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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 655991

Proj. ECN

2. ECN Category (mark one)
Supplemental []
Direct Revision ☒
Change ECN []
Temporary []
Standby []
Supersedure ~~[X]~~
Cancel/Void []
2-1-00

3. Originator's Name, Organization, MSIN, and Telephone No.
Melvin R. Adams, Data Development and Interpretation, R2-12, 373-6167

4. USQ Required?
[] Yes [X] No

5. Date
01/31/00

6. Project Title/No./Work Order No.
Tank 241-U-105

7. Bldg./Sys./Fac. No.
241-U-105

8. Approval Designator
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9. Document Numbers Changed by this ECN (includes sheet no. and rev.)
WHC-SD-WM-ER-617, Rev. 0-C

10. Related ECN No(s).
ECNs: 638285, 647955. 653791

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12a. Modification Work
[] Yes (fill out Blk. 12b)
[X] No (NA Blks. 12b, 12c, 12d)

12b. Work Package No.
N/A

12c. Modification Work Complete
N/A
Design Authority/Cog. Engineer Signature & Date

12d. Restored to Original Condition (Temp. or Standby ECN only)
N/A
Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

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FEB 24 2000
EDMC

14a. Justification (mark one)
Criteria Change [X]
Design Improvement []
Environmental []
Facility Deactivation []
As-Found []
Facilitate Const []
Const. Error/Omission []
Design Error/Omission []

14b. Justification Details
Electronic access to information and data is superseding hard copy document.

15. Distribution (include name, MSIN, and no. of copies)
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ENGINEERING CHANGE NOTICE	Page 2 of 2	1. ECN (use no. from pg. 1) ECN-655991

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
☐ Yes	Additional	☐ $	Additional	☐ $	Improvement	☐
☒ No	Savings	☐ $	Savings	☐ $	Delay	☐

19. 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 13. Enter the affected document number in Block 20.

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

20. 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		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. M. R. Adams	MRAdams	1/31/00	PE		
Cog. Mgr. J. G. Field	JG Field	1/31/00	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

HNF
~~WHC-~~SD-WM-ER-617, Rev. 1
2-1-00.

Tank Characterization Report for Single-Shell Tank 241-U-105

Melvin R. Adams
CH2M HILL Hanford Group, Inc., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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RECORD OF REVISION

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Page 1

(2) Title

Tank Characterization Report for Single-Shell Tank 241-U-105

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 9/26/96 on EDT-617550.	T. M. Brown	J. G. Kristofzski
0A RS	Incorporate per ECN-638285.	M. J. Kupfer	K. M. Hodgson
		MJ Kupfer 8-14-97	K M Hodgson 8-14-97
0B RS	Incorporate per ECN-647955.	M.J. Kupfer	K.M. Hodgson
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This report prepared especially for Archive TIR on 1/5/00

Some of the reports herein may contain data that has not been reviewed or edited. The data will have been reviewed or edited as of the date that a Tank Interpretive Report (TIR) is prepared and approved. The TIR for this tank was approved on December 21, 1999.

Tank: 241-U-105

Sampling Events:

Reports:
- Tank Interpretive Report

Constituent Groups:
- Anions
- Inorganics
- Metals/Nonmetals
- Organics
- PCBs
- Physical Properties
- Radionuclides

Table of Contents

Data Dictionary to Reports in this Document

Report	Field	Description
Tank Interpretive Report		Interprets information about the tank answering a series of six questions covering areas such as information drivers, tank history, tank comparisons, disposal implications, data quality and quantity, and unique aspects of the tank.

Tank Interpretive Report For c:\temp\dict.doc241-U-105

c:\temp\dict.doc241-U-105Tank Information Drivers

Question 1: What are the information drivers applicable to this tank? What type of information does each driver require from this tank? (Examples of drivers are Data Quality Objectives, Mid-Level Disposal Logic, RPP Operation and Utilization Plan, test plans and Letters of Instruction.) To what extent have the information and data required in the driving document been satisfied to date by the analytical and interpretive work done on this tank?

The information drivers for tank 241-U-105 include the Safety Screening Data Quality Objective (DQO) (Dukelow et al. 1995), the Historical Model DQO (Simpson and McCain 1997), the Organic Complexant Safety Issue DQO (Turner et al. 1995), the Organic Test Plan (Meacham 1995), the Hazardous Vapor Screening DQO (Osborne and Buckley 1995), and the Compatibility DQO (Fowler 1995, Mulkey and Miller 1998).

Safety Screening DQO: Does the waste pose or contribute to any recognized potential safety problems?

In 1996, three core samples were acquired from tank 241-U-105 to evaluate the safety screening DQO criteria. Based on these three cores, Reynolds et al. (1999) have determined that the safety screening DQO criteria for tank 241-U-105 have been met. The data requirements for screening the waste in tank 241-U-105 for potential safety problems are documented in *Tank Safety Screening Data Quality Objective* (Dukelow et.al.1995). These potential safety problems are exothermic conditions in the waste, flammable gases in the waste and/or tank headspace, and criticality conditions in the waste. Sampling and analysis satisfied all requirements of the safety screening DQO. Fritts (1996) presents the data for the 1996 core samples.

Ten of 34 subsamples submitted for differential scanning calorimetry (DSC) generated exotherms that exceeded the decision threshold of 480 J/g (dry-weight basis). Twelve of 34 subsamples had a one-sided 95 percent confidence limit that exceeded the decision threshold of 480 J/g (dry-weight basis).

Because the energetics threshold was exceeded, the secondary analyses of total organic carbon (TOC) and the propagating reactive system screening test (PRSST) were run on tank samples. Because the organic DQO was applied to tank 241-U-105, TOC was run on every sample whether or not the sample exceeded the energetics threshold limit.

Only one solid sample had a TOC content greater than the organic DQO threshold of 3.0 weight percent (dry-weight basis). This sample was from the upper half of segment 7 of core 136 with a wet-weight mean value of 23,100 μg/g and an equivalent dry-weight mean value of 32,900 μg/g (based on a mean moisture content of 29.8 weight percent water). The TOC value of 32,900 μg/g converts to 877 J/g (dry weight) using a conversion factor of 1,200 J/4.5 wt% TOC (Meacham et al. 1998). The TOC content accounts for the measured exotherms for the samples in this tank.

