GTCC LLW ENVIRONMENTAL IMPACT STATEMENT: POST-CLOSURE PERFORMANCE DATA PACKAGE

Waste Isolation Pilot Plant

ADDENDUM B
REVISED INVENTORY

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1. INTRODUCTION

This addendum to *GTCC LLW Environmental Impact Statement, Post-Closure Assessment Data Package, Site A – Waste Isolation Pilot Plant* (SNL 2008a) is to update the post-closure assessment in light of updated inventory information (ANL 2010). The same methodology and assumptions contained in the parent document (SNL 2008a) are used in this addendum, and the reader is referred to that document for additional detail.

2. APPROACH

The approach used in the post-closure performance calculations for this update is to analyze the GTCC LLW and GTCC-like waste as a whole. Per direction from the Department of Energy, a second scenario which excludes some waste will also be analyzed. The first case, denoted S1, includes all the Groups 1 and 2 waste, while the second case, denoted S2, includes all the Groups 1 and 2 waste, minus the West Valley decommissioning waste.

The same assumptions and procedures that were used in the parent document will be used for this analysis. Table 1 provides a summary of the Group 1 volumes, container types and number of containers, while Table 2 summarizes the same information for Group 2. The methods and assumptions used to formulate the information summarized in Table 1 and Table 2 are documented in ANL (2010) and SNL (2008b).

Based on the amount of each container type that can be placed in a WIPP disposal room, the number of WIPP disposal rooms can be calculated from the number of containers. Table 3 and Table 4 show the number of WIPP disposal rooms required for each of the waste streams in Table 1 and Table 2. Using the information in these tables, the total volume and room space required for the two cases can be calculated. The volume and room space required for cases S1 and S2 are shown in Table 5.

Table 1. Summary of Group 1 GTCC LLW and GTCC-like Waste Volumes[a]

Waste Type	Description	Volume (m^3)	Container Type	Total Containers
GTCC LLW	Activated metal BWR	210	h-SAMC	3,045[b]
GTCC LLW	Activated metal PWR	670	h-SAMC	9,715[b]
GTCC LLW	Sealed sources - small	1,800	55-gallon drum	8,654[c]
GTCC LLW	Sealed sources - Cs irradiators	1,000	Irradiator	1,435[d]
GTCC LLW	Other waste - CH	42	55-gallon drum	202[c]
GTCC LLW	Other waste - RH	34	h-SAMC	173[e]
GTCC-like Waste	Activated metal	13	h-SAMC	186[e]
GTCC-like Waste	Sealed sources - small	0.83	55-gallon drum	4[c]
GTCC-like Waste	Other waste - CH (West Valley decommissioning)	710	SWB	378[f]
GTCC-like Waste	Other waste - RH (West Valley decommissioning)	540	h-SAMC	2,741[e]
GTCC-like Waste	Other waste - CH (Other Sites)	34	55-gallon drum	164[c]
GTCC-like Waste	Other waste - RH (Other Sites)	170	h-SAMC	863[e]

[a]All volumes taken from Argonne (2010). [b]Calculated with the limiting factor of 4,023 Ci of Co-60 (SNL 2008b). [c]Calculated using the internal volume (0.208 m^3) (SNL 2008b). [d]Determined from sources (SNL 2008b). [e]Calculated using the internal volume (0.197 m^3) (SNL 2008b). [f]Calculated using the internal volume (1.88 m^3) (SNL 2008b).

Table 2. Summary of Group 2 GTCC LLW and GTCC-like Waste Volumes[a]

Waste Type	Description	Volume (m^3)	Container Type	Total Containers
GTCC LLW	Activated metal BWR	73	h-SAMC	956[b]
GTCC LLW	Activated metal PWR	300	h-SAMC	4,789[b]
GTCC LLW	West Valley NDA - Activated Metal	210	h-SAMC	1,068[b]
GTCC LLW	West Valley SDA - Activated Metal	530	h-SAMC	2,668[b]
GTCC LLW	Sealed sources - West Valley SDA	23	55-gallon drum	111[c]
GTCC LLW	Other waste - CH (West Valley SDA)	1,600	SWB	851[d]
GTCC LLW	Other waste - RH (West Valley NDA)	1,900	Lead shielded container	16,814[e]
GTCC LLW	Other waste - RH (West Valley SDA)	7.3	h-SAMC	37[f]
GTCC LLW	Other waste - RH (Mo-99 production)	390	Lead shielded container	3,451[e]
GTCC-like Waste	Other waste - CH (West Valley decommissioning)	220	SWB	117[d]
GTCC-like Waste	Other waste - RH (West Valley decommissioning)	760	h-SAMC	3,858[f]
GTCC-like Waste	Other waste - CH (Pu-238 production)	260	SWB	138[d]
GTCC-like Waste	Other waste - RH (Pu-238 production)	120	h-SAMC	609[f]

