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1	1	Cog. Mgr. K. M. Hodgson	<i>K. M. Hodgson</i>	8-27-97	H2-11	3		M. D. LeClair (4)	H0-50
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Preliminary Tank Characterization Report for Single-Shell Tank 241-SX-105: Best-Basis Inventory

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Abstract: An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-SX-105 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

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**PRELIMINARY TANK
CHARACTERIZATION REPORT
FOR SINGLE-SHELL TANK
241-SX-105:
BEST-BASIS INVENTORY**

August 1997

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**PRELIMINARY TANK CHARACTERIZATION REPORT
FOR SINGLE-SHELL TANK 241-SX-105:
BEST-BASIS INVENTORY**

This document is a preliminary Tank Characterization Report (TCR) and contains only the current best-basis inventory (Appendix D) for tank 241-SX-105. No TCRs have been previously issued for this tank. Consequently, the best-basis inventory is based on an independent assessment of waste type, process flow sheet data, early sample data, and other available information.

The *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes* (Kupfer et al. 1997) describes standard methodology used to derive the tank-by-tank best-basis inventories. This preliminary TCR will be updated using this same methodology when additional data on tank contents become available.

REFERENCE

Kupfer, M. J., A. L. Boldt, B. A. Higley, K. M. Hodgson, L. W. Shelton, B. C. Simpson, and R. A. Watrous (LMHC), S. L. Lambert, and D. E. Place (SESC), R. M. Orme (NHC), G. L. Borsheim (Borsheim Associates), N. G. Colton (PNNL), M. D. LeClair (SAIC), R. T. Winward (Meier Associates), and W. W. Schulz (W²S Corporation), 1997, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

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APPENDIX D

**EVALUATION TO ESTABLISH BEST-BASIS
INVENTORY FOR SINGLE-SHELL
TANK 241-SX-105**

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-SX-105

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-SX-105 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task.

D1.0 CHEMICAL INFORMATION SOURCES

There is no Tank Characterization Report (TCR) for tank 241-SX-105. Available information for tank 241-SX-105 includes the following:

- Analytical data from S and U Tank Farm tanks with similar Supernatant Mixing Model 242-S Evaporator salt cake (SMMS) (it is assumed from lack of other data that the Supernatant Mixing Model 242-T Evaporator salt cake generated from 1965 until 1976 [SMMT2] concentrations are similar to SMMS) and REDOX high-level waste generated between 1952 and 1957 (R1) sludge waste types.
- The Hanford Defined Waste (HDW) model document (Agnew et al. 1996) provides tank content estimates.

D2.0 COMPARISON OF COMPONENT INVENTORY VALUES

The HDW model inventories, generated by the HDW model (Agnew et al. 1996), are shown in Tables D2-1 and D2-2. No samples have been taken from tank 241-SX-105 that can be used to estimate tank inventories for comparison with the HDW model estimate. The tank volume used to generate this inventory is 2,585 kL (683 kgal) waste which partitions into 208 kL (55 kgal) sludge, and 2,377 kL (628 kgal) salt cake (Agnew et al. 1996). This differs slightly from the 2,585 kL (683 kgal) waste reported by Hanlon (1996) which partitions into 276 kL (73 kgal) sludge and 2,309 kL (610 kgal) saltcake. The HDW model tank layer model density for the sludge is 1.61 g/mL and the supernatant mixing model density is 1.62 and the total density is 1.62 g/mL. (The chemical species are reported without charge designation per the best-basis inventory convention.)

Table D2-1. Hanford Defined Waste-Based Inventory Estimates for Nonradioactive Components in Tank 241-SX-105.

Analyte	HDW ^a inventory estimate (kg)	Analyte	HDW ^a inventory estimate (kg)
Al	130,000	NO ₃	889,000
Bi	677	OH	371,000
Ca	5,250	oxalate	8.93
Cl	20,300	Pb	550
Cr	20,100	P as PO ₄	23,100
F ^b	3,470	Si	7,030
Fe	9,570	S as SO ₄	64,500
Hg	4.69	Sr	3.46
K	6,010	TIC as CO ₃	75,800
La	16.5	TOC	37,000
Mn	601	U _{TOTAL}	11,400
Na	755,000	Zr	202
Ni	1,530	H ₂ O (wt %)	33.4
NO ₂	313,000	density (kg/L)	1.62

HDW = Hanford Defined Waste

^a Agnew et al. (1996)^b Fluoride based on water soluble portion only.

