D.3.4.5.2 Alternative 2 – Processing without Plutonium Separation

The filter media residues processing technologies considered for this alternative include calcination/vitrification, blend down, and sonic wash. Only HEPA filter media can be processed using the calcination/vitrification technology. All filter media can be processed using the blend down and the sonic wash technologies. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. The blend down process and the sonic wash process will be performed at Rocky Flats in Building 371, Room 3701. Building 707 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process.

Similar accidents are applicable to all of these technologies. **Table D–165** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of processing filter media residues using the processing technologies at Rocky Flats. **Table D–166** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of filter media residues. The risks associated with these processing technologies are summarized in **Table D–167** and **Table D–168**.

Table D–165 Filter Media Residue Accident Scenario Parameters for the Calcination/ Vitrification, Blend Down, and Sonic Wash Processes at Rocky Flats

				Material at Risk (grams)		
Accident Scenario	***Frequency (per year)***	***Filter Media Residues***	***HEPA Banks***	***Calcination/Vitrification Process*** [a]	***Blend Down Process*** [b]	***Sonic Wash Process*** [c]
Explosion	0.00005	2 drums [d]	0/2 [f]	4,000 g	4,000 g	4,000 g
Nuclear Criticality [f]	–	–	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [g] 4 drums [k]	 2 0	 4,810 g feed + 3,206 g product [h] 6,000 g	 1,948 [a] 6,000 g	 1,908 g feed + 1,074 g product [j] 6,000 g powder
Spill: a. Room [l] b. Glovebox c. Loading Dock	 – 0.80 0.001	 – 1 feed prep container 1 drum [m]	 – 2 0	 – 83.5 g 3,000 g	 – 23.2 g 3,000 g	 – 214 g 3,000 g
Earthquake: a. Building 707 b. Building 371	 0.0026 0.000094	 5-day supply [g] 5-day supply [g]	 0 0	 4,810 g feed + 3,206 g product [h] N/A	 1,948 g N/A 1,948 g	 N/A 1,908 g feed + 1,074 g product [j]
Aircraft Crash: a. Building 707 b. Building 371	 0.00003 0.00004	 Consequences enveloped by the earthquake. The aircraft will not penetrate the building wall.	 – –	 – N/A	 – –	 N/A –

Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Explosion: a. Building 707 b. Building 371	 1.0 1.0	 0.001 0.001	 0.01 0.01	 1.0 2.0×10^{-6}	 Ground Elevated
Nuclear Criticality [f]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.01 05.0	 Ground Ground

Accident Scenario	DR	ARF	RF	LPF	Release Point
Spill:					
a. Glovebox	1.0	1.0×10^-6 n	1.0 n	2.0×10^-6	Elevated
b. Loading Dock	0.25	1.0×10^-6 n	1.0 n	0.10	Ground
Earthquake:					
a. Building 707	1.0	0.002 p	0.30 p	0.10	Ground
b. Building 371	1.0	0.002 p	0.30 p	0.10	Ground
Aircraft Crash:					
a. Building 707 q	–	–	–	–	–
b. Building 371 r	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Building 707, Modules D, E, and F.
[b] Building 371, Room 3701, or Building 707.
[c] Building 371, Room 3701.
[d] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[e] Building 707, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[f] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification, blend down, and sonic wash technology assessments.
[g] 3-day supply of feed and 2-day supply of product.
[h] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[j] 90% of the product is glass, 10% is powder. The effect of the vitrified product on the accident source term is negligible. The powder product is included in the feed accident source term.
[k] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[l] Materials are opened in a glovebox. No room spill is considered.
[m] 1 drum at the maximum plutonium content level.
[n] The product of ARF×RF = 1.0×10^-6.
[p] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[q] Consequences enveloped by the earthquake.
[r] The aircraft will not penetrate the building walls.

Table D–166 Summary of the Filter Media Residue Accident Analysis Doses for the Calcination/Vitrification, Blend Down, and Sonic Wash Processes at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Calcination/Vitrification Process							
Explosion	0.04	Metal	0.096	0.0104	1,680	40.0	1.12
Fire (Room)	0.0289	Metal	0.0693	0.0075	121	28.9	0.808
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000075	Metal	0.000180	1.95×10^{-6}	3.15	0.075	0.00210
Earthquake	0.381	Metal	0.914	0.0990	16,000	381	10.7
Blend Down Process—Building 371							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Fire (Room)	0.0117	Metal	0.0421	0.00421	491	11.7	0.327
Fire (Dock)	0.00180	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	4.64×10^{-11}	Metal	1.39×10^{-10}	1.58×10^{-11}	1.95×10^{-6}	4.64×10^{-8}	1.16×10^{-10}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.00210
Earthquake	0.154	Metal	0.555	0.0555	6,480	154	4.32
Blend Down Process—Building 707							
Explosion	0.0400	Metal	0.0960	0.0104	1,680	40.0	1.12
Fire (Room)	0.0117	Metal	0.0281	0.00304	491	11.7	0.327
Fire (Dock)	0.00180	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	4.64×10^{-11}	Metal	1.48×10^{-11}	5.57×10^{-12}	6.96×10^{-7}	3.57×10^{-8}	8.82×10^{-12}
Spill (Dock)	0.0000750	Metal	0.000180	0.0000195	3.15	0.0750	0.00210

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Earthquake	0.154	Metal	0.370	0.0401	6,480	154	4.32
Sonic Wash Process							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Fire (Room)	0.0114	Metal	0.0412	0.00412	481	11.4	0.321
Fire (Dock)	0.00180	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	4.28×10^{-10}	Metal	1.28×10^{-9}	1.46×10^{-10}	0.000018	4.28×10^{-7}	1.07×10^{-9}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.00210
Earthquake	0.151	Metal	0.544	0.0544	6,350	151	4.23

MEI = maximally exposed individual   Met = meteorological data

Table D–167 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification, Blend Down, and Sonic Wash Processes at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Calcination/Vitrification Process						
Explosion	0.00005	2.40×10^{-9}	2.60×10^{-10}	0.000042	1.00×10^{-6}	2.24×10^{-8}
Fire (Room)	0.0005	1.73×10^{-8}	1.88×10^{-9}	0.000303	7.22×10^{-6}	1.62×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.0010	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	1.19×10^{-6}	1.29×10^{-7}	0.0208	0.000495	0.0000111
Blend Down Process—Building 371						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Fire (Room)	0.0005	1.05×10^{-8}	1.05×10^{-9}	0.000123	2.92×10^{-6}	6.55×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	5.57×10^{-14}	6.31×10^{-15}	7.80×10^{-10}	1.86×10^{-11}	3.71×10^{-14}
Spill (Dock)	0.0010	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	2.61×10^{-8}	2.61×10^{-9}	0.000305	7.25×10^{-6}	1.62×10^{-7}
Blend Down Process—Building 707						
Explosion	0.00005	2.40×10^{-9}	2.60×10^{-10}	0.0000420	1.00×10^{-6}	2.24×10^{-8}
Fire (Room)	0.0005	7.01×10^{-9}	7.60×10^{-10}	0.000123	2.92×10^{-6}	6.55×10^{-8}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.8	5.94×10^{-15}	2.23×10^{-15}	2.78×10^{-10}	1.43×10^{-11}	2.82×10^{-15}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	4.81×10^{-7}	5.21×10^{-8}	0.00842	0.000201	$4.49\times10_{-6}$
Sonic Wash Process						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Fire (Room)	0.0005	1.03×10^{-8}	1.03×10^{-9}	0.00012	2.86×10^{-6}	6.41×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	5.14×10^{-13}	5.82×10^{-14}	7.19×10^{-9}	1.71×10^{-10}	3.42×10^{-13}
Spill (Dock)	0.0010	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	2.56×10^{-8}	2.56×10^{-9}	0.000298	0.0000710	1.59×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–168 Alternative 2 Accident Risks During Filter Media Residue Processing

Filter Media Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Calcination/Vitrification Process						
HEPA Filter Media (IDC 338)	0.21	2.54×10^{-7}	2.75×10^{-8}	0.00444	0.000106	2.37×10^{-6}
HEPA Filter Media (All other IDCs)	0.01	1.21×10^{-8}	1.31×10^{-9}	0.000211	5.03×10^{-6}	1.13×10^{-7}
All HEPA Filter Media Residues	0.22	2.66×10^{-7}	2.88×10^{-8}	0.00465	0.000111	2.48×10^{-6}
Blend Down Process – Building 371						
HEPA Filter Media (IDC 338)	0.90	3.31×10^{-8}	3.31×10^{-9}	0.000386	9.19×10^{-6}	2.06×10^{-7}
HEPA Filter Media (All other IDCs)	0.02	7.35×10^{-10}	7.35×10^{-11}	8.58×10^{-6}	2.04×10^{-7}	4.58×10^{-9}
Ful Flo Filter Media (IDC 331)	0.19	6.99×10^{-9}	6.99×10^{-10}	0.0000815	1.94×10^{-6}	4.35×10^{-8}
All Filter Media Residues	1.11	4.08×10^{-8}	4.08×10^{-9}	0.000476	0.0000113	2.54×10^{-7}
Blend Down Process – Building 707						
HEPA Filter Media (IDC 338)	0.90	4.42×10^{-7}	4.79×10^{-8}	0.00773	0.000184	4.12×10^{-6}
HEPA Filter Media (All other IDCs)	0.02	9.82×10^{-9}	1.06×10^{-9}	0.000172	4.09×10^{-6}	9.16×10^{-8}
Ful Flo Filter Media (IDC 331)	0.19	9.33×10^{-8}	1.01×10^{-8}	0.00163	0.0000389	8.70×10^{-7}
All Filter Media Residues	1.11	5.45×10^{-7}	5.90×10^{-8}	0.00954	0.000227	5.09×10^{-6}
Sonic Wash Process						
HEPA Filter Media (IDC 338)	0.58	2.09×10^{-8}	2.09×10^{-9}	0.000244	5.80×10^{-6}	1.30×10^{-7}
HEPA Filter Media (All other IDCs)	0.01	3.60×10^{-10}	3.60×10^{-11}	4.20×10^{-6}	1.00×10^{-7}	2.24×10^{-9}
Ful flo Filter Media (IDC 331)	0.13	4.68×10^{-9}	4.68×10^{-10}	0.0000546	1.30×10^{-6}	2.91×10^{-8}
All Filter Media Residues	0.72	2.59×10^{-8}	2.59×10^{-9}	0.000303	7.20×10^{-6}	1.61×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.5.3 Alternative 3 – Processing with Plutonium Separation

The filter media residues processing technology considered for this alternative is mediated electrochemical oxidation. Most of the mediated electrochemical oxidation process will be performed at Rocky Flats in Building 371, Room 3701. The final calcination in the process will be performed at Rocky Flats in Building 707A, Module J.

Similar accidents are applicable to the mediated electrochemical oxidation processes in both buildings. **Table D–169** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of processing filter media residues using the mediated electrochemical oxidation technology at Rocky Flats. **Table D–170** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of filter media residues. The risks associated with this processing technology are summarized in **Table D–171** and **Table D–172**.

