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Determination of Waste Groupings for Safety Analyses

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DETERMINATION OF WASTE GROUPINGS FOR SAFETY ANALYSES

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1.0 Introduction

Two workshops were held in May and July 1999 to review data analysis methodologies associated with the analysis of flammable gas behavior. The workshop participants decided that missing data could be estimated by using a distribution of values that encompassed tanks with wastes that behaved in a similar fashion. It was also determined that because of the limited amount of tank data pertaining to flammable gas generation and retention, it was not justified to divide the tanks into many small waste groupings. The purpose for grouping tanks is so that limited gas retention and release data, which may be available for some tanks within a group, can be applied to other tanks containing the same waste form. This is necessary when estimating waste properties for tanks with missing or incomplete information. Following the workshop, a preliminary tank grouping was prepared based on content of solids, liquids, sludge, saltcake, or salt slurry. The saltcake and salt slurry were then grouped together and referred to as saltcake/salt slurry. Initial tank classifications were based on waste forms from the Best Basis Inventory, the Hanford Defined Waste (HDW) ("Agnew") Model, or the Waste Tank Summary ("Hanlon") Report. The results of this grouping are presented in "*Flammable Gas Safety Analysis Data Review*", SNL-000198 (Barker, et al., 1999).

At the time of the release of SNL-000198, tank waste inventories were not consistent between published sources, such as the "Best Basis Inventory" and the "*Waste Tank Summary Report for Month Ending August 31, 1999*" (Hanlon 1999). This calculation note documents the process and basis used when revising the waste groupings following the release of SNL-000198. The waste layer volume information is compared between the various databases, including information obtained from process measurements. Differences are then resolved based on tank characterization information and waste behavior.

2.0 Methodology

The waste tank groupings were determined by using data provided by Hanlon (1999), Field (1999), Koreski (1999), and Cammann (1999). On September 7, 1999, a review of tank waste volumes was completed. The review included an update of total tank volume, including the use of the Double-Shell Tanks Inventory and Material Balance report (Koreski 1999) as the basis for Double-Shell Tank (DST) volumes; an update of waste volumes by waste type based on analytical data and comparison of layer compositions; and an update of liquid inventories (Field 1999). The waste inventories were given by type and were used as the starting point for this document. These waste volumes (Cammann 1999) also became the basis for the waste volumes reported in Hanlon (1999). The information received from the Best Basis Inventory was then reviewed and updated based on Field (1999). Finally, additional changes were made based on surface level measurements, photographs of the tank contents, and adjusting the estimate of the waste inventory consistent with the purpose of the database. Because of differing purposes for the various databases (see Table 2-1), the values reported are not necessarily the same.

Table 2-1 Comparison of Waste Inventory Databases

Database	Basis and special considerations
Best Basis Inventory (Cammann 1999)	Waste inventory is by mass, based on chemical constituent.
"*Updated Pumpable Liquid Volume Estimates and Jet Pump Durations for Interim Stabilization of Remaining Single-Shell Tanks*" (Field 1999).	Saltwell pumping liquid inventories. This database specifically excludes measured retained gas volumes.
"*Waste Tank Inventory Summary Report...*" (Hanlon 1999)**	Waste inventory is based on volume of tank wastes. Special handling is done for tanks being saltwell pumped. Reported liquid pumped reduces volume of waste, even though liquid may be interstitial and not affect total waste volume. At conclusion of saltwell pumping, the waste volumes are re-adjusted to represent surface level measurements.
"*Double-Shell Tanks Inventory and Material Balance...*" report (Koreski 1999)**	Tank inventory is based on volume of tank wastes modified by monthly reports by tank farm operations concerning waste transfers to and from the tanks. The purpose of this report is to track DST space usage and availability.
Process Engineering Safety Hazards Database	Waste inventory and properties are based on volumetric basis with retained gas included. Densities and component concentrations are based on bulk properties. This database supports process engineering safety analyses of tank farms.

Note: * The names of reports are truncated since they consist of monthly reports and the table refers to the collection as a group

Figure 2-1 presents the general process logic used for determining the waste volumes. As shown in Figure 2-1, the waste volumes and type designations were determined based on the Best Basis Inventory (Cammann 1999). The inventories for the DSTs were changed to agree with "*Double-Shell Tanks Inventory and Material Balance Report for October, 1999*" (Koreski 1999). Additional changes in liquid waste volumes were made to bring the liquid inventories in agreement with "*Updated Pumpable Liquid Volume Estimates and Jet Pump Durations for Interim Stabilization of Remaining Single-Shell Tanks*" (Field 1999). Next, the liquid volumes obtained from Field were adjusted to add back retained gas volumes – the information presented in this report is based on bulk layer data with retained gas included in the respective layer. Finally, an adjustment was made to Tank 241-AN-101 to reflect the observation that the liquid density in the tank is too low for the solution to be a saturated salt solution, which would be expected if any appreciable volume of saltcake waste were present in the tank. The Waste Tank Summary Report was then used as a check of the waste volumes.

