OSR 45-24 (Rev 1-20-2009)

Calculation Cover Sheet

Project/Task	Calculation No.	Project/Task No.
N/A	X-CLC-Z-00035	N/A
Title SALTSTONE FACILITY BASIS INFORMATION FOR CONSENT ORDER OF DISMISSAL SECTION III.7 WEBSITE DATA – FOURTH QUARTER 2010	**Functional Classification** GS	Sheet 1 of 24
	Discipline Chemical Process	
Calculation Type ☒ Type 1 ☐ Type 2	**Type 1 Calc Status** ☐ Preliminary ☒ Confirmed	
Computer Program No. Microsoft Excel ☐ N/A	**Version/Release No.** 2002 SP3	
Purpose and Objective This calculation provides the basis information for the website data required by the Consent Order of Dismissal, Section III.7. This report covers the period of Saltstone Facility operation under the Z-Area Saltstone Industrial Solid Landfill Permit #025500-1603 (modified effective 2/7/07), during the fourth quarter of 2010 (10/1/2010 through 12/31/2010). Additionally, this report provides updated information for the third quarter of 2010 based on additional data that has been received and incorporated since the initial reporting was performed.	**DC/RO** N/A	**Date**

Summary of Conclusion

The results of this calculation from the fourth quarter of 2010 are listed in tables 1, 2, 4, 6, and 7; located in appendix 1. The updated results from the third quarter of 2010 are listed in tables 3 and 5; also located in appendix 1.

Revisions

Rev #	Revision Description
0	Initial Issue

Sign Off

Rev #	Originator (Print) Sign/Date	Verification/Checking Method	Verifier/Checker (Print) Sign/Date	Manager (Print) Sign/Date
	Andrew R Carter 1/25/11	☐ Design Check (GS/PS only) ☒ Document Review ☐ Qualification Testing ☐ Alternate Calculation ☐ Operational Testing	Denise Snyder 1/26/11	A.V. STAUB 1/26/11
		☐ Design Check (GS/PS only) ☐ Document Review ☐ Qualification Testing ☐ Alternate Calculation ☐ Operational Testing		

Additional Reviewer (Print) N/A	Signature	Date
Design Authority (Print) N/A	Signature	Date
Release to Outside Agency (Print) N/A	Signature	Date
Security Classification of the Calculation (U)		

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References

1. Waste Characterization System, v. 1.5, December 2010
2. Reigel, M. M., and Bibler, N. E., "Results for the Fourth Quarter 2010 Tank 50 WAC Slurry Sample: Chemical and Radionuclide Contaminant Results," SRNL-STI-2010-00713, Rev. 0, January 2011.
3. Le, T. A., "Alternative Determination of Saltstone Disposal Facility (SDF) Radionuclides Inventory from April 1 of 2010 to June 30 of 2010," X-ESR-H-00284, Rev. 0.

Introduction

This calculation provides the basis information for the website data required by the Consent Order of Dismissal, Section III.7. The website data is provided in Appendix 1. The basis for the website data is discussed in the body of this calculation. This report covers the period of Saltstone Facility operation under the Z-Area Saltstone Industrial Solid Landfill Permit #025500-1603 (modified effective 2/7/07), during the fourth quarter of 2010 (10/1/2010 through 12/31/2010). Additionally, this report provides updated information for the third quarter of 2010 based on additional data that has been received and incorporated from Reference 1 since the initial reporting was performed.

III.7 Z-Area Saltstone Disposal Facility Permit General Condition B.5.a-h Information

Table 2 in Appendix 1 provides information on the amounts of salt waste disposed, saltstone grout disposed, remaining vault volume, curies disposed, highly radioactive curies disposed, and the cells to which this material was sent. The basis information for this content is provided in the above references and process run data shown in Table 1.

III.7 (1) Chemical and Radiological Composition of Salt Waste

Table 4 in Appendix 1 provides information on the chemical and radiological composition of the salt waste as required by section III.7 (1) of the consent order.

The Tank 50 material balance provides composition information for acceptance "limits" and acceptance "targets". For acceptance limits, a material balance is maintained and the data is provided in Reference 1. The material balance is updated monthly based on the transfers into Tank 50, the transfers out of Tank 50, and the characterization information for the influent streams. The material balance is rebaselined in accordance with the results of quarterly (chemical) and semi-annual (radionuclide) Tank 50 sample results. For acceptance targets, the periodic sample results provide the only characterization information available, given in Reference 2. The data presented are the most recent available at the time of publication.

The data presented in Appendix 1 for chemical and radiological composition of salt waste were developed as follows:

1) For acceptance limits, the data presented in the Tank 50 material balance after monthly updates are attributed to the salt solution transfers to Saltstone for that month. A weighted average

Tank 50 concentration is reported for the quarter. The weightings will be based on the relative amounts of salt waste transferred to the Saltstone Facility during each of the three months.

2) For acceptance targets, the latest baseline sample results are reported in Reference 2. For radionuclides with high detection limits, salt solution compositions were calculated in Reference 3.
3) The Tank 50 Material Balance provides no characterization for the following radionuclides which are in radioactive equilibrium with another radionuclide reported due to their short half-lives. In these cases, the concentration reported in Appendix 1 is identical to that reported for the parent radionuclide:
    a. Y-90 Sr-90 (parent)
    b. Rh-106 Ru-106 (parent)
    c. Te-125m Sb-125 (parent)
    d. Pr-144 Ce-144 (parent)
4) Ba-137m is in radioactive equilibrium with Cs-137, but in this case the Ba-137m is reported as 94.6% of the Cs-137 activity because only 94.6% of the Cs-137 decays to Ba-137m.
5) Total transuranic alpha emitters with ($t_{1/2}$)>5 years are bounded by the "Total Alpha" value reported for the Latest Baseline Sample. Therefore, the total transuranic alpha emitters with ($t_{1/2}$)>5 years is reported as "less than" the total alpha sample result value in Appendix 1.

III.7 (2) Formulation of Grout Used to Treat and Solidify the Salt Waste

All process runs during the reporting period used the 45/45/10 dry premix composition, although the salt solution density varied.

The overall grout composition by weight based on the above formulation is determined as follows:

Inputs and Assumptions:

1) Specific Gravity of Salt Waste = 1.19

    Basis: SW24.6, Section 3.1, Mixing and Transfer System Pre-Startup (CCR Checks). The data is taken from procedures for all process runs during the quarter. The weighted average for the quarter is 1.19.

2) Total Solids in Salt Waste = 24.4 wt%

    Basis: SOP 210-Z-4349-A, which provides an algorithm for the total solids in salt solution based on solution specific gravity. For a specific gravity of 1.19, the total solids is 24.4 wt%.

3) Water to Premix Ratio = 0.62

    Basis: SW24.6, Section 3.1, Mixing and Transfer System Pre-Startup (CCR Checks). The data is taken from procedures for all process runs during the quarter. The weighted average for the quarter is 0.62; thus 0.62 pounds of free water are added to the process for each pound of dry premix fed to the saltstone mixer.

4) Specific gravity of saltstone grout = 1.5

   Basis: Average value from PI trends of DI-1144 for process runs during 4Q 2010.