Table D–169 Filter Media Residue Accident Scenario Parameters for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Filter Media Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				MEO Process	
				Building 371	*Building 707A* [a]
Explosion (Acetylene)	0.00005	2 drums [b]	2/0 [c]	4,000 g powder	2,000 g
Explosion (Ion Exchange Column)	0.0001	Solution	2	0.245 mg [d]	N/A
Nuclear Criticality [e]	0.0001	Solution	2	1.0×10^{19} fissions	N/A [f]
Fire:					
a. Room	0.0005	5-day supply [g]	2	5,572 g	6,000 g
b. Loading Dock	2.0×10^{-6}	4 drums [h]	0	6,000 g	4,000 g
Spill:					
a. Room [j]	–	–	–	–	–
b. Glovebox	0.80	1 feed prep container	2	200 g	1,000 g
c. Loading Dock	0.0010	1 drum [k]	0	3,000 g	1,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [g]	0	5,572 g	N/A
b. Building 707A	0.0026	5-day supply [g]	0	N/A	6,000 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion (Acetylene):					
a. Building 707A	1.0	0.001	0.01	1.0	Ground
b. Building 371	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Explosion (Ion Exchange Column) [l]	1.0	1.0	1.0	1.0	Elevated
Nuclear Criticality [e, f]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.0060	0.01	0.10	Ground
b. Loading Dock	0.01	0.0060	0.01	0.50	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [m]	1.0 [m]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [m]	1.0 [m]	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [d]	0.30 [d]	0.10	Ground

Accident Scenario	DR	ARF	RF	LPF	Release Point
Aircraft Crash: a. Building 707A [n] b. Building 371 [p]	 – –	 – –	 – –	 – –	 – –

MEO = mediated electrochemical oxidation N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product container transported from Building 371 to Building 707A for processing.
[b] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[c] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[d] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[e] Refer to Table D–28 for Building 371 mediated electrochemical oxidation criticality accident source term.
[f] The wet nuclear criticality is not a viable accident scenario for the mediated electrochemical oxidation process in Building 707A.
[g] 3-day supply of feed and 2-day supply of product.
[h] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[j] Materials are opened in a glovebox. No room spill is considered.
[k] 1 drum at the maximum plutonium content level.
[l] Respirable source term value in milligrams of plutonium released up the stack.
[m] The product of ARF×RF = 1.0×10^{-6}.
[n] Consequences enveloped by the earthquake.
[p] The aircraft will not penetrate the building walls.

Table D–170 Summary of the Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Building 371							
Explosion (Acetylene)	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Explosion (Ion Exchange Column)	0.000245	Metal	0.000735	0.0000833	10.3	0.245	0.000613
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321
Fire (Room)	0.0334	Metal	0.120	0.012	1,400	33.4	0.936
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	4.00×10^{-10}	Metal	1.20×10^{-9}	1.36×10^{-10}	0.0000168	4.00×10^{-7}	1.00×10^{-9}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.441	Metal	1.59	0.159	18,500	441	12.4
Building 707A							
Explosion (Acetylene)	0.02	Oxide	0.024	0.0026	500	12.0	0.420
Fire (Room)	0.036	Oxide	0.0432	0.00468	900	21.6	0.756
Fire (Dock)	0.0012	Oxide	0.00144	0.000156	30.0	0.720	0.0252
Spill (Glovebox)	2.00×10^{-9}	Oxide	3.20×10^{-10}	1.20×10^{-10}	0.0000174	9.00×10^{-7}	2.80×10^{-10}
Spill (Dock)	0.000025	Oxide	0.00003	3.25×10^{-6}	0.625	0.015	0.000525
Earthquake	0.475	Oxide	0.570	0.0618	11,900	285	9.98

MEI = maximally exposed individual Met = meteorological data
[a] 1.0×10^{19} fissions.

Table D–171 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
Explosion (Acetylene)	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Explosion (Ion Exchange Column)	0.0001	3.68×10^{-11}	4.17×10^{-12}	5.15×10^{-7}	1.23×10^{-8}	2.45×10^{-11}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	3.01×10^{-8}	3.01×10^{-9}	0.000351	8.36×10^{-6}	1.87×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	4.80×10^{-13}	5.44×10^{-14}	6.72×10^{-9}	1.60×10^{-10}	3.20×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	7.47×10^{-8}	7.47×10^{-9}	0.000871	0.0000207	4.65×10^{-7}
Building 707A						
Explosion (Acetylene)	0.00005	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Fire (Room)	0.0005	1.08×10^{-8}	1.17×10^{-9}	0.000225	5.40×10^{-6}	1.51×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.44×10^{-12}	1.56×10^{-13}	3.00×10^{-8}	7.20×10^{-10}	2.02×10^{-11}
Spill (Glovebox)	0.80	1.28×10^{-13}	4.80×10^{-14}	6.96×10^{-9}	3.60×10^{-10}	8.96×10^{-14}
Spill (Dock)	0.001	1.50×10^{-11}	1.63×10^{-12}	3.13×10^{-7}	7.50×10^{-9}	2.10×10^{-10}
Earthquake	0.0026	7.41×10^{-7}	8.03×10^{-8}	0.0154	0.000371	0.0000104

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–172 Alternative 3 Accident Risks During Mediated Electrochemical Oxidation Processing at Rocky Flats

Filter Media Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
HEPA Filter Media (IDC 338)	0.31	4.48×10^{-8}	4.96×10^{-9}	0.000488	0.0000129	2.06×10^{-7}
HEPA Filter Media (All other IDCs)	0.01	1.44×10^{-9}	1.60×10^{-10}	0.0000157	4.18×10^{-7}	6.66×10^{-9}
Ful Flo Filter Media (IDC 331)	0.07	1.01×10^{-8}	1.12×10^{-9}	0.00011	2.92×10^{-6}	4.66×10^{-8}
All Filter Media Residues	0.39	5.63×10^{-8}	6.24×10^{-9}	0.000614	0.0000162	2.59×10^{-7}

Filter Media Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 707A						
HEPA Filter Media (IDC 338)	0.38	2.86×10^{-7}	3.10×10^{-8}	0.00596	0.000143	4.00×10^{-6}
HEPA Filter Media (All other IDCs)	0.01	7.53×10^{-9}	8.15×10^{-10}	0.000157	3.76×10^{-6}	1.05×10^{-7}
Ful Flo Filter Media (IDC 331)	0.08	6.02×10^{-8}	6.52×10^{-9}	0.00125	0.0000301	8.43×10^{-7}
All Filter Media Residues	0.47	3.54×10^{-7}	3.83×10^{-8}	0.00737	0.000177	4.95×10^{-6}
Buildings 371 and 707A						
HEPA Filter Media (IDC 338)	–	3.31×10^{-7}	3.59×10^{-8}	0.00645	0.000156	4.21×10^{-6}
HEPA Filter Media (All other IDCs)	–	8.97×10^{-7}	9.75×10^{-10}	0.000173	4.18×10^{-6}	1.12×10^{-7}
Ful Flo Filter Media (IDC 331)	–	7.03×10^{-8}	7.64×10^{-9}	0.00136	0.000033	8.90×10^{-7}
All Filter Media Residues	–	4.10×10^{-7}	4.46×10^{-8}	0.00798	0.000193	5.21×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.5.4 Alternative 4 – Combination of Processing Technologies

The full flow filter media residue, IDC 331, is not under consideration for Alternative 4. The high-efficiency particulate air filter media residue processing technologies considered for Alternative 4 are the neutralization/dry process for IDC 338 and the repackaging process for all other IDCs. The neutralization/dry process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.5.1, Alternative 1 - No Action. Refer to Section D.3.4.5.1 for details.

The repackaging process will be performed in Rocky Flats Building 707, Module E. **Table D-173** provides the applicable accident scenarios, assumptions, and paramenters used in determining the impacts of repackaging the high-efficiency particulate air filter media residue (not including IDC 338) at Rocky Flats. **Table D-174** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the repackaging of this high-efficiency particulate air filter media residue. The risks associated with repackaging are presented in **Table D-175** and are summarized for the processing of all filter media residue in **Table D-176.**

Table D–173 High-Efficiency Particulate Air Filter Media Residue (IDC 338 excluded) Accident Scenario Parameters for the Repackaging Process at Rocky Flats

Accident Scenario	Frequency (per year)	HEPA Filter Media Residue	HEPA Banks	Material at Risk (grams)
Explosion	0.00005	2 drums [a]	2	400 g

Accident Scenario	Frequency (per year)	HEPA Filter Media Residue	HEPA Banks	Material at Risk (grams)
Nuclear Criticality [b]	-	-	-	-
Fire: a. Room b. Loading Dock	 0.0005 $2.0x10^{-6}$	 5-day supply [c] 4 drums [a]	 2 0	 1,856 g 800 g
Spill: a. Room b. Glovebox c. Loading Dock	 [d] 0.8 0.001	 - 1 feed prep container 1 drum [e]	 - 2 0	 - 23.2 g 200 g
Earthquake	0.0026	5-day supply [c]	0	1,856 g
Aircraft Crash	-	Conseuences enveloped by the earthquake.	-	-

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion	1.0	0.001	0.01	1.0	Ground
Nuclear Criticality	-	-	-	-	-
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.1 0.5	 Ground Ground
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 $1.0x10^{-6}$ [f] $1.0x10^{-6}$ [f]	 1.0 [f] 1.0 [f]	 $2.0x10^{-6}$ 0.1	 Elevated Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	-	-	-	-	-

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Each drum with a plutonium content levelof 200 g.
[b] The wet criticality is not a viable accident scenario for this process.
[c] 3-day supply of feed and 2-day supply of product.
[d] Materials are opened in a glovebox. No room spill is considered.
[e] 1 drum with a plutonium content level of 200 g.
[f] The product of ARFxRF = $1.0x10^{-6}$.
[g] Add 0.000192 to all ARFxRF values for the resuspension of respirable particulates after the earthquake (e.g., ARFxRF + 0.000192 = 0.000792).
[h] Consequences enveloped by the earthquake.