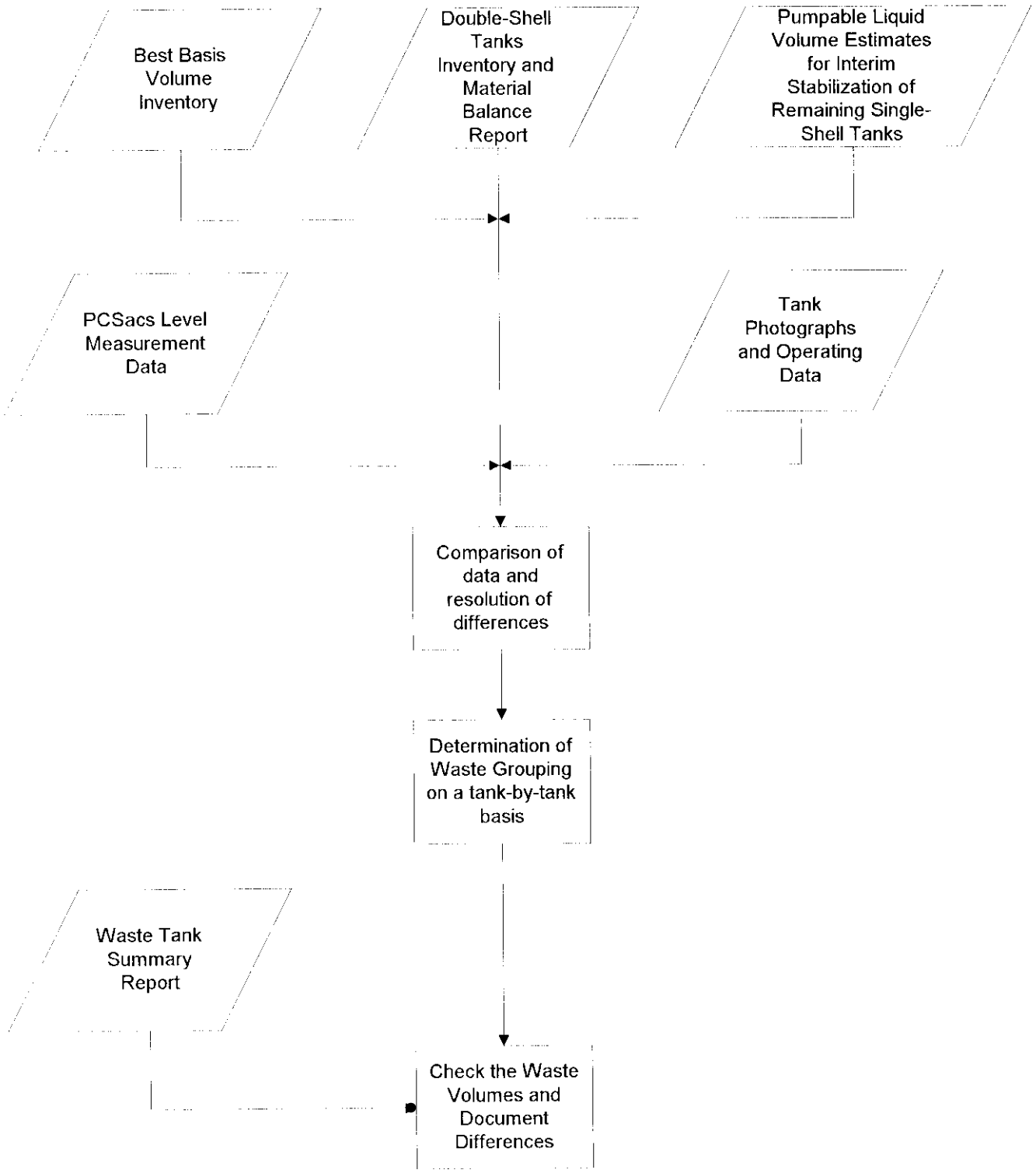

Figure 2-1. Tank Waste Grouping Analysis Flowsheet

Table 2-2 summarizes the differences between the August Waste Tank Inventory Summary Report (Hanlon 1999) – which was issued based on the set of Best Basis Inventory waste volumes contained in the September 7, 1999 electronic mail message (Cammann 1999) – and the waste volumes used in this report. In addition there were a number of volume differences concerning the DSTs since Koreski (1999) updated the August Waste Tank Inventory Summary Report.

Table 2-2. Summary of Differences Between Inventories Used and Hanlon August Report

	Waste Tank Inventory Used (11/3/99)				Waste Tank Inventory Summary Report (Hanlon 8/31/99)				
Tank I.D.	Supernatant Layer Volume [kL(kGal)]	Saltcake Layer Volume [kL(kGal)]	Sludge Layer Volume [kL(kGal)]	Waste Volume [kL(kGal)]	Supernatant Layer Volume [kL(kGal)]	Saltcake Layer Volume [kL(kGal)]	Sludge Layer Volume [kL(kGal)]	Waste Volume [kL(kGal)]	Comments
241-AN-101	481 (127)	0 (0)	125 (33)	606 (160)	481 (127)	125 (33)	0 (0)	606 (160)	Saltcake changed to Sludge due to the Tank Advisory Panel Subcommittee comment that liquid density is too low for the presence of Saltcake (Barker 1999)
241-C-105	0 (0)	0 (0)	496 (131)	496 (131)	170 (45)	0 (0)	337 (89)	496 (131)	Review of stabilization data (Boettger 1997)
241-S-106	0 (0)	1613 (426)	0 (0)	1613 (426)	0 (0)	1295 (342)	0 (0)	1295 (342)	Difference in handling saltwell pumping drawdown
241-S-111	420 (111)	1181 (312)	443 (117)	2044 (540)	87 (23)	1431 (378)	526 (139)	2044 (540)	Changed to be consistent with Field (1999)
241-SX-102	507 (134)	1438 (380)	0 (0)	1946 (514)	0 (0)	1946 (514)	0 (0)	1946 (514)	Changed to be consistent with Field (1999) and difference in saltwell pumping progress data
241-SX-106	379 (100)	1223 (323)	0 (0)	1601 (423)	235 (62)	1223 (323)	0 (0)	1457 (385)	Difference in handling saltwell pumping progress data
241-T-110	0 (0)	0 (0)	1465 (387)	1465 (387)	0 (0)	0 (0)	1314 (347)	1314 (347)	Difference in handling saltwell pumping drawdown

3.0 Results

The results of this analysis are presented in three tables. Table 3-1 presents the volumes of all 177 tanks, the supernatant layer volume, the saltcake layer volume, the sludge layer volume, the total waste volume, and the headspace volume. All volumes are given in kiloliters and kilogallons. Table 3-2 presents the results of the waste grouping analysis performed using the criteria presented by Barker (1999). Finally, Table 3-3 presents a mapped view of the waste grouping analysis for all 177 waste tanks.

