using the water lance method. This method involves additions of no more than 1500 gallons of non-fissile bearing liquid through a pipe for safe installation.

Justification

Reasonable and conservative assumptions and sample results factored into analyses contained in CSERs demonstrate that the documented tanks affected are likely to be overmoderated. Given these analyses, non-fissile liquid additions will actually decrease the effective multiplication factor and thus decrease the nuclear reactivity within the tank (Reference: WHC-SD-SQA-CSA-20108, "Underground Waste Storage Tanks and Associated Equipment", page 3). The H/Pu ratio at 40 percent water (60 percent sludge) is far too large for low plutonium density waste to be critical (H/Pu equals 10,615 for one gram of plutonium per liter). The maximum H/Pu for a critical system is about 3600 and the optimum H/Pu ratio (maximum k-infinity) is in the 100 to 1000 range. In reducing the water content to obtain this range, the sludge density must increase. This requires water contents of less than ten percent in most cases. It is extremely unlikely that this low a water content could be obtained except on a hot plate. Installation of this monitoring equipment is necessary to provide data for heat transfer modeling.

Allowed Operation #6

WHC may conduct operations involving aqueous additions to assist with temperature control and conduct operations involving the addition or transfer of non fissile aqueous solutions into waste tanks. This may be done to perform instrument flushes, pump catch tanks, enter pits, maintain liquid levels, conduct evaporator mini-run and operations, and conduct routine maintenance.

Justification

Tanks affected by these operations, as described in Operation #5, are thought to be overmoderated based on analyses contained in the CSER. Addition of non-fissile aqueous solutions, per these analyses, should decrease the effective multiplication factor, and decrease the nuclear reactivity in the tank. Operational history has shown that the return water from pump pits and catch tanks is primarily non-fissile, contaminated water which does not affect the fissile material content, and therefore, does not increase the nuclear reactivity in the tanks. Aqueous additions are necessary to ensure the safety of work performed in the tank farm. Evaporator operations are evaluated in WHC-SD-SQA-CSA-20112, "CSAR 81-022, Waste Evaporators 242-A, 242-S" and state "With the maximum concentration of fissile material in the feed solution limited to 0.01 grams per gallon, we conclude there is no criticality potential and the evaporators meet the safety requirements...".

Allowed Operation #7

WHC may conduct 101-SY Window Activities for the same basis cited in Allowed Operation #5. These activities are called-out separately because of their visibility and importance to waste tank safety programs. Operations such as removal of the sludge weight (including addition of water for flushing), air lance removal, pump pit entry to support photography (including addition of water for contamination control) and Multifunctional Instrument Tree (MIT) installation have negligible impact on the mass or distribution of the fissionable material; on the nuclear reactivity within the tanks; and, therefore, on criticality safety.

Hydrogen mitigation activities may potentially impact the distribution of fissionable material and are not included in Allowed Operation #7. These hydrogen mitigation operations have been separately evaluated and will be approved per Section C.2.

Justification

See Allowed Operation #5.

Allowed Operation #8

WHC may transfer new liquid waste from generators (e.g. analytical laboratories, Plutonium Finishing Plant, Purex) to "Non-Watch List" DSTs with total fissile inventories established within their respective CPS.

Justification

These operations will be authorized by WHC only after the following administrative controls/checks and balances have been performed to assure a safe envelope of operations:

- o An auditable record of transfers and continuous inventory will be maintained by WHC. The incremental addition of new liquid wastes, complying with the technically defensible CPS, will be in the form of very low concentration solutions and will provide negligible nuclear reactivity to the already subcritical DSTs.
- o A fissionable inventory of the DSTs to which the wastes are proposed to be transferred will be established, with bounding estimates which take cognizance of inaccuracies in analytical results and inconsistencies between analytical results, DST Tracking records, or other historical data. The upper bound of the fissionable inventory thus obtained, will be used for purposes of determining whether any given operation of this kind can be allowed. The estimation technique and methodology will be documented in sufficient detail to be technically defensible and to allow for independent review and verification.
- o The operational limit for all DSTs, except as allowed below, will be reduced to 25 kg Pu equivalent. The existing CPS limits are based on a maximum Pu concentration of 4 g/l which requires a minimum of 250 kg Pu for criticality. A tank operating mass limit an order of magnitude less than the minimum critical mass will be used in place of the Criticality Prevention Specification (CPS) limit while operating under this JCO.
- o Tanks containing more than 25 kg Pu equivalent fissile material (except 102-SY) are restricted from receiving newly generated waste under this JCO. Tank 102-SY, with a Pu equivalent inventory above 42 kg is a special case and is addressed under Allowed Operation #10.
- o The maximum concentration of fissile material entering the tanks shall not exceed 0.05 grams of Pu equivalent per gallon of waste.
- o Approval for transfers containing less than 15 grams of fissile material will be allowed only after confirmation of the fissile material inventory of the waste batch is performed by the Operations Shift Manager. Systems Engineering will review each transfer on a case-by-case basis to ensure compliance with the CPS.

- o Approval for transfers containing greater than 15 grams of fissile material will require documented justification and approval from the Criticality Safety Representative (CSR) and Waste Tank Safety Assurance, (WHC General Transfer Procedure, TO-025-001). This represents an additional layer of scrutiny to ensure safe operations with respect to criticality safety.