Table D–174 Summary of the HEPA Filter Media Residue (IDC 338 excluded) Accident Doses for the Repackaging Process at Rocky Flats

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.00400	Metal	0.00960	0.00104	168	4.00	0.112
Fire (Room)	0.0111	Metal	0.0267	0.00290	468	11.1	0.312
Fire (Dock)	0.000240	Metal	0.000576	0.0000624	10.1	0.240	0.00672
Spill (Glovebox)	$4.64x10^{-11}$	Metal	$1.48x10^{-11}$	$5.57x10^{-12}$	$6.96x10^{-7}$	$3.57x10^{-8}$	$8.82x10^{-12}$

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	5.00×10^{-6}	Metal	0.0000120	1.30×10^{-6}	0.0210	0.00500	0.000140
Earthquake	0.147	Metal	0.353	0.0382	6,170	147	4.12

MEI = maximally exposed individual Met = meteorological data

Table D–175 Summary of the Repackaging Process Accident Analysis Risks in Terms of Latent Cancer Fatalities per year

Accident Scenario	Accident Frequency (per year)	MEI (rem)		Population (person-rem)		Worker (rem)
		95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.00005	2.40×10^{-10}	2.60×10^{-11}	4.20×10^{-6}	1.00×10^{-7}	2.24×10^{-9}
Fire (Room)	0.0005	6.68×10^{-9}	7.24×10^{-10}	0.000117	2.78×10^{-6}	6.24×10^{-8}
Fire (Dock)	2.0×10^{-6}	5.76×10^{-13}	6.24×10^{-14}	1.01×10^{-8}	2.40×10^{-10}	5.38×10^{-12}
Spill (Glovebox)	0.8	5.94×10^{-15}	2.23×10^{-15}	2.78×10^{-10}	1.43×10^{-11}	2.82×10^{-15}
Spill (Dock)	0.001	6.00×10^{-12}	6.50×10^{-13}	1.05×10^{-7}	2.50×10^{-9}	5.60×10^{-11}
Earthquake	0.0026	4.59×10^{-7}	4.97×10^{-8}	0.00803	0.000191	4.28×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality

Table D–176 Alternative 4 Accident Risks During Filter Media Residue Processing

Filter Media Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
HEPA Filter Media (IDC 338)	1.13	3.29×10^{-8}	3.29×10^{-9}	0.000384	9.13×10^{-6}	2.05×10^{-7}
HEPA Filter Media (All other IDCs)	0.021	9.78×10^{-9}	1.06×10^{-9}	0.000171	4.07×10^{-6}	9.12×10^{-8}
Sum	1.51	4.27×10^{-8}	4.35×10^{-9}	0.000555	0.0000321	2.96×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.6 Sludge Residues

D.3.4.6.1 Alternative 1 – No Action

The sludge residues processing technology considered for this alternative is filter/dry. The processing of the sludge residues will be conducted within glovebox lines at Rocky Flats in Building 371, Room 3701.

Table D–177 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the filter/dry processing of sludge residues at Rocky Flats. **Table D–178** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of sludge residues at Rocky Flats. The risks associated with this processing technology are summarized in **Table D–179** and **Table D–180**.

Table D–177 Sludge Residue Accident Scenario Parameters for the Filter/Dry Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Sludge Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				Sludge Residue (IDCs 089, 099, 332)	*Sludge Residue (All other IDCs)*
Explosion	0.00005	2 drums [a]	0	4,000 g	4,000 g
Nuclear Criticality	–	–	–	–	–
Fire:					
a. Room	0.0005	5-day supply [b]	2	1,827 g	2,426 g
b. Loading Dock	2.0×10^{-6}	4 drums [c]	0	6,000 g	6,000 g
Spill:					
a. Room	0.008	1 container at the maximum limit [d]	2	600 g	600 g
b. Glovebox	0.8	1 feed prep container	2	87 g	89 g
c. Loading Dock	0.001	1 drum [e]	0	3,000 g	3,000 g
Earthquake	0.000094	5-day supply [b]	0	1,827 g	2,426 g
Aircraft Crash	0.00004	Consequences enveloped by the earthquake.	–	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Nuclear Criticality [f]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content

[b] 3-day supply of feed and 2-day supply of product.

[c] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[d] 5 containers per drum of feed.

[e] 1 drum at the maximum plutonium content level.
[f] The wet nuclear criticality is not a viable accident scenario for the filter/dry process in Building 371.
[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[h] Consequences enveloped by the earthquake.

Table D–178 Summary of the Sludge Residue Accident Analysis Doses for the Filter/Dry Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Process Sludge Residue (IDCs 089, 099, 332)							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.011	Metal	0.0395	0.00395	460	11.0	0.307
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.8	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	1.74×10^{-9}	Metal	5.22×10^{-9}	5.92×10^{-10}	0.0000731	1.74×10^{-6}	4.35×10^{-9}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.0	0.084
Earthquake	0.145	Metal	0.521	0.0521	6,080	145	4.05
Process Sludge Residue (All other IDCs)							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.0146	Metal	0.0524	0.00524	611	14.6	0.408
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	1.78×10^{-9}	Metal	5.34×10^{-9}	6.05×10^{-10}	0.0000748	1.78×10^{-6}	4.45×10^{-9}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.192	Metal	0.692	0.0692	8,070	192	5.38

MEI = maximally exposed individual Met = meteorological data

Table D–179 Summary of the Sludge Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Filter/Dry Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Process Sludge Residue (IDCs 089, 099, 332)						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	9.87×10^{-9}	9.87×10^{-10}	0.000115	2.74×10^{-6}	6.14×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.8	2.09×10^{-12}	2.37×10^{-13}	2.92×10^{-8}	6.96×10^{-10}	1.39×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	2.45×10^{-8}	2.45×10^{-9}	0.000286	6.80×10^{-6}	1.52×10^{-7}
Process Sludge Residue (all other IDCs)						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	1.31×10^{-8}	1.31×10^{-9}	0.000153	3.64×10^{-6}	8.15×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.80	2.14×10^{-12}	2.42×10^{-13}	2.99×10^{-8}	7.12×10^{-10}	1.42×10^{-12}

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	3.25×10^{-8}	3.25×10^{-9}	0.000379	9.03×10^{-6}	2.02×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–180 Alternative 1 Accident Risks During Sludge Residue Processing

Sludge Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
IDCs 089, 099, 332	0.01	3.98×10^{-10}	3.98×10^{-11}	4.64×10^{-6}	1.10×10^{-7}	2.47×10^{-9}
All other IDCs	0.20	1.02×10^{-8}	1.02×10^{-9}	0.000119	2.83×10^{-6}	6.35×10^{-8}
All Residues	0.21	1.06×10^{-8}	1.06×10^{-9}	0.000124	2.94×10^{-6}	6.60×10^{-8}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.6.2 Alternative 2 – Processing without Plutonium Separation

The sludge residues processing technologies considered for this alternative are calcination/vitrification and blend down. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. The blend down process will be performed at Rocky Flats in Building 707, Module E. Building 371 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process. Similar accidents are applicable to both these technologies. **Table D–181** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of sludge processing technologies at Rocky Flats. **Table D–182** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of sludge residues. The risks associated with these processing technologies are summarized in **Table D–183** and **Table D–184**.

Table D–181 Sludge Residue Accident Scenario Parameters for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

Accident Scenario	Frequency (per year)	Sludge Residues	HEPA Banks	Material at Risk (grams)		
				Calcination/ Vitrification Process [a]	Blend Down Process [b]	
					Blend Down Process (IDCs 089, 099, 332)	Blend Down Process (All other IDCs)
Explosion	0.00005	2 drums [c]	2/0 [d]	4,000 g	4,000 g	4,000 g
Nuclear Criticality [e]	–	–	–	–	–	–
Fire:						
a. Room	0.0005	5-day supply [f]	2	4,810 g feed + 3,206 g product [g]	551 g	8,016 g
b. Loading Dock	2.0×10^{-6}	4 drums [h]	0	6,000 g	6,000 g	6,000 g
Spill:						
a. Room	0.008	1 container at the maximum limit [j]	2	600 g	600 g	600 g
b. Glovebox	0.8	1 feed prep container	2	83.5 g	83.5 g	83.5 g
c. Loading Dock	0.001	1 drum [k]	0	3,000 g	3,000 g	3,000 g

Accident Scenario	Frequency (per year)	Sludge Residues	HEPA Banks	Material at Risk (grams)		
				Calcination/ Vitrification Process [a]	Blend Down Process [b]	
					Blend Down Process (IDCs 089, 099, 332)	Blend Down Process (All other IDCs)
Earthquake:						
a. Building 707	0.0026	5-day supply [f]	0	4,810 g feed + 3,206 g product [g]	551 g	8,016 g
b. Building 371	0.000094	5-day supply [f]	0	N/A	551 g	8,016 g
Aircraft Crash:						
a. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–	–	–
b. Building 371	0.00004	The aircraft will not penetrate the building walls.	–	–	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion:					
a. Building 707	1	0.001	0.1	1	Ground
b. Building 371	1	0.001	0.1	2.0×10^{-6}	Elevated
Nuclear Criticality [e]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake	1.0	0.002 [l]	0.30 [l]	0.10	Ground
Aircraft Crash					
a. Building 707 [m]	–	–	–	–	–
b. Building 371 [n]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Building 707, Modules D, E, and F, or Building 707.
[b] Building 707, Module E.
[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[d] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.
[e] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification and blend down technology assessments.
[f] 3-day supply of feed and 2-day supply of product.
[g] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[h] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[j] 5 containers per drum of feed.
[k] 1 drum at the maximum plutonium content level.
[l] Add 0.000192 to all (ARF×RF) values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[m] Consequences enveloped by the earthquake.
[n] The aircraft will not penetrate the building walls.

Table D–182 Summary of the Sludge Residue Accident Analysis Doses for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Calcination/Vitrification Process							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0289	Metal	0.0693	0.0075	1,210	28.9	0.808
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.381	Metal	0.914	0.099	16,000	381	10.7
Blend Down Process (IDCs 089, 099, 332)—Building 707							
Explosion	0.400	Metal	0.96	0.104	16,800	400	11.2
Fire (Room)	0.00331	Metal	0.00793	0.00086	139	3.31	0.0926
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}
Spill (Dock)	0.00300	Metal	0.0072	0.00078	126	3.0	0.084
Earthquake	0.0436	Metal	0.105	0.0113	1,830	43.6	1.22
Blend Down Process (All other IDCs)—Building 707							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0481	Metal	0.115	0.0125	2,020	48.1	1.35
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.635	Metal	1.52	0.165	26,700	635	17.8
Blend Down Process (IDCs 089, 099, 332)—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.00331	Metal	0.0119	0.00119	139	3.31	0.0926
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.8	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.01×10^{-9}	5.68×10^{-10}	0.0000701	1.67×10^{-6}	4.18×10^{-9}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.0436	Metal	0.157	0.0157	1,830	43.6	1.22
Blend Down Process (All other IDCs)—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.000800	2.00×10^{-6}
Fire (Room)	0.0481	Metal	0.173	0.0173	2,020	48.1	1.35
Fire (Dock)	0.00180	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.0000120	3.00×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.01×10^{-9}	5.68×10^{-10}	0.0000701	1.67×10^{-6}	4.18×10^{-9}
Spill (Dock)	0.00300	Metal	0.0108	0.00108	126	3.00	0.0840
Earthquake	0.635	Metal	2.29	0.229	26,700	635	17.8