[a]All volumes taken from Argonne (2010). [b]Calculated with the limiting factor of 4,023 Ci of Co-60 (SNL 2008b). [c]Calculated using the internal volume (0.208 m^3) (SNL 2008b). [d]Calculated using the internal volume (1.88 m^3) (SNL 2008b). [e]Calculated using the internal volume (0.113 m^3) (U.S. DOE 2009). [f]Calculated using the internal volume (0.197 m^3) (SNL 2008b).

Table 3. WIPP Room Space Required for Group 1 GTCC LLW and GTCC-like Waste Disposal

Waste Type	Description	Container Type	Room Space Required
GTCC LLW	Activated metal BWR	h-SAMC	1.08[a]
GTCC LLW	Activated metal PWR	h-SAMC	3.46[a]
GTCC LLW	Sealed sources - small	55-gallon drum	0.75[b]
GTCC LLW	Sealed sources - Cs irradiators	Irradiator	0.66[c]
GTCC LLW	Other waste - CH	55-gallon drum	0.02[b]
GTCC LLW	Other waste - RH	h-SAMC	0.06[a]
GTCC-like Waste	Activated metal	h-SAMC	0.07[a]
GTCC-like Waste	Sealed sources - small	55-gallon drum	0.00[b]
GTCC-like Waste	Other waste - CH (West Valley decommissioning)	SWB	0.23[c]
GTCC-like Waste	Other waste - RH (West Valley decommissioning)	h-SAMC	0.98[a]
GTCC-like Waste	Other waste - CH (Other Sites)	55-gallon drum	0.01[b]
GTCC-like Waste	Other waste - RH (Other Sites)	h-SAMC	0.31[a]

[a]Calculated using 2,807 containers per disposal room (SNL 2008b). [b]Calculated using 11,466 containers per disposal room (SNL 2008b). [c]Calculated using 2,184 containers per disposal room (SNL 2008b). [d]Calculated using 1,638 containers per disposal room (SNL 2008b).

Table 4. WIPP Room Space Required for Group 2 GTCC LLW and GTCC-like Waste Disposal

Waste Type	**Description**	**Container Type**	**Room Space Required**
GTCC LLW	Activated metal BWR	h-SAMC	0.34[a]
GTCC LLW	Activated metal PWR	h-SAMC	1.71[a]
GTCC LLW	West Valley NDA - Activated Metal	h-SAMC	0.38[a]
GTCC LLW	West Valley SDA - Activated Metal	h-SAMC	0.95[a]
GTCC LLW	Sealed sources - West Valley SDA	55-gallon drum	0.01[b]
GTCC LLW	Other waste - CH (West Valley SDA)	SWB	0.52[c]
GTCC LLW	Other waste - RH (West Valley NDA)	Lead shielded container	10.27[d]
GTCC LLW	Other waste - RH (West Valley SDA)	h-SAMC	0.01[a]
GTCC LLW	Other waste - RH (Mo-99 production)	Lead shielded container	2.11[d]
GTCC-like Waste	Other waste - CH (West Valley decommissioning)	SWB	0.07[c]
GTCC-like Waste	Other waste - RH (West Valley decommissioning)	h-SAMC	1.37[a]
GTCC-like Waste	Other waste - CH (Pu-238 production)	SWB	0.08[c]
GTCC-like Waste	Other waste - RH (Pu-238 production)	h-SAMC	0.22[a]

[a]Calculated using 2,807 containers per disposal room (SNL 2008b). [b]Calculated using 11,466 containers per disposal room (SNL 2008b). [c]Calculated using 1,638 containers per disposal room (SNL 2008b). [d]Calculated using 1,638 containers per disposal room (U.S. DOE 2009).