5) Density of water = 997 kg/m^3 (0.997 kg/L)

   Basis: Perry's Chemical Engineers' Handbook (7^{th} Edition), Table 2-28, for water at 25^oC

6) Tank 50 did not see many significant transfers during the fourth quarter of 2010. It is assumed that the concentrations of Pu-242 and Cm-245 are unchanged from the previous reporting period. These concentrations have been determined through the "Alternative Determination of Saltstone Disposal Facility (SDF)Radionuclides Inventory…" calculation (Ref 3).

7) Process data was obtained using PI process monitoring software tags: ZFQI1046 (Tank 50 Flow Totalizer), ZFQI1144 (Grout Flow Totalizer), ZFQI1002 (Leachate Flow Totalizer).

Analytical Methods and Computations

Let: x = mass of salt waste in grout
y = mass of premix in grout

Water to Premix Ratio = (Mass of Water in Salt Waste) / (Mass of Premix)

$0.62 = (1 – 0.244)\ (x) / (y)$

$0.62 = (0.756)\ (x) / (y)$

$(0.62)\ (y) = (0.756)\ (x)$

$y = (1.219)\ (x)$

Weight Fraction of Salt Waste in Grout = $(x) / (x + y)$

$= (x) / (x + 1.219x)$

$= 0.451$

Weight Fraction of Premix in Grout = $(y) / (x + y)$

$= (1.219x) / (x + 1.219x)$

$= 0.549$

Therefore, for every mass unit of salt waste (x), the weight fraction of salt waste in grout is 0.451 (45 wt%) and the weight fraction of premix in grout is 0.549 (55 wt%).

Based on the composition of dry premix (10 wt% cement, 45 wt% flyash, 45 wt% slag), the overall percentage of each dry premix component in the overall grout formulation can be calculated as follows:

wt% cement = (weight fraction of premix in grout) (weight fraction of cement in premix) (100)

= (0.549) (0.10) (100) = 6 wt%

wt% flyash = (0.549) (0.45) (100) = 25 wt%

wt% slag = (0.549) (0.45) (100) = 25 wt%

Admixture is added at 0.066 wt% of the premix for Q2-3183A antifoam. The total contribution of admixture is insignificant at <0.2 wt% [(0.066 wt%) (0.549) = 0.04 wt%].

Mass of 1-liter of salt waste = (SpG of salt waste) (density of water)

=(1 L) (1.19) (0.997 kg/L) = 1.186 kg

Mass of grout from 1-liter of salt waste =

(mass of 1-liter of salt waste) / (wt fraction of salt waste in grout)

= (1.186 kg) / (0.451)

= 2.63 kg

Volume of grout from 1-liter of salt waste =

(mass of grout from 1-liter of salt waste) / (density of grout)

= (2.63 kg) / (1.50) (0.997 kg/L)

= 1.76 liters

Chemical Composition of Saltstone

A per-month weighted average will be used to accurately depict the average composition of the individual components disposed of in the saltstone.

The average concentration of component “n” in the saltstone can be determined as follows:

Concentration of a salt waste component of interest "n" is given on a monthly basis. Therefore, for this calculation:

C_1 (mg/L) = concentration of component "n" in month 1 of quarter
C_2 (mg/L) = concentration of component "n" in month 2 of quarter
C_3 (mg/L) = concentration of component "n" in month 3 of quarter

The volume of salt solution transferred to the Saltstone Facility is determined from PI Process Book trend FQI-1046, and can be broken down into monthly totals. Therefore, for this calculation:

V_1 (gal) = volume of salt solution transferred from Tank 50 in month 1 of the quarter
V_2 (gal) = volume of salt solution transferred from Tank 50 in month 2 of the quarter
V_3 (gal) = volume of salt solution transferred from Tank 50 in month 3 of the quarter

The weighted average composition of component "n" in the salt solution for the quarter is obtained using the following equation:

$$C_A \text{ (average in salt solution) (mg/L)} = \frac{C_1V_1 + C_2V_2 + C_3V_3}{V_1 + V_2 + V_3}$$

The weight averaged concentration of component "n" in saltstone is then obtained using the following equation:

$$C_{AG} \text{ (average in saltstone) (mg/L)} = C_A * \frac{1L\ SS}{1.76L\ grout}$$

Since Sodium is reported in units of molarity, it is necessary to make the following conversion before conducting the weighted average composition calculation for sodium:

$$C_{Na} \text{ (mg/L)} = M_{Na}(mol/L) * \frac{22990mg}{mol}$$

The concentration of aluminate is not directly measured by Savannah River Remediation. Since elemental aluminum is primarily converted to aluminate ions at the high pH levels found in the Salt Solution, it is assumed that the concentration of the aluminate ion can be determined through the following relationship:

$$C_{[Al(OH)_4]}\ (mg/L) = C_{Al}\ (mg/L) * \frac{3.52mg\ [Al(OH)_4]}{1mg\ Al}$$

<u>Radiological Composition of Saltstone</u>

The radiological composition of Saltstone is determined using a similar weighted averaging method to what was used for the chemical composition of saltstone. The concentrations of the radiological elements is measured and reported in units of pCi/mL.

Concentration of a radiological salt waste component of interest "m" is given on a monthly basis. Therefore, for this calculation:

R_1 (pCi/mL) = concentration of radiological component "m" in month 1 of quarter
R_2 (pCi/mL) = concentration of radiological component "m" in month 2 of quarter
R_3 (pCi/mL) = concentration of radiological component "m" in month 3 of quarter

The weighted average composition of component "m" in the salt solution for the quarter is obtained using the following equation:

$$R_{AS}\text{ (average in salt solution) (pCi/mL)} = \frac{R_1V_1 + R_2V_2 + R_3V_3}{V_1 + V_2 + V_3}$$

The weight averaged concentration of radiological component "m" in saltstone is then obtained using the following equation:

$$R_{AG}\text{ (average in saltstone) (pCi/mL)} = R_{AS} * \frac{1\ L\ SS}{1.76\ L\ grout}$$

The total curies disposed during the quarter is determined by summing the individual component concentrations (using the less-than-reportables at their measurable limit) and multiplying by the volume of salt solution transferred from Tank 50 during the quarter.

$$\text{Curies Disposed (kCi)} = R_{total}(pCi/mL) * V_{total}(gal) * \frac{kCi}{10^{15}\ pCi} * \frac{3785.4mL}{gal}$$

Remaining Vault Volume

There are presently 5 cells used to determine remaining vault volume: B, F, J, H, L. Each cell is approximately square with side length of 98.5 ft and can be poured with grout up to 23 ft. The total volume remaining for grout in the five cells is therefore:

$$\text{Remaining Volume (kgal)} = (5 * 23\,ft - \textit{total saltstone height}) * 98.5^2\ ft^2 * \frac{0.00748kgal}{ft^3}$$

Results and Conclusion:

The results of this calculation from the fourth quarter of 2010 are listed in tables 1, 2, 4, 6, and 7; located in appendix 1. The updated results from the third quarter of 2010 are listed in tables 3 and 5; also located in appendix 1.