The safety screening DQO requires that a reactive system screening test be performed if the energetics threshold value of 480 J/g is exceeded. With the approval of the organic safety program, a PRSST was performed in place of the reactive system screening test. The test was performed on the upper half of segment 5 of core 136. Results showed that the sample did not exhibit a tendency to propagate an exothermic reaction.

The vapor sampling data and the monitoring data have shown that the dome space of the tank has remained below 25 % of the LFL. The flammable gas level in the tank headspace may become a greater concern when the tank waste is disturbed during saltwell pumping or sluicing operations (see Question 4, *Disposal Implications*). The flammable gas content in the tank headspace is continuously monitored by a standard hydrogen monitoring system (SHMS) installed on riser 9. For the period of March 1995 through June 30, 1999, McCain (1999) reports that the largest SHMS hydrogen concentration detected in the headspace of tank 241-U-105 was 3,680 ppmv which corresponds to 9 percent of the lower flammability limit (LFL) for hydrogen in air. For the period of July 1995 through June 1999, McCain (1999) reports the results from tank 241-U-105 SHMS grab samples that range from 260 to 1490 ppmv for hydrogen, from 10 to 50 ppmv for methane, and 700 to 4,700 ppmv nitrous oxide. For the period of July 1998 through June 1999, McCain (1999) reports that the largest ammonia concentration was 2,900 ppmv; this is well below the lower flammable concentration of about 150,000 ppmv for ammonia in air. Sniff data obtained April 30, 1999, report a flammable gas content of 5 percent of the LFL, an ammonia concentration greater than 700 ppmv, and an organic vapor concentration of 76.7 ppmv. Brown (1996) reports flammable gas sniff data that ranged between 0 percent and 7 percent of the LFL. This was well below the safety screening DQO decision threshold of 25 percent of the LFL. Hydrogen was not detected in a vapor sample taken on February 24, 1995 (Pool et al. 1995). The percent of the LFL was not calculated for the February 1995 sample.

The sample with the highest total alpha measurement was the lower half of segment 9 of core 133 with an average result of 4.04 µCi/g and the upper limit to a one-sided 95 percent confidence interval on the mean of 7.13 µCi/g. Assuming that all alpha is from ^{239}Pu, this converts to an average result of 0.11 g/L with an upper limit to a one-sided 95 percent confidence interval on the mean of 0.20 g/L. This is well below the safety screening DQO criticality threshold of 1.0 g/L.

Table 1-1 summarizes the safety screening DQO as well as the organics issues discussed later in this tank interpretive report.

Table 1-1. Decision Variables and Criteria for the Safety Screening DQO, the Organic Complexant DQO, and the Organic Test Plan

Primary Decision Variable	Applicable DQO or Test Plan	Decision Criteria Threshold	Analytical Result
Total fuel content/ energetics	Safety Screening	480 J/g dry weight	9 samples exceeded the 480 J/g threshold: largest exotherm (dry weight) was 755.2 J/g (Core 133, segment 6); no samples exceeded the threshold of 1,200 J/g
	Organic Complexant	480 J/g dry weight	
	Organic Test Plan	1,200 J/g dry weight	

Table 1-1. Decision Variables and Criteria for the Safety Screening DQO, the Organic Complexant DQO, and the Organic Test Plan

Primary Decision Variable	Applicable DQO or Test Plan	Decision Criteria Threshold	Analytical Result
TOC	Organic Complexant	30,000 µg C/g dry weight	Highest sample from solids = 32,900 µg C/g (Core 136, segment 7) Supernatant = 30,700 µg C/g
	Organic Test Plan	45,000 µg C/g dry weight	
Wt% water	Organic Complexant	17 weight percent	Lowest sample = 10.0% (Core 133, segment 9, upper half)
	Organic Test Plan	0.022 [fuel (in J/g) 1,200] wt%, or >20 wt%	
Total alpha activity	Safety Screening	1.0 g/L	Highest sample = 0.11 g/L (Core 133, segment 9, lower half)
Flammable gas	Safety Screening	25% of LFL	9% of LFL (maximum)

Organic Complexants DQO: Does the possibility exist for a point source ignition in the waste followed by a propagation of the reaction in the solid/liquid phase of the waste?

The data requirements for the organic complexant issue are documented in *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue* (Turner et al. 1995), the Organic Test Plan (Meacham 1995), and the *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997). Energetics by DSC, TOC, and sample moisture analyses were conducted to address the organic complexant issue.

The data indicate that a propagating reaction in the waste is unlikely and not a concern. This issue was closed for all tanks in December 1998 (Owendoff 1998). The DSC and TOC analyses were performed on all samples from cores 131, 133, and 136; the results are summarized in the evaluation of the safety screening DQO and in Table 1-1. Two samples had TOC values that exceeded 3.0 weight percent on a dry-weight basis: the upper half of segment 7, core 136, and the only supernatant sample from the core sampling event. The supernatant sample had a dry-weight TOC content of 3.07 weight percent. All dry-weight TOC values were below the 45,000 µg/g (dry weight basis) threshold for the organic complexant DQO. The mean moisture content of the core samples ranged from 10.0 to 44.7 weight percent; the mean moisture content of the solid sample that exceeded 3.0 weight percent TOC (upper half of segment 7, core 136) was 29.8 weight percent.

Hazardous Vapor Screening DQO: Do hazardous storage conditions exist associated with gases and vapors in the tank?

The vapor safety screening DQO (Osborne and Buckley 1995) addresses two issues. The first is vapor flammability. This issue was already discussed in the evaluation for the safety screening DQO. For the period of March 1995 through June 30, 1999, McCain (1999) reports that the largest SHMS hydrogen concentration detected in the headspace of tank 241-U-105 was 3,680 ppmv. This value is below the action limit for hydrogen of 6,250 ppmv (Estey 1998). Sniff data obtained

April 30, 1999, report a flammable gas content of 5 percent of the LFL, an ammonia concentration greater than 700 ppmv, and an organic vapor concentration of 76.7 ppmv.