Table 5. Volumes[a] and Room Spaced Required[b] for GTCC LLW and DOE GTCC-like Waste Analysis Cases

Case	**Description**	**Volume (m^3)**	**Room Space Required**
S1	Total of Groups 1 and 2 waste	11,617	26
S2	Total of Groups 1 and 2 waste minus the West Valley decommissioning waste	9,387	23

[a]Data taken from Table 1 and Table 2. [b]Data taken from Table 3 and Table 4.

The same 13 radionuclides that resulted from the previous screening analyses will be used for this analysis. After the screening process, 13 radionuclides remain, ^{14}C, ^{59}Ni, ^{63}Ni, ^{90}Sr, ^{137}Cs, ^{233}U, ^{234}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{241}Am, and ^{244}Cm, which have longer half-lives and contribute to the majority of the total activity of the GTCC LLW and DOE GTCC-like waste for WIPP PA. Table 6 shows the radionuclide activities, after the screening analyses, which were used for each case in the post-closure performance calculations discussed below.

Table 6. Screened Radionuclide Activity for GTCC LLW and DOE GTCC-like Waste[a]

Radionuclide	Case S1	Case S2
^{14}C	3.39E+04	3.38E+04
^{59}Ni	1.81E+05	1.81E+05
^{63}Ni	2.52E+07	2.52E+07
^{90}Sr	2.89E+05	2.14E+05
^{137}Cs	2.61E+06	2.26E+06
^{233}U	8.48E+02	8.24E+02
^{234}U	1.88E+02	9.44E+01
^{238}Pu	1.24E+05	1.15E+05
^{239}Pu	2.49E+04	2.03E+04
^{240}Pu	7.03E+03	3.75E+03
^{241}Pu	1.11E+05	6.22E+04
^{241}Am	1.79E+05	1.66E+05
^{244}Cm	1.46E+03	1.32E+03

[a]Data from ANL (2010).

3. INPUT PARAMETERS

The combined f_w of each case with the WIPP inventory was used in the analysis and is shown in Table 7.

Table 7. The Individual and Combined "Unit of Waste" for the Analysis.

	Case S1	Case S2
Individual f_w [a]	0.335	0.306
Combined f_w [b]	2.655	2.626

[a]Calculated from Equation 1.2 in SNL (2008a) and the activity from Table 6. [b]Calculated by adding 2.320 (the f_w for the WIPP inventory [Leigh and Trone 2005]) to the individual f_w.

3.1 PANEL

The script, input and output file names and locations for each code execution for the PANEL analysis is shown below in Table 8.

Table 8. PANEL Code, Preprocessor and Post-Processor Script, Input and Output File Names and Locations for the Analysis.

Code/File Type	**File Names**	**Directory**
GENMESH		
Script	GM_PANEL_GTCC.COM	PANEL
Input	GM_PANEL_CRA1BC.INP	PANEL/PNLINP
Output	GM_PANEL_GTCC.CDB	PANEL/GMCDB
Output	GM_PANEL_GTCC.DBG	PANEL/GMCDB
MATSET		
Script	MS_PANEL_GTCC.COM	PANEL
Input	MS_PANEL_GTCC_*c*.INP	PANEL/PNLINP
Input	GM_PANEL_GTCC.CDB	PANEL/GMCDB
Output	MS_PANEL_GTCC_*c*.CDB	PANEL/MSCDB
Output	MS_PANEL_GTCC_*c*.DBG	PANEL/MSCDB
POSTLHS		
Script	LHS3_PANEL_GTCC.COM	PANEL
Input	LHS2_CRA1BC_R1.TRN	PANEL/PNLINP
Input	LHS3_DUMMY.INP	PANEL/PNLINP
Input	MS_PANEL_GTCC_*c*.CDB	PANEL/MSCDB
Output	LHS3_PANEL_GTCC_ *c*_V*vvv*.CDB	PANEL/LHS3CDB
Output	LHS3_PANEL_GTCC_ *c*.DBG	PANEL/LHS3CDB

