ENGINEERING CHANGE NOTICE	Page 1 of 2	1. ECN 653807 Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Steve G. McKinney, Data Assessment and Interpretation, R2-12, 372-1945	[] Yes [X] No	05/26/99
	6. Project Title/No./Work Order No. Tank 241-BY-104	7. Bldg./Sys./Fac. No. 241-BY-104	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-608, Rev. 0-B	10. Related ECN No(s). ECNs: 643411, 649435	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change — 13b. Design Baseline Document? [] Yes [X] No

This ECN has been generated in order to update the document to reflect results of recent data/information evaluation.

Replace pages:

5-15 and 5-16

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

A tank characterization report page change revision is required to reflect the results of recent evaluation of data/information pertaining to adequacy of tank sampling for safety screening purposes (Reynolds et al. 1999, Evaluation of Tank Data for Safety Screening, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington).

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

RELEASE STAMP

DATE: 6-4-99 HANFORD RELEASE ID: 19

STA 4

A-7900-013-2 (05/96) GEF095

A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-653807

16. Design Verification Required	17. Cost Impact						18. Schedule Impact (days)	
	ENGINEERING			CONSTRUCTION				
[] Yes	Additional	[]	$	Additional	[]	$	Improvement	[]
[X] 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. S.G. McKinney *[signature]*	6/4/99	PE	
Cog. Mgr. K.M. Hall *[signature]*	6/4/99	QA	
QA		Safety	
Safety		Design	
Environ.		Environ.	
Other		Other	

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

S

Tank Characterization Report for Single-Shell Tank 241-BY-104

Steve G. McKinney
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-653807 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
B&R Code: EW 3120074 Total Pages: 271

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-BY-104, Tank BY-104, BY-104, BY Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

6.4.99
DATE HANFORD RELEASE ID: 19
STA 4

6/4/99

Release Approval Date Release Stamp

Approved for Public Release

RECORD OF REVISION

(1) Document Number: WHC-SD-WM-ER-608

Page 1

(2) Title

Tank Characterization Report for Single-Shell Tank 241-BY-104

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 09/26/96 on EDT 617546.	C. J. Benar (signature) 8-26-97	J. G. Kristofzski
0A RS	Incorporate per ECN-643411.	M. J. Kupfer (signature) 8-22-97	K. M. Hodgson (signature) 8-25-97
RS 0B	Incorporate per ECN-649435.	M.J. Kupfer (signature) 9-2-98	K.M. Hodgson (signature) 9-8-98
0-C RS	Incorporate per ECN-653807.	S.G. McKinney (signature) 6/4/99	K.M. Hall (signature) 6/4/99

A-7320-005 (08/91) WEF168

should be based only on the mean analytical values from the bottom three segments of each core (Agnew et al. 1996a). Another method of estimating the amount of $Na_2NiFe(CN)_6$ originally present would be to assume that all the nickel currently found in the tank originated from $Na_2NiFe(CN)_6$. The mean nickel concentration based on the bottom three segments of cores 116 and 117 was 3,620 μg/g. If all the nickel originated from $Na_2NiFe(CN)_6$, the observed nickel concentration indicates that 19,500 μg/g of $Na_2NiFe(CN)_6$ (52,500 kg of $Na_2NiFe(CN)_6$) existed in the tank before degradation. Therefore, these three sources of information place the original $Na_2NiFe(CN)_6$ inventory approximately within the 14,000- to 52,500-kg range.

The total cyanide analytical mean based on the bottom three segments of cores 116 and 117 was 17.7 μg/g (47.5 kg of cyanide) which is equivalent to 96.4 kg of $Na_2NiFe(CN)_6$. Consequently, it appears that 99.3 to 99.8 percent (1-96.4/14,000 to 1-96.4/52,500) of the ferrocyanide complex has decomposed.

Eight samples had less than the required 17 weight percent water, 12 after computation of the 95 percent confidence interval lower limits. Analysis for moisture content using gravimetry was performed for the eight original samples and one of the four additional samples which had DSC results above the decision threshold. Gravimetric analysis indicated six samples still had water contents below 17 weight percent.

Another factor in assessing tank safety is the heat generation from radioactive decay and the resultant temperature increase of the waste. The 1995 analytical results provided mean estimates for ^{60}Co, ^{137}Cs, and ^{90}Sr. Table 5-9 predicts the tank heat load to be 8,270 W (28,200 Btu/hr). Agnew 1996a provides an estimate of 1,310 W (4,470 Btu/hr), and Kummerer (1994) estimated 2,550 W (8,700 Btu/hr) based on tank headspace temperatures. All estimates were below the 11,700 W (40,000 Btu/hr) design specification for single-shell tanks (Bergmann 1991). Because tank temperatures have decreased since January 1993, it may be concluded that any heat generated from radioactive sources is adequately dissipated.

Table 5-9. Tank 241-BY-104 Estimated Heat Load.

Radionuclide	μCi/g	Ci	Watts
^{60}Co	< 0.0149	< 40.1	< 0.618
^{137}Cs	97.0	2.61E+05	1,230
^{90}Sr	391	1.05E+06	7,040
Total		1.31E+06	8,270

In summary, all analyses requested by the safety DQOs were performed during the October and November 1995 sampling event. The analytical results indicate the tank can be assumed to be safe based on current DQO and threshold values.