Allowed Operation #9

WHC may perform waste transfers within tank farms (i.e.- inter-tank transfers); however, these transfers will be limited to non-"Wyden Amendment" DSTs. Inter-DST tank transfers are subject to the same administrative controls described in Allowed Operation #8. SST activities are placed on hold per the restrictions described in Section C.

Justification

Both core sample analysis and historical records review will establish defensible fissile inventory values for DSTs involved in inter-tank transfers. Core sample analysis from DSTs show that fissile concentrations are at least an order of magnitude below the one gram/liter limit allowed by the CPS. Inter-tank transfers will also be subject to the same administrative controls/checks and balances described for transfers of newly generated waste in Allowed Operation #8. Inter-tank transfers will not involve SSTs. SST operations affecting nuclear reactivity are "on hold" per the discussion in Section C.

Allowed Operation #10

WHC may transfer liquid wastes to Tank 102-SY. This operation is called-out separately because of its vital importance to the stabilization and clean out of material in the Plutonium Finishing Plant (PFP). No means of moving new liquid waste from PFP exists except by transfer to 102-SY using existing piping systems.

WHC may transfer to 102-SY from sources other than PFP, provided the solution being transferred is within the specifications for PFP transfers. For example, the 222-S Laboratory and T-Plant, the primary sources of HLW tank analysis, may discharge waste to 102-SY.

Justification

The fissile material inventory in 102-SY was previously reported as 37.1 kilograms and 0.14 grams per liter in the solids, according to the DST tracking system. The inventory was recently revised to 42 kilograms and 0.16 gram per liter based on core sample analysis. This is well within the CPS limit of 125 kilograms and 2 grams per liter in the solids.

Although the concern about the redistribution of fissile material by air lift circulators (ALCs) has been raised, and 102-SY does have ALCs, those ALCs have not been used in the tank since the mid-1980's and they are currently locked out; no other redistribution mechanism exists within the tank.

Fissile material entering 102-SY is discharged by the PFP, which specifically adds iron (a neutron "poison" and a diluent for controlling the concentration of fissile material within the sludge) to the waste to control nuclear reactivity and to ensure compliance with the Tank Farm CPS (Reference: OSD-Z-184-00010).

The following controls and limits apply to all transfers into 102-SY.

- o The fissile material concentration entering 102-SY will not exceed 0.05 grams Pu equivalent per gallon of waste mix (solids and solutions).
- o The waste mix entering 102-SY will contain solids of no less than 0.6 percent by volume.
- o The fissile concentration in the solids will be less than 2 grams Pu equivalent per liter.
- o Iron hydroxide (or equivalent neutron absorber) at a concentration of at least 35 grams of iron per liter of solids will be coprecipitated with the fissile material. Iron hydroxide is added to PFP waste as a diluent and a neutron poison.
- o All waste material will be sampled, with independent verification of results, for compliance with the above controls and limits prior to transfer to 102-SY.

C. This section lists operations that may affect nuclear reactivity; these operations are not listed in Sections A or B because they require further evaluation. As such, these operations are placed on administrative hold until further conclusive data relative to criticality safety impact is available:

1. Single Shell Tank Stabilization - pumping of liquid waste from SSTs to accomplish SST Stabilization requires additional evaluation. The evaluation shall address the removal of supernatant moderator and, if necessary, establish appropriate administrative and operational controls to minimize risk and ensure the safety of these operations.
2. Other intrusive operations (e.g. 101-SY mitigation activities such as mixer pump installation, Hydrogen mitigation activities, SST retrieval activities, etc.) performed in HLW Tanks that may affect nuclear reactivity must be evaluated for impact and approved by RL and/or HQ prior to performing the operation.

At such time as further conclusive data becomes available to support additional operations, the proposed operation and its supporting data will be referenced at the end of the JCO, but the entire data package should not be included. Similarly, the JCO should be cross referenced in the documentation for the operation. Conditions specified under the allowed operations in this JCO must still be satisfied until issues associated with the USQ are addressed. This data must support the position that the proposed operation will provide no or negligible effect to nuclear reactivity in the tank. The package will be submitted to RL and/or HQ for review and approval prior to conduct of the operation.

AMENDMENT 1:

1. Single Shell Tank stabilization of 101-T is evaluated in CSER 92-008. This tank is inactive and has not received waste since before 1981 and will not receive any more process waste, furthermore the tank is suspected of leaking. Pumping the tank will reduce the environmental impact, however the CSER only addresses removing the liquid regardless of the method. Removal of liquid reduces the degree of neutron moderation from a highly overmoderated state to a state of lower moderation. It is concluded that the waste will remain well subcritical throughout the process of removing the liquids. There is no credible way for a critical configuration to be achieved, even if the solids are mixed or otherwise redistributed. Criticality is precluded by the low enrichment of the fissile isotopes in the heavy metals. Due to their physical and chemical similarities, the Pu is expected to remain well mixed with the uranium. Nevertheless, even if the Pu is assumed separated from the uranium, the concentration would still be so low that no scenario can be constructed which might credibly lead to criticality.

Waste from tank 101-T will be sampled in 244-TX and a destination will be determined from that analysis. From past analysis of 101-T tank waste, tank 102-SY will be the probable destination. If the waste is transferred to tank 102-SY all requirements in AO #10 of this JCO will be met.