MEI = maximally exposed individual   Met = meteorological data

Table D–183 Summary of the Sludge Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Calcination/Vitrification Process						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	1.73×10^{-8}	1.88×10^{-9}	0.000303	7.22×10^{-6}	1.62×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.80	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	8.23×10^{-6}	1.29×10^{-7}	0.0208	0.000495	0.0000111
Blend Down Process (IDCs 089, 099, 332)—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	1.98×10^{-9}	2.15×10^{-10}	0.0000347	8.27×10^{-7}	1.85×10^{-8}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.8	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	1.36×10^{-7}	1.48×10^{-8}	0.00238	0.0000567	1.27×10^{-6}
Blend Down Process (All other IDCs)—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	2.89×10^{-8}	3.13×10^{-9}	0.000505	0.000012	2.69×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.80	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	1.98×10^{-6}	2.15×10^{-7}	0.0347	0.000825	0.0000185
Blend Down Process (IDCs 089, 099, 332)—Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	2.98×10^{-9}	2.98×10^{-10}	0.0000347	8.27×10^{-7}	1.85×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.8	2.00×10^{-12}	2.27×10^{-13}	2.81×10^{-8}	6.68×10^{-10}	1.34×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	7.38×10^{-9}	7.38×10^{-10}	0.0000861	2.05×10^{-6}	4.59×10^{-8}
Blend Down Process (All other IDCs) —Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	4.33×10^{-8}	4.33×10^{-9}	0.000505	0.0000120	2.69×10^{-7}

Accident Scenario	***Accident Frequency (per year)***	***MEI (LCF/yr)***		***Population (LCF/yr)***		***Worker (LCF/yr)***
		95% Met	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.8	2.00×10^{-12}	2.27×10^{-13}	2.81×10^{-8}	6.68×10^{-10}	1.34×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.0000630	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	1.07×10^{-7}	1.07×10^{-8}	0.00125	0.0000298	6.68×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–184 Alternative 2 Accident Risks During Sludge Residue Processing

Sludge Residue	***Process Duration (yr)***	***Risks [a]***				
		MEI (LCF)		***Population (LCF)***		***Worker (LCF)***
		95% Met	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Vitrification Process						
IDCs 088, 099, 332	0.002	2.47×10^{-9}	2.67×10^{-10}	0.0000432	1.03×10^{-6}	2.30×10^{-8}
All other IDCs	0.062	7.65×10^{-8}	8.28×10^{-9}	0.00134	0.0000319	7.14×10^{-7}
All Sludge Residues	0.064	7.89×10^{-8}	8.55×10^{-9}	0.00138	0.0000329	7.37×10^{-7}
Blend Down Process – Building 707						
IDCs 088, 099, 332	0.035	5.80×10^{-9}	6.28×10^{-10}	0.000102	2.42×10^{-6}	5.41×10^{-8}
All other IDCs	0.062	1.26×10^{-7}	1.37×10^{-8}	0.00221	0.0000526	1.18×10^{-6}
All Sludge Residues	0.097	1.32×10^{-7}	1.43×10^{-8}	0.00231	0.000055	1.23×10^{-6}
Blend Down Process – Building 371						
IDCs 088, 099, 332	0.035	5.52×10^{-10}	5.52×10^{-11}	6.44×10^{-6}	1.53×10^{-7}	3.43×10-9
All other IDCs	0.062	9.68×10^{-9}	9.68×10^{-10}	0.000113	2.69×10^{-6}	6.02×10^{-8}
All Sludge Residues	0.097	1.02×10^{-8}	1.02×10^{-9}	0.000119	2.84×10^{-6}	6.37×10^{-8}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.6.3 Alternative 3 – Processing with Plutonium Separation

The sludge residues processing technology considered for this alternative is the acid dissolution/plutonium oxide recovery process. Sludge residue IDCs 089, 099, and 332 can not be processed using the acid dissolution/ plutonium oxide recovery technology. Most of the process will be performed at Rocky Flats in Building 371, Room 3701. The final calcination will be performed at Rocky Flats in Building 707A, Module J.

Similar accidents are applicable to the process in both buildings. **Table D–185** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the sludge processing technology at Rocky Flats. **Table D–186** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of sludge residues. The risks associated with the acid dissolution/plutonium oxide recovery process are summarized in **Table D–187** and **Table D–188**.

Table D–185 Sludge Residue (IDCs 089, 090, 332 excluded) Accident Scenario Parameters for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Sludge Residues*	*HEPA Banks*	*Material at Risk (grams) — Acid Dissolution/Plutonium Oxide Recovery Process*	
				Building 371	*Building 707A* [a]
Explosion	0.00005	2 drums	2/0 [b]	4,000 g [c]	2,000 g
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [d]
Fire:					
a. Room	0.0005	5-day supply [e]	2	560 g	8,000 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [f]	4,000 g
Spill:					
a. Room	0.008	1 container at the maximum limit [g]	2	600 g	N/A [h]
b. Glovebox	0.8	1 feed prep container	2	20 g	1,000 g
c. Loading Dock	0.001	1 drum	0	3,000 [j]	1,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [e]	0	560 g	N/A
b. Building 707A	0.0026	5-day supply [e]	0	N/A	8,000 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707A	1.0	0.001	0.010	1.0	Ground
b. Building 371	1.0	0.001	1.0	2.0×10^{-6}	Elevated
Nuclear Criticality [d, k]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.006	0.01	0.010	Ground
b. Loading Dock	0.01	0.006	0.01	5.0	Ground
Spill:					
a. Room [h]	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [l]	0.30 [l]	0.10	Ground
Aircraft Crash:					
a. Building 707A [m]	–	–	–	–	–
b. Building 371 [n]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product containers are transported from Building 371 to Building 707A for processing.

[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.

[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[d] The wet nuclear criticality is not a viable accident scenario for the process in Building 707A.

[e] 3-day supply of feed and 2-day supply of product.
[f] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[g] 5 containers per drum of feed.
[h] Materials are opened in a glovebox in Building 707A. No room spill is considered.
[j] 1 drum at the maximum plutonium content level.
[k] Refer to Table D–28 for Building 371 criticality accident source term.
[l] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[m] Consequences enveloped by the earthquake.
[n] The aircraft will not penetrate the building walls.

Table D–186 Summary of the Sludge Residue (IDCs 089, 099, 332 excluded) Accident Analysis Doses for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371							
Explosion	8.00×10^{-7}	Oxide	1.20×10^{-6}	1.36×10^{-7}	0.02	0.00048	1.44×10^{-6}
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321
Fire (Room)	0.00336	Metal	0.0121	0.00121	141	3.36	0.0941
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Oxide	2.16×10^{-8}	2.16×10^{-9}	0.0003	7.20×10^{-6}	2.52×10^{-7}
Spill (Glovebox)	4.00×10^{-10}	Oxide	6.00×10^{-10}	6.80×10^{-11}	0.00001	2.40×10^{-7}	7.20×10^{-10}
Spill (Dock)	0.003	Oxide	0.0054	0.00054	75.0	1.80	0.063
Earthquake	0.0444	Oxide	0.0798	0.00798	1,110	26.6	0.931
Building 707A							
Explosion	0.200	Oxide	0.240	0.026	5,000	120	4.20
Fire (Room)	0.048	Oxide	0.0576	0.00624	1,200	28.8	1.01
Fire (Dock)	0.0012	Oxide	0.00144	0.000156	30.0	0.720	0.0252
Spill (Glovebox)	2.00×10^{-8}	Oxide	3.20×10^{-9}	1.20×10^{-9}	0.000174	9.00×10^{-6}	2.80×10^{-9}
Spill (Dock)	0.001	Oxide	0.0012	0.00013	25.0	0.600	0.021
Earthquake	0.634	Oxide	0.760	0.0824	15,800	380	13.3

MEI = maximally exposed individual Met = meteorological data

Table D–187 Summary of the Sludge Residue (IDCs 089, 099, 332 excluded) Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
Explosion	0.00005	$3.00×10^{-14}$	$3.40×10^{-15}$	$5.00×10^{-10}$	$1.20×10^{-11}$	$2.88×10^{-14}$
Criticality (Liquid)	0.0001	$3.95×10^{-8}$	$5.50×10^{-9}$	0.000349	0.0000126	$1.28×10^{-8}$
Fire (Room)	0.0005	$3.02×10^{-9}$	$3.02×10^{-10}$	0.0000353	$8.40×10^{-7}$	$1.88×10^{-8}$
Fire (Dock)	$2.0×10^{-6}$	$6.48×10^{-12}$	$6.48×10^{-13}$	$7.56×10^{-8}$	$1.80×10^{-9}$	$4.03×10^{-11}$
Spill (Room)	0.008	$8.64×10^{-14}$	$8.64×10^{-15}$	$1.20×10^{-9}$	$2.88×10^{-11}$	$8.06×10^{-13}$
Spill (Glovebox)	0.80	$2.40×10^{-13}$	$2.72×10^{-14}$	$4.00×10^{-9}$	$9.60×10^{-11}$	$2.30×10^{-13}$
Spill (Dock)	0.001	$2.70×10^{-9}$	$2.70×10^{-10}$	0.0000375	$9.00×10^{-7}$	$2.52×10^{-8}$
Earthquake	0.000094	$3.75×10^{-9}$	$3.75×10^{-10}$	0.0000521	$1.25×10^{-6}$	$3.50×10^{-8}$
Building 707A						
Explosion	0.00005	$6.00×10^{-9}$	$6.50×10^{-10}$	0.000125	$3.00×10^{-6}$	$8.40×10^{-8}$
Fire (Room)	0.0005	$1.44×10^{-8}$	$1.56×10^{-9}$	0.0003	$7.20×10^{-6}$	$2.02×10^{-7}$
Fire (Dock)	$2.0×10^{-6}$	$1.44×10^{-12}$	$1.56×10^{-13}$	$3.00×10^{-8}$	$7.20×10^{-10}$	$2.02×10^{-11}$
Spill (Glovebox)	0.80	$1.28×10^{-12}$	$4.80×10^{-13}$	$6.96×10^{-8}$	$3.60×10^{-9}$	$8.96×10^{-13}$
Spill (Dock)	0.001	$6.00×10^{-10}$	$6.50×10^{-11}$	0.0000125	$3.00×10^{-7}$	$8.40×10^{-9}$
Earthquake	0.0026	$9.88×10^{-7}$	$1.07×10^{-7}$	0.0206	0.000494	0.0000138

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–188 Alternative 3 Accident Risks During Acid Dissolution /Plutonium Oxide Recovery Processing at Rocky Flats

Sludge Residue	*Process Duration (yr)*	*Risks [a]*				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
IDCs 089, 099, 332	N/A	---	---	---	---	---
All other IDCs	0.88	$4.31×10^{-8}$	$5.67×10^{-9}$	0.000417	0.0000137	$8.09×10^{-8}$
Building 707A						
IDCs 089, 099, 332	N/A	---	---	---	---	---
All other IDCs	0.061	$6.16×10^{-8}$	$6.67×10^{-9}$	0.00128	0.0000308	$8.62×10^{-7}$
Buildings 371 and 707A						
IDCs 089, 099, 332	N/A	---	---	---	---	---
All other IDCs	–	$1.05×10^{-7}$	$1.23×10^{-8}$	0.00170	0.0000445	$9.43×10^{-7}$

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality N/A = not applicable
[a] Sum of postulated accident scenario risks

D.3.4.6.4 Alternative 4 – Combination of Processing Technologies

Sludge residue processing technologies considered for this alternative are the filter/dry process and the repackaging process. Sludge residue IDCs 089, 099, and 332 will be processed with the repackaging technology. The repackaging process will be performed in Rocky Flats Building 707, Module E. The remaining sludge residue will be processed using the filter/dry technology. The filter/dry process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.6.1, Alternative 1 - No Action. Refer to Section D.3.4.6.1 for details.