Table D2-2. Predicted Inventory Estimates for Radioactive Components in Tank 241-SX-105.

Analyte	HDW ^a inventory estimate (Ci)	Analyte	HDW ^a inventory estimate (Ci)
⁹⁰ Sr	696,000	^{239/240} Pu	243
¹³⁷ Cs	706,000		

HDW = Hanford Defined Waste

^a Agnew et al. (1996), radionuclide decayed to January 1, 1994.

D3.0 COMPONENT INVENTORY EVALUATION

D3.1 WASTE HISTORY TANK 241-SX-105

Tank 241-SX-105 received high-level (R1) waste from the reduction and oxidation (REDOX) plant in 1955. The tank also received REDOX process waste from a cascade from tank 241-SX-104. Between 1962 and 1965 tank 241-SX-105 received and sent (R1) waste to and from six other SX Tank Farm tanks. In 1966 and 1967 (R2) waste from the REDOX plant was sent to tank 241-SX-105. Large volumes of recycled supernatant and evaporator bottoms were received and transferred from approximately 1968 through 1980, during which significant amounts of salt cake accumulated. Between 1979 and 1980, the tank sent and received small amounts of waste from tanks 241-S-103, 241-S-107, 241-SY-102, and 241-SX-102, the last transfer being in 1980 from tank 241-S-103. The tank was removed from service in 1980, and was partially isolated in 1985.

D3.2 CONTRIBUTING WASTE TYPES

The HDW model (Agnew et al. 1996) predicts that the tank contains a total of 2,585 kL (683 kgal) of waste which consists of REDOX process high-level waste (91 kL [24 kgal] R1 and R2), REDOX process salt cake (RSltCk) (117 kL [31 kgal]), and 2,377 kL (628 kgal) of salt cake (the salt cake contains 2,309 kL (610 kgal) of Supernatant Mixing Model 242-S Evaporator salt cake generated from 1973 to 1976 (SMMS1) and 68 kL (18 kgal) of Supernatant Mixing Model 242-T Evaporator salt cake generated from 1965 until 1976 (SMMT2)) predicted from the supernatant mixing model.

The Sort on Radioactive Waste Type (SORWT) model (Hill et al. 1995) lists R (high level REDOX process waste), and Evaporator Bottoms (EB) as the primary and secondary waste types, respectively. Evaporator bottoms waste in Hill et al. is comparable to the Supernatant Mixing Model (SMMS1) and Supernatant Mixing Model (SMMT2) salt wastes in Agnew et al. (1996). Hill et al. also lists REDOX process ion exchange (RIX) waste as a tertiary contributor.

Hanlon (1996) indicates 2,585 kL (683 kgal) of waste which consists of 276 kL (73 kgal) of sludge and 2,309 kL (610 kgal) of salt cake. No description of the source of the sludge and salt cake are given.

D3.3 ASSUMPTIONS USED

For this evaluation, the following assumptions and observations are made:

- Tank volume listed in Hanlon (1996) is 2,585 kL (683 kgal). This agrees with the total volume used by Agnew et al. (1996). The volumes of the sludge and salt cake layer differ between two references.
- Only the SMM and REDOX (R) process streams contributed to solids formation.
- The sludge and salt cake volumes from Hanlon (1996) are used.

D3.4 BASIS FOR CALCULATIONS USED IN THIS ENGINEERING EVALUATION

Table D3-1 shows the engineering evaluation approaches used on tank 241-SX-105.

Table D3-1. Engineering Evaluation Approaches Used on Tank 241-SX-105.