The second issue is vapor toxicity. The vapor toxicity issue was closed for all tanks (Hewitt 1996). The DQO requires the analysis of ammonia, carbon dioxide, carbon monoxide, nitric oxide, nitrous oxide, and nitrogen dioxide from a vapor sample taken in the tank headspace. The vapor samples taken on February 24, 1995 (Pool et al. 1995 and Huckaby and Bratzel 1995) were analyzed for these compounds. Ammonia and nitrous oxide exceeded the threshold limits of the vapor safety screening DQO. Ammonia had a concentration of 325 parts per million by volume (ppmv), well over the DQO threshold value of 25 ppmv. Nitrous oxide had a concentration of 154 ppmv, over the threshold value of 25 ppmv. Sniff data obtained April 30, 1999, reported an ammonia concentration greater than 700 ppmv. However, all these measurements were performed on vapor samples from the tank headspace and not in the workers' breathing area where the DQO threshold values actually apply.

Historical DQO: Is the waste inventory generated by a model based on process knowledge and historical information (Agnew et al. 1997a) representative of the current tank waste inventory?

The purpose of the historical evaluation is to determine whether the Hanford Defined Waste (HDW) model, based on process knowledge and historical information (Agnew et al. 1997a), agrees with current descriptions of tank inventories based on sampling. If the historical model accurately predicts the waste characteristics as observed through sample characterization, the possibility exists to reduce the amount of total sampling and analysis needed. Data requirements for this evaluation are documented in *Historical Model Evaluation Data Requirements* (Simpson and McCain 1997).

Tank 241-U-105 was selected for historical evaluation because it was expected to contain 242-S Evaporator saltcake (S2) and 242-T Evaporator saltcake (T2) layers thick enough to provide entire segments composed of these waste types (Agnew et al. 1997a). The first step in the evaluation is to compare the analytical results with DQO-defined concentration levels for the key analytes. This comparison is to determine if the predicted waste type is in the tank and at the predicted location within the waste. If the analytical results are greater than 10 percent of the DQO defined levels, and if the analytes shown in Table 1-2 compose at least 85 percent by weight of the waste, the waste type and layer identification are considered acceptable (Simpson and McCain 1997).

According to Agnew et al. (1997a), segments 2 through 6 should be S2 saltcake and segments 7 and 8 should consist of T2 saltcake. The analytical results for the key analytes were compared to the concentrations for the S2 and T2 saltcake waste types presented in Simpson and McCain (1997). The key analytes for S2 saltcake are sodium, aluminum, water, nitrate, carbonate, phosphate, and sulfate. The key analytes for T2 saltcake are sodium, aluminum, chromium, water, nitrate, and sulfate. Table 1-2 indicates that all of the analytical results exceeded the 10 percent criterion specified in the DQO. However, because some of the segments were dry and the percent water was low, some of the segments did not meet the 85 percent criteria. Segments 7 and 8 were also compared to the S2 waste type and were found to pass the 10 percent criterion for that waste type also. In general, it appears that segments 1 through 8 are consistent with the S2 and T2 waste types. Because the first eight segments are also consistent with S2, these segments could be assumed to be a single waste type.

Table 1-2. Comparison of Core Sample Data to Historical Waste Streams

Analyte	S2 Saltcake[1] (ppm)	Minimum for Segments 1-6[2] (ppm)	T2 Saltcake[1] (ppm)	Minimum for Segments 7, 8[2] (ppm)
Na	215,500	170,000	173,000	203,500
Al	37,000	6,950	17,300	8,140
Cr	n/a	(1,035)	1,870	1,440
H_2O	299,000	202,450	398,000	165,550
NO_3	174,500	101,500	275,000	266,300
CO_3	20,200	29,577	n/a	(12,391)
PO_4	18,000	2,671	n/a	(3,778)
SO_4	28,700	7,873	13,136	7,385

Notes:

n/a = not applicable

[1] Simpson and McCain (1997)

[2] Numbers in parentheses are not part of the gateway analysis, but are for comparison only

According to the Tank Layer Model (TLM), segment 9 of the tank 241-U-105 cores should be metal waste (MW). The key analytes for MW are sodium, water, carbonate, phosphate, sulfate, and uranium. Comparison of the segment 9 results for cores 131, 133, and 136 to the MW waste type revealed that only core 136, segment 9A bottom passed the 10 percent gateway criterion. The remaining segment 9 samples all had less than 10 percent of the predicted uranium content. All the segment 9 samples failed the 85 percent sample weight criterion.

Compatibilty DQO: Will safety problems be created as a result of mixing waste in interim storage? Do operations issues exist which should be addressed before waste is transferred?

Tank 241-U-105 is scheduled to be saltwell pumped to double-shell tank 241-SY-102 starting in FY 2000. Therefore, three liquid grab samples were obtained from the saltwell in tank 241-U-105 in July 1999 in order to determine the compatibility of the liquid waste in tank 241-U-105 with the double-shell tank waste system.

The July 1999 grab samples were obtained and analyzed according to the requirements of the *Data Quality Objectives for Tank Farms Waste Compatibility Program* (Fowler 1995, Mulkey and Miller 1998). These requirements include the safety considerations of criticality, corrosion, energetics, and flammable gas accumulation and operational issues of heat generation of commingled waste, segregation of complexant waste, and high phosphate waste. Ammonia was added to the compatibility analyses per the *Addition of Ammonia to Suite of Compatibility Analyses* memo (Fowler 1998a), while assessment of the transuranic (TRU) constituent concentrations is now addressed by analysis of total alpha activity per the *Addition of Total Alpha to Suite of Compatibility Analyses* memo (Fowler 1998b). Concurrent with the July 1999 grab sampling effort, revision 3 of the compatibility DQO was issued (Banning 1999).

The compatibility DQO was applied to the July 1999 liquid grab samples. Fowler (1999) presents the compatibility assessment for these samples following the requirements of Banning (1999). Fowler (1999) determined that the tank 241-U-105 saltwell liquid met all applicable compatibility criteria with two exceptions:

- The grab sample data indicate that the tank 241-U-105 liquid may not meet low-activity waste Envelope A for ^{90}Sr. Envelope A specifies a ^{90}Sr-to-sodium ratio of less than 4.4×10^7 becquerel (Bq) ^{90}Sr per mole of sodium. The ratio of mean ^{90}Sr to mean sodium for the liquid samples is 9.42×10^7 Bq/mole.