Code/File Type	**File Names**	**Directory**
ALGEBRACDB		
Script	ALG_PANEL_GTCC.COM	PANEL
Input	ALG_PANEL_CRA1BC.INP	PANEL/PNLINP
Input	LHS3_PANEL_GTCC_ *c*_V*vvv*.CDB	PANEL/LHS3CDB
Output	ALG_PANEL_GTCC_ *c*_V*vvv*.CDB	PANEL/ALGCDB
Output	ALG_PANEL_GTCC_ *c*_V*vvv*.DBG	PANEL/ALGCDB
PANEL		
Script	PANEL_GTCC.COM	PANEL
Input	ALG_PANEL_GTCC_ *c*_V*vvv*.CDB	PANEL/ALGCDB
Output	PANEL_CON_GTCC_ *c*_S*s*_V*vvv*.CDB	PANEL/PNLCDB
Output	PANEL_CON_GTCC_ *c*_S*s*_V*vvv*.DBG	PANEL/PNLCDB
SUMMARIZE		
Script	SUM_GTCC.COM	PANEL
Input	SUM_PANEL_CON_GTCC_*c*_S*s*.INP	PANEL/SUMINP
Input	PANEL_CON_GTCC_ *c*_S*s*_V*vvv*.CDB	PANEL/PNLCDB
Output	SUM_PANEL_CON_GTCC_*c*_S*s*.TBL	PANEL/SUMTBL
Output	GTCC_*c*_S*s*.LOG	PANEL/SUMTBL

1. $c \in \{S1, S2\}$
2. $s \in \{1, 2\}$ for each c
3. $vvv \in \{001, 002, ..., 100\}$ for each s

Of the input files listed in Table 8, only the MS_PANEL_GTCC_*c*.INP and SUM_PANEL_CON_GTCC_*c*_S*s*.INP files were modified from the existing baseline, CRA-2004 PABC, PANEL input files (Long and Kanney 2005). The MS_PANEL_GTCC_*c*.INP files were modified to include the inventory (Table 6) and the updated f_w (Table 7). The SUM_PANEL_CON_ GTCC_*c*_S*s*.INP files were modified to use the correct file name and location of the PANEL_CON_GTCC_ *c*_S*s*_V*vvv*.CDB files. All other input files used are either input files used in the CRA-2004 PABC or output from a computer code.

3.2 EPAUNI

Using the equivalent radionuclides discussed in Section 3.2 of SNL (2008a), input values for the activities of the 10 radionuclides modeled in the EPAUNI can be derived for each case and are shown in Table 9. The activities shown in Table 9 were used to modify the EPAUNI input files. The script, input and output file names and locations for each code execution for the EPAUNI analysis is shown below in Table 10. The EPU_GTCC_*c*_CH.INP files were modified to add the activity of the GTCC LLW and DOE GTCC-like waste for each case and the EPU_GTCC_*c*_CH_MISC.INP files were modified to include the updated f_w (Table 7).

Table 9. Equivalent Radionuclide Activity (Ci) for Each Case Used in EPAUNI[a]

Equivalent Radionuclide	Case S1	Case S2
^{90}Sr	2.89E+05	2.14E+05
^{137}Cs	2.61E+06	2.26E+06
^{233}U	8.48E+02	8.24E+02
^{234}U[b]	1.83E+04	1.82E+04
^{238}Pu[c]	4.73E+06	4.72E+06
^{239}Pu	2.49E+04	2.03E+04
^{240}Pu[d]	4.10E+04	3.75E+04
^{241}Pu	1.11E+05	6.22E+04
^{241}Am	1.79E+05	1.66E+05
^{244}Cm	1.46E+03	1.32E+03

[a]Based on data in Table 6. [b]Sum of ^{234}U and ^{59}Ni/10 activities. [c]Sum of ^{238}Pu and 1.83/10 × ^{63}Ni activities. [d]Sum of ^{240}Pu and ^{14}C activities.

Table 10. EPAUNI Code Script, Input and Output File Names and Locations for the analysis.

Code/File Type	**File Names**	**Directory**
EPAUNI		
Script	EPU_GTCC.COM	EPAUNI
Input	EPU_GTCC_*c*_CH.INP	EPAUNI/EPUINP
Input	EPU_GTCC_*c*_CH_MISC.INP	EPAUNI/EPUINP
Output	EPU_GTCC_*c*_CH.DAT	EPAUNI/EPUDAT
Output	EPU_GTCC_*c*_CH.OUT	EPAUNI/EPUOUT
Output	EPU_GTCC_*c*_CH.OUT2	EPAUNI/EPUOUT
Output	EPU_GTCC_*c*_CH.DIA	EPAUNI/EPUOUT
Output	EPU_GTCC_*c*_CH_ACTIVITY.DIA	EPAUNI/EPUOUT

1. $c \in \{S1, S2\}$

3.3 CCDFGF

The scaled CH area, scaled repository volume and scaled repository fraction occupied by waste parameters for each case are shown in Table 11.