Type of waste	How calculated	Check method
Supernatant	Assumed no supernatant	None.
Salt cake Volume = 2,309 kL (610 kgal) Density = 1.63 g/mL $2,309 \text{ E}+06 \text{ L} \times 1.63 \text{ kg/L} = 3.76 \text{ E}+06 \text{ kg}$	Used sample-based concentrations from tanks with SMMS1 salt cake waste. R1SlTck and SMMT2 salt cake treated as SMMS1 waste.	None, no sampling data available for this tank.
Sludge Volume = 276 kL (73 kgal) Density = 1.77 g/mL $276 \text{ E}+06 \text{ L} \times 1.77 \text{ kg/L} = 4.8 \text{ E}+05 \text{ kg/L}$	Used the average analyte concentration from tank 241-S-102, 241-S-104, and 241-S-107. All have sample data and R1 waste. Only the segments that are believed to have R1 waste were used to calculate the concentration from each tank.	None, no sample-based information is available for this tank.

R = REDOX process sludge waste

SMMS = Supernatant mixing model S Evaporator

SMMT = Supernatant mixing model T Evaporator

D3.4.1 Basis for Salt Cake Calculations Used in this Engineering Evaluation.

For this evaluation the methodology developed for SMMS1 salt cake was used. This is based on comparing concentrations from S and U Tank Farm sample data shown in Table D3-2. Tanks 241-S-101 (Kruger et al. 1996), 241-S-102 (Eggers et al. 1996), 241-U-106 (Brown et al. 1997), and 241-U-109 (Baldwin and Stephens 1996) were used to produce the average salt cake analyte concentrations for SMMS1 salt cake. To calculate the average SMMS1 concentration the waste volume and predicted location from Agnew et al. (1996) for the SMMS1 layers in each tank was determined. The sample data was reviewed and using the segments that were located within the predicted location from Agnew et al. (1996), an average concentration was calculated. The concentrations from each tank and the segments used in the calculation are shown in Table D3-2. For comparison the SMM salt cake composition predicted by the HDW model for tank 241-SX-105 is also shown.

Table D3-2. SMMS1 Salt Cake Concentrations. (2 Sheets)

Analyte	241-S-101 segments 2L-4U ^a μg/g	241-S-102 segments 7L-10U ^b μg/g	241-U-106 segments 2U-4L ^c μg/g	241-U-109 segments 5U-8L ^d μg/g	Average conc. ^e μg/g	HDW model SMM conc. for tank 241-SX-105 ^f μg/g
Al	18,000	15,085	13,620	13,625	15,100	30,000
Ag	12	17	16	NR	15	NR
B	110	75	80	NR	88	NR
Bi	71	76	<DL	<DL	73.5	176
Ca	273	237	336	<DL	282	963
Cl	4,500	4,099	2,926	NR	3,842	5,110
Cr	10,000	4,359	3,170	4,233	5,440	2,160
F	500	13,596	4,669	NR	6,255	900
Fe	508	1,298	3,096	<DL	1,630	295
K	1,109	898	1,309	NR	1,110	1,520
La	<DL	37	43	NR	40	3.28
Mn	266	597	1,189	<DL	684	156
Na	150,000	189,500	170,500	218,300	182,000	188,000
Ni	114	49	304	<DL	155	266
NO ₂	91,000	40,100	56,000	42,900	57,500	76,700
NO ₃	110,000	99,200	147,200	297,000	163,000	221,000
Pb	91	137	348	NR	192	142
PO ₄	9,500	114,500	5,888	5,970	34,000	6,000

Table D3-2. SMMS1 Salt Cake Concentrations. (2 Sheets)