- In tank 241-SY-102, liquid waste from tanks 241-U-105 and 241-SY-101 will be mixed. Waste with a phosphate concentration greater than 0.1 moles/liter may not be mixed with waste with sodium concentrations greater than 8.0 moles/liter. The mean sodium content of the tank 241-U-105 liquid grab samples is 9.86 moles/liter; the phosphate concentration of tank 241-SY-102 waste is projected to be 0.2 moles/liter after addition of waste from tank 241-SY-101. O'Rourke (1999) presents results of a mixing test to determine the extent of any precipitation that might occur upon commingling liquid waste from tanks 241-U-105 and 241-SY-101. The test results indicated that only a small amount of solids would precipitate from mixing the two wastes.

Heat Load Estimate: A factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. The heat load estimate based on the tank process history is 3,660 W (12,500 Btu/hr) (Agnew et al. 1997a). The heat load estimate based on the tank headspace temperature is 1,868 W (6,373 Btu/hr) (Kummerer 1995). The heat load estimated from the best basis inventory (*Best-Basis Inventory Estimate (Radioactive)* standard report) is 3,037 W (10,363 Btu/hr) (see Table 1-3).

Table 1-3. Heat Load Estimate Based on the Best-Basis Radionuclide Inventory.

Radionuclide	Waste Inventory (Ci)	Decay Heat (W/Ci)	Heat Load (Watts)
Strontium-90	33,400	0.00670[1]	224
Cesium-137	5.96E+05	0.00472[2]	2,813
		Total	3,037

Notes:

[1] Includes ^{90}Y.

[2] Includes ^{137}Ba.

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Question 2: What is known about the history of this tank as it relates to waste behavior?

The 241-U Tank Farm was constructed during 1943 and 1944 in the 200 West Area. The farm contains twelve 100-series tanks and four 200-series tanks. Tank 241-U-105 has a capacity of 2,010 kL (530 kgal), a diameter of 23 m (75 ft), and a liner height of 5.8 m (19 ft) as measured from the bottom of the tank at the tank centerline (Leach and Stahl 1997). Built according to the first generation design, the 241-U Tank Farm was designed for nonboiling waste with a maximum fluid temperature of 104 °C (220 °F). A cascade overflow line 7.6 cm (3 in.) in diameter connects tank 241-U-105 as the second in a cascade series of three tanks beginning with tank 241-U-104 and ending with tank 241-U-106. Each tank in the cascade is one foot lower in elevation from the preceding tank. The cascade overflow height is approximately 60 cm (2 ft) below the top of the steel liner. The tank has a dished bottom with a 1.2-m (4-ft) radius knuckle. Tank 241-U-105 was designed with a mild-steel liner and a concrete dome with risers. The tank is set on a reinforced concrete foundation. Tank descriptions and figures are presented in standard reports *Description of Tank, Tank Plan View, Tank Profile View,* and *Riser Configuration Table.*

The *Major Transfers* standard report summarizes the waste transfer history of tank 241-U-105 (Agnew et al. 1997b). Tank 241-U-105 began receiving waste in the fourth quarter of 1947. It received metal waste that cascaded from tank 241-U-104, until the third quarter of 1948; thereafter, waste was cascaded from tank 241-U-105 to 241-U-106.

In the first quarter of 1953, the tank received flush water, and waste was sent to tank 241-U-106. In the second quarter of 1953, waste was sent to U Plant for uranium recovery. In the fourth quarter of 1954, metal waste again cascaded from tank 241-U-104 through 241-U-105 to 241-U-106.

In the first quarter of 1956, the tank received flush water, and the contents of tank 241-U-104 were pumped to tank 241-U-105 for sluicing in the same period. Waste was periodically sent to U Plant in 1956 and in the first quarter of 1957. In 1957, the tank was sluiced, and the waste was sent to the U Plant. After sluicing, the tank was declared empty. In the third quarter of 1957, flush water was sent to the tank. In the first quarter of 1961, high-level Reduction-Oxidation (REDOX) Plant waste was cascaded to tank 241-U-105 from tank 241-U-104; in the fourth quarter of 1961, cladding removal waste was sent from tank 241-U-108.

In the first quarter of 1974, waste was sent to tank 241-S-110. In the second quarter of 1975, tank 241-U-105 received evaporator bottoms waste from tank 241-TX-106. Subsequently, it received evaporator waste from tank 241-TX-118 in the third and fourth quarters of 1975 and the first quarter of 1976. Waste also was sent to tank 241-U-111 during this period. In the remainder of 1976 and in the first quarter of 1977, tank 241-U-105 received waste from tank 241-S-102, and it sent waste to tank 241-U-111.

Tank 241-U-105 underwent partial interim isolation in December 1982 and was declared inactive in 1979. Intrusion prevention is not yet completed. The tank is categorized as sound. The tank has passive ventilation and is on the hydrogen Watch List (Public Law 101-510). The waste in tank 241-U-105 is classified as noncomplexed.

The most recent photographs of tank 241-U-105 were taken July 7, 1988. The 1988 photographic montage of the tank 241-U-105 interior shows the tank surface as a mixture of liquid and yellow-white salt-like material. In addition, a salt-like crust shaped like a crescent moon is visible against the tank wall. At the time the photographs were taken, the tank contained approximately 1,580 kL (418 kgal) of waste. Because the tank has been inactive, the photographs should reflect the current appearance of the tank waste.

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Tank Comparisons

Question 3: What other tanks have similar waste types and waste behaviors, and how does knowledge of the similar tanks contribute to the understanding of this tank?

Tank 241-U-105 is the second in a line of three cascading tanks, including tanks 241-U-104 and 241-U-106. From process knowledge, tank 241-U-105 is expected to contain, from the tank bottom up, a MW heel, T2 saltcake, and S2 saltcake (Agnew et al. 1997a). The majority waste type is S2, followed by T2, then MW. A number of other tanks in the S, SX, SY, and U tank farms contain the S2 waste type. Tanks predicted to have significant amounts of T2 waste are 241-S-107, 241-U-102, 241-T-101, most of the TX tanks, 241-TY-102, and 241-TY-103. A number of tanks in the BX, BY, and U farms are predicted to contain significant MW heels.