Table 3-1. Tank Waste, Total Tank, and Headspace Volumes (4 pages)

Tank	Supernatant Layer Volume (kL(kgal))	Saltcake Layer Volume (kL(kgal))	Sludge Layer Volume (kL(kgal))	Total Waste Volume (kL(kgal))	Mean Tank Volume (kL(kgal))	Tank Volume Standard Deviation (kL(kgal))	Headspace Volume (kL(kgal))
SINGLE-SHELL TANKS							
241-A-101	1923 (508)	1673 (442)	11 (3)	3608 (953)	4989 (1318)	42 (11)	1382 (365)
241-A-102	15 (4)	83 (22)	57 (15)	155 (41)	4989 (1318)	42 (11)	4834 (1277)
241-A-103	19 (5)	0 (0)	1385 (366)	1404 (371)	4989 (1318)	42 (11)	3585 (947)
241-A-104	0 (0)	0 (0)	106 (28)	106 (28)	4989 (1318)	42 (11)	4883 (1290)
241-A-105	0 (0)	0 (0)	193 (51)	193 (51)	4989 (1318)	42 (11)	4796 (1267)
241-A-106	0 (0)	0 (0)	473 (125)	473 (125)	4989 (1318)	42 (11)	4516 (1193)
241-AX-101	1461 (386)	1359 (359)	11 (3)	2831 (748)	5103 (1348)	49 (13)	2271 (600)
241-AX-102	0 (0)	87 (23)	26 (7)	114 (30)	5103 (1348)	49 (13)	4989 (1318)
241-AX-103	0 (0)	394 (104)	30 (8)	424 (112)	5103 (1348)	49 (13)	4679 (1236)
241-AX-104	0 (0)	0 (0)	30 (8)	30 (8)	5103 (1348)	49 (13)	5072 (1340)
241-B-101	0 (0)	428 (113)	0 (0)	428 (113)	3214 (849)	30 (8)	2786 (736)
241-B-102	15 (4)	106 (28)	0 (0)	121 (32)	3214 (849)	30 (8)	3093 (817)
241-B-103	0 (0)	223 (59)	0 (0)	223 (59)	3214 (849)	30 (8)	2990 (790)
241-B-104	4 (1)	231 (61)	1170 (309)	1404 (371)	3214 (849)	30 (8)	1809 (478)
241-B-105	0 (0)	492 (130)	106 (28)	598 (158)	3214 (849)	30 (8)	2616 (691)
241-B-106	4 (1)	0 (0)	439 (116)	443 (117)	3214 (849)	30 (8)	2771 (732)
241-B-107	4 (1)	269 (71)	352 (93)	625 (165)	3214 (849)	30 (8)	2589 (684)
241-B-108	0 (0)	155 (41)	201 (53)	356 (94)	3214 (849)	30 (8)	2858 (755)
241-B-109	0 (0)	242 (64)	238 (63)	481 (127)	3214 (849)	30 (8)	2733 (722)
241-B-110	4 (1)	0 (0)	927 (245)	931 (246)	3214 (849)	30 (8)	2283 (603)
241-B-111	4 (1)	0 (0)	893 (236)	897 (237)	3214 (849)	30 (8)	2317 (612)
241-B-112	11 (3)	0 (0)	114 (30)	125 (33)	3214 (849)	30 (8)	3089 (816)
241-B-201	4 (1)	0 (0)	106 (28)	110 (29)	223 (59)	8 (2)	114 (30)
241-B-202	0 (0)	0 (0)	102 (27)	102 (27)	223 (59)	8 (2)	121 (32)
241-B-203	4 (1)	0 (0)	189 (50)	193 (51)	223 (59)	8 (2)	30 (8)
241-B-204	4 (1)	0 (0)	185 (49)	189 (50)	223 (59)	8 (2)	34 (9)
241-BX-101	4 (1)	0 (0)	159 (42)	163 (43)	3218 (850)	30 (8)	3055 (807)
241-BX-102	0 (0)	0 (0)	363 (96)	363 (96)	3218 (850)	30 (8)	2854 (754)
241-BX-103	34 (9)	0 (0)	235 (62)	269 (71)	3218 (850)	30 (8)	2949 (779)
241-BX-104	11 (3)	0 (0)	363 (96)	375 (99)	3218 (850)	30 (8)	2843 (751)
241-BX-105	19 (5)	0 (0)	174 (46)	193 (51)	3218 (850)	30 (8)	3025 (799)
241-BX-106	0 (0)	0 (0)	144 (38)	144 (38)	3218 (850)	30 (8)	3074 (812)
241-BX-107	4 (1)	0 (0)	1302 (344)	1306 (345)	3218 (850)	30 (8)	1912 (505)
241-BX-108	0 (0)	0 (0)	98 (26)	98 (26)	3218 (850)	30 (8)	3119 (824)
241-BX-109	0 (0)	0 (0)	731 (193)	731 (193)	3218 (850)	30 (8)	2487 (657)
241-BX-110	11 (3)	269 (71)	503 (133)	784 (207)	3218 (850)	30 (8)	2434 (643)
241-BX-111	4 (1)	515 (136)	95 (25)	613 (162)	3218 (850)	30 (8)	2604 (688)
241-BX-112	4 (1)	0 (0)	621 (164)	625 (165)	3218 (850)	30 (8)	2593 (685)
241-BY-101	0 (0)	1052 (278)	413 (109)	1465 (387)	3967 (1048)	38 (10)	2502 (661)
241-BY-102	0 (0)	1049 (277)	0 (0)	1049 (277)	3967 (1048)	38 (10)	2919 (771)
241-BY-103	0 (0)	1480 (391)	34 (9)	1514 (400)	3967 (1048)	38 (10)	2453 (648)
241-BY-104	0 (0)	666 (176)	568 (150)	1234 (326)	3967 (1048)	38 (10)	2733 (722)
241-BY-105	0 (0)	1722 (455)	182 (48)	1904 (503)	3967 (1048)	38 (10)	2063 (545)
241-BY-106	0 (0)	1809 (478)	318 (84)	2127 (562)	3967 (1048)	38 (10)	1840 (486)

Table 3-1. Tank Waste, Total Tank, and Headspace Volumes (4 pages)