APPENDIX 1

CONSENT ORDER OF DISMISSAL, SECTION III.7
WEBSITE DATA
FOURTH QUARTER 2010 and UPDATED THIRD QUARTER 2010

Table 1: Saltstone Processing Summary, 4th Quarter 2010

4th Quarter 2010						
Run Dates	***Production Cell***	***W/P Ratio***	***Specified SFT SPG***	***Tk50 Xfer gal***	***Total Grout gal***	***Bleed Water Return gal***
No transfers Oct. 2010						
Monthly Total				0.00E+00	0.00E+00	0.00E+00
11/8/2010	J	***0.62***	***1.19***	0.00E+00	4.90E+03	0.00E+00
11/11/2010	J	***0.62***	***1.19***	0.00E+00	9.60E+03	0.00E+00
11/15/2010	J	***0.62***	***1.19***	0.00E+00	5.88E+03	1.39E+03
11/16/2010				0.00E+00	0.00E+00	2.07E+03
11/17/2010	J	***0.62***	***1.19***	2.29E+04	4.34E+04	2.09E+03
11/18/2010				0.00E+00	0.00E+00	1.96E+03
11/19/2010	J	***0.62***	***1.19***	1.95E+04	3.43E+04	1.86E+03
11/20/2010				0.00E+00	0.00E+00	2.21E+03
11/22/2010	L	***0.62***	***1.19***	2.13E+04	3.57E+04	1.11E+03
11/23/2010				0.00E+00	0.00E+00	5.36E+02
11/24/2010				0.00E+00	0.00E+00	3.17E+02
11/25/2010				0.00E+00	0.00E+00	2.70E+02
11/27/2010				0.00E+00	0.00E+00	2.45E+03
Monthly Total				6.37E+04	1.34E+05	1.63E+04
12/1/2010	J	***0.62***	***1.19***	0.00E+00	1.55E+03	0.00E+00
12/3/2010	J	***0.62***	***1.19***	3.00E+04	7.33E+03	2.35E+03
12/4/2010				0.00E+00	0.00E+00	1.97E+03
12/5/2010				0.00E+00	0.00E+00	3.05E+02
12/6/2010	L	***0.62***	***1.19***	3.21E+04	3.85E+03	1.42E+03
12/10/2010	J	***0.61***	***1.19***	2.08E+04	2.16E+04	2.85E+03
12/11/2010				0.00E+00	0.00E+00	2.64E+03
12/13/2010	J	***0.61***	***1.19***	2.02E+04	1.74E+04	1.54E+03
12/14/2010				0.00E+00	0.00E+00	1.88E+03
12/15/2010				0.00E+00	0.00E+00	8.18E+02
12/16/2010				0.00E+00	0.00E+00	7.07E+02
12/17/2010	L	***0.60***	***1.19***	2.63E+04	3.62E+04	9.97E+02
12/18/2010				0.00E+00	0.00E+00	8.63E+02
12/19/2010				0.00E+00	0.00E+00	2.73E+02
Monthly Total				1.29E+05	8.79E+04	1.86E+04
Quarter Total		***0.62***	***1.19***	1.93E+05	2.22E+05	3.49E+04

Note: Water-to-premix ratio (W/P) shown above represents the weight of free water added to the saltstone process for every pound of dry premix fed to the mixer.

Table 2: Consent Order of Dismissal, Section III.7
Z-Area Saltstone Disposal Facility Permit
General Condition B.5.a-h Information
Fourth Quarter 2010

4th Quarter 2010			
Permit Condition	**Requirement**	**Estimated Value**	**Updated Value**
B.5 a)	Cumulative process volume of salt waste disposed to date	Not Applicable	4174 thousand gallons (kgals)
b)	Process volume of saltstone grout disposed and vault location (cell identity) for the reporting period	Not Applicable	222 kgals Vault 4, Cell J, L
c)	Cumulative process volume of saltstone grout disposed to date	Not Applicable	6833 kgals
d)	Remaining vault volume;	Not Applicable	4.8E+03 kgals
e)	Curies disposed and vault location for the reporting period	8 kilocuries (kCi) Vault 4, Cell J, L	
f)	Cumulative inventory of curies disposed to date	522 kCi Vault 4, Cells D, E, F, J, K, L	
g)	Curies of highly radioactive radionuclides disposed and vault location for the reporting period	8 kilocuries (kCi) Vault 4, Cell J, L	
h)	Cumulative inventory of highly radioactive radionuclides disposed to date	520 kCi Vault 4, Cells D, E, F, J, K, L	

Table 3: Consent Order of Dismissal, Section III.7
Z-Area Saltstone Disposal Facility Permit
General Condition B.5.a-h Information
Updated Third Quarter 2010

Third Quarter 2010 General Information			
Permit Condition	**Requirement**	**Estimated Value**	**Updated Value**
B.5 a)	Cumulative process volume of salt waste disposed to date	Not Applicable	3981 thousand gallons (kgals)
b)	Process volume of saltstone grout disposed and vault location (cell identity) for the reporting period	Not Applicable	228 kgals Vault 4, Cell F, J, L
c)	Cumulative process volume of saltstone grout disposed to date	Not Applicable	6611 kgals
d)	Remaining vault volume;	Not Applicable	5.2E+03 kgals
e)	Curies disposed and vault location for the reporting period	7 kilocuries (kCi) Vault 4, Cell F, J, L	7 kilocuries (kCi) Vault 4, Cell F, J, L
f)	Cumulative inventory of curies disposed to date	514 kCi Vault 4, Cells D, E, F, J, K, L	514 kCi Vault 4, Cells D, E, F, J, K, L
g)	Curies of highly radioactive radionuclides disposed and vault location for the reporting period	7 kilocuries (kCi) Vault 4, Cell F, J, L	7 kilocuries (kCi) Vault 4, Cell F, J, L
h)	Cumulative inventory of highly radioactive radionuclides disposed to date	512 kCi Vault 4, Cells D, E, F, J, K, L	512 kCi Vault 4, Cells D, E, F, J, K, L

Table 4: Consent Order of Dismissal, Section III.7 (1)
Chemical and Radiological Composition of Salt Waste and Saltstone
Fourth Quarter 2010

Estimated Compositions for the 4th Quarter 2010		
Chemical Name	**Mass Averaged Concentration for Quarter**	
	Average in Salt Solution	Average in Grout
Major Constituent	mg/L	mg/L
Water [H_2O]	8.99E+05	5.09E+05
Portland (II) Cement	0.00E+00	8.27E+04
Class F Flyash	0.00E+00	3.72E+05
Grade 100/120 Slag	0.00E+00	3.72E+05
Solvated Ions		
Aluminate [$Al(OH)_4$]	1.23E+04	6.93E+03
Carbonate [CO_3^{2-}]	7.13E+03	4.03E+03
Chloride [Cl^-]	2.03E+02	1.15E+02
Fluoride [F^-]	1.48E+02	8.37E+01
Hydroxide [OH^-]	2.95E+04	1.67E+04
Nitrate [NO_3^-]	1.39E+05	7.89E+04
Nitrite [NO_2^-]	1.66E+04	9.37E+03
Sulfate [SO_4^{2-}]	5.38E+03	3.04E+03
RCRA Hazardous Metals		
Arsenic [As]	1.83E-01	1.03E-01
Barium [Ba]	7.44E-01	4.21E-01
Cadmium [Cd]	8.95E-01	5.06E-01
Chromium [Cr]	5.69E+01	3.22E+01
Lead [Pb]	3.68E+00	2.08E+00
Mercury [Hg]	1.77E+01	1.00E+01
Selenium [Se]	3.27E-01	1.85E-01
Silver [Ag]	2.94E+00	1.66E+00
Other Metals		
Aluminum [Al]	3.48E+03	1.97E+03
Boron [B]	1.13E+02	6.39E+01
Cobalt [Co]	<1.64E-01	<9.28E-02
Copper [Cu]	<1.38E+00	<7.81E-01
Iron [Fe]	1.88E+02	1.06E+02
Lithium [Li]	<7.37E+00	<4.17E+00
Manganese [Mn]	1.33E+02	7.52E+01
Molybdenum [Mo]	2.95E+01	1.67E+01
Nickel [Ni]	9.54E+00	5.40E+00
Sodium [Na]**	9.08E+04	5.14E+04
Strontium [Sr]	8.88E-02	5.02E-02
Zinc [Zn]	5.74E+00	3.25E+00
Organic Compounds		
Tetraphenylborate [$B(C_6H_5)^{4-}$]	4.76E+00	2.69E+00
Total Organic Carbon	4.32E+02	2.44E+02
Total Insoluble Solids		
Total Insoluble Solids	2.21E+03	1.25E+03