Table 11. The CH Area and Repository Volume Parameters Used in CCDFGF Calculations

	Rooms Needed[a]	CH Waste Volume (m^3)[a]	CH area (m^2)[b]	Repository Volume (m^3)[c]	Repository Fraction Occupied by Waste[d]
Case S1	26	11,617	1.550E+05	6.096E+05	0.296
Case S2	23	9,387	1.500E+05	5.898E+05	0.302

[a]From Table 5. [b]Calculated as 1.115E+05 × (1 + CH Rooms Needed ÷ 66.59). [c]Calculated as 4.384E+05 × (1 + CH Rooms Needed ÷ 66.59). [d]Calculated as (4.384E+05 m^3 × 0.385 + GTCC CH waste volume) / scaled repository volume.

The script, input and output file names and locations for each code execution for the CCDFGF analysis is shown below in Table 12. Of the input files listed in Table 12, only the MS_CCGF_GTCC_*c*.INP file was modified to include the updated f_w (Table 7), repository volume, CH effective area and repository fraction occupied by waste (Table 11). All other input files used are either input files used in the CRA-2004 PABC (Long and Kanney 2005) or output from the computer codes previous discussed.

Table 12. CCDFGF Code and Preprocessor Script, Input and Output File Names and Locations for the analysis.

Code/File Type	**File Names**	**Directory**
GENMESH		
Script	GM_CCGF_GTCC.COM	CCDFGF
Input	GM_CCGF_CRA1BC.INP	CCDFGF/CCGFINP
Output	GM_CCGF_GTCC.CDB	CCDFGF/GMCDB
Output	GM_CCGF_GTCC.DBG	CCDFGF/GMCDB
MATSET		
Script	MS_CCGF_GTCC.COM	CCDFGF
Input	MS_CCGF_GTCC_*c*.INP	CCDFGF/CCGFINP
Input	GM_CCGF_GTCC.CDB	CCDFGF/GMCDB
Output	MS_CCGF_GTCC_*c*.CDB	CCDFGF/MSCDB
Output	MS_CCGF_GTCC_*c*.DBG	CCDFGF/MSCDB
POSTLHS		
Script	LHS3_CCGF_GTCC.COM	CCDFGF
Input	LHS2_CRA1BC_R1.TRN	CCDFGF/CCGFINP
Input	LHS3_DUMMY.INP	CCDFGF/CCGFINP
Input	MS_CCGF_GTCC_*c*.CDB	CCDFGF/MSCDB
Output	LHS3_CCGF_GTCC_ *c*_V*vvv*.CDB	CCDFGF/LHS3CDB
Output	LHS3_CCGF_GTCC_ *c*.DBG	CCDFGF/LHS3CDB

Code/File Type	**File Names**	**Directory**
PRECCDFGF		
Script	PRECCDFGF_GTCC.COM	CCDFGF
Input	MS_CCGF_GTCC_*c*.CDB	CCDFGF/MSCDB
Input	LHS3_CCGF_GTCC_ *c*_V*vvv*.CDB	CCDFGF/LHS3CDB
Input	SUM_PANEL_CON_GTCC_*c*_S*s*.TBL	PANEL/SUMTBL
Input	EPU_GTCC_*c*_CH.DAT	EPAUNI/EPUDAT
Input	EPU_CRA1BC_RH.DAT	CCDFGF/CRA1BCFILES
Input	INTRUSIONTIMES.IN	CCDFGF/CRA1BCFILES
Input	CUSP_CRA1BC_R1.TBL	CCDFGF/CRA1BCFILES
Input	SUM_DBR_CRA1BC_R1_S*s*_T*ttttt*_*d*.TBL	CCDFGF/CRA1BCFILES
Input	SUM_NUT_CRA1BC_R1_S1.TBL	CCDFGF/CRA1BCFILES
Input	SUM_NUT_CRA1BC_R1_S*s*_T*ttttt*.TBL	CCDFGF/CRA1BCFILES
Input	SUM_PANEL_INT_CRA1BC_R1_S6_T*ttttt*.TBL	CCDFGF/CRA1BCFILES
Input	SUM_PANEL_ST_CRA1BC_R1_S*s*.TBL	CCDFGF/CRA1BCFILES
Input	SUM_ST2D_CRA1BC_R1_M*m*.TBL	CCDFGF/CRA1BCFILES
Output	RELTAB_GTCC_*c*.DAT	CCDFGF/CCGFINP
CCDFGF		
Script	CCGF_GTCC.COM	CCDFGF
Input	CCGF_CRA1BC_CONTROL_R1.INP	CCDFGF/CCGFINP
Input	RELTAB_GTCC_*c*.DAT	CCDFGF/CCGFINP
Output	CCGF_GTCC_*c*.OUT	CCDFGF/CCGFOUT
Output	CCGF_GTCC_*c*.PRT	CCDFGF/CCGFOUT