Analyte	241-S-101 segments 2L-4U ^a μg/g	241-S-102 segments 7L-10U ^b μg/g	241-U-106 segments 2U-4L ^c μg/g	241-U-109 segments 5U-8L ^d μg/g	Average conc. ^e μg/g	HDW model SMM conc. for tank 241-SX-105 ^f μg/g
P	2,290	33,900	1,949	<DL	12,700	NR
S	5,940	2,683	3,878	NR	4,170	NR
Si	5,269	517	176	<DL	1,990	1,590
SO ₄	20,700	12,500	10,774	11,100	13,800	16,600
Sr	7	<DL	<DL	NR	7	0.90
TOC	1,900	5,340	24,626	3,920	8,950	9,610
U	560	1,403	781	<DL	914	2,080
Zn	30	32	54	<DL	39	NR
Zr	14	39	88	NR	47	52.3
Oxalate	15,400	15,700	9,880	NR	13,700	2.32
Density g/mL	1.58	1.69	1.57	1.67	1.63	1.46
Radionuclides ^g (μCi/g)						
⁹⁰ Sr	252	23	77	9	90	62
¹³⁷ Cs	175	121	175	142	153	162

<DL = Less than the Detectable Limit.

HDW = Hanford Defined Waste

NR = Not reported

SMMS1 = Supernatant Mixing Model 242-S Evaporator salt cake generated from 1973 until 1976

^a Kruger et al. (1996)^b Eggers et al. (1996)^c Brown et al. (1997)^d Baldwin and Stephens (1996)^e Average of tank 241-S-101, 241-S-102, 241-U-106, and 241-U-109 concentrations^f Agnew et al. (1996)^g Radionuclides are reported as of the date of sample analysis.

D3.4.2 Basis for Sludge Calculations used In This Engineering Evaluation

Data from tanks 241-S-102 (Eggers et al. 1996), 241-S-104 (DiCenso et al. 1994), and 241-S-107 (Simpson et al. 1996) were used to produce average analyte concentrations for R1 sludge waste. To calculate the average concentration, the volumes and predicted location of the sludge were taken from Agnew et al. (1996) for the tanks R1 waste. The sample data were then reviewed, and only the segments that were located within the predicted sludge location from Agnew et al. were used in deriving an average concentration. The average concentration from each tank and the segments used in the calculation are shown below in Table D3-3. For comparison the average sludge layer composition predicted by the HDW model for tank 241-SX-105 is also shown.

Table D3-3. R1 Sludge Concentration $\mu\text{g/g}$ (Average from Tanks with Tank Characterization Reports for Tank 241-SX-105). (2 Sheets)

Analyte	241-S-101 segments 7U-8L ^a ($\mu\text{g/g}$)	241-S-104 (total sludge concentration) ^b ($\mu\text{g/g}$)	241-S-107 segments ^c ($\mu\text{g/g}$)	Average Concentration ^d ($\mu\text{g/g}$)	HDW Model Sludge Values for 241-SX-105 ^e ($\mu\text{g/g}$)
Al	127,000	117,000	56,400	100,000	45,000
Bi	<38.8	<45.7	NR	<42.2	0.553
Ca	322	247	234	268	4,610
Cl	2,050	3,200	1,860	2,370	1,870
Cr	2,230	2,350	1,180	1,920	35,100
F	<65.7	145	150	<120	2.88
Fe	1,960	1,720	1,160	1,613	25,200
Hg	NR	<0.126	NR	<0.126	0
K	539	300	457	432	450
La	<19.5	<2.07	NR	<10.8	0
Mn	2,750	1,150	83	1,330	1.06
Na	112,000	121,000	60,400	97,800	88,100
Ni	90.7	56	206	118	1,520
NO ₂	31,100	25,900	34,300	30,433	52,700
NO ₃	119,000	191,000	57,600	122,500	115,000
Pb	37	29.6	33	33.2	13.7
PO ₄	1,360	<2,190	1,630	<1,730	16.2
Si	1,360	1,330	1,060	1,250	2,690
SO ₄	897	2,270	1,300	1,489	1,910

Table D3-3. R1 Sludge Concentration $\mu\text{g/g}$ (Average from Tanks with Tank Characterization Reports for Tank 241-SX-105). (2 Sheets)