Table D–189 provides the applicable accident scenarios, assumptions, and paramenters used in determining the impacts of repackaging the sludge residue (not including IDCs 089, 099, and 332) at Rocky Flats. **Table D–190** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with repackaging of this sludge residue. The risks associated with repackaging are presented in **Table D–191** and are summarized for the processing of all sludge residue in **Table D-192.**

Table D–189 Sludge Residue (IDCs 089, 099, 332 excluded) Accident Scenario Parameters for the Repackage Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Sludge Residue*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	2	2,000 g
Nuclear Criticality [b]	-	-	-	-
Fire:				
a. Room	0.0005	5-day supply [c]	2	1,202 g
b. Loading Dock	$2.0x10^{-6}$	4 drums [a]	0	4,000 g
Spill:				
a. Room	0.008	1 containter at the maximum limit [d]	2	250 g
b. Glovebox	0.8	1 feed prep container	2	167 g
c. Loading Dock	0.001	1 drum [e]	0	1,000 g
Earthquake	0.0026	5-day supply [c]	0	1,202 g
Aircraft Crash	-	Conseuences enveloped by the earthquake.	-	-

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.1	1.0	Ground
Nuclear Criticality	-	-	-	-	-
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.5	$2.0x10^{-6}$	Elevated
b. Glovebox	1.0	0.00002	0.5	$2.0x10^{-6}$	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [f]	0.3 [f]	0.1	Ground
Aircraft Crash [g]	-	-	-	-	-

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Each drum with a plutonium content levelof 1,000 g.
[b] The wet criticality is not a viable accident scenario for this process.
[c] 3-day supply of feed and 2-day supply of product.
[d] 5 containers per drum of feed.
[e] 1 drum with a plutonium content level of 1,000 g.
[f] Add 0.000192 to all ARFxRF values for the resuspension of respirable particulates after the earthquake (e.g., ARFxRF + 0.000192 = 0.000792).
[g] Consequences enveloped by the earthquake.

Table D–190 Summary of the Sludge Residue (IDCs 089, 099, 332 excluded) Accident Doses for the Repackaging Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.0200	Metal	0.480	0.0520	8,400	200	5.60
Fire (Room)	0.00721	Metal	0.0173	0.00188	303	7.21	0.202
Fire (Dock)	0.00120	Metal	0.00288	0.000312	50.4	1.20	0.0336
Spill (Room)	$5.00x10^{-9}$	Metal	$1.60x10^{-9}$	$6.00x10^{-15}$	0.0000750	$3.85x10^{-6}$	$9.50x10^{-10}$
Spill (Glovebox)	$3.34x10^{-9}$	Metal	$1.07x10^{-9}$	$4.01x10^{-10}$	0.0000501	$2.57x10^{-6}$	$6.35x10^{-10}$
Spill (Dock)	0.00100	Metal	0.00240	0.000260	42.0	1.00	0.0280
Earthquake	0.0952	Metal	0.228	0.0248	4,000	95.2	2.67

MEI = maximally exposed individual Met = meteorological data

Table D–191 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per year

Accident Scenario	*Accident Frequency (per year)*	*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.00005	$1.20x10^{-8}$	$1.30x10^{-9}$	0.000210	$1.00x10^{-6}$	$1.12x10^{-7}$
Fire (Room)	0.0005	$4.33x10^{-9}$	$4.69x10^{-10}$	0.0000757	$1.80x10^{-6}$	$4.04x10^{-8}$
Fire (Dock)	$2.0x10^{-6}$	$2.88x10^{-12}$	$3.12x10^{-13}$	$5.04x10^{-8}$	$1.20x10^{-9}$	$2.69x10^{-11}$
Spill (Room)	0.008	$6.40x10^{-15}$	$2.40x10^{-15}$	$3.00x10^{-10}$	$1.54x10^{-11}$	$3.04x10^{-15}$
Spill (Glovebox)	0.8	$4.28x10^{-13}$	$1.60x10^{-13}$	$2.00x10^{-8}$	$1.03x10^{-9}$	$2.03x10^{-13}$
Spill (Dock)	0.001	$1.20x10^{-9}$	$1.30x10^{-10}$	0.0000210	$5.00x10^{-7}$	$1.12x10^{-8}$
Earthquake	0.0026	$2.97x10^{-7}$	$3.22x10^{-8}$	0.00520	0.000124	$2.77x10^{-6}$

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality

Table D–192 Alternative 4 Accident Risks During Sludge Residue Processing

Sludge Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
IDCs 089, 099, 332	0.015	$4.72x10^{-9}$	$5.11x10^{-10}$	0.0000826	$1.97x10^{-6}$	$4.40x10^{-8}$
All other IDCs	0.20	1.02×10^{-8}	1.02×10^{-9}	0.000119	2.84×10^{-6}	6.37×10^{-8}
All sludge residues	0.22	1.42×10^{-8}	1.53×10^{-9}	0.000202	4.81×10^{-6}	1.08×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.7 Glass Residues

D.3.4.7.1 Alternative 1 – No Action

The glass residues processing technology considered for this alternative is the neutralization/dry process. This process will be conducted within glovebox lines at Rocky Flats in Building 371, Room 3701.

Table D–193 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the neutralization/dry processing of glass residues. **Table D–194** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with this processing of glass residues. The risks associated with this processing technology are summarized in **Table D–195** and **Table D–196**.

Table D–193 Glass Residue Accident Scenario Parameters for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	Frequency (per year)	Glass Residues	HEPA Banks	Material at Risk (grams)
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [b] 4 drums [c]	 2 0	 2,646 g 6,000 g
Spill: a. Room [d] b. Glovebox c. Loading Dock	 – 0.80 0.001	 – 1 feed prep container 1 drum [e]	 – 2 0	 – 189 g 3,000 g
Earthquake	0.000094	5-day supply [b]	0	2,646 g
Aircraft Crash	0.00004	Consequences enveloped by the earthquake.	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Nuclear Criticality [f]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 1.0×10^{-6} [g] 1.0×10^{-6} [g]	 1.0 [g] 1.0 [g]	 2.0×10^{-6} 0.10	 Elevated Ground
Earthquake	1.0	0.002 [h]	0.30 [h]	0.10	Ground
Aircraft Crash [j]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

a 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

b 3-day supply of feed and 2-day supply of product.

c 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

d Materials are opened in a glovebox. No room spill is considered.

e 1 drum at the maximum plutonium content level.

f The wet nuclear criticality is not a viable accident scenario for the neutralization/dry process in Building 371.

g The product of ARF×RF = 1.0×10^{-6}.

h Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

j Consequences enveloped by the earthquake.

Table D–194 Summary of the Glass Residue Accident Analysis Doses for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	8.00×10^{-7}	Metal		2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.0159	Metal	0.0572	0.00572	667	15.9	0.445
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	3.78×10^{-10}	Metal	1.13×10^{-9}	1.29×10^{-10}	0.0000159	3.78×10^{-7}	9.45×10^{-10}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.210	Metal	0.754	0.0754	8,800	210	5.87

MEI = maximally exposed individual Met = meteorological data

Table D–195 Summary of the Glass Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	1.43×10^{-8}	1.43×10^{-9}	0.000167	3.97×10^{-6}	8.89×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	4.54×10^{-13}	5.14×10^{-14}	6.35×10^{-9}	1.51×10^{-10}	3.02×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	3.55×10^{-8}	3.55×10^{-9}	0.000414	9.85×10^{-6}	2.21×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–196 Alternative 1 Accident Risks During Glass Residue Processing

Glass Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
All Residues	0.037	1.85×10^{-9}	1.85×10^{-10}	0.0000215	5.13×10^{-7}	1.15×10^{-8}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.7.2 Alternative 2 – Processing without Plutonium Separation

The glass residues processing technologies considered for this alternative are calcination/vitrification, blend down, and sonic wash. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. The blend down and sonic wash processes will be performed at Rocky Flats in Building 371, Room 3701. Building 707 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process.

Similar accidents are applicable to all of these technologies. **Table D–197** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of glass residues processing at Rocky Flats. **Table D–198** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of glass residues. The risks associated with these processing technologies are summarized in **Table D–199** and **Table D–200**.

Table D–197 Glass Residue Accident Scenario Parameters for theCalcination/ Vitrification Process, Blend Down Process, and Sonic Wash Process at Rocky Flats

Accident Scenario	Frequency (per year)	Glass Residues	HEPA Banks	Material at Risk (grams)		
				Calcination/ Vitrification Process [a]	Blend Down Process [b]	Sonic Wash Process [c]
Explosion	0.00005	2 drums [d]	0/2 [e]	4,000 g	4,000 g	4,000 g
Nuclear criticality [f]	–	–	–	–	–	–
Fire:						
a. Room	0.0005	5-day supply [g]	2	4,810 g feed + 3,206 g product [h]	7,014 g powder	1,588 g feed + 1,058 g product [h]
b. Loading Dock	2.0×10^{-6}	4 drums [j]	0	6,000 g	6,000 g	6,000 g
Spill:						
a. Room [k]	–	–	–	–	–	–
b. Glovebox	0.80	1 feed prep container	2	83.5 g	83.5 g	189 g
c. Loading Dock	0.001	1 drum [l]	0	3,000 g	3,000 g	3,000 g
Earthquake:						
a. Building 707	0.0026	5-day supply [g]	0	4,810 g feed + 3,206 g product [h]	7,014 g	N/A
b. Building 371	0.000094	5-day supply [g]	0	N/A	7,014 g	1,588 g feed + 1,058 g product [h]
Aircraft Crash:						
a. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–	–	N/A
b. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	N/A	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion: a. Building 707 b. Building 371	 1.0 1.0	 0.001 0.001	 0.1 0.1	 1.0 2.0×10^{-6}	 Ground Elevated
Nuclear criticality [f]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.1 0.5	 Ground Ground
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 1.0×10^{-6} [m] 1.0×10^{-6} [m]	 1.0 [m] 1.0 [m]	 2.0×10^{-6} 0.10	 Elevated Ground
Earthquake: a. Building 707 b. Building 371	 1.0 1.0	 0.002 [n] 0.002 [n]	 0.30 [n] 0.30 [n]	 0.1 0.1	 Ground Ground
Aircraft Crash: a. Building 707 [p] b. Building 371 [q]	 – –	 – –	 – –	 – –	 – –

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Building 707, Modules D, E, and F.
[b] Building 371, Room 3701, or Building 707.
[c] Building 371, Room 3701.
[d] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[e] Building 707, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[f] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification, blend down, and sonic wash technology assessments.
[g] 3-day supply of feed and 2-day supply of product.
[h] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[j] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[k] Materials are opened in a glovebox. No room spill is considered.
[l] 1 drum at the maximum plutonium content level.
[m] The product of $ARF\times RF = 1.0\times10^{-6}$.
[n] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[p] Consequences enveloped by the earthquake.
[q] The aircraft will not penetrate the building walls.