1. $c \in \{\text{S1,S2}\}$
2. $vvv \in \{001, 002, ..., 100\}$ for each c
3. $s \in \begin{cases} \{1, 2, 3, 4, 5\} \text{ for SUM\_DBR} \\ \{2, 3, 4, 5\} \text{ for SUM\_NUT} \\ \{1, 2\} \text{ for SUM\_PANEL\_ST} \\ \{1, 2\} \text{ for SUM\_PANEL\_CON for each } c \end{cases}$
4. $ttttt \in \begin{cases} \{00100, 00350, 01000, 03000, 05000, 10000\} \text{ for S1 for SUM\_DBR} \\ \{00550, 07500, 02000, 04000, 10000\} \text{ for S2, S4 for SUM\_DBR} \\ \{01200, 01400, 03000, 05000, 10000\} \text{ for S3, S5 for SUM\_DBR} \\ \{00100, 00350\} \text{ for S2, S4 for SUM\_NUT} \\ \{01000, 03000, 05000, 07000, 09000\} \text{ for S3, S5 for SUM\_NUT} \\ \{00100, 00350, 01000, 02000, 04000, 06000, 09000\} \text{ for SUM\_PANEL\_INT} \end{cases}$
5. $d \in \{\text{L, M, U}\}$ for each $ttttt$
6. $m \in \{\text{F, P}\}$

4. POST-CLOSURE PERFORMANCE RESULTS

The post-closure performance results show that including all the GTCC LLW and DOE GTCC-like waste in the WIPP repository will satisfy the three performance objectives stated in the GTCC EIS Task 3.4 document (SNL 2007). The WIPP repository has no significant member of public (MOP) groundwater releases and adding the GTCC LLW and DOE GTCC-like waste to the WIPP repository does not cause a significant MOP groundwater release. The incremental increases in the normalized releases to the inadvertent human intruder (IHI) from adding the GTCC LLW and DOE GTCC-like waste to the WIPP repository are not substantial enough to jeopardize the WIPP repository compliance with the release limits. The WIPP repository has long-term stability and adding the GTCC LLW and DOE GTCC-like waste does not adversely affect the long-term stability. More details of the post-closure performance results are discussed below.

4.1 UNDISTURBED RESULTS (MOP)

For WIPP PA, Salado transport calculations are performed for the undisturbed scenario to determine the concentration of radionuclides at receptor locations. The Salado transport calculations for the CRA-2004 PABC show negligible radionuclide concentrations at receptor locations, which are most likely due to numerical dispersion as a result of the finite-difference solution (Lowry 2005) and should be zero instead. As the addition of the GTCC LLW and DOE GTCC-like waste to the WIPP inventory would increase the total radionuclide concentration by at most one order of magnitude, the undisturbed result from the CRA-2004 PABC Salado transport calculations is still applicable. Therefore, there are no releases to the MOP at the receptor locations with the addition of the GTCC LLW and DOE GTCC-like waste to the WIPP repository.