The historical DQO evaluation for tank 241-U-105 indicates that the waste in the tank is consistent with the S2 and T2 waste types. Analytical data from the tank 241-U-105 core samples may provide information about the S2 and T2 waste in other tanks with similar histories. This is of particular value for estimating the compositions of tanks containing these waste types and for which limited core data are available. Such tanks are 241-S-103 and 241-U-111 which are expected to contain significant quantities of S2 waste, and tanks 241-U-102, 241-T-101, most of the TX farm tanks, 241-TY-102, and 241-TY-103 which are expected to contain significant quantities of T2. Comparisons may be made to analytical data from tanks 241-S-101, -S-102, -SX-101, -SX-102, -SX-106, -U-102, -U-103, -U-107, -U-108, and -U-109 which have similar S2 saltcake. Tanks with analytical data for the T2 waste type are 241-S-107, -TX-104, -TX-113, and -TX-118.

The bottom segments from tank 241-U-105 were not consistent with the aluminum, phosphate and uranium contents expected for MW. Because the MW was sluiced from the tank for uranium recovery and because REDOX cladding removal waste was subsequently added to the tank in 1961, the bottom layer of waste in the tank may be REDOX cladding waste (CWR1) waste rather than MW. Comparison of the tank 241-U-105 bottom segment analytical data with that from other U farm tanks may provide additional information regarding the content of the bottom layers of these tanks.

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Question 4: Given what is known about the waste properties and waste behaviors in this tank, what are the implications of the waste properties and behaviors to the waste retrieval/processing methodologies and equipment selection?

Given what is known about the waste types and behaviors in tank 241-U-105, several items should be considered in regard to waste retrieval. Tank 241-U-105 is on the Watch List for the flammable gas issue (Public Law 101-510), and the waste generates ammonia and other flammable gases. The waste consists of supernatant, dry to moist saltcake, and a small sludge heel. Three major issues to consider are (1) retrieval and processing of the liquid waste via saltwell pumping, (2) possible increases in flammable gas concentration during saltwell pumping, and (3) possible changes in the solid waste after interim stabilization is complete.

Kirch (1999) and Fowler (1999) identify four possible issues associated with the retrieval and processing of liquid waste from tank 241-U-105:

- The high total organic carbon (TOC) content of the waste may generate complexed waste during evaporation of the waste to remove water.
- When commingled with the waste in tank 241-SY-102, the high TOC content of the waste may complex with the TRU in the sludge of tank 241-SY-102 and generate additional TRU waste (waste in which the TRU content exceeds 100 nCi/g) and potentially exceed the TRU limit for low-activity waste feed envelope A.
- The ^{90}Sr levels in tank 241-U-105 may generate waste that exceeds the low-activity waste feed envelope A value for ^{90}Sr.
- Mixing the high sodium content waste from tank 241-U-105 with the phosphate-containing waste in tank 241-SY-102 may cause precipitation of phosphate salts.

Beck (1997, 1998) presents results of boildown studies that show the liquid waste from tank 241-U-105 did not gel or demonstrate any other attributes of complexed waste during the boildown studies. Therefore, the waste does not meet the compatibility DQO definition for complexed waste.

To assess the possibility of generating additional TRU waste Beck (1997) reported the results of mixing U farm tank liquids with tank 241-SY-102 sludge under a variety of conditions. These tests confirmed the possibility that additional TRU waste could be formed when U farm tank liquids are added to tank 241-SY-102 even under conditions of minimal agitation. Therefore, the agitation of tank 241-SY-102 solids in the presence of U farm tank liquids should be minimized. Minimizing the formation of TRU waste will also help to maintain TRU levels within low-activity waste feed envelope A specifications.

Kirch (1999) and Fowler (1999) both indicate that the ^{90}Sr levels in tank 241-U-105 may generate waste that exceeds the waste feed envelope A value for ^{90}Sr.

Finally, O'Rourke (1999) presents results of a mixing test to determine the extent of any precipitation that might occur upon commingling liquid waste from tanks 241-U-105 and

241-SY-101. The test results indicated that only a small amount of solids would precipitate from mixing the two wastes.

Because tank 241-U-105 is scheduled to be saltwell pumped in FY 2000, the consequences of this waste-disturbing activity must be examined. McCain (1999) reports that during saltwell pumping of tank 241-S-106, the hydrogen concentration in the tank headspace increased from 100 ppmv to 1,600 ppmv. Because tank 241-S-106 contains primarily S1 saltcake waste, a type similar to the S2 saltcake found in tank 241-U-105, it is conceivable that saltwell pumping tank 241-U-105 may lead to a similar increase in the flammable gas concentration in the tank headspace.

The current baseline method for retrieving solid waste from single-shell tanks is past-practice sluicing (Bloom and Nguyen 1996). The solids in tank 241-U-105 consist of moist to dry saltcake and a sludge heel. These materials were successfully sampled in 1996 using push-mode core sampling with fair to good recovery of the sampled waste. This indicates that in its present condition, the waste should be easily recovered using past-practice sluicing. However, as the waste is saltwell pumped, the waste may begin to dry and form a less tractable material. Therefore, the ability to recover the solid waste using past-practice sluicing will need to be reevaluated after the tank has been interim stabilized.

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Scientists Assessment of Data Quality and Quantity

Question 5: Given the current state of understanding of the waste in this tank on the one hand and the information drivers on the other; should additional tank data be sought via sampling/analysis from a strictly technical point-of-view? Can the waste behavior in this tank be adequately understood by other means (eg. archive samples, tank grouping studies, modeling) without additional sampling and analysis? If so, what characteristics of the tank waste lend themselves to a non-sample alternative? Is the quality of the data from this tank adequate from a field sampling and analytical laboratory point-of-view? Are there any clarifications or explanations needed for the data tables and figures?