Tank	Supernatant Layer Volume (kL(kgal))	Saltcake Layer Volume (kL(kgal))	Sludge Layer Volume (kL(kgal))	Total Waste Volume (kL(kgal))	Mean Tank Volume (kL(kgal))	Tank Volume Standard Deviation (kL(kgal))	Headspace Volume (kL(kgal))
241-BY-107	0 (0)	856 (226)	151 (40)	1007 (266)	3967 (1048)	38 (10)	2960 (782)
241-BY-108	0 (0)	280 (74)	583 (154)	863 (228)	3967 (1048)	38 (10)	3104 (820)
241-BY-109	0 (0)	882 (233)	216 (57)	1098 (290)	3967 (1048)	38 (10)	2869 (758)
241-BY-110	0 (0)	1117 (295)	390 (103)	1507 (398)	3967 (1048)	38 (10)	2461 (650)
241-BY-111	0 (0)	1738 (459)	0 (0)	1738 (459)	3967 (1048)	38 (10)	2230 (589)
241-BY-112	0 (0)	1102 (291)	0 (0)	1102 (291)	3967 (1048)	38 (10)	2866 (757)
241-C-101	0 (0)	0 (0)	333 (88)	333 (88)	3214 (849)	30 (8)	2881 (761)
241-C-102	0 (0)	0 (0)	1196 (316)	1196 (316)	3214 (849)	30 (8)	2018 (533)
241-C-103	299 (79)	0 (0)	450 (119)	750 (198)	3214 (849)	30 (8)	2464 (651)
241-C-104	0 (0)	0 (0)	1117 (295)	1117 (295)	3214 (849)	30 (8)	2097 (554)
241-C-105	0 (0)	0 (0)	496 (131)	496 (131)	3214 (849)	30 (8)	2718 (718)
241-C-106	269 (71)	0 (0)	132 (35)	405 (107)	3214 (849)	30 (8)	2809 (742)
241-C-107	0 (0)	0 (0)	973 (257)	973 (257)	3214 (849)	30 (8)	2241 (592)
241-C-108	0 (0)	0 (0)	250 (66)	250 (66)	3214 (849)	30 (8)	2964 (783)
241-C-109	15 (4)	0 (0)	235 (62)	250 (66)	3214 (849)	30 (8)	2964 (783)
241-C-110	4 (1)	0 (0)	670 (177)	674 (178)	3214 (849)	30 (8)	2540 (671)
241-C-111	0 (0)	0 (0)	216 (57)	216 (57)	3214 (849)	30 (8)	2998 (792)
241-C-112	0 (0)	0 (0)	394 (104)	394 (104)	3214 (849)	30 (8)	2820 (745)
241-C-201	0 (0)	0 (0)	8 (2)	8 (2)	223 (59)	8 (2)	216 (57)
241-C-202	0 (0)	0 (0)	4 (1)	4 (1)	223 (59)	8 (2)	220 (58)
241-C-203	0 (0)	0 (0)	19 (5)	19 (5)	223 (59)	8 (2)	204 (54)
241-C-204	0 (0)	0 (0)	11 (3)	11 (3)	223 (59)	8 (2)	212 (56)
241-S-101	45 (12)	772 (204)	799 (211)	1616 (427)	3975 (1050)	34 (9)	2358 (623)
241-S-102	0 (0)	1548 (409)	397 (105)	1946 (514)	3975 (1050)	34 (9)	2029 (536)
241-S-103	64 (17)	840 (222)	34 (9)	939 (248)	3975 (1050)	34 (9)	3036 (802)
241-S-104	4 (1)	0 (0)	1109 (293)	1113 (294)	3975 (1050)	34 (9)	2862 (756)
241-S-105	0 (0)	1719 (454)	8 (2)	1726 (456)	3975 (1050)	34 (9)	2249 (594)
241-S-106	0 (0)	1613 (426)	0 (0)	1613 (426)	3975 (1050)	34 (9)	2362 (624)
241-S-107	53 (14)	261 (69)	1109 (293)	1423 (376)	3975 (1050)	34 (9)	2551 (674)
241-S-108	0 (0)	1685 (445)	19 (5)	1703 (450)	3975 (1050)	34 (9)	2271 (600)
241-S-109	0 (0)	1870 (494)	49 (13)	1919 (507)	3975 (1050)	34 (9)	2055 (543)
241-S-110	0 (0)	980 (259)	496 (131)	1476 (390)	3975 (1050)	34 (9)	2498 (660)
241-S-111	420 (111)	1181 (312)	443 (117)	2044 (540)	3975 (1050)	34 (9)	1931 (510)
241-S-112	0 (0)	1957 (517)	23 (6)	1980 (523)	3975 (1050)	34 (9)	1995 (527)
241-SX-101	0 (0)	1696 (448)	0 (0)	1696 (448)	4902 (1295)	38 (10)	3206 (847)
241-SX-102	507 (134)	1438 (380)	0 (0)	1946 (514)	4902 (1295)	38 (10)	2956 (781)
241-SX-103	0 (0)	1965 (519)	435 (115)	2400 (634)	4902 (1295)	38 (10)	2502 (661)
241-SX-104	0 (0)	1253 (331)	515 (136)	1768 (467)	4902 (1295)	38 (10)	3134 (828)
241-SX-105	0 (0)	2165 (572)	246 (65)	2411 (637)	4902 (1295)	38 (10)	2491 (658)
241-SX-106	379 (100)	1223 (323)	0 (0)	1601 (423)	4902 (1295)	38 (10)	3301 (872)
241-SX-107	0 (0)	0 (0)	394 (104)	394 (104)	4902 (1295)	38 (10)	4508 (1191)
241-SX-108	0 (0)	0 (0)	329 (87)	329 (87)	4902 (1295)	38 (10)	4573 (1208)
241-SX-109	0 (0)	662 (175)	284 (75)	946 (250)	4902 (1295)	38 (10)	3956 (1045)
241-SX-110	0 (0)	0 (0)	235 (62)	235 (62)	4902 (1295)	38 (10)	4667 (1233)
241-SX-111	0 (0)	0 (0)	462 (122)	462 (122)	4902 (1295)	38 (10)	4440 (1173)
241-SX-112	0 (0)	0 (0)	409 (108)	409 (108)	4902 (1295)	38 (10)	4493 (1187)

Table 3-1. Tank Waste, Total Tank, and Headspace Volumes (4 pages)