5.5.2 Historical Model Evaluation

The primary objective of the historical model evaluation DQO was to acquire adequate information through selective tank sampling to quantify the errors associated with predicting tank waste composition based on waste transaction history and waste type compositions (Simpson and McCain 1995). The requirement of a minimum of two widely spaced cores with thick layered segments was met. The DQO identifies key waste components for certain waste types including BY saltcake and ferrocyanide waste. Tank 241-BY-104 was selected for historical evaluation because it was expected to contain layers thick enough to provide entire segments composed of these two waste types (Agnew et al. 1996a). The first step in the evaluation is to compare the analytical results with DQO-defined concentration levels for waste components. If the analytical results are ≥ 10 percent of the DQO levels (ratio of 0.1 or more), the waste type and layer identification are considered acceptable and further analyses are requested (Simpson and McCain 1995).

According to the TLM (see Figure 2-3), it is likely the top three segments were BY saltcake, and the bottom three segments consisted of ferrocyanide waste. The analytical results were compared in Table 5-10 to the historical model evaluation DQO predicted concentrations for the BY saltcake and ferrocyanide waste types. The waste components for BY saltcake were sodium, aluminum, nitrate, sulfate, and percent water, and those for ferrocyanide waste were sodium, bismuth, nickel, ^{137}Cs, ^{90}Sr, and percent water. As samples were collected to meet historical DQOs in Simpson and McCain (1995), adequate analyses also were completed to fulfill requirements for Simpson and McCain (1996). The 1996 revision of the historical DQOs adds uranium as a waste component for BY saltcake waste and iron and phosphate for PFeCN waste.

When possible, the fusion digested results for the metals were used rather than the acid digested results because the fusion results more closely represent total concentrations. Only the saltcake results (subsegments upper or lower half in the Appendix A tables) were compared to the BY saltcake levels, and only the sludge results (subsegments A, B, C, or D in the Appendix A tables) were used for the ferrocyanide waste levels. Subsegment breakdowns did not strictly follow the TLM predictions: sludge subsegments were formed from material from the top three subsegments, and a saltcake subsegment was formed from segment 4 of core 117. The comparisons were made at the subsegment mean level for both cores.

All analytical results for the BY saltcake waste components exceeded the 10 percent criterion specified in the DQO with the exception of sulfate in some subsegments. For the ferrocyanide waste comparison, some subsegments from four out of eight analytes (iron, bismuth, nickel, and percent water) did not meet the criterion. The TLM seems to overpredict these analytes for other BY-tanks also. A closer inspection of the data reveals that several adjacent subsegments met the criteria, but comparing the results for all sludge subsegments causes the ratios to be below the DQO levels. Results from the bottom three subsegments from core 116 and the bottom subsegment from segment 2 through segment 4

DISTRIBUTION SHEET

To	From	Page 1 of 2
Distribution	Data Assessment and Interpretation	Date 05/26/99
Project Title/Work Order		**EDT No.** N/A
Tank Characterization Report for Single-Shell Tank 241-BY-104, WHC-SD-WM-ER-608, Rev. 0-C		**ECN No.** ECN-653807

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
<u>OFFSITE</u>					
<u>Sandia National Laboratory</u> P.O. Box 5800 MS-0744, Dept. 6404 Albuquerque, NM 87815					
D. Powers		X			
<u>Nuclear Consulting Services Inc.</u> P. O. Box 29151 Columbus, OH 43229-01051					
J. L. Kovach		X			
<u>Chemical Reaction Sub-TAP</u> P.O. Box 271 Lindsborg, KS 67456					
B. C. Hudson		X			
<u>SAIC</u> 555 Quince Orchard Rd., Suite 500 Gaithersburg, MD 20878-1437					
H. Sutter		X			
<u>Los Alamos Laboratory</u> CST-14 MS-J586 P. O. Box 1663 Los Alamos, NM 87545					
S. F. Agnew		X			
<u>Tank Advisory Panel</u> 102 Windham Road Oak Ridge, TN 37830					
D. O. Campbell		X			

DISTRIBUTION SHEET

To	From	Page 2 of 2
Distribution	Data Assessment and Interpretation	Date 05/26/99
Project Title/Work Order		EDT No. N/A
Tank Characterization Report for Single-Shell Tank 241-BY-104, WHC-SD-WM-ER-608, Rev. 0-C		ECN No. ECN-653807

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
ONSITE					
Department of Energy - Richland Operations					
W. S. Liou	S7-54	X			
DOE/RL Reading Room	H2-53	X			
DE&S Hanford, Inc.					
G. D. Johnson	S7-73	X			
Fluor Daniel Hanford Corporation					
J. S. Hertzel	H8-67	X			
Lockheed Martin Hanford, Corp.					
J. W. Cammann	R2-11	X			
R. E. Larson	T4-07	X			
S. G. McKinney	R2-12	X			
L. M. Sasaki	R2-12	X			
B. C. Simpson	R2-12	X			
R. R. Thompson	R2-12	X			
ERC (Environmental Resource Center)	R1-51	X			
T.C.S.R.C.	R1-10	5			
Lockheed Martin Services, Inc.					
B. G. Lauzon	R1-08	X			
Central Files	B1-07	X			
EDMC	H6-08	X			
Numatec Hanford Corporation					
J. S. Garfield	R3-73	X			
D. L. Herting	T6-07	X			
Pacific Northwest National Laboratory					
A. F. Noonan	K9-91	X			
Scientific Applications International Corporation					
M. D. LeClair	R3-75	X			