Sampling/Analysis

All appropriate DQO and waste issues have been addressed for this tank and accepted by the Office of River Protection (ORP) River Protection Project (RPP). No additional sampling and analyses are necessary to satisfy current issue requirements for this tank.

Additional sampling may be necessary to better understand the physical and chemical characteristics of the waste from a disposal perspective. Given the schedule for Phase II disposal, additional analytical/physical information have a moderate priority from a strictly technical point of view. Behavior of the waste may be adequately understood by sampling tanks with similar waste types. None of the Disposal DQOs were applied to tank 241-U-105 as of June 1999.

Data Quality

The data generated from the core, grab, and vapor sampling events were obtained with approved and recognized laboratory procedures (*Analysis Methods and Procedures* standard report). Quality Control (QC) parameters assessed in conjunction with tank 241-U-105 samples included standard recoveries, spike recoveries, duplicate analyses and blanks. Appropriate quality control footnotes were applied to data outside quality control parameter limits (*Analytical Results* standard report).

The majority of QC results are within the boundaries specified in the sampling and analysis plans. The high relative percent differences (RPDs) noted for the core segment results are attributed to sample heterogeneity. Core 133, segment 1 drainable liquid exhibited high lithium and bromide values that indicate the presence of 0.3 mole/liter lithium bromide-traced wash water in the sample. All other lithium and bromide results were very near or below detection limits. Lithium bromide intrusion calculations were performed using the lithium bromide results from the core 133, segment 1 drainable liquid. The intrusion calculations indicate the drainable liquid for this segment was almost entirely 0.3 mole/liter lithium bromide-traced wash water. Therefore, the results from this drainable liquid sample were not used in the calculation of the average results for the tank. The remaining small discrepancies noted in the analytical reports and footnoted in the analytical results standard report (*Analytical Results* standard report) should not impact the data validity or use.

Clarification to *Description of Tank* Standard Report
Hanlon (1999) gives a total tank volume of 1,582 kL (418 kgal) which is equivalent to a waste depth of 405.0 cm (159.5 inches). The manual ENRAF surveillance measurement listed in the *Description of Tank* standard report is 417.4 cm (164.3 inches) which converts to a volume of 1,633 kL (431 kgal). The discrepancy between the Hanlon (1999) volume and the volume from the manual ENRAF measurement is 51 kL (13 kgal) of total waste. Swaney (1993) provides a possible reason for this discrepancy. Swaney (1993) indicates the surface of the tank appears to be irregular with the ENRAF plummet touching near a mound of saltcake. Hence, the volume estimate based on the manual ENRAF data may be biased high.

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Unique Aspects of the Tank

Question 6: What are unique chemical, physical, historical, operational or other characteristics of this tank or its contents?

The waste types in this tank are found in a number of other tanks and are relatively well defined and understood. Based upon visual observations of the extrusion photographs, the waste is mostly a brown to black mixture of moist to dry sludge and saltcake. The one exception to this description was segment 9A of core 136; this segment was described as a yellow-brown sludge. This segment was found to have elevated levels of aluminum and uranium and lower concentrations of phosphate, sodium, and sulfate compared to the rest of the tank waste. The concentrations of these species may indicate a CWR1 waste sludge heel in the tank.

The 1988 photographic montage of the tank 241-U-105 interior shows the tank surface as a mixture of liquid and yellow-white salt-like material. In addition, a salt-like crust shaped like a crescent moon is visible against the tank wall. At the time the photographs were taken, the tank contained approximately 1,580 kL (418 kgal) of waste. Because the tank has been inactive, the photographs should reflect the current appearance of the tank waste.

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Best-Basis Inventory Derivation

Question 7: What is the source data used to derive this tank's Best-Basis inventories by mass (kg) and activity (Ci) for the standard list of 25 chemicals and 46 radionuclides?

The Best-Basis Inventory (BBI) effort involves developing and maintaining waste tank inventories comprising 25 chemical and 46 radionuclide components in the 177 Hanford Site underground storage tanks. These best-basis inventories provide waste composition data necessary as part of the RPP process flowsheet modeling work, safety analyses, risk assessments, and system design for waste retrieval, treatment, and disposal operations.

Development and maintenance of the best-basis inventory is an on-going effort. The inventories for certain tanks are changing as the result of waste being transferred into or out of the tanks. The process of updating the inventories of these tanks is being performed on a quarterly basis. Single-shell tank 241-U-105 is scheduled to be saltwell pumped and, therefore, the inventory of this tank will be updated quarterly until the interim stabilization criteria are met. A re-evaluation of the best-basis inventories for tank 241-U-105, as of October 1, 1999, was performed and is documented in the following text. The following information was used in this evaluation:

- Statistical means for the following:
  1996, core 131, segments 1-9 saltcake,
  1996, core 133, segments 1-9, saltcake,
  1996, core 136, segments 1-9A (upper half), saltcake,
  1996, core 136, segment 9A (lower half), sludge,
  1999, grab samples, drainable liquid,
  1999, grab samples, supernatant
  (*Means and Confidence Intervals* standard report).

- Samples from other S and U farm tanks, with similar S2 and T2 saltcake and CWR1 sludge waste types (referred to as "templates").

- Hanford Defined Waste (HDW) Model document (Agnew et al. 1997a) which provides tank content estimates in terms of component concentration and inventories.

Table 7-1 presents what data were selected to derive best-basis inventories.

Table 7-1. Tank 241-U-105 Best-Basis Inventory Source Data.

Waste Phase	Waste Type	Applicable Concentration Data	Associated Density (g/mL)	Associated Volume
Supernatant	n/a	1999 Grab Samples	1.46	140 kL (37 kgal)
		S2 SltSlr liquid template	1.83	
Saltcake	Saltcake (liquid)	1999 grab samples	1.46	329 kL (87 kgal)
		S2 SltSlr liquid template	1.83	
	S2 Saltcake (solids)	1996 core saltcake solids segment means	1.7	780 kL (206 kgal)
		S2 SltSlr solid template	1.59	
	T2 Saltcake (solids)	1996 core saltcake solids segment means	1.7	212 kl (56 kgal)

Table 7-1. Tank 241-U-105 Best-Basis Inventory Source Data.