**Sodium Monthly Concentration reported in molarity, Mass Averaged Concentrations for Sodium are reported in the standard mg/L

Table 4 (Cont'd): Consent Order of Dismissal, Section III.7 (1)
Chemical and Radiological Composition of Salt Waste and Saltstone (continued)
Fourth Quarter 2010

Estimated Compositions for the 4th Quarter 2010		
Radionuclide	**Mass Averaged Concentration for Quarter**	
	Average in Salt Solution	Average in Grout
	pCi/mL	pCi/mL
H-3	5.88E+02	3.32E+02
C-14	3.53E+02	2.00E+02
Co-60	7.69E+00	4.35E+00
Ni-59	<2.48E-01	<1.40E-01
Ni-63	1.19E+03	6.73E+02
Se-79*	3.07E+02	1.74E+02
Sr-90*	1.08E+05	6.10E+04
Y-90*	1.08E+05	6.10E+04
Tc-99*	3.00E+04	1.69E+04
Ru-106	<3.43E+00	<1.94E+00
Rh-106	<3.43E+00	<1.94E+00
Sb-125	6.76E+03	3.82E+03
Te-125m	6.76E+03	3.82E+03
I-129*	1.54E+01	8.71E+00
Cs-134	<5.77E+02	<3.26E+02
Cs-137*	5.64E+06	3.19E+06
Ba-137m*	5.34E+06	3.02E+06
Ce-144	<5.63E+00	<3.18E+00
Pr-144	<5.63E+00	<3.18E+00
Pm-147	<6.17E+02	<3.49E+02
Eu-154	3.23E+02	1.83E+02
Np-237 (α) ($t_{1/2}$) > 5 yr	<1.10E+01	<6.22E+00
Pu-238* (α) ($t_{1/2}$) > 5 yr	2.98E+04	1.69E+04
Pu-239* (α) ($t_{1/2}$) > 5 yr	1.97E+03	1.11E+03
Pu-240 (α) ($t_{1/2}$) > 5 yr	1.97E+03	1.11E+03
Pu-241	3.29E+04	1.86E+04
Pu-242 (α) ($t_{1/2}$) > 5 yr	<5.95E+01	<3.37E+01
Am-241* (α) ($t_{1/2}$) > 5 yr	1.18E+03	6.67E+02
Am-242m	3.45E-01	1.95E-01
Cm-242 (α)	2.86E-01	1.62E-01
Cm-244* (α) ($t_{1/2}$) > 5 yr	2.68E+03	1.52E+03
Cm-245 (α) ($t_{1/2}$) > 5 yr	<1.14E+01	<6.45E+00
Total Transuranic Alpha Emitters with ($t_{1/2}$) > 5 years	4.02E+04	2.28E+04

* Indicates Radionuclide is considered a "highly radioactive nuclide"

Table 5: Consent Order of Dismissal, Section III.7 (1)
Chemical and Radiological Composition of Salt Waste and Saltstone
Updated Third Quarter 2010

Estimated Compositions for the 3rd Quarter 2010			Updated Compositions	
Chemical Name	Mass Averaged Concentration for Quarter		Mass Averaged Concentration for Quarter	
	Average in Salt Solution	Average in Grout	Average in Salt Solution	Average in Grout
Major Constituent	mg/L	mg/L	mg/L	mg/L
Water [H_2O]	9.18E+05	5.8E+05	9.18E+05	5.8E+05
Portland (II) Cement	0.00E+00	9.7E+03	0.00E+00	9.7E+04
Class F Flyash	0.00E+00	4.4E+04	0.00E+00	4.4E+05
Grade 100/120 Slag	0.00E+00	4.4E+04	0.00E+00	4.4E+05
Solvated Ions				
Aluminate [$Al(OH)_4$]	1.24E+04	7.8E+03	1.18E+04	7.5E+03
Carbonate [CO_3^{2-}]	8.13E+03	5.1E+03	8.38E+03	5.3E+03
Chloride [Cl^-]	2.59E+02	1.6E+02	1.76E+02	1.1E+02
Fluoride [F^-]	2.25E+02	1.4E+02	1.07E+02	6.8E+01
Hydroxide [OH^-]	2.67E+04	1.7E+04	2.51E+04	1.6E+04
Nitrate [NO_3^-]	1.61E+05	1.0E+05	1.47E+05	9.3E+04
Nitrite [NO_2^-]	1.00E+04	6.3E+03	8.59E+03	5.4E+03
Sulfate [SO_4^{2-}]	6.26E+03	4.0E+03	5.85E+03	3.7E+03
RCRA Hazardous Metals				
Arsenic [As]	1.89E-01	1.2E-01	1.53E-01	9.7E-02
Barium [Ba]	1.88E+00	1.2E+00	1.74E+00	1.1E+00
Cadmium [Cd]	6.72E-01	4.2E-01	6.67E-01	4.2E-01
Chromium [Cr]	6.67E+01	4.2E+01	5.65E+01	3.6E+01
Lead [Pb]	2.74E+00	1.7E+00	1.47E+00	9.3E-01
Mercury [Hg]	1.83E+01	1.2E+01	1.57E+01	9.9E+00
Selenium [Se]	3.09E-01	2.0E-01	2.56E-01	1.6E-01
Silver [Ag]	2.21E+00	1.4E+00	1.90E+00	1.2E+00
Other Metals				
Aluminum [Al]	3.52E+03	2.2E+03	3.36E+03	2.1E+03
Boron [B]	9.26E+01	5.9E+01	9.26E+01	5.9E+01
Cobalt [Co]	1.05E-01	6.6E-02	1.05E-01	6.6E-02
Copper [Cu]	<1.18E+00	<7.5E-01	<1.18E+00	<7.46E-01
Iron [Fe]	1.69E+02	1.1E+02	1.69E+02	1.1E+02
Lithium [Li]	<1.44E+00	<9.1E-01	<1.44E+00	<9.10E-01
Manganese [Mn]	8.44E+01	5.3E+01	8.44E+01	5.3E+01
Molybdenum [Mo]	3.43E+01	2.2E+01	3.43E+01	2.2E+01
Nickel [Ni]	7.66E+00	4.8E+00	7.66E+00	4.8E+00
Sodium [Na]**	9.58E+04	6.1E+04	4.22E+00	2.7E+00
Strontium [Sr]	9.12E-02	5.8E-02	9.12E-02	5.8E-02
Zinc [Zn]	5.18E+00	3.3E+00	5.18E+00	3.3E+00
Organic Compounds				
Tetraphenylborate [$B(C_6H_5)^{4-}$]	5.18E+00	3.3E+00	5.24E+00	3.3E+00
Total Organic Carbon	5.31E+02	3.4E+02	5.01E+02	3.2E+02
Total Insoluble Solids				
Total Insoluble Solids	5.78E+03	3.7E+03	8.15E+03	5.2E+03