Tank	Supernatant Layer Volume (kL(kgal))	Saltcake Layer Volume (kL(kgal))	Sludge Layer Volume (kL(kgal))	Total Waste Volume (kL(kgal))	Mean Tank Volume (kL(kgal))	Tank Volume Standard Deviation (kL(kgal))	Headspace Volume (kL(kgal))
241-SX-113	0 (0)	0 (0)	117 (31)	117 (31)	4902 (1295)	38 (10)	4785 (1264)
241-SX-114	0 (0)	129 (34)	556 (147)	685 (181)	4902 (1295)	38 (10)	4217 (1114)
241-SX-115	0 (0)	0 (0)	45 (12)	45 (12)	4902 (1295)	38 (10)	4857 (1283)
241-T-101	4 (1)	242 (64)	140 (37)	386 (102)	3214 (849)	30 (8)	2828 (747)
241-T-102	49 (13)	0 (0)	72 (19)	121 (32)	3214 (849)	30 (8)	3093 (817)
241-T-103	15 (4)	0 (0)	87 (23)	102 (27)	3214 (849)	30 (8)	3112 (822)
241-T-104	0 (0)	0 (0)	1234 (326)	1234 (326)	3214 (849)	30 (8)	1980 (523)
241-T-105	0 (0)	0 (0)	371 (98)	371 (98)	3214 (849)	30 (8)	2843 (751)
241-T-106	8 (2)	0 (0)	72 (19)	79 (21)	3214 (849)	30 (8)	3134 (828)
241-T-107	0 (0)	0 (0)	655 (173)	655 (173)	3214 (849)	30 (8)	2559 (676)
241-T-108	0 (0)	87 (23)	79 (21)	167 (44)	3214 (849)	30 (8)	3047 (805)
241-T-109	0 (0)	220 (58)	0 (0)	220 (58)	3214 (849)	30 (8)	2994 (791)
241-T-110	0 (0)	0 (0)	1465 (387)	1465 (387)	3214 (849)	30 (8)	1749 (462)
241-T-111	0 (0)	0 (0)	1688 (446)	1688 (446)	3214 (849)	30 (8)	1526 (403)
241-T-112	26 (7)	0 (0)	227 (60)	254 (67)	3214 (849)	30 (8)	2960 (782)
241-T-201	4 (1)	0 (0)	106 (28)	110 (29)	223 (59)	8 (2)	114 (30)
241-T-202	0 (0)	0 (0)	79 (21)	79 (21)	223 (59)	8 (2)	144 (38)
241-T-203	0 (0)	0 (0)	132 (35)	132 (35)	223 (59)	8 (2)	91 (24)
241-T-204	0 (0)	0 (0)	144 (38)	144 (38)	223 (59)	8 (2)	79 (21)
241-TX-101	11 (3)	38 (10)	280 (74)	329 (87)	3967 (1048)	38 (10)	3638 (961)
241-TX-102	0 (0)	821 (217)	0 (0)	821 (217)	3967 (1048)	38 (10)	3146 (831)
241-TX-103	0 (0)	594 (157)	0 (0)	594 (157)	3967 (1048)	38 (10)	3373 (891)
241-TX-104	19 (5)	140 (37)	87 (23)	246 (65)	3967 (1048)	38 (10)	3721 (983)
241-TX-105	0 (0)	2305 (609)	0 (0)	2305 (609)	3967 (1048)	38 (10)	1662 (439)
241-TX-106	0 (0)	1291 (341)	0 (0)	1291 (341)	3967 (1048)	38 (10)	2676 (707)
241-TX-107	4 (1)	102 (27)	30 (8)	136 (36)	3967 (1048)	38 (10)	3831 (1012)
241-TX-108	0 (0)	485 (128)	23 (6)	507 (134)	3967 (1048)	38 (10)	3460 (914)
241-TX-109	0 (0)	0 (0)	1454 (384)	1454 (384)	3967 (1048)	38 (10)	2514 (664)
241-TX-110	0 (0)	1609 (425)	140 (37)	1749 (462)	3967 (1048)	38 (10)	2218 (586)
241-TX-111	0 (0)	1238 (327)	163 (43)	1401 (370)	3967 (1048)	38 (10)	2567 (678)
241-TX-112	0 (0)	2457 (649)	0 (0)	2457 (649)	3967 (1048)	38 (10)	1510 (399)
241-TX-113	0 (0)	1605 (424)	693 (183)	2298 (607)	3967 (1048)	38 (10)	1669 (441)
241-TX-114	0 (0)	2010 (531)	15 (4)	2025 (535)	3967 (1048)	38 (10)	1942 (513)
241-TX-115	0 (0)	2150 (568)	0 (0)	2150 (568)	3967 (1048)	38 (10)	1817 (480)
241-TX-116	0 (0)	2131 (563)	257 (68)	2389 (631)	3967 (1048)	38 (10)	1579 (417)
241-TX-117	0 (0)	2260 (597)	110 (29)	2370 (626)	3967 (1048)	38 (10)	1597 (422)
241-TX-118	0 (0)	1007 (266)	129 (34)	1136 (300)	3967 (1048)	38 (10)	2831 (748)
241-TY-101	0 (0)	174 (46)	273 (72)	447 (118)	3975 (1050)	34 (9)	3528 (932)
241-TY-102	0 (0)	242 (64)	0 (0)	242 (64)	3975 (1050)	34 (9)	3732 (986)
241-TY-103	0 (0)	0 (0)	613 (162)	613 (162)	3975 (1050)	34 (9)	3361 (888)
241-TY-104	11 (3)	0 (0)	163 (43)	174 (46)	3975 (1050)	34 (9)	3801 (1004)
241-TY-105	0 (0)	0 (0)	874 (231)	874 (231)	3975 (1050)	34 (9)	3100 (819)
241-TY-106	0 (0)	0 (0)	79 (21)	79 (21)	3975 (1050)	34 (9)	3895 (1029)
241-U-101	11 (3)	0 (0)	83 (22)	95 (25)	3214 (849)	30 (8)	3119 (824)
241-U-102	68 (18)	1189 (314)	163 (43)	1420 (375)	3214 (849)	30 (8)	1794 (474)
241-U-103	49 (13)	1677 (443)	45 (12)	1772 (468)	3214 (849)	30 (8)	1442 (381)

Table 3-1. Tank Waste, Total Tank, and Headspace Volumes (4 pages)