4.2 DISTURBED RESULTS (IHI)

The code CCDFGF assembles the release estimates from all other components of the WIPP PA system to generate cumulative complementary distribution functions (CCDFs) of releases. The CCDFs are then compared with the release limits stated in Section 191.13, less than a 10% chance of a normalized radionuclide release of one unit of waste (f_w) and a less than 0.1% chance of a normalized radionuclide release of ten times the unit of waste (f_w). The values of the mean total normalized release from the CCDFs for each case at the 10% and 0.1% probability are summarized below in Table 13. The incremental changes due to the addition of each waste stream are also shown. As seen in Table 13, the incremental increases in the normalized releases to the IHI from adding the GTCC LLW and DOE GTCC-like waste to the WIPP repository are not substantial enough to jeopardize the WIPP repository compliance with the release limits. The results for each individual case are discussed below.

Table 13. Mean Total Normalized Release at the 10% and 0.1% probability level for each case compared the CRA-2004 PABC (Vugrin and Dunagan 2005).

	10% probability level	Difference from PABC	0.1% probability level	Difference from PABC
CRA-2004 PABC	0.09	-	0.57	-
Case S1	0.21	0.12	2.09	1.52
Case S2	0.20	0.11	1.99	1.42
Max Allowable	1.00		10.00	

4.2.1 Case S1

Adding all the GTCC LLW and DOE GTCC-like waste to the WIPP inventory increased the mean total release CCDF at all probabilities. The mean total release CCDF for Case S1 (shown as Group 1 and 2 Waste) compared with the results from the CRA-2004 PABC (shown as WIPP Baseline) are shown in Figure 1. The increase is mainly due to the increase in the normalized radionuclide concentration for brine release, while the increase in the CH area contributed as well. As seen in Figure 1, at the 10% probability level, the mean total normalized release increased from 0.09 to 0.21, while at the 0.1% probability level, the mean total normalized release increased from 0.57 to 2.09, which are both well below the release limits.

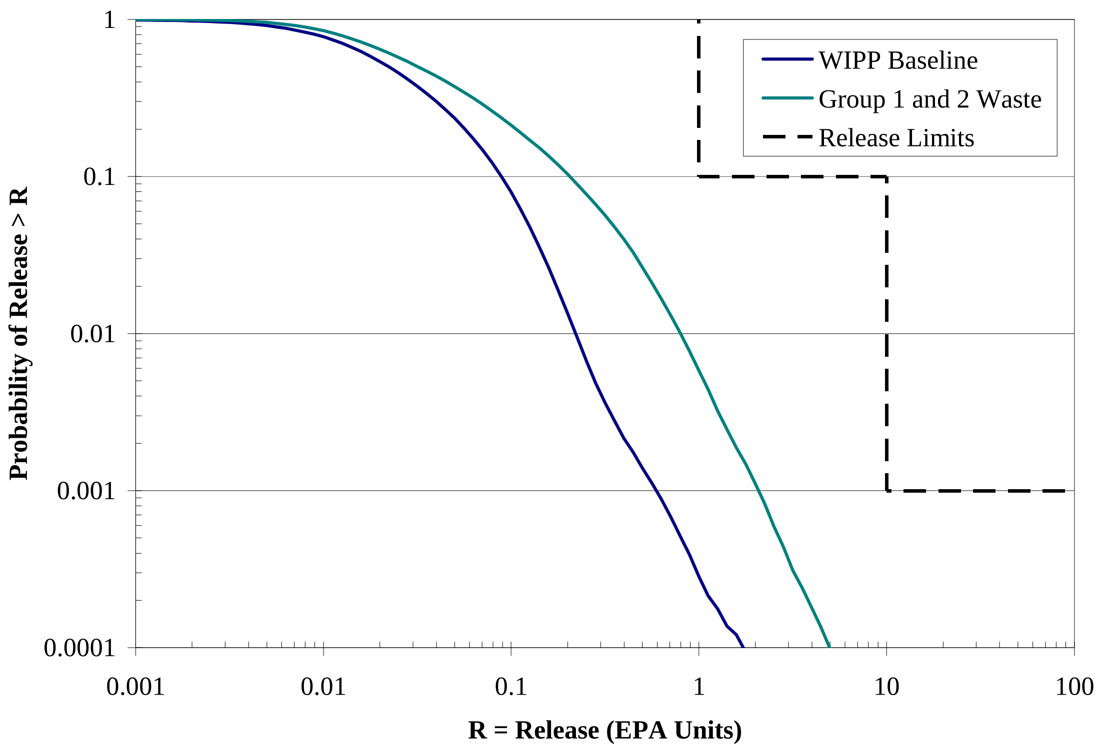

Figure 1. Mean total release CCDF for Case S1 compared with the CRA-2004 PABC (Vugrin and Dunagan 2005).