**Sodium Monthly Concentration reported in molarity, Mass Averaged Concentrations for Sodium are reported in the standard mg/L

Table 5 (cont'd): Consent Order of Dismissal, Section III.7 (1)
Chemical and Radiological Composition of Salt Waste and Saltstone
Updated Third Quarter 2010

Estimated Compositions for the 3rd Quarter 2010			Updated Compositions	
Radionuclide	Mass Averaged Concentration for Quarter		Mass Averaged Concentration for Quarter	
	Average in Salt Solution	Average in Grout	Average in Salt Solution	Average in Grout
	pCi/mL	pCi/mL	pCi/mL	pCi/mL
H-3	8.95E+02	5.7E+02	6.53E+02	4.1E+02
C-14	5.74E+02	3.6E+02	8.55E+01	5.4E+01
Co-60	7.87E+00	5.0E+00	7.87E+00	5.0E+00
Ni-59	<3.32E-01	<2.1E-01	<3.32E-01	<2.1E-01
Ni-63	4.26E+02	2.7E+02	5.36E+02	3.4E+02
Se-79*	3.57E+02	2.3E+02	3.57E+02	2.3E+02
Sr-90*	1.01E+05	6.4E+04	6.56E+04	4.1E+04
Y-90*	1.01E+05	6.4E+04	6.56E+04	4.1E+04
Tc-99*	3.03E+04	1.9E+04	2.79E+04	1.8E+04
Ru-106	<3.33E+00	<2.1E+00	<3.33E+00	<2.1E+00
Rh-106	3.33E+00	2.1E+00	<3.33E+00	<2.1E+00
Sb-125	9.26E+03	5.9E+03	9.26E+03	5.9E+03
Te-125m	9.26E+03	5.9E+03	9.26E+03	5.9E+03
I-129*	1.45E+01	9.2E+00	1.49E+01	9.4E+00
Cs-134	<8.33E+01	<5.3E+01	<8.33E+01	<5.3E+01
Cs-137*	6.90E+06	4.4E+06	7.02E+06	4.4E+06
Ba-137m*	6.53E+06	4.1E+06	6.64E+06	4.2E+06
Ce-144	<4.45E+00	<2.8E+00	<4.45E+00	<2.8E+00
Pr-144	<4.45E+00	<2.8E+00	<4.45E+00	<2.8E+00
Pm-147	<6.58E+02	<4.2E+02	<6.58E+02	<4.2E+02
Eu-154	2.65E+02	1.7E+02	2.65E+02	1.7E+02
Np-237 (α) ($t_{1/2}$) > 5 yr	<1.46E+01	<9.2E+00	<1.46E+01	<9.2E+00
Pu-238* (α) ($t_{1/2}$) > 5 yr	2.03E+04	1.3E+04	2.03E+04	1.3E+04
Pu-239* (α) ($t_{1/2}$) > 5 yr	1.17E+03	7.4E+02	1.17E+03	7.4E+02
Pu-240 (α) ($t_{1/2}$) > 5 yr	1.17E+03	7.4E+02	1.17E+03	7.4E+02
Pu-241	5.12E+04	3.2E+04	3.15E+04	2.0E+04
Pu-242 (α) ($t_{1/2}$) > 5 yr	<1.19E+02	<7.5E+01	5.37E-10	3.39E-10
Am-241* (α) ($t_{1/2}$) > 5 yr	1.12E+03	7.1E+02	1.12E+03	7.1E+02
Am-242m	<7.75E-01	<4.9E-01	<7.75E-01	<4.9E-01
Cm-242 (α)	<6.40E-01	<4.0E-01	<6.40E-01	<4.0E-01
Cm-244* (α) ($t_{1/2}$) > 5 yr	1.84E+03	1.2E+03	1.84E+03	1.2E+03
Cm-245 (α) ($t_{1/2}$) > 5 yr	<1.58E+01	<1.0E+01	9.19E-12	5.81E-12
Total Transuranic Alpha Emitters with ($t_{1/2}$) > 5 years	7.58E+04	4.8E+04	4.32E+04	2.7E+04

* Indicates Radionuclide is considered a "highly radioactive nuclide"

Consent Order of Dismissal, Section III.7 (2)
Formulation of Saltstone Used to Treat and Solidify the Salt Waste

The saltstone formulation is defined by the proportions of dry premix components (Type II Portland cement, Class F flyash, and Grade 120/100 slag) and the ratio of the water content in the salt waste to dry premix. Small quantities of admixture are added as required to minimize air entrainment. This has an insignificant effect on the overall grout composition (<0.2 wt% of the overall saltstone composition).

The formulation used for the reporting period is shown below:

Table 6: Saltstone Dry Premix Composition

Component	Weight %
Type II Portland cement	10
Class F flyash	45
Grade 120/100 slag	45

Water to Premix Ratio (by weight) – 0.62

Utilizing this saltstone formulation leads to an overall saltstone composition as shown below (values have been rounded to two significant figures):

Table 7: Overall Saltstone Composition

(Due to rounding, numbers may not add to 100%)

Component	Weight %
Salt Waste	45
Type II Portland cement	6
Grade 120/100 slag	25
Class F flyash	25

APPENDIX 2

CALCULATION SPECIFICS AND COMPOSITION LOCATIONS

Table 8: Excel Spreadsheet Used to Determine Tables 1, 2, 4, 6, and 7

The following excel worksheets labeled Table 8a, 8b, 8c, and 8d show the method in which excel was used to calculate the desired values and create the tables reported above. Any cell highlighted in red indicates a cell that requires a manual input value. The run data was obtained from PI Process Book, and the chemical and radionuclide composition data was obtained from the locations shown in Table 9.

Table 8a: Excel Worksheet 'Process Data'

	B	C	D	E	F	G	H
3	*Run Dates*	*Production Cell*	*W/P Ratio*	*Specified SFT SPG*	*Tk50 Xfer gal*	*Total Grout gal*	*Bleed Water Return gal*
4							
5							
6							
7	Monthly Total				=SUM(F5:F6)	=SUM(G5:G6)	=SUM(H5:H6)
8							
9							
10							
11	Monthly Total				=SUM(F9:F10)	=SUM(G9:G10)	=SUM(H9:H10)
12							
13							
14							
15	Monthly Total				=SUM(F13:F14)	=SUM(G13:G14)	=SUM(H13:H14)
16							
17	Quarter Total				=SUM(F7,F11,F15)	=SUM(G7,G11,G15)	=H7+H11+H15
18							
19							
20	Predicted dissolved solids		wt%		Info from previous quarter:		
21	Reported insoluble solids		wt%				
22	Total solids	=C20+C21	wt%		B.5 a		kgal
23	Total water	=100-C22	wt%		B.5 c		kgal
24	Average Di-1144		SpG		B.5 f		kCi
25					B.5 h		kCi
26	Premix Composition	Component	Weight %				
27		Type II Portland Cement			Present Grout Height		
28		Class F Flyash			Cell		
29		Grade 120/100 slag			B		ft
30					F		ft
31	Saltstone Composition	Component	Weight %		H		ft
32		Salt Solution	=(1/((C23/100/D17)+1))*100		J		ft
33		Type II Portland Cement	=D27*(100-D$32)/100		L		ft
34		Class F Flyash	=D28*(100-D$32)/100		Total	=SUM(G29:G33)	
35		Grade 120/100 slag	=D29*(100-D$32)/100				
36							