Waste Phase	Waste Type	Applicable Concentration Data	Associated Density (g/mL)	Associated Volume
		T2 SltCk solid template	1.67	
Sludge	Sludge (liquid)	1999 grab samples	1.46	19 kL (5 kgal)
		S2 SltSlr liquid template	1.83	
	CWR1 Sludge (solids)	1996 core sludge solids segment means	1.7	102 kL (27 kgal)
		CWR1 solids template	1.62	
Total Tank	n/a	n/a	n/a	1,582 kL (418 kgal)

Hanlon (1999) gives a total tank volume of 1,582 kL (418 kgal) which is equivalent to a waste depth of 405.0 cm (159.5 inches). The manual ENRAF surveillance measurement listed in the *Description of Tank* standard report is 417.4 cm (164.3 inches) which converts to a volume of 1,633 kL (431 kgal). The discrepancy between the Hanlon (1999) volume and the volume from the manual ENRAF measurement is 51 kL (13 kgal) of total waste. Swaney (1993) provides a possible reason for this discrepancy. Swaney (1993) indicates the surface of the tank appears to be irregular with the ENRAF plummet touching near a mound of saltcake. Hence, the volume estimate based on the manual ENRAF data may be biased high. Therefore, the value of 1,582 kL (418 kgal) will be used as the best estimate of the total waste volume.

Waste phases in Table 7-1 were based on the core sampling extrusion results, the analytical results, and the process history. The core extrusions and the analytical results support maintaining the saltcake volume of 1,321 kL (349 kgal) and in-tank photographs showing a pool of supernatant support maintaining the supernatant volume of 140 kL (37 kgal) as stated in Hanlon (1999) and Field and Vladimiroff (1999). The determination of the sludge layer was derived from a combination of process history as well as the analytical results. None of the tank 241-U-105 cores penetrated to the depth of the 121 kL (32 kgal) MW layer predicted by the tank layer model. However, core 136, segment 9A, lower half, showed elevated aluminum and uranium concentrations consistent with the presence of CWR1 sludge. For that reason, the sludge volume of 121 kL (32 kgal) in Hanlon (1999) and Field and Vladimiroff (1999) was maintained for best-basis inventory purposes.

The core extrusions did not yield any drainable liquid. However, a tank liquid level of about 416.6 cm (164 in.) obtained from the Surveillance Analysis Computer System (SACS) shows there is drainable liquid present (LMHC 1999). In the absence of sample data, porosity assumptions must be made in order to determine drainable liquid volumes for best basis inventory purposes. For saltcake, a drainable porosity estimate of 25% was used and for sludge, a drainable porosity of 15% was used (Field and Vladimiroff 1999). These porosity estimates were applied to the total saltcake and total sludge volumes, respectively, to generate the drainable liquid volumes in Table 7-1.

Means and variances were calculated using sample data as described above. The only drainable liquid obtained during the core extrusions was from core 133, segment 1. Calculations were performed to determine potential intrusion from 0.3 mole/liter lithium bromide-traced wash water into the sample. Segment 1 of core 133 was shown to be almost entirely 0.3 mole/liter LiBr. For this reason, core 133, segment 1 sample data were excluded from the means and variance calculations. Analytical results for nickel and potassium derived from potassium hydroxide fusion preparation in a nickel crucible were also excluded.

Based on analytical results and process history, the saltcake portion of the tank waste was assumed to be S2 and T2 saltcake waste types, and the sludge portion was assumed to be CWR1 waste type. The 1996 core sample results were the primary source for analyte concentrations with waste type templates for S2 and T2 saltcakes as a secondary source where sample data were not available for specific analytes. Templates are based on sampling data from tanks that contain the same waste type as tank 241-U-105, supplemented with Hanford Defined Waste (HDW) model data. A multiplier was used to scale the template vector to the sample data using the sample-based weight percent water and density. Tran (1999) presents a more detailed description of the template data. The supernatant and drainable liquid were assumed to be S2 SltSlr waste type based on analytical results and process history. The 1999 grab sample results were the primary source for analyte concentrations with the S2 SltSlr template as a secondary source where sample data were not available for specific analytes. Densities for solids and liquids were sample based.

All inventory calculations were performed using the Best-Basis Inventory Maintenance tool. The updated best-basis inventory for tank 241-U-105 can be found in Standard Reports *Best Basis Inventory Estimate (Nonradioactive)* and *Best Basis Inventory Estimate (Radioactive)*.

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Reference List

Agnew, S. F., J. Boyer, R. A. Corbin, T. B. Duran, J. R. FitzPatrick, K. A. Jurgensen, T. P. Ortiz, and B. L. Young, 1997a, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, LA-UR-96-3860, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. A. Corbin, T. B. Duran, and K. A. Jurgensen, 1997b, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4*, LA-UR-97-311, Los Alamos National Laboratory, Los Alamos, New Mexico.

Banning, D. L., 1999, *Data Quality Objectives for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 3, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

Beck, M. A., 1997, *TRU Solubility Mixing and Boildown Studies for U Tank Farm*, (letter 8C510-PCS96-099 to D. J. Sauressig, Lockheed Martin Hanford Corporation, January 22) Numatec Hanford Corporation, Richland, Washington.

Beck, M. A., 1998, *U-Farm Boildown Analysis Report*, (letter 82100-98-034 to J. G. Field, Lockheed Martin Hanford Corporation, December 17) Numatec Hanford Corporation, Richland, Washington.

Bloom, G. R. and Q. H. Nguyen, 1996, *Characterization Data Needs for Development, Design, and Operation of Retrieval Equipment Developed Through the Data Quality Objectives Process*, WHC-SD-WM-DQO-008, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Brown, R. G., 1996, *Compilation of Hydrogen Data for 22 Single-Shell Flammable Gas Watch List Tanks*, WHC-SD-WM-ER-576, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Estey, S. D., 1998, *Flammable Gas Tank Safety Program: Technical Basis for Gas Sampling and Monitoring*, HNF-SD-WM-ES-346, Rev. 1, Lockheed Martin Hanford Corporation, Richland, Washington.