Table D–198 Summary of the Glass Residue Accident Analysis Doses for the Calcination/Vitrification Process, Blend Down Process, Sonic Wash Process at Rocky Flats

Accident Scenario	*Building Source Term* (grams)	*Type*	*MEI (rem)* 95% Met	*MEI (rem)* 50% Met	*Population (person-rem)* 95% Met	*Population (person-rem)* 50% Met	*Worker (rem)* 50% Met
Calcination/Vitrification Process							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0289	Metal	0.0693	0.00750	1,210	28.9	0.808
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000075	Metal	0.00018	0.0000195	3.15	0.075	0.0021
Earthquake	0.381	Metal	0.914	0.099	16,000	381	10.7
Blend Down Process—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.0421	Metal	0.152	0.0152	1,770	42.1	1.18

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.01×10^{-10}	5.68×10^{-11}	7.01×10^{-6}	1.67×10^{-7}	4.18×10^{-10}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.556	Metal	2.00	0.200	23,300	556	15.6
Blend Down Process—Building 707							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0421	Metal	0.101	0.0109	1,770	42.1	1.18
Fire (Dock)	0.00180	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000750	Metal	0.000180	0.0000195	3.15	0.0750	0.00210
Earthquake	0.556	Metal	1.33	0.144	23,300	556	15.6
Sonic Wash Process							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.00953	Metal	0.0343	0.00343	400	9.53	0.267
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	3.78×10^{-10}	Metal	1.13×10^{-9}	1.29×10^{-10}	0.0000159	3.78×10^{-7}	9.45×10^{-10}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.00210
Earthquake	0.126	Metal	0.453	0.0453	5,280	126	3.52

MEI = maximally exposed individual   Met = meteorological data

Table D–199 Summary of the Glass Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification Process, Blend Down Process, Sonic Wash Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Calcination/Vitrification Process						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	1.73×10^{-8}	1.88×10^{-9}	0.000303	7.21×10^{-6}	1.62×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	1.19×10^{-6}	1.29×10^{-7}	0.0208	0.000495	0.0000111
Blend Down Process—Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	3.79×10^{-8}	3.79×10^{-9}	0.000442	0.0000105	2.36×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.00×10^{-13}	2.27×10^{-14}	2.81×10^{-9}	6.68×10^{-11}	1.34×10^{-13}

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	9.40×10^{-8}	9.40×10^{-9}	0.0011	0.0000261	5.85×10^{-7}
Blend Down Process—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.000420	0.0000100	2.24×10^{-7}
Fire (Room)	0.0005	2.53×10^{-8}	2.74×10^{-9}	0.000442	0.0000105	2.36×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.8	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-14}
Earthquake	0.0026	1.73×10^{-6}	1.88×10^{-7}	0.0303	0.000722	0.0000162
Sonic Wash Process						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	8.58×10^{-9}	8.58×10^{-10}	0.0001	2.38×10^{-6}	5.34×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	4.54×10^{-13}	5.14×10^{-14}	6.35×10^{-9}	1.51×10^{-10}	3.02×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	2.13×10^{-8}	2.13×10^{-9}	0.000248	5.91×10^{-6}	1.32×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–200 Alternative 2 Accident Risks During Glass Residue Processing

Glass Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Calcination/Vitrification Process						
All Residues	0.012	1.48×10^{-8}	1.60×10^{-9}	0.000258	6.15×10^{-6}	1.38×10^{-7}
Blend Down Process – Building 371						
All Residues	0.014	1.85×10^{-9}	1.85×10^{-10}	0.0000216	5.13×10^{-7}	1.15×10^{-8}
Blend Down Process – Building 707						
All Residues	0.014	2.50×10^{-8}	2.70×10^{-9}	0.000437	0.0000104	2.33×10^{-7}
Sonic Wash Process						
All Residues	0.037	1.11×10^{-9}	1.11×10^{-10}	0.0000129	3.08×10^{-7}	6.91×10^{-9}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.7.3 Alternative 3 – Processing with Plutonium Separation

The glass residues processing technology considered for this alternative is mediated electrochemical oxidation. Most of the mediated electrochemical oxidation process will be performed at Rocky Flats in Building 371, Room 3701. The final calcination in the process will be performed at Rocky Flats in Building 707A, Module J.

Similar accidents are applicable to the mediated electrochemical oxidation processes in both buildings. **Table D–201** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of processing glass residues using the mediated electrochemical oxidation technology at Rocky Flats. **Table D–202** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of glass residues. The risks associated with this processing technology are summarized in **Table D–203** and **Table D–204**.

Table D–201 Glass Residue Accident Scenario Parameters for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Frequency (per year)	Glass Residues	HEPA Banks	Material at Risk (grams)	
				MEO Process	
				Building 371	Building 707A
Explosion (Acetylene)	0.00005	2 drums	2/0 [a]	4,000 g [b]	1,960 g [c]
Explosion (Ion Exchange Column)	0.0001	Solution	2	0.245 mg [d]	N/A
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [e]
Fire:					
a. Room	0.0005	5-day supply [f]	2	5,180 g	14,700 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [g]	3,920 g [c]
Spill:					
a. Room [h]	–	–	–	–	–
b. Glovebox	0.80	1 feed prep container	2	200 g	980 g
c. Loading Dock	0.001	1 drum	0	3,000 g [j]	980 g [c]
Earthquake:					
a. Building 371	0.000094	5-day supply [f]	0	5,180 g	N/A
b. Building 707A	0.0026	5-day supply [f]	0	N/A	14,700 g

Accident Scenario	***Frequency (per year)***	***Glass Residues***	***HEPA Banks***	***Material at Risk (grams) MEO Process Building 371***	***Building 707A***
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Explosion (Acetylene):					
a. Building 707A	1.0	0.001	0.1	1.0	Ground
b. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
Explosion (Ion Exchange Column) [d]	1.0	1.0	1.0	1.0	Elevated
Nuclear Criticality [e, k]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [l]	1.0 [l]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [l]	1.0 [l]	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [m]	0.30 [m]	0.10	Ground
Aircraft Crash:					
a. Building 707A [n]	–	–	–	–	–
b. Building 371 [p]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

a Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.

b 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

c 980-g product containers are transported from Building 371 to Building 707A for processing.

d Respirable source term value in milligrams of plutonium released up the stack.

e The wet nuclear criticality is not a viable accident scenario for the mediated electrochemical oxidation process in Building 707A.

f 3-day supply of feed and 2-day supply of product.

g 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

h Materials are opened in a glovebox. No room spill is considered.

j 1 drum at the maximum plutonium content level.

k Refer to Table D–28 for Building 371 mediated electrochemical oxidation criticality accident source term.

l The product of ARF×RF = 1.0×10^{-6}.

m Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

n Consequences enveloped by the earthquake.

p The aircraft will not penetrate the building walls.

Table D–202 Summary of the Glass Residue Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	***Building Source Term (grams)***	***Type***	***MEI (rem) 95% Met***	***50% Met***	***Population (person-rem) 95% Met***	***50% Met***	***Worker (rem) 50% Met***
Building 371							
Explosion (Acetylene)	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Explosion (Ion Exchange Column)	0.000245	Metal	0.000735	0.0000833	10.3	0.245	0.000613
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Fire (Room)	0.0311	Metal	0.112	0.0112	1,310	31.1	0.870
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	4.00×10^{-10}	Metal	1.20×10^{-9}	1.36×10^{-10}	0.0000168	4.00×10^{-7}	1.00×10^{-9}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.410	Metal	1.48	0.148	17,200	410	11.5
Building 707A							
Explosion (Acetylene)	0.196	Oxide	0.235	0.0255	4,900	118	4.12
Fire (Room)	0.0882	Oxide	0.106	0.0115	2,210	52.9	1.85
Fire (Dock)	0.00118	Oxide	0.00141	0.000153	29.4	0.706	0.0247
Spill (Glovebox)	1.96×10^{-9}	Oxide	3.14×10^{-10}	1.18×10^{-10}	0.0000171	8.82×10^{-7}	2.74×10^{-10}
Spill (Dock)	0.0000245	Oxide	0.0000294	3.19×10^{-6}	0.613	0.0147	0.000515
Earthquake	1.16	Oxide	1.40	0.151	29,100	699	24.4

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–203 Summary of the Glass Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
Explosion (Acetylene)	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Explosion (Ion Exchange Column)	0.0001	3.68×10^{-11}	4.17×10^{-12}	5.15×10^{-7}	1.23×10^{-8}	2.45×10^{-11}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	2.80×10^{-8}	2.80×10^{-9}	0.000326	7.77×10^{-6}	1.74×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	4.80×10^{-13}	5.44×10^{-14}	6.72×10^{-9}	1.60×10^{-10}	3.20×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	6.94×10^{-8}	6.94×10^{-9}	0.00081	0.0000193	4.32×10^{-7}
Building 707A						
Explosion (Acetylene)	0.00005	5.88×10^{-9}	6.37×10^{-10}	0.000123	2.94×10^{-6}	8.23×10^{-8}
Fire (Room)	0.0005	2.65×10^{-8}	2.87×10^{-9}	0.000551	0.0000132	3.70×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.41×10^{-12}	1.53×10^{-13}	2.94×10^{-8}	7.06×10^{-10}	1.98×10^{-11}
Spill (Glovebox)	0.80	1.25×10^{-13}	4.70×10^{-14}	6.82×10^{-9}	3.53×10^{-10}	8.78×10^{-14}
Spill (Dock)	0.001	1.47×10^{-11}	1.59×10^{-12}	3.06×10^{-7}	7.35×10^{-9}	2.06×10^{-10}
Earthquake	0.0026	1.82×10^{-6}	1.97×10^{-7}	0.0378	0.000908	0.0000509

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–204 Alternative 3 Accident Risks During Mediated Electrochemical Oxidation Processing at Rocky Flats

Glass Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
All Residues	0.019	2.60×10^{-9}	2.90×10^{-10}	0.0000283	7.54×10^{-7}	1.18×10^{-8}
Building 707A						
All Residues	0.0064	1.18×10^{-8}	1.28×10^{-9}	0.000246	5.92×10^{-6}	3.28×10^{-7}
Buildings 371 and 707A						
All Residues	–	1.44×10^{-8}	1.57×10^{-9}	0.000275	6.67×10^{-6}	3.40×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.7.4 Alternative 4 – Combination of Processing Technologies

The glass residue processing technology considered for this alternative is the neutralization/dry process. All glass residue can be processed using this technology. The neutralization/dry process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.7.1, Alternative 1 - No Action. Refer to Section D.3.4.7.1 for details.