Table 8b: Excel Worksheet 'Chem'

	B	C	D	E	F	G	H
1	Important Process Data:						
2	Month 1 Total Tank 50 xfer	='Process Data'!F7	gal	Average SS Conc. in Saltstone		='Process Data'!D32	wt%
3	Month 2 Total Tank 50 xfer	='Process Data'!F11	gal	Average Saltstone Specific Gravity		='Process Data'!C24	
4	Month 3 Total Tank 50 xfer	='Process Data'!F15	gal	Type II Portland Cement in Saltstone		='Process Data'!D33	wt%
5	Weight Percent Water in SS	='Process Data'!C23	wt%	Class F Flyash in Saltstone		='Process Data'!D34	wt%
6	Average Salt Solution SpG	='Process Data'!E17		Grade 120/100 Slag in Saltstone		='Process Data'!D35	wt%
7	**Estimated Compositions for the 3rd Quarter 2010**						
8	**Chemical Name**	**Reported Monthly Values**			**Mass Averaged Concentration for Quarter**		
		Month 1	Month 2	Month 3	Average in Salt Solution	Average in Saltstone	
9		mg/L	mg/L	mg/L	mg/L	mg/L	
10	**Major Constituent**						
11	Water [H_2O]	=$C$6*$C$5/100*1000*1000	=$C$6*$C$5/100*1000*1000	=$C$6*$C$5/100*1000*1000	=(C11*C$2+D11*C$3+E11*C$4)/SUM(C$2:C$4)	=F11*G$2/100)*(1/C$6)*(G$3)	
12	Portland (II) Cement		N/A	N/A	N/A 0	=G4*G3*1000	
13	Class F Flyash		N/A	N/A	N/A 0	=G3*G5*1000	
14	Grade 100/120 Slag		N/A	N/A	N/A 0	=G6*G3*1000	
15	**Solvated Ions**						
16	Aluminate [$Al(OH)_4$]	=3.52*C34	=3.52*D34	=3.52*E34	=(C16*C$2+D16*C$3+E16*C$4)/SUM(C$2:C$4)	=(F16*G$2/100)*(1/C$6)*(G$3)	
17	Carbonate [CO_3^{-2}]				=(C17*C$2+D17*C$3+E17*C$4)/SUM(C$2:C$4)	=(F17*G$2/100)*(1/C$6)*(G$3)	
18	Chloride [Cl]				=(C18*C$2+D18*C$3+E18*C$4)/SUM(C$2:C$4)	=(F18*G$2/100)*(1/C$6)*(G$3)	
19	Fluoride [F]				=(C19*C$2+D19*C$3+E19*C$4)/SUM(C$2:C$4)	=(F19*G$2/100)*(1/C$6)*(G$3)	
20	Hydroxide [OH]				=(C20*C$2+D20*C$3+E20*C$4)/SUM(C$2:C$4)	=(F20*G$2/100)*(1/C$6)*(G$3)	
21	Nitrate [NO_3]				=(C21*C$2+D21*C$3+E21*C$4)/SUM(C$2:C$4)	=(F21*G$2/100)*(1/C$6)*(G$3)	
22	Nitrite [NO_2]				=(C22*C$2+D22*C$3+E22*C$4)/SUM(C$2:C$4)	=(F22*G$2/100)*(1/C$6)*(G$3)	
23	Sulfate [SO_4^{-2}]				=(C23*C$2+D23*C$3+E23*C$4)/SUM(C$2:C$4)	=(F23*G$2/100)*(1/C$6)*(G$3)	
24	**RCRA Hazardous Metals**						
25	Arsenic [As]				=(C25*C$2+D25*C$3+E25*C$4)/SUM(C$2:C$4)	=(F25*G$2/100)*(1/C$6)*(G$3)	
26	Barium [Ba]				=(C26*C$2+D26*C$3+E26*C$4)/SUM(C$2:C$4)	=(F26*G$2/100)*(1/C$6)*(G$3)	
27	Cadmium [Cd]				=(C27*C$2+D27*C$3+E27*C$4)/SUM(C$2:C$4)	=(F27*G$2/100)*(1/C$6)*(G$3)	
28	Chromium [Cr]				=(C28*C$2+D28*C$3+E28*C$4)/SUM(C$2:C$4)	=(F28*G$2/100)*(1/C$6)*(G$3)	
29	Lead [Pb]				=(C29*C$2+D29*C$3+E29*C$4)/SUM(C$2:C$4)	=(F29*G$2/100)*(1/C$6)*(G$3)	
30	Mercury [Hg]				=(C30*C$2+D30*C$3+E30*C$4)/SUM(C$2:C$4)	=(F30*G$2/100)*(1/C$6)*(G$3)	
31	Selenium [Se]				=(C31*C$2+D31*C$3+E31*C$4)/SUM(C$2:C$4)	=(F31*G$2/100)*(1/C$6)*(G$3)	
32	Silver [Ag]				=(C32*C$2+D32*C$3+E32*C$4)/SUM(C$2:C$4)	=(F32*G$2/100)*(1/C$6)*(G$3)	
33	**Other Metals**						
34	Aluminum [Al]				=(C34*C$2+D34*C$3+E34*C$4)/SUM(C$2:C$4)	=(F34*G$2/100)*(1/C$6)*(G$3)	
35	Boron [B]				=(C35*C$2+D35*C$3+E35*C$4)/SUM(C$2:C$4)	=(F35*G$2/100)*(1/C$6)*(G$3)	
36	Cobalt [Co]				=(C36*C$2+D36*C$3+E36*C$4)/SUM(C$2:C$4)	=(F36*G$2/100)*(1/C$6)*(G$3)	
37	Copper [Cu]				=(C37*C$2+D37*C$3+E37*C$4)/SUM(C$2:C$4)	=(F37*G$2/100)*(1/C$6)*(G$3)	
38	Iron [Fe]				=(C38*C$2+D38*C$3+E38*C$4)/SUM(C$2:C$4)	=(F38*G$2/100)*(1/C$6)*(G$3)	
39	Lithium [Li]				=(C39*C$2+D39*C$3+E39*C$4)/SUM(C$2:C$4)	=(F39*G$2/100)*(1/C$6)*(G$3)	
40	Manganese [Mg]				=(C40*C$2+D40*C$3+E40*C$4)/SUM(C$2:C$4)	=(F40*G$2/100)*(1/C$6)*(G$3)	
41	Molybdenum [Mo]				=(C41*C$2+D41*C$3+E41*C$4)/SUM(C$2:C$4)	=(F41*G$2/100)*(1/C$6)*(G$3)	
42	Nickel [Ni]				=(C42*C$2+D42*C$3+E42*C$4)/SUM(C$2:C$4)	=(F42*G$2/100)*(1/C$6)*(G$3)	
43	Sodium [Na]**				=(C43*C$2+D43*C$3+E43*C$4)/SUM(C$2:C$4)*22990	=(F43*G$2/100)*(1/C$6)*(G$3)	
44	Strontium [Sr]				=(C44*C$2+D44*C$3+E44*C$4)/SUM(C$2:C$4)	=(F44*G$2/100)*(1/C$6)*(G$3)	
45	Zinc [Zn]				=(C45*C$2+D45*C$3+E45*C$4)/SUM(C$2:C$4)	=(F45*G$2/100)*(1/C$6)*(G$3)	
46	**Organic Compounds**						
47	Tetraphenylborate [$B(C_6H_5)_4^-$]				=(C47*C$2+D47*C$3+E47*C$4)/SUM(C$2:C$4)	=(F47*G$2/100)*(1/C$6)*(G$3)	
48	Total Organic Carbon				=(C48*C$2+D48*C$3+E48*C$4)/SUM(C$2:C$4)	=(F48*G$2/100)*(1/C$6)*(G$3)	
49	**Total Insoluble Solids**						
50	Total Insoluble Solids				=(C50*C$2+D50*C$3+E50*C$4)/SUM(C$2:C$4)	=(F50*G$2/100)*(1/C$6)*(G$3)	
51							
52	**Sodium Monthly Concentration reported in molarity; Mass Averaged Concentrations for Sodium are reported in the standard mg/L						