Analyte	241-S-101 segments 7U-8L ^a ($\mu\text{g/g}$)	241-S-104 (total sludge concentration) ^b ($\mu\text{g/g}$)	241-S-107 segments ^c ($\mu\text{g/g}$)	Average Concentration ^d ($\mu\text{g/g}$)	HDW Model Sludge Values for 241-SX-105 ^e ($\mu\text{g/g}$)
Sr	456	424	378	420	2.74 E-06
TIC as CO ₃	NR	4,140	NR	4,140	7,010
TOC	NR	1,730	NR	1,730	35
U	7,684	6,690	8,685	7,690	1,020
Zr	36	33.6	131	66.9	0.117
Radionuclides ^f ($\mu\text{Ci/g}$)					
⁹⁰ Sr	NR	301	276	288	4.2
¹³⁷ Cs	98	60.5	74	77.6	0.481
density (g/ml)	1.77	1.64	1.90	1.77	1.75

NR = Not reported.

HDW = Hanford Defined Waste.

^a Kruger et al. (1996)^b DiCenso et al. (1994)^c Statistically determined median R1 sludge concentrations for tank 241-S-107 contained in the attachment to Simpson et al. (1996)^d Average of analyte concentrations for tank 241-S-101, 241-S-104, and 241-S-107^e Agnew et al. (1996)^f Radionuclides decayed to January 1, 1994.**D3.5 ESTIMATED COMPONENT INVENTORIES**

The chemical inventory of tanks 241-SX-105 is estimated from the assumed salt cake and sludge volumes (Table D3-1). The resulting inventories are provided in Table D-6. The inventories estimated by the HDW model are included for comparison.

Table D3-4. Comparison of Selected Component Inventory Estimates for Tank 241-SX-105. (2 Sheets)

Component	This evaluation (kg) Sludge	This evaluation (kg) Salt Cake	This evaluation (kg)	HDW estimated (kg)
Bi	<22	277	299	677
K	207	4,176	4,383	6,010

Table D3-4. Comparison of Selected Component Inventory Estimates for Tank 241-SX-105. (2 Sheets)

Component	This evaluation (kg) Sludge	This evaluation (kg) Salt Cake	This evaluation (kg)	HDW estimated (kg)
La	NR	150	150	16.5
NO ₃	58,829	613,213	672,042	889,000
Mn	639	2,573	3,212	601
SO ₄	715	51,916	52,631	64,500
Cr	922	20,465	21,388	20,100
Ca	129	1,061	1,190	5,252
Ni	57	583	640	1,530
PO ₄	831	127,909	128,740	23,100
F	< 58	23,532	23,589	3,470
Al	48,024	56,807	104,831	130,000
Fe	775	6,132	6,907	9,570
TOC	831	33,670	34,501	37,000
Na	46,967	684,691	731,659	755,000
H ₂ O (percent)	NR	30.6	30.6	33.4

HDW = Hanford Defined Waste, Agnew et al. (1996)

NR = Not reported.

Since no post-1989 analytical data were available from this tank, the reliability of these estimates (in either this engineering assessment or the HDW model inventory estimates) are suspect. Although these uncertainties cannot be resolved at this point, some trends can be discussed.

Manganese. Potassium permanganate was used in the REDOX process until 1959, thus manganese is expected to be found in tanks containing waste from that process. It is most likely present as highly insoluble manganese dioxide in the alkaline waste materials and would be expected to be in the sludge. The R1 Sludge composition estimate developed in this engineering assessment for manganese was 1,330 $\mu\text{g/g}$. Interestingly, the SMMS1 salt cake composition estimate for manganese was 684 $\mu\text{g/g}$ —much higher than would be expected based on solubility considerations. It should be noted that there are large ranges in both the SMMS1 and R1 data sets for manganese.

The HDW model predicts approximately zero manganese in the Sludge (0.354 kg) in tank 241-SX-105 and 156 $\mu\text{g/g}$ in the salt cake layer. The HDW model inventory estimate

for manganese is 601 kg. Based on the discussion above, the 3,208 kg inventory estimate developed in this engineering assessment is likely to be closer to the true value.