D.3.4.8 Graphite Residues

D.3.4.8.1 Alternative 1 – No Action

The graphite residues processing technology considered for this alternative is repackaging. Repackaging of residues will be conducted within glovebox lines in Modules D, E, and F in Building 707 at Rocky Flats.

Table D–205 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of repackaging graphite residues at Rocky Flats. **Table D–206** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the repackaging of graphite residues at Rocky Flats. The risks associated with this processing technology are summarized in **Table D–207** and **Table D–208**.

Table D–205 Graphite Residue Accident Scenario Parameters for Repackaging at Rocky Flats

Accident Scenario	Frequency (per year)	Graphite Residues	HEPA Banks	Material at Risk (grams)
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [b] 4 drums [c]	 2 0	 8,016 g 6,000 g

Accident Scenario	***Frequency (per year)***	***Graphite Residues***	***HEPA Banks***	***Material at Risk (grams)***
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.80 0.001	 1 container at the maximum limit [d] 1 feed prep container 1 drum [e]	 2 2 0	 600 g 83.5 g 3,000 g
Earthquake	0.0026	5-day supply [b]	0	8,016 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Explosion	1.0	0.001	0.10	1.0	Ground
Nuclear Criticality [f]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 1.0 1.0 0.25	 0.00002 0.00002 0.00008	 0.50 0.50 0.50	 2.0×10^{-6} 2.0×10^{-6} 0.10	 Elevated Elevated Ground
Earthquake	1.0	0.002 [g]	0.30 [g]	0.10	Ground
Aircraft Crash [h]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content

[b] 3-day supply of feed and 2-day supply of product.

[c] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[d] 5 containers per drum of feed.

[e] 1 drum at the maximum plutonium content level.

[f] The wet nuclear criticality is not a viable accident scenario for the repackaging process in Building 707.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

Table D–206 Summary of the Graphite Residue Accident Analysis Doses for Repackaging at Rocky Flats

	Building Source Term		***MEI (rem)***		***Population (person-rem)***		***Worker (rem)***
Accident Scenario	***(grams)***	***Type***	***95% Met***	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0481	Metal	0.115	0.0125	2,020	48.1	1.35
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.635	Metal	1.52	0.165	26,700	635	17.8

MEI = maximally exposed individual Met = meteorological data

Table D–207 Summary of the Graphite Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for Repackaging at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	2.89×10^{-8}	3.13×10^{-9}	0.000505	1.20×10^{-6}	2.69×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.80	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	1.98×10^{-6}	2.15×10^{-7}	0.0347	0.000825	0.0000185

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–208 Alternative 1 Accident Risks During Graphite Residue Processing

Graphite Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
All Residues	0.23	4.69×10^{-7}	5.08×10^{-8}	0.0082	0.000195	4.37×10^{-6}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.8.2 Alternative 2 – Processing without Plutonium Separation

The graphite residues processing technologies considered for this alternative are calcination/vitrification, blend down, and cementation. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. The blend down process will be performed at Rocky Flats in Building 707, Module E. Building 371 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process. The cementation process will be performed at Rocky Flats in Building 371, Room 3701. Building 707 is under consideration as an alternate location for the cementation process. The accident analysis evaluates both the primary and alternate locations for the cementation process.

Similar accidents are applicable to all of these technologies. **Table D–209** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of graphite residues processing at Rocky Flats. **Table D–210** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of graphite residues. The risks associated with these processing technologies are summarized in **Table D–211** and **Table D–212**.

Table D–209 Graphite Residue Accident Scenario Parameters for the Calcination/Vitrification Process, Blend Down Process, and Cementation Process at Rocky Flats

Accident Scenario	Frequency (per year)	Graphite Residues	HEPA Banks	Material at Risk (grams)		
				Calcination/ Vitrification Process [a]	Blend Down Process [b]	Cementation Process [c]
Explosion	0.00005	2 drums [d]	0/2 [e]	4,000 g	4,000 g	4,000 g
Nuclear Criticality [f]	–	–	–	–	–	–
Fire:						
a. Room	0.0005	5-day supply [g]	2	4,810 g feed + 3,206 g product [h]	8,016 g	3,507 g feed + 2,338 g product [j]
b. Loading Dock	2.0×10^{-6}	4 drums [k]	0	6,000 g	6,000 g	6,000 g
Spill:						
a. Room	0.008	1 container at the maximum limit [l]	2	600 g	600 g	600 g
b. Glovebox	0.8	1 feed prep container	2	83.5 g	83.5g	83.5g
c. Loading Dock	0.001	1 drum [m]	0	3,000 g	3,000 g	3,000 g
Earthquake:						
a. Building 707	0.0026	5-day supply [g]	0	4,810 g feed + 3,206 g product [h]	8,016 g	3,507 g feed + 2,338 g product [j]
b. Building 371	0.000094	5-day supply [g]	0	N/A	8,016 g	3,507 g feed + 2,338 g product [j]
Aircraft Crash:						
a. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–	–	–
b. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	N/A	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion:					
a. Building 707	1.0	0.001	0.10	1.0	Ground
b. Building 371	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Nuclear Criticality [f]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Room	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake:					
Buildings 371 and 707	1.0	0.002 [n]	0.30 [n]	0.10	Ground
Aircraft Crash:					
a. Building 707 [p]	–	–	–	–	–
b. Building 371 [q]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

a Building 707, Modules D, E, and F.

b Building 707, Module E, or Building 371.

c Building 371, Room 3701, or Building 707.

d 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

e Building 707, 0 HEPA Banks; Building 371, 2 HEPA Banks.

f The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification, blend down, and sonic wash technology assessments.

[g] 3-day supply of feed and 2-day supply of product.
[h] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[j] The product is concrete. The effect of the residue immobilized in the concrete on the accident source term is negligible.
[k] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[l] 5 containers per drum of feed.
[m] 1 drum at the maximum plutonium content level.
[n] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[p] Consequences enveloped by the earthquake.
[q] The aircraft will not penetrate the building walls.

Table D–210 Summary of the Graphite Residue Accident Analysis Doses for the Calcination/Vitrification Process, Blend Down Process, and Cementation Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Calcination/Vitrification Process							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0289	Metal	0.0693	0.0075	1,210	28.9	0.808
Fire (Dock)	0.00180	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.381	Metal	0.914	0.099	16,000	381	10.7
Blend Down Process—Building 707							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0481	Metal	0.115	0.0125	2,020	48.1	1.35
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.00018	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.635	Metal	1.52	0.165	26,700	635	17.8
Blend Down Process—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.000800	2.00×10^{-6}
Fire (Room)	0.0481	Metal	0.173	0.0173	2,020	48.1	1.35
Fire (Dock)	0.00180	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.0000120	3.00×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.01×10^{-9}	5.68×10^{-10}	0.0000701	1.67×10^{-6}	4.18×10^{-9}
Spill (Dock)	0.00300	Metal	0.0108	0.00108	126	3.00	0.0840
Earthquake	0.635	Metal	2.29	0.229	26,700	635	17.8
Cementation Process—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}

Accident Scenario	***Building Source Term (grams)***	***Building Source Term Type***	***MEI (rem) 95% Met***	***MEI (rem) 50% Met***	***Population (person-rem) 95% Met***	***Population (person-rem) 50% Met***	***Worker (rem) 50% Met***
Fire (Room)	0.021	Metal	0.0758	0.00758	884	21.0	0.589
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.08	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.01×10^{-9}	5.68×10^{-10}	0.0000701	1.67×10^{-6}	4.18×10^{-9}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.278	Metal	1.00	0.100	11,700	278	7.78
Cementation Process—Building 707							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0210	Metal	0.0505	0.00547	884	21.0	0.589
Fire (Dock)	0.00180	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.84×10^{-9}	1.44×10^{-9}	0.000180	9.24×10^{-6}	2.28×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Metal	5.34×10^{-10}	2.00×10^{-10}	0.0000251	1.29×10^{-6}	3.17×10^{-10}
Spill (Dock)	0.00300	Metal	0.00720	0.000780	126	3.00	0.0840
Earthquake	0.278	Metal	0.667	0.0722	11,700	278	7.78

MEI = maximally exposed individual   Met = meteorological data

Table D–211 Summary of the Graphite Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification Process, Blend Down Process, and Cementation Process at Rocky Flats

Accident Scenario	***Accident Frequency (per year)***	***MEI (LCF/yr) 95% Met***	***MEI (LCF/yr) 50% Met***	***Population (LCF/yr) 95% Met***	***Population (LCF/yr) 50% Met***	***Worker (LCF/yr) 50% Met***
Calcination/Vitrification Process						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	1.73×10^{-8}	1.88×10^{-9}	0.000303	7.22×10^{-6}	1.62×10^{-7}
Fire (Dock)	2.00×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.800	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	1.19×10^{-6}	1.29×10^{-7}	0.0208	0.000495	0.0000111
Blend Down Process—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	2.89×10^{-8}	3.13×10^{-9}	0.000505	0.000012	2.69×10^{-7}
Fire (Dock)	2.00×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.800	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	1.98×10^{-6}	2.15×10^{-7}	0.0347	0.000825	0.0000185
Blend Down Process—Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	4.33×10^{-8}	4.33×10^{-9}	0.000505	0.0000120	2.69×10^{-7}
Fire (Dock)	2.00×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.8	2.00×10^{-12}	2.27×10^{-13}	2.81×10^{-8}	6.68×10^{-10}	1.34×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.0000630	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	1.07×10^{-7}	1.07×10^{-8}	0.00125	0.0000298	6.68×10^{-7}
Cementation Process—Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	1.89×10^{-8}	1.89×10^{-9}	0.000221	5.26×10^{-6}	1.18×10^{-7}
Fire (Dock)	2.00×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.800	2.00×10^{-13}	2.27×10^{-13}	2.81×10^{-8}	6.68×10^{-10}	1.34×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	4.70×10^{-8}	4.70×10^{-9}	0.000548	0.0000131	2.92×10^{-7}
Cementation Process—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.000420	0.0000100	2.24×10^{-7}
Fire (Room)	0.0005	1.26×10^{-8}	1.37×10^{-9}	0.000221	5.26×10^{-6}	1.18×10^{-7}
Fire (Dock)	2.00×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.54×10^{-14}	5.76×10^{-15}	7.20×10^{-10}	3.70×10^{-11}	7.30×10^{-15}
Spill (Glovebox)	0.8	2.14×10^{-13}	8.02×10^{-14}	1.00×10^{-8}	5.14×10^{-10}	1.02×10^{-13}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.0000630	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	8.67×10^{-7}	9.39×10^{-8}	0.0152	0.000361	8.09×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–212 Alternative 2 Accident Risks During Graphite Residue Processing

Graphite Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Calcination/Vitrification Process						
All Residues	0.23	2.84×10^{-7}	3.07×10^{-8}	0.00496	0.000118	2.65×10^{-6}
Blend Down Process – Building 707						
All Residues	0.23	4.69×10^{-7}	5.08×10^{-8}	0.0082	0.000195	4.37×10^{-6}

Graphite Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Blend Down Process – Building 371						
All Residues	0.23	3.59×10^{-8}	3.59×10^{-9}	0.000419	9.97×10^{-6}	2.23×10^{-7}
Cementation Process – Building 371						
All Residues	0.32	2.28×10^{-8}	2.28×10^{-9}	0.000266	6.34×10^{-6}	1.42×10^{-7}
Cementation Process – Building 707						
All Residues	0.32	2.90×10^{-7}	3.14×10^{-8}	0.00508	0.000121	2.71×10^{-6}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.8.3 Alternative 3 – Processing with Plutonium Separation

The graphite residues processing technology considered for this alternative is mediated electrochemical oxidation. Processing of graphite residues with the mediated electrochemical oxidation process may be performed at either Rocky Flats or the Savannah River Site. At Rocky Flats, most of the mediated electrochemical oxidation process will be performed in Building 371, Room 3701; the final calcination in the process will be performed in Building 707A, Module J. For processing at the Savannah River Site, the packaging of the residues at Rocky Flats will be performed in Building 371, Room 371. The mediated electrochemical oxidation process will be performed in the canyon facilities at the Savannah River Site.