Table 8c: Excel Worksheet 'Rad'

	B	C	D	E	F	G	H
2	Month 1 Total Tank 50 xfer	='Process Data'!F7	gal	Average SS Concentration in Saltstone		='Process Data'!D32	wt%
3	Month 2 Total Tank 50 xfer	='Process Data'!F11	gal	Average Saltstone Specific Gravity		='Process Data'!C24	
4	Month 3 Total Tank 50 xfer	='Process Data'!F15	gal	Type II Portland Cement in Saltstone		='Process Data'!D33	wt%
5	Weight Percent Water in SS	='Process Data'!C23	wt%	Class F Flyash in Saltstone		='Process Data'!D34	wt%
6	Average Salt Solution SpG	='Process Data'!E17		Grade 120/100 slag in Saltstone		='Process Data'!D35	wt%
7							
8	Estimated Compositions for the 3rd Quarter 2010						
9	Radionuclide	Reported Monthly Values			Mass Averaged Concentration for Quarter		
10		Month 1	Month 2	Month 3	Average in Salt Solution	Average in Saltstone	
11		pCi/mL	pCi/mL	pCi/mL	pCi/mL	pCi/mL	
12	H-3				=(C12*C$2+D12*C$3+E12*C$4)/SUM(C$2:C$4)	=(F12*G$2/100)*(1/C$6)*(G$3)	
13	C-14				=(C13*C$2+D13*C$3+E13*C$4)/SUM(C$2:C$4)	=(F13*G$2/100)*(1/C$6)*(G$3)	
14	Co-60				=(C14*C$2+D14*C$3+E14*C$4)/SUM(C$2:C$4)	=(F14*G$2/100)*(1/C$6)*(G$3)	
15	Ni-59				=(C15*C$2+D15*C$3+E15*C$4)/SUM(C$2:C$4)	=(F15*G$2/100)*(1/C$6)*(G$3)	
16	Ni-63				=(C16*C$2+D16*C$3+E16*C$4)/SUM(C$2:C$4)	=(F16*G$2/100)*(1/C$6)*(G$3)	
17	Se-79*				=(C17*C$2+D17*C$3+E17*C$4)/SUM(C$2:C$4)	=(F17*G$2/100)*(1/C$6)*(G$3)	
18	Sr-90*				=(C18*C$2+D18*C$3+E18*C$4)/SUM(C$2:C$4)	=(F18*G$2/100)*(1/C$6)*(G$3)	
19	Y-90*	N/A	N/A		=F18	=(F19*G$2/100)*(1/C$6)*(G$3)	
20	Tc-99*				=(C20*C$2+D20*C$3+E20*C$4)/SUM(C$2:C$4)	=(F20*G$2/100)*(1/C$6)*(G$3)	
21	Ru-106				=(C21*C$2+D21*C$3+E21*C$4)/SUM(C$2:C$4)	=(F21*G$2/100)*(1/C$6)*(G$3)	
22	Rh-106	N/A	N/A		=F21	=(F22*G$2/100)*(1/C$6)*(G$3)	
23	Sb-125				=(C23*C$2+D23*C$3+E23*C$4)/SUM(C$2:C$4)	=(F23*G$2/100)*(1/C$6)*(G$3)	
24	Te-125m	N/A	N/A		=F23	=(F24*G$2/100)*(1/C$6)*(G$3)	
25	I-129*				=(C25*C$2+D25*C$3+E25*C$4)/SUM(C$2:C$4)	=(F25*G$2/100)*(1/C$6)*(G$3)	
26	Cs-134				=(C26*C$2+D26*C$3+E26*C$4)/SUM(C$2:C$4)	=(F26*G$2/100)*(1/C$6)*(G$3)	
27	Cs-137*				=(C27*C$2+D27*C$3+E27*C$4)/SUM(C$2:C$4)	=(F27*G$2/100)*(1/C$6)*(G$3)	
28	Ba-137m*	N/A	N/A		=F27*0.946	=(F28*G$2/100)*(1/C$6)*(G$3)	
29	Ce-144				=(C29*C$2+D29*C$3+E29*C$4)/SUM(C$2:C$4)	=(F29*G$2/100)*(1/C$6)*(G$3)	
30	Pr-144	N/A	N/A		=F29	=(F30*G$2/100)*(1/C$6)*(G$3)	
31	Pm-147				=(C31*C$2+D31*C$3+E31*C$4)/SUM(C$2:C$4)	=(F31*G$2/100)*(1/C$6)*(G$3)	
32	Eu-154				=(C32*C$2+D32*C$3+E32*C$4)/SUM(C$2:C$4)	=(F32*G$2/100)*(1/C$6)*(G$3)	
33	Np-237 (α) ($t_{1/2}$) > 5 yr				=(C33*C$2+D33*C$3+E33*C$4)/SUM(C$2:C$4)	=(F33*G$2/100)*(1/C$6)*(G$3)	
34	Pu-238* (α) ($t_{1/2}$) > 5 yr				=(C34*C$2+D34*C$3+E34*C$4)/SUM(C$2:C$4)	=(F34*G$2/100)*(1/C$6)*(G$3)	
35	Pu-239* (α) ($t_{1/2}$) > 5 yr				=(C35*C$2+D35*C$3+E35*C$4)/SUM(C$2:C$4)	=(F35*G$2/100)*(1/C$6)*(G$3)	
36	Pu-240 (α) ($t_{1/2}$) > 5 yr				=(C36*C$2+D36*C$3+E36*C$4)/SUM(C$2:C$4)	=(F36*G$2/100)*(1/C$6)*(G$3)	
37	Pu-241				=(C37*C$2+D37*C$3+E37*C$4)/SUM(C$2:C$4)	=(F37*G$2/100)*(1/C$6)*(G$3)	
38	Pu-242 (α) ($t_{1/2}$) > 5 yr				=(C38*C$2+D38*C$3+E38*C$4)/SUM(C$2:C$4)	=(F38*G$2/100)*(1/C$6)*(G$3)	
39	Am-241* (α) ($t_{1/2}$) > 5 yr				=(C39*C$2+D39*C$3+E39*C$4)/SUM(C$2:C$4)	=(F39*G$2/100)*(1/C$6)*(G$3)	
40	Am-242m				=(C40*C$2+D40*C$3+E40*C$4)/SUM(C$2:C$4)	=(F40*G$2/100)*(1/C$6)*(G$3)	
41	Cm-242 (α)				=(C41*C$2+D41*C$3+E41*C$4)/SUM(C$2:C$4)	=(F41*G$2/100)*(1/C$6)*(G$3)	
42	Cm-244* (α) ($t_{1/2}$) > 5 yr				=(C42*C$2+D42*C$3+E42*C$4)/SUM(C$2:C$4)	=(F42*G$2/100)*(1/C$6)*(G$3)	
43	Cm-245 (α) ($t_{1/2}$) > 5 yr				=(C43*C$2+D43*C$3+E43*C$4)/SUM(C$2:C$4)	=(F43*G$2/100)*(1/C$6)*(G$3)	
44	Total Transuranic Alpha Emitters with ($t_{1/2}$) > 5 years				=(C44*C$2+D44*C$3+E44*C$4)/SUM(C$2:C$4)	=(F44*G$2/100)*(1/C$6)*(G$3)	
45							
46	* Indicates Radionuclide is considered a "highly radioactive nuclide"						