Phosphate. There is a large difference between the engineering assessment tank inventory estimate (129,000 kg) and the HDW model estimate (23,100 kg). The engineering assessment value is biased high because of one extremely high phosphate value in the data set used to develop the SMMS1 salt cake composition estimate (see Table D-4). If the phosphate data from tank 241-S-102 are eliminated from the SMMS1 composition estimate, then the engineering assessment and the HDW estimate would be in reasonable agreement. However, since the HDW model failed to predict the high phosphate value for tank 241-S-102, it should not be taken as a reliable indicator for phosphate in tank 241-SX-105.

Calcium. The calcium found in tanks containing REDOX process waste is believed to have been an impurity in the commercial grade sodium hydroxide used in the neutralization of high-level waste in the process. The calcium value developed in this engineering assessment (1,190 kg) is about one third of the HDW model value (5,250 kg). Since many calcium salts of anions such as carbonate, oxalate, and phosphate are insoluble and the concentrations of these anions are essentially unknown, it is not surprising that calcium values differ between this engineering assessment and the HDW model.

Fluoride. The fluoride ion inventory estimate is about 5.2 times higher in the engineering assessment (23,600) than in the HDW model (3,470). The fluoride concentration in tanks 241-S-102 and 241-U-106 are much higher. Without analytical data from tank 241-SX-105 it is difficult to defend the choice of one value over the other.

Total Hydroxide. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valence of other analytes. In some cases, this approach requires that other analyte (e.g., sodium or nitrate) inventories be adjusted to achieve the charge balance. During such adjustments, the number of significant figures is retained. This charge balance approach is consistent with that used by Agnew et al. (1997).

D4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

Key waste management activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing them into a form that is suitable for long-term storage/disposal. Information about chemical, radiological, and/or physical properties is used to perform safety analyses, engineering evaluations, and risk assessment associated with these activities.

Chemical and radiological inventory information are generally derived using three approaches: (1) component inventories are estimated using the results of sample analyses, (2) component inventories are predicted using the HDW model, process knowledge, and historical information, or (3) a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material usage, and other operating data.

As part of this effort, an evaluation of available chemical information for tank 241-SX-105 was performed, including the following:

- The inventory estimate generated by the HDW model (Agnew et al. 1996)
- An engineering evaluation which produced a predicted SMMS1 salt cake inventory and R1 sludge inventory based on methodology developed by evaluation of similar S and U Tanks.

Based on this evaluation, a best-basis inventory was developed for tank 241-SX-105 since sampling information is not available. The engineering evaluation inventory was chosen as the best basis for those analytes for which sample-based analytical values were available, from S and U Tank Farm tanks with similar wastes, for the following reasons:

- The sample-based inventory analytical concentrations of the S and U Tank Farm tanks containing SMMS1 compared favorably with each other for SMMS1 salt cake.
- No methodology is available to fully predict SMMS1 or SMMT2 salt cake from process flowsheet or historical records.
- No methodology is available to fully predict R1 waste from process flowsheet or historical records for this tank. REDOX process first-cycle R1 waste changed composition during the process and accurate records of these changes are not available at this time. Also R1 waste was cascaded and transferred into and out of many S, SX, and U Tank Farm tanks between 1972 and 1978 which makes it hard to predict precipitation factors for analytes in the waste. Some tanks will

show higher concentrations for certain analytes because of the length of time the waste was in the tank before being transferred out.

- For those few analytes where no values were available from the sample-based inventory of similar tanks, the HDW model values were used.

The best-basis inventory for tank 241-SX-105 is presented in Tables D4-1 and D4-2. The inventory values reported in Tables D4-1 and D4-2 are subject to change. Refer to the Tank Characterization Database (TCD) for the most current inventory values.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr , ^{137}Cs , $^{239/240}\text{Pu}$, and total uranium, (or total beta and total alpha) while other key radionuclides such as ^{60}Co , ^{99}Tc , ^{129}I , ^{154}Eu , ^{155}Eu , and ^{241}Am , etc., have been infrequently reported. For this reason it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions. (These computer models are described in Kupfer et al. 1997, Section 6.1 and in Watrous and Wootan 1997.) Model generated values for radionuclides in any of 177 tanks are reported in the HDW Rev. 4 model results (Agnew et al. 1997). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. (No attempt has been made to ratio or normalize model results for all 46 radionuclides when values for measured radionuclides disagree with the model.) For a discussion of typical error between model derived values and sample derived values, see Kupfer et al. 1997, Section 6.1.10.