Similar accidents are applicable to the mediated electrochemical oxidation processes at both sites. **Table D–213** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of graphite residues processing using the mediated electrochemical oxidation technology at Rocky Flats. **Table D–214** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of graphite residues at Rocky Flats. The risks associated with this processing technology at Rocky Flats are summarized in **Table D–215** and **Table D–216**.

Table D–213 Graphite Residue Accident Scenario Parameter for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Frequency (per year)	Graphite Residues	HEPA Banks	Material at Risk (grams)	
				Mediated Electrochemical Oxidation Process	
				Building 371	Building 707A [a]
Explosion (Acetylene)	0.00005	2 drums	2/0 [b]	4,000 g [c]	2,000 g
Explosion (Ion Exchange Column)	0.0001	Solution	2	0.245 mg [d]	N/A
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [e]
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [f] 4 drums	 2 0	 5,550 g 6,000 g [g]	 6,000 g 4,000 g

Accident Scenario	Frequency (per year)	Graphite Residues	HEPA Banks	Material at Risk (grams) — Mediated Electrochemical Oxidation Process: Building 371	Material at Risk (grams) — Mediated Electrochemical Oxidation Process: Building 707A [a]
Spill:					
a. Room	0.008	1 container at the maximum limit [h]	2	600 g	N/A [j]
b. Glovebox	0.80	1 feed prep container	2	200 g	1,000 g
c. Loading Dock	0.001	1 drum	0	3,000 g [k]	1,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [f]	0	5,550 g	N/A
b. Building 707A	0.0026	5-day supply [f]	0	N/A	6,000 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion (Acetylene):					
a. Building 707A	1.0	0.001	0.10	1.0	Ground
b. Building 371	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Explosion (Ion Exchange Column) [d]	1.0	1.0	1.0	1.0	Elevated
Nuclear Criticality [e, l]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Room [j]	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.50	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [m]	0.30 [m]	0.10	Ground
Aircraft Crash:					
a. Building 707A [n]	–	–	–	–	–
b. Building 371 [p]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product container transported from Building 371 to Building 707A for processing.

[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.

[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[d] Respirable source term value in milligrams of plutonium released up the stack.

[e] The wet nuclear criticality is not a viable accident scenario for the mediated electrochemical oxidation process in Building 707A.

[f] 3-day supply of feed and 2-day supply of product.

[g] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[h] 5 containers per drum of feed.

[j] Materials are opened in a glovebox in Building 707A. No room spill is considered.

[k] 1 drum at the maximum plutonium content level.

[l] Refer to Table D–28 for Building 371 mediated electrochemical oxidation criticality accident source term.

[m] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[n] Consequences enveloped by the earthquake.

[p] The aircraft will not penetrate the building walls.

Table D–214 Summary of the Graphite Residue Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Building 371							
Explosion (Acetylene)	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Explosion (Ion Exchange Column)	0.000245	Metal	0.000735	0.0000833	10.3	0.245	0.000613
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321
Fire (Room)	0.0333	Metal	0.120	0.012	1,400	33.3	0.932
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	4.00×10^{-9}	Metal	1.20×10^{-8}	1.36×10^{-9}	0.000168	4.00×10^{-6}	1.00×10^{-8}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.440	Metal	1.58	0.158	18,500	440	12.3
Building 707A							
Explosion (Acetylene)	0.200	Oxide	0.240	0.026	5,000	120	4.20
Fire (Room)	0.036	Oxide	0.0432	0.00468	900	21.6	0.756
Fire (Dock)	0.0012	Oxide	0.00144	0.000156	30.0	0.720	0.0252
Spill (Glovebox)	2.00×10^{-8}	Oxide	3.20×10^{-9}	1.20×10^{-9}	0.000174	9.00×10^{-6}	2.80×10^{-9}
Spill (Dock)	0.001	Oxide	0.0012	0.00013	25.0	0.600	0.021
Earthquake	0.475	Oxide	0.570	0.0618	11,900	285	9.98

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–215 Summary of the Graphite Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
Explosion (Acetylene)	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Explosion (Ion Exchange Column)	0.0001	3.68×10^{-11}	4.17×10^{-12}	5.15×10^{-7}	1.23×10^{-8}	2.45×10^{-11}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	3.00×10^{-8}	3.00×10^{-9}	0.00035	8.33×10^{-6}	1.86×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}
Spill (Glovebox)	0.80	4.80×10^{-12}	5.44×10^{-13}	6.72×10^{-8}	1.60×10^{-9}	3.20×10^{-12}

Accident Scenario	***Accident Frequency (per year)***	***MEI (LCF/yr)***		***Population (LCF/yr)***		***Worker (LCF/yr)***
		95% Met	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	7.44×10^{-8}	7.44×10^{-9}	0.000868	0.0000207	4.63×10^{-7}
Building 707A						
Explosion (Acetylene)	0.00005	6.00×10^{-9}	6.50×10^{-10}	0.000125	3.00×10^{-6}	8.40×10^{-8}
Fire (Room)	0.0005	1.08×10^{-8}	1.17×10^{-9}	0.000225	5.40×10^{-6}	1.51×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.44×10^{-12}	1.56×10^{-13}	3.00×10^{-8}	7.20×10^{-10}	2.02×10^{-11}
Spill (Glovebox)	0.80	1.28×10^{-12}	4.80×10^{-13}	6.96×10^{-8}	3.60×10^{-9}	8.96×10^{-13}
Spill (Dock)	0.001	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Earthquake	0.0026	7.41×10^{-7}	8.03×10^{-8}	0.0154	0.000371	0.0000104

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–216 Alternative 3 Accident Risks During Mediated Electrochemical Oxidation Processing at Rocky Flats

Graphite Residue	***Process Duration (yr)***	***Risks [a]***				
		MEI (LCF)		***Population (LCF)***		***Worker (LCF)***
		95% Met	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Building 371						
All Residues	0.33	4.93×10^{-8}	5.44×10^{-9}	0.000538	0.0000142	$2.30\times^{-7}$
Building 707A						
All Residues	0.31	2.35×10^{-7}	2.55×10^{-8}	0.0049	0.000118	3.29×10^{-6}
Buildings 371 and 707A						
All Residues	–	2.84×10^{-7}	3.09×10^{-8}	0.00544	0.000132	3.52×10^{-6}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

Table D–217 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of packaging the graphite residues at Rocky Flats and of processing the residues using the mediated electrochemical oxidation technology at the Savannah River Site. **Table D–218** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with packaging the graphite residues at Rocky Flats and processing the graphite residues at the Savannah River Site. The risks associated with packaging at Rocky Flats and using the mediated electrochemical oxidation process at the Savannah River Site are summarized in **Table D–219** and **Table D–220**. The processes at the Savannah River Site could be performed in either the F-Canyon and FB-Line or the H-Canyon and HB-Line. Data are presented in Table D–217, Table D–218, Table d-219 and Table D–220 for both options.

Table D–217 Graphite Residue Accident Scenario Parameters for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	***Frequency (per year)***	***Graphite Residues***	***HEPA Banks***	***Material at Risk (grams)***
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site				
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 8,652 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.80 0.001	 1 container at the maximum limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 600 g 103 g 3,000 g
Earthquake	0.000094	5-day supply [c]	0	8,652 g
Aircraft Crash	0.00004	The aircraft will not penetrate the building wall.	–	–

Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Explosion	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 1.0 1.0 0.25	 0.00002 0.00002 0.00008	 0.50 0.50 0.50	 2.0×10^{-6} 2.0×10^{-6} 0.10	 Elevated Elevated Ground
Earthquake	1.0	0.002 [g]	0.30 [g]	0.10	Ground
Aircraft Crash [h]	–	–	–	–	–

Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon		
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***
Explosion: a. Hydrogen b. Ion Exchange column	 0.000015 0.0001	 4,000 g 120.5 mg [j]
Nuclear Criticality [k]	0.0001	1.0×10^{19} fissions
Fire	0.00061	4,000 g
Spill	0.01	103 g
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Metal Liquid	0.000125	 12,000 g 1,000 g 1,000 g 1,000 g

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Metal Liquid	 1.0 1.0 1.0 1.0	 0.000047 0.002 0.0022 0.000047	 0.10 0.10 0.10 0.10	 Ground Ground Ground Ground

Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon

Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***
Explosion: a. Hydrogen b. Ion Exchange column	 0.000015 0.0001	 4,000 g 241 mg [j, l]
Nuclear Criticality [k]	0.0001	1.0×10^{19} fissions
Fire	0.00061	6,000 g
Spill	0.01	103 g
Earthquake: a. H-Canyon Liquid b. HB-Line Powder Liquid	0.000182	 27,000 g 4,000 m 4,000 m

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated
Earthquake: a. H-Canyon b. HB-Line Powder HB-Line Liquid	 1.0 1.0 1.0	 0.000047 0.002 0.000047	 0.10 0.10 0.10	 Ground Ground Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

a 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

b The wet nuclear criticality is not a viable accident scenario for the residue packaging process in Building 371.

c 3-day supply of feed and 2-day supply of product.

d 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

e 5 containers per drum of feed.

f 1 drum at the maximum plutonium content level.

g Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

h The aircraft will not penetrate the building walls.

j Respirable source term value in milligrams of plutonium released up the stack.

k Refer to Table D–28 for criticality accident source term.

l Duty cycle = 60%.

Table D–218 Summary of the Graphite Residue Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.0519	Metal	0.187	0.0187	2,180	51.9	1.45
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Room)	1.20×10^{-8}	Metal	3.60×10^{-8}	4.08×10^{-9}	0.000504	0.000012	3.00×10^{-8}
Spill (Glovebox)	2.06×10^{-9}	Metal	6.18×10