Field, J. G. and D. T. Vladimiroff, 1999, *Updated Pumpable Liquid Volume Estimates and Jet Pump Durations for Interim Stabilization of Remaining Single-Shell Tanks,* HNF-2978, Rev. 1, Lockheed Martin Hanford Corporation, Richland, Washington.

Fowler, K. D., 1995, *Data Quality Objective for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Fowler, K. D., 1998a, *Addition of Ammonia to Suite of Compatibility Analyses*, (internal memorandum 7A150-98-035 to K. M. Hall and J. W. Hunt, August 17) Lockheed Martin Hanford Corporation, Richland, Washington.

Fowler, K. D., 1998b, *Addition of Total Alpha to Suite of Compatibility Analyses*, (internal memorandum 74B50-98-059 to K. M. Hall and J. W. Hunt, November 19) Lockheed Martin Hanford Corporation, Richland, Washington.

Fowler, K. D., 1999, *Waste Compatibility Assessment of Tank 241-U-105 Waste (SST-99-09) with Tank 241-SY-102 Waste*, (internal memorandum 74B50-99-102 to R. E. Larsen, November 5) Lockheed Martin Hanford Corporation, Richland, Washington.

Fritts, L. L., 1996, *Final Report for Tank 241-U-105, Cores 131, 133, and 136*, WHC-SD-WM-DP-182, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Hanlon, B. M., 1999, *Waste Tank Summary Report for Month Ending August 31, 1999*, HNF-EP-0182-137, Lockheed Martin Hanford Corporation, Richland, Washington.

Hewitt, E. R., 1996, *Tank Waste Remediation System Resolution of Potentially Hazardous Vapor Issues*, WHC-SD-TWR-RPT-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Huckaby, J. L., and D. R. Bratzel, 1995, *Tank 241-U-105 Headspace Gas and Vapor characterization Results for Samples collected in February 1995*, WHC-SD-WM-ER-511, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Kirch, N. W., 1999, *Status and Recommendation for U-Farm Tanks Commingling Study*, (internal memorandum 74B50-99-005 to M. R. Koch, February 1) Lockheed Martin Hanford Corporation, Richland, Washington.

Kummerer, M., 1995, *Heat Removal Characteristics of Waste Storage Tanks*, WHC-SD-WM-SARR-010, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Leach, C. E., and S. M. Stahl, 1997, *Hanford Site Tank Farm Facilities Interim Safety Basis*, WHC-SD-WM-ISB-001, Rev. 0M, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

LMHC, 1999, *Neutron Profile of Tank 241-U-105 Riser 19 Liquid Observation Well*, Surveillance Analysis Computer System, September 22, 1999, Lockheed Martin Hanford Corporation, Richland, Washington.

McCain, D. J., 1999, *Results of Vapor Space Monitoring of Flammable Gas Watchlist Tanks*, HNF-SD-WM-TI-797, Rev. 4, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

Meacham, J. E., 1995, *Test Plan for Samples From Hanford Waste Tanks 241-BY-103, BY-104, BY-105, BY-106, BY-108, BY-110, TY-103, U-105, U-107, U-108, and U-109*, WHC-SD-WM-TP-378, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Meacham, J. E., W. L. Cowley, A. B. Webb, N. W. Kirch, J. A. Lechelt, D. A. Reynolds, L. A. Stauffer, D. B. Bechtold, D. M. Camaioni, F. Gao, R. T. Hallen, P. G. Heasler, R. D. Scheele, C. S. Simmons, J. J. Toth, and L. M. Stock, 1998, *Organic Complexant Topical Report*, HNF-3588, Rev. 0, Duke Engineering and Services Hanford, Inc. for Fluor Daniel Hanford, Inc., Richland, Washington.

Mulkey, C. H., and M. S. Miller, 1998, *Data Quality Objectives for Tank Farms Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 2, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

O'Rourke, J. F., 1999, *Results of Mixing Study with Tank 241-U-105 and Tank 241-SY-101 Wastes*, (internal memorandum 82800-99-042 to K. D. Fowler, November 8), Numatec Hanford Corporation, Richland, Washington.

Osborne, J. W., and L. L. Buckley, 1995, *Data Quality Objectives for Tank Hazardous Vapor Safety Screening*, WHC-SD-WM-DQO-002, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Owendoff, J. M., 1998, *Approval to Close the Organic Complexant Safety Issue and Remove 18 Organic Complexant Tanks from the Watchlist*, (memorandum to J. Wagoner, December 9), U. S. Department of Energy, Washington, D. C.

Pool, K. H., T. W. Clauss, M. W. Ligotke, B. D. McVeety, G. S. Klinger, K. B. Olsen, O. P. Bredt, and J. S. Goheen, 1995, *Vapor Space Characterization of Waste Tank 241-U-105: Results from Samples Collected 2/24/95*, PNL-10702, Pacific Northwest National Laboratory, Richland, Washington.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of National Defense Authorization Act for Fiscal Year 1991.

Reynolds, D. A., W. T. Cowley, J. A. Lechelt, B. C. Simpson, and C. DeFigh-Price, 1999, *Evaluation of Tank Data for Safety Screening*, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

Schreiber, R. D., 1997, *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements*, HNF-SD-WM-RD-060, Rev. 0, Lockheed Martin Hanford Corp. for Fluor Daniel Hanford, Inc., Richland, Washington.

Simpson, B. C., and D. J. McCain, 1997, *Historical Model Evaluation Data Requirements*, HNF-SD-WM-DQO-018, Rev. 2, Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

Swaney, S. L., 1993, *Waste Level Discrepancies Between Manual Level Readings and Current Waste Inventory for Single-Shell Tanks*, (internal memorandum 7C242-93-038 to G. T. Frater, December 10), Westinghouse Hanford Company, Richland, Washington.

Turner, D. A., H. Babad, L. L. Buckley, and J. E. Meacham, 1995, *Data Quality Objective to Support Resolution of the Organic Complexant Safety Issue*, WHC-SD-WM-DQO-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Tran, T. T., 1999, *Review and Approval of Fiscal Year 2000 Waste Type Templates for Deriving Best Basis Inventories*, (internal memorandum 74B20-99-044 to J. G. Field, November 22), Lockheed Martin Hanford Corporation, Richland, Washington.

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