Best-basis tables for chemicals and only four radionuclides (^{90}Sr , ^{137}Cs , Pu, and U) were being generated in 1996, using values derived from an earlier version (Rev. 3) of the HDW model. When values for all 46 radionuclides became available in Rev 4 of the HDW model, they were merged with draft best-basis chemical inventory documents. Defined scope of work in FY 1997 did not permit Rev. 3 chemical values to be updated to Rev. 4 chemical values.

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-SX-105 (Effective January 31, 1997).

Analyte	Total inventory (kg)	Basis (S, M, C, or E) ¹	Comment
Al	107,000	E	
Bi	299	E	
Ca	1,190	E	
Cl	15,300	E	
TIC as CO ₃	75,800	M	
Cr	21,400	E	
F	18,000	E	
Fe	6,930	E	
Hg	4.69	M	
K	4,820	E	
La	151	E	
Mn	3,210	E	
Na	734,000	E	
Ni	641	E	
NO ₂	231,000	E	
NO ₃	659,000	E	
OH	337,000	C	
Pb	737	E	
P as PO ₄	129,000	E	
Si	8,080	E	
S as SO ₄	52,500	E	
Sr	227	E	
TOC	34,200	E	
U _{TOTAL}	7,090	E	
Zr	209	E	

¹S = Sample-based

M = Hanford Defined Waste model-based, Agnew et al. (1996)

E = Engineering assessment-based

C = Calculated by charge balance; includes oxides as hydroxides, not including CO₃, NO₂, NO₃, PO₄, SO₄, and SiO₃.

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-105, decayed to January 1, 1994 (Effective January 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E) ¹	Comment
³ H	759	M	
¹⁴ C	109	M	
⁵⁹ Ni	11.1	M	
⁶⁰ Co	121	M	
⁶³ Ni	1,090	M	
⁷⁹ Se	12.4	M	
⁹⁰ Sr	499,000	E	
⁹⁰ Y	499,000	E	Referenced to ⁹⁰ Sr
⁹³ Zr	59.9	M	
^{93m} Nb	44.9	M	
⁹⁹ Tc	775	M	
¹⁰⁶ Ru	0.0215	M	
^{113m} Cd	276	M	
¹²⁵ Sb	520	M	
¹²⁶ Sn	18.5	M	
¹²⁹ I	1.49	M	
¹³⁴ Cs	7.85	M	
¹³⁷ Cs	646,000	E	
^{137m} Ba	611,000	E	Referenced to ¹³⁷ Cs
¹⁵¹ Sm	43,800	M	
¹⁵² Eu	17.4	M	
¹⁵⁴ Eu	1,960	M	
¹⁵⁵ Eu	982	M	
²²⁶ Ra	8.02 E-04	M	
²²⁷ Ac	0.00446	M	
²²⁸ Ra	0.404	M	
²²⁹ Th	0.00905	M	
²³¹ Pa	0.0152	M	
²³² Th	0.0271	M	
²³² U	2.09	M	

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-SX-105, decayed to January 1, 1994 (Effective January 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E) ¹	Comment
²³³ U	8.03	M	
²³⁴ U	2.56	M	
²³⁵ U	0.104	M	
²³⁶ U	0.0816	M	
²³⁷ Np	2.82	M	
²³⁸ Pu	7.51	M	
²³⁸ U	2.93	M	
²³⁹ Pu	136	E	
²⁴⁰ Pu	39.6	M	
²⁴¹ Am	3,860	E	
²⁴¹ Pu	452	M	
²⁴² Cm	0.652	M	
²⁴² Pu	0.00249	M	
²⁴³ Am	0.01	M	
²⁴³ Cm	0.0615	M	
²⁴⁴ Cm	0.981	M	

¹S = Sample-based

M = Hanford Defined Waste model-based, Agnew et al. (1997)

E = Engineering assessment-based

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D5.0 APPENDIX D REFERENCES

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