Tank	Supernatant Layer Volume (kL(kgal))	Saltcake Layer Volume (kL(kgal))	Sludge Layer Volume (kL(kgal))	Total Waste Volume (kL(kgal))	Mean Tank Volume (kL(kgal))	Tank Volume Standard Deviation (kL(kgal))	Headspace Volume (kL(kgal))
241-U-104	0 (0)	163 (43)	299 (79)	462 (122)	3214 (849)	30 (8)	2752 (727)
241-U-105	140 (37)	1321 (349)	121 (32)	1582 (418)	3214 (849)	30 (8)	1632 (431)
241-U-106	57 (15)	799 (211)	0 (0)	856 (226)	3214 (849)	30 (8)	2358 (623)
241-U-107	125 (33)	1363 (360)	57 (15)	1544 (408)	3214 (849)	30 (8)	1669 (441)
241-U-108	91 (24)	1571 (415)	110 (29)	1772 (468)	3214 (849)	30 (8)	1442 (381)
241-U-109	72 (19)	1556 (411)	132 (35)	1760 (465)	3214 (849)	30 (8)	1454 (384)
241-U-110	0 (0)	0 (0)	704 (186)	704 (186)	3214 (849)	30 (8)	2510 (663)
241-U-111	0 (0)	1147 (303)	98 (26)	1245 (329)	3214 (849)	30 (8)	1968 (520)
241-U-112	15 (4)	0 (0)	170 (45)	185 (49)	3214 (849)	30 (8)	3028 (800)
241-U-201	4 (1)	0 (0)	15 (4)	19 (5)	223 (59)	8 (2)	204 (54)
241-U-202	4 (1)	0 (0)	15 (4)	19 (5)	223 (59)	8 (2)	204 (54)
241-U-203	4 (1)	0 (0)	8 (2)	11 (3)	223 (59)	8 (2)	212 (56)
241-U-204	4 (1)	0 (0)	8 (2)	11 (3)	223 (59)	8 (2)	212 (56)
DOUBLE-SHELL TANKS							
241-AN-101	481 (127)	125 (33)	0 (0)	606 (160)	5326 (1407)	42 (11)	4720 (1247)
241-AN-102	3676 (971)	337 (89)	0 (0)	4013 (1060)	5326 (1407)	42 (11)	1314 (347)
241-AN-103	2074 (548)	1552 (410)	0 (0)	3626 (958)	5326 (1407)	42 (11)	1700 (449)
241-AN-104	2286 (604)	1700 (449)	0 (0)	3986 (1053)	5326 (1407)	42 (11)	1340 (354)
241-AN-105	2411 (637)	1851 (489)	0 (0)	4262 (1126)	5326 (1407)	42 (11)	1064 (281)
241-AN-106	83 (22)	64 (17)	0 (0)	148 (39)	5326 (1407)	42 (11)	5178 (1368)
241-AN-107	3017 (797)	935 (247)	0 (0)	3952 (1044)	5326 (1407)	42 (11)	1374 (363)
241-AP-101	4221 (1115)	0 (0)	0 (0)	4221 (1115)	5326 (1407)	42 (11)	1105 (292)
241-AP-102	4134 (1092)	0 (0)	0 (0)	4134 (1092)	5326 (1407)	42 (11)	1192 (315)
241-AP-103	1075 (284)	0 (0)	4 (1)	1079 (285)	5326 (1407)	42 (11)	4247 (1122)
241-AP-104	91 (24)	0 (0)	0 (0)	91 (24)	5326 (1407)	42 (11)	5235 (1383)
241-AP-105	2559 (676)	337 (89)	0 (0)	2896 (765)	5326 (1407)	42 (11)	2430 (642)
241-AP-106	352 (93)	0 (0)	0 (0)	352 (93)	5326 (1407)	42 (11)	4974 (1314)
241-AP-107	3695 (976)	0 (0)	0 (0)	3695 (976)	5326 (1407)	42 (11)	1632 (431)
241-AP-108	1397 (369)	0 (0)	0 (0)	1397 (369)	5326 (1407)	42 (11)	3929 (1038)
241-AW-101	3104 (820)	1158 (306)	0 (0)	4262 (1126)	5326 (1407)	42 (11)	1064 (281)
241-AW-102	151 (40)	151 (40)	0 (0)	303 (80)	5326 (1407)	42 (11)	5023 (1327)
241-AW-103	613 (162)	178 (47)	1139 (301)	1931 (510)	5326 (1407)	42 (11)	3396 (897)
241-AW-104	3361 (888)	874 (231)	0 (0)	4236 (1119)	5326 (1407)	42 (11)	1090 (288)
241-AW-105	564 (149)	0 (0)	1060 (280)	1624 (429)	5326 (1407)	42 (11)	3702 (978)
241-AW-106	927 (245)	863 (228)	0 (0)	1791 (473)	5326 (1407)	42 (11)	3536 (934)
241-AY-101	174 (46)	0 (0)	409 (108)	583 (154)	5326 (1407)	42 (11)	4743 (1253)
241-AY-102	1556 (411)	0 (0)	799 (211)	2355 (622)	5326 (1407)	42 (11)	2972 (785)
241-AZ-101	3021 (798)	0 (0)	178 (47)	3199 (845)	5326 (1407)	42 (11)	2127 (562)
241-AZ-102	3131 (827)	0 (0)	394 (104)	3524 (931)	5326 (1407)	42 (11)	1802 (476)
241-SY-101	2286 (604)	2214 (585)	0 (0)	4501 (1189)	5326 (1407)	42 (11)	825 (218)
241-SY-102	1984 (524)	0 (0)	333 (88)	2317 (612)	5326 (1407)	42 (11)	3009 (795)
241-SY-103	1446 (382)	1370 (362)	0 (0)	2816 (744)	5326 (1407)	42 (11)	2510 (663)

Table 3-2. Tank Waste Classification (2pages)