Table 8d: Excel Worksheet 'General Information'

Third Quarter 2010 General Information				
Permit Condition		**Requirement**	**Estimated Value**	**Updated Value**
B.5	**a)**	Cumulative process volume of salt waste disposed to date	Not Applicable	='Process Data'!G29+('Process Data'!F24/1000)
	b)	Process volume of saltstone grout disposed and vault location (cell identity) for the reporting period	Not Applicable	='Process Data'!G24/1000 Vault 4, Cell F, J, L
	c)	Cumulative process volume of saltstone grout disposed to date	Not Applicable	='Process Data'!G30+'Process Data'!G24/1000
	d)	Remaining vault volume;	Not Applicable	=(5*23-'Process Data'!G41)*98.5^2*7.48/1000
	e)	Curies disposed and vault location for the reporting period	=(SUM(Rad!F12:Rad!F43))/(10^12*1000)*(3785.412*' Vault 4, Cell F, J, L	=(SUM(Rad!K12:Rad!K43))/(10^12*1000)*(3785.412*'Process Data'!F24) Vault 4, Cell F, J, L
	f)	Cumulative inventory of curies disposed to date	=D9+'Process Data'!G31 Vault 4, Cells D, E, F, J, K, L	=E9+'Process Data'!G31 Vault 4, Cells D, E, F, J, K, L
	g)	Curies of highly radioactive radionuclides disposed and vault location for the reporting period	=SUM(Rad!F17:F20,Rad!F25,Rad!F27,Rad!F28,Rad!F Vault 4, Cell F, J, L	=SUM(Rad!K17:K20,Rad!K25,Rad!K27,Rad!K28,Rad!K34:K35,Rad!K39,Rad! Vault 4, Cell F, J, L
	h)	Cumulative inventory of highly radioactive radionuclides disposed to date	=D13+'Process Data'!G32 Vault 4, Cells D, E, F, J, K, L	=E13+'Process Data'!G32 Vault 4, Cells D, E, F, J, K, L

Table 9: Locations for Monthly Component Composition

Chemical Name	Location
Major Constituent	
Water [H_2O]	Calculated
Portland (II) Cement	Calculated
Class F Flyash	Calculated
Grade 100/120 Slag	Calculated
Solvated Ions	
Aluminate [$Al(OH)_4$]	Calculated
Carbonate [CO_3^{2-}]	Tk 50 Mass Balance
Chloride [Cl^-]	Tk 50 Mass Balance
Fluoride [F^-]	Tk 50 Mass Balance
Hydroxide [OH^-]	Tk 50 Mass Balance
Nitrate [NO_3^-]	Tk 50 Mass Balance
Nitrite [NO_2^-]	Tk 50 Mass Balance
Sulfate [SO_4^{2-}]	Tk 50 Mass Balance
RCRA Hazardous Metals	
Arsenic [As]	Tk 50 Mass Balance
Barium [Ba]	Tk 50 Mass Balance
Cadmium [Cd]	Tk 50 Mass Balance
Chromium [Cr]	Tk 50 Mass Balance
Lead [Pb]	Tk 50 Mass Balance
Mercury [Hg]	Tk 50 Mass Balance
Selenium [Se]	Tk 50 Mass Balance
Silver [Ag]	Tk 50 Mass Balance
Other Metals	
Aluminum [Al]	Tk 50 Mass Balance
Boron [B]	SRNL Tank 50 WAC Sample
Cobalt [Co]	SRNL Tank 50 WAC Sample
Copper [Cu]	SRNL Tank 50 WAC Sample
Iron [Fe]	SRNL Tank 50 WAC Sample
Lithium [Li]	SRNL Tank 50 WAC Sample
Manganese [Mg]	SRNL Tank 50 WAC Sample
Molybdenum [Mo]	SRNL Tank 50 WAC Sample
Nickel [Ni]	SRNL Tank 50 WAC Sample
Sodium [Na]	Tk 50 Mass Balance
Strontium [Sr]	SRNL Tank 50 WAC Sample
Zinc [Zn]	SRNL Tank 50 WAC Sample
Organic Compounds	
Tetraphenylborate [$B(C_6H_5)^{4-}$]	Tk 50 Mass Balance
Total Organic Carbon	Tk 50 Mass Balance
Total Insoluble Solids	
Total Insoluble Solids	Tk 50 Mass Balance

Radionuclide	Location
H-3	Tk 50 Mass Balance
C-14	Tk 50 Mass Balance
Co-60	SRNL Tank 50 WAC Sample
Ni-59	SRNL Tank 50 WAC Sample
Ni-63	Tk 50 Mass Balance
Se-79*	SRNL Tank 50 WAC Sample
Sr-90*	Tk 50 Mass Balance
Y-90*	Calculated
Tc-99*	Tk 50 Mass Balance
Ru-106	SRNL Tank 50 WAC Sample
Rh-106	Calculated
Sb-125	SRNL Tank 50 WAC Sample
Te-125m	Calculated
I-129*	Tk 50 Mass Balance
Cs-134	SRNL Tank 50 WAC Sample
Cs-137*	Tk 50 Mass Balance
Ba-137m*	Calculated
Ce-144	SRNL Tank 50 WAC Sample
Pr-144	Calculated
Pm-147	SRNL Tank 50 WAC Sample
Eu-154	SRNL Tank 50 WAC Sample
Np-237 (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Pu-238* (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Pu-239* (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Pu-240 (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Pu-241	Tk 50 Mass Balance
Pu-242 (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample (Estimate) Alternative Determination of SDF Radionuclides (Updated)
Am-241* (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Am-242m	SRNL Tank 50 WAC Sample
Cm-242 (α)	SRNL Tank 50 WAC Sample
Cm-244* (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample
Cm-245 (α) ($t_{1/2}$) > 5 yr	SRNL Tank 50 WAC Sample (Estimate) Alternative Determination of SDF Radionuclides (Updated)
Total Transuranic Alpha Emitters with ($t_{1/2}$) > 5 years	Tk 50 Mass Balance