4.2.2 Case S2

Adding all the GTCC LLW and DOE GTCC-like waste minus the West Valley decommissioning waste to the WIPP inventory increased the mean total release CCDF at all probabilities. The mean total release CCDF for Case S2 (shown as Group 1 and 2 Waste) compared with the results from the CRA-2004 PABC (shown as WIPP Baseline) are shown in Figure 2. The increase is mainly due to the increase in the normalized radionuclide concentration for brine release, while the increase in the CH area contributed as well. As seen in Figure 2, at the 10% probability level, the mean total normalized release increased from 0.09 to 0.20, while at the 0.1% probability level, the mean total normalized release increased from 0.57 to 0.1.99, which are both well below the release limits.

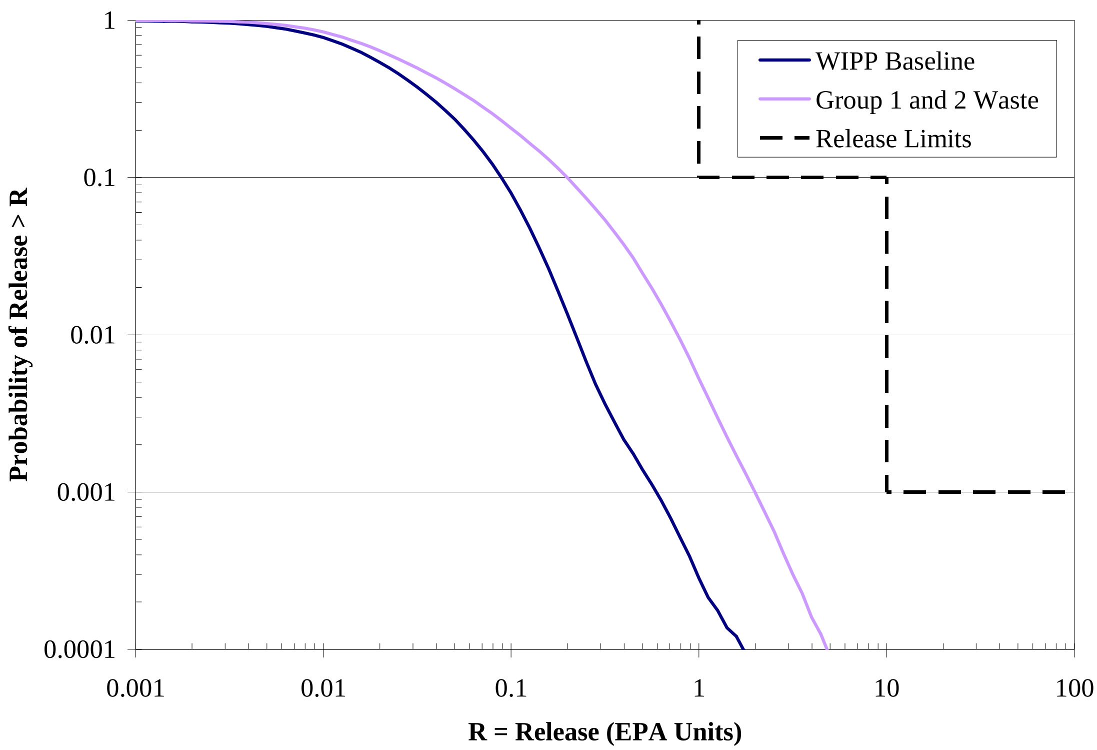

Figure 2. Mean total release CCDF for Case S2 compared with the CRA-2004 PABC (Vugrin and Dunagan 2005).

4.3 LONG-TERM STABILITY

Long-term stability is also a requirement of the WIPP repository. Analyses of the potential excavation-induced subsidence were conducted and found that it would not be significant due to the depth of the repository and low extraction ratio (U.S. DOE 1996). Furthermore, active institutional controls are to be emplaced such that the repository will not be disturbed for at least 100 years after closure. Therefore, it was determined that there are no long-term stability issues for the WIPP repository. The addition of the GTCC LLW and DOE GTCC-like waste will not adversely affect the long-term stability, as the same emplacement strategy is used.

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