Tank I.D.	Waste Class	Tank I.D.	Waste Class	Tank I.D.	Waste Class
241-A-101	SC/SS-NL	241-BX-110	MIX-NL	241-SY-103	SC/SS-LIQ
241-A-102	MIX-NL	241-BX-111	SC/SS-NL	241-T-101	MIX-NL
241-A-103	SL-NL	241-BX-112	SL-NL	241-T-102	SL-NL
241-A-104	SL-NL	241-BY-101	SC/SS-NL	241-T-103	SL-NL
241-A-105	SL-NL	241-BY-102	SC/SS-NL	241-T-104	SL-NL
241-A-106	SL-NL	241-BY-103	SC/SS-NL	241-T-105	SL-NL
241-AN-101	SL-LIQ	241-BY-104	MIX-NL	241-T-106	SL-NL
241-AN-102	SC/SS-LIQ	241-BY-105	SC/SS-NL	241-T-107	SL-NL
241-AN-103	SC/SS-LIQ	241-BY-106	SC/SS-NL	241-T-108	MIX-NL
241-AN-104	SC/SS-LIQ	241-BY-107	SC/SS-NL	241-T-109	SC/SS-NL
241-AN-105	SC/SS-LIQ	241-BY-108	MIX-NL	241-T-110	SL-NL
241-AN-106	SC/SS-NL	241-BY-109	SC/SS-NL	241-T-111	SL-NL
241-AN-107	SC/SS-LIQ	241-BY-110	SC/SS-NL	241-T-112	SL-NL
241-AP-101	LIQ	241-BY-111	SC/SS-NL	241-T-201	SL-NL
241-AP-102	LIQ	241-BY-112	SC/SS-NL	241-T-202	SL-NL
241-AP-103	LIQ	241-C-101	SL-NL	241-T-203	SL-NL
241-AP-104	LIQ	241-C-102	SL-NL	241-T-204	SL-NL
241-AP-105	SC/SS-LIQ	241-C-103	SL-NL	241-TX-101	SL-NL
241-AP-106	LIQ	241-C-104	SL-NL	241-TX-102	SC/SS-NL
241-AP-107	LIQ	241-C-105	SL-NL	241-TX-103	SC/SS-NL
241-AP-108	LIQ	241-C-106	SL-NL	241-TX-104	MIX-NL
241-AW-101	SC/SS-LIQ	241-C-107	SL-NL	241-TX-105	SC/SS-NL
241-AW-102	SC/SS-NL	241-C-108	SL-NL	241-TX-106	SC/SS-NL
241-AW-103	SL-LIQ	241-C-109	SL-NL	241-TX-107	SC/SS-NL
241-AW-104	SL-LIQ	241-C-110	SL-NL	241-TX-108	SC/SS-NL
241-AW-105	SL-LIQ	241-C-111	SL-NL	241-TX-109	SL-NL
241-AW-106	SC/SS-LIQ	241-C-112	SL-NL	241-TX-110	SC/SS-NL
241-AX-101	SC/SS-NL	241-C-201	SL-NL	241-TX-111	SC/SS-NL
241-AX-102	SC/SS-NL	241-C-202	SL-NL	241-TX-112	SC/SS-NL
241-AX-103	SC/SS-NL	241-C-203	SL-NL	241-TX-113	MIX-NL
241-AX-104	SL-NL	241-C-204	SL-NL	241-TX-114	SC/SS-NL
241-AY-101	SL-NL	241-S-101	MIX-NL	241-TX-115	SC/SS-NL
241-AY-102	SL-LIQ	241-S-102	SC/SS-NL	241-TX-116	SC/SS-NL
241-AZ-101	SL-LIQ	241-S-103	SC/SS-NL	241-TX-117	SC/SS-NL
241-AZ-102	SL-LIQ	241-S-104	SL-NL	241-TX-118	SC/SS-NL
241-B-101	SC/SS-NL	241-S-105	SC/SS-NL	241-TY-101	MIX-NL
241-B-102	SC/SS-NL	241-S-106	SC/SS-NL	241-TY-102	SC/SS-NL
241-B-103	SC/SS-NL	241-S-107	SL-NL	241-TY-103	SL-NL
241-B-104	SL-NL	241-S-108	SC/SS-NL	241-TY-104	SL-NL
241-B-105	SC/SS-NL	241-S-109	SC/SS-NL	241-TY-105	SL-NL
241-B-106	SL-NL	241-S-110	MIX-NL	241-TY-106	SL-NL
241-B-107	MIX-NL	241-S-111	SC/SS-LIQ	241-U-101	SL-NL
241-B-108	MIX-NL	241-S-112	SC/SS-NL	241-U-102	SC/SS-NL

Table 3-2. Tank Waste Classification (2pages)

Tank I.D.	Waste Class	Tank I.D.	Waste Class	Tank I.D.	Waste Class
241-B-109	MIX-NL	241-SX-101	SC/SS-NL	241-U-103	SC/SS-NL
241-B-110	SL-NL	241-SX-102	SC/SS-LIQ	241-U-104	MIX-NL
241-B-111	SL-NL	241-SX-103	SC/SS-NL	241-U-105	SC/SS-NL
241-B-112	SL-NL	241-SX-104	SC/SS-NL	241-U-106	SC/SS-NL
241-B-201	SL-NL	241-SX-105	SC/SS-NL	241-U-107	SC/SS-NL
241-B-202	SL-NL	241-SX-106	SC/SS-NL	241-U-108	SC/SS-NL
241-B-203	SL-NL	241-SX-107	SL-NL	241-U-109	SC/SS-NL
241-B-204	SL-NL	241-SX-108	SL-NL	241-U-110	SL-NL
241-BX-101	SL-NL	241-SX-109	SC/SS-NL	241-U-111	SC/SS-NL
241-BX-102	SL-NL	241-SX-110	SL-NL	241-U-112	SL-NL
241-BX-103	SL-NL	241-SX-111	SL-NL	241-U-201	SL-NL
241-BX-104	SL-NL	241-SX-112	SL-NL	241-U-202	SL-NL
241-BX-105	SL-NL	241-SX-113	SL-NL	241-U-203	SL-NL
241-BX-106	SL-NL	241-SX-114	SL-NL	241-U-204	SL-NL
241-BX-107	SL-NL	241-SX-115	SL-NL		
241-BX-108	SL-NL	241-SY-101	SC/SS-LIQ		
241-BX-109	SL-NL	241-SY-102	SL-LIQ		

Table 3-3. Mapped View of Tank Waste Groupings

	A	AN	AP	AW	AX	AY	AZ	B	BX	BY	C	S	SX	SY	T	TX	TY	U
101	SC/SS-NL	SL-LIQ	LIQ	SC/SS-LIQ	SC/SS-NL	SL-NL	SL-LIQ	SC/SS-NL	SL-NL	SC/SS-NL	SL-NL	MIX-NL	SC/SS-NL	SC/SS-LIQ	MIX-NL	SL-NL	MIX-NL	SL-NL
102	MIX-NL	SC/SS-LIQ	LIQ	SC/SS-NL	SC/SS-NL	SL-LIQ	SL-LIQ	SC/SS-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SC/SS-LIQ	SL-LIQ	SL-NL	SC/SS-NL	SC/SS-NL	SC/SS-NL
103	SL-NL	SC/SS-LIQ	LIQ	SL-LIQ	SC/SS-NL			SC/SS-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SC/SS-NL	SC/SS-LIQ	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL
104	SL-NL	SC/SS-LIQ	LIQ	SL-LIQ	SL-NL			SL-NL	SL-NL	MIX-NL	SL-NL	SL-NL	SC/SS-NL		SL-NL	MIX-NL	SL-NL	MIX-NL
105	SL-NL	SC/SS-LIQ	SC/SS-LIQ	SL-LIQ				SC/SS-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SC/SS-NL		SL-NL	SC/SS-NL	SL-NL	SC/SS-NL
106	SL-NL	SC/SS-NL	LIQ	SC/SS-LIQ				SL-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SC/SS-NL		SL-NL	SC/SS-NL	SL-NL	SC/SS-NL
107		SC/SS-LIQ	LIQ					MIX-NL	SL-NL	SC/SS-NL	SL-NL	SL-NL	SL-NL		SL-NL	SC/SS-NL		SC/SS-NL
108			LIQ					MIX-NL	SL-NL	MIX-NL	SL-NL	SC/SS-NL	SL-NL		MIX-NL	SC/SS-NL		SC/SS-NL
109								MIX-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SC/SS-NL		SC/SS-NL	SL-NL		SC/SS-NL
110								SL-NL	MIX-NL	SC/SS-NL	SL-NL	MIX-NL	SL-NL		SL-NL	SC/SS-NL		SL-NL
111								SL-NL	SC/SS-NL	SC/SS-NL	SL-NL	SC/SS-LIQ	SL-NL		SL-NL	SC/SS-NL		SC/SS-NL
112								SL-NL	SL-NL	SC/SS-NL	SL-NL	SC/SS-NL	SL-NL		SL-NL	SC/SS-NL		SL-NL
113													SL-NL			MIX-NL		SL-NL
114													SL-NL			SC/SS-NL		SL-NL
115													SL-NL			SC/SS-NL		SL-NL
116																SC/SS-NL		SL-NL
117																SC/SS-NL		
118																SC/SS-NL		
201								SL-NL			SL-NL				SL-NL			SL-NL
202								SL-NL			SL-NL				SL-NL			SL-NL
203								SL-NL			SL-NL				SL-NL			SL-NL
204								SL-NL			SL-NL				SL-NL			SL-NL

4.0 Recommendations

As waste transfers and waste disposal progress, it will be necessary to update this information. For a number of SSTs, the surface is very uneven. In addition as time passes, liquids are transferred and the wastes continue to slump and compress. Due to difficulty in determining the volumes of the tanks, it is important for tank farms process engineering to have a well-documented and authoritative inventory of tank volumes. The update of the mass- and volume-based inventories is necessary until the material is remediated.

5.0 References

Barker, S. A. (LMHC), W. B. Barton (LMHC), D. R. Bratzel (LMHC), M. Epstein (FAI), P. A. Gauglitz (PNNL), G. D. Johnson (LMHC), S. N. Maruvada (MACTC), C. E. Olson (SNL), M. L. Sauer (SNL), S. E. Slezak (SNL), C. W. Stewart (PNNL), J. Young (MSI), 1999, "*Flammable Gas Safety Analysis Data Review*", SNL-000198, Sandia National Laboratory, Albuquerque, New Mexico.

Boettger, J. S., 1997, "*Single-Shell Tank Leak Stabilization Record*", HNF-SD-RE-TI-178, Rev. 6, Lockheed Martin Hanford Corp., Richland, Washington.

Cammann, J. W., 1999, Electronic mail message to S. A. Barker presenting Best Basis Waste Inventory as of September 7, 1999, Lockheed Martin Hanford Corp., Richland, Washington.

Field, J. G., 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 Corp., Richland, Washington.

Hanlon, B. M., 1999, "*Waste Tank Summary Report for Month Ending August 31, 1999*", HNF-EP-0182-137, Fluor Daniel Hanford Inc., Richland, Washington.

Koreski, G. M., 1999, "*Double-Shell Tanks Inventory and Material Balance Report for October, 1999*", 74B40-00-154, Lockheed Martin Hanford Corp., Richland, Washington.

6.0 Checklist For Independent Review

CHECKLIST FOR INDEPENDENT REVIEW

Document: DETERMINATION OF WASTE GROUPINGS FOR SAFETY ANALYSIS

Author: S.A. BARKER

Scope of Review: TABLES 3.1, 3.2 & 3.3 and supporting spreadsheets

Yes	No	N/A	
[ ]	[ ]	[X]*	Previous reviews complete and cover analysis, up to scope of the review, with no gaps.
[X]	[ ]	[ ]	Problem completely defined.
[X]	[ ]	[ ]	Necessary assumptions explicitly stated and supported.
[X]	[ ]	[ ]	Computer codes and data files documented.
[X]	[ ]	[ ]	Data used in calculations explicitly stated in document.
[X]	[ ]	[ ]	Data checked for consistency with original source information as applicable.
[X]	[ ]	[ ]	Mathematical derivations checked including dimensional consistency of results.
[ ]	[ ]	[X]	Models appropriate and used within range of validity or use outside range of established validity justified.
** [X]	[ ]	[ ]	Hand calculations checked for errors. *Spreadsheet results should be treated exactly the same as hand calculations.*
[ ]	[ ]	[X]	Software/Code input correct and consistent with analysis documentation.
[ ]	[ ]	[X]	Software/Code output consistent with input and with results reported in analysis/documentation.
[ ]	[ ]	[X]	Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references.
[ ]	[ ]	[X]	Safety margins consistent with good engineering practices.
[ ]	[ ]	[X]	Conclusions consistent with analytical results and applicable limits.
[X]	[ ]	[ ]	Results and conclusions address all points required in the problem statement.
[X]	[ ]	[ ]	Format consistent with appropriate standards.
[ ]	[ ]	[X]*	Review calculations, comments, and/or notes attached.
[X]	[ ]	[ ]	Document approved.

JAMES D. BINGHAM James D. Bingham 4/27/00

Reviewer (Printed Name and Signature)

* Any calculation, comments or notes generated as part of this review should be signed, dated, and attached to the checklist. Such material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party.

** a sample set of calculations ~~were~~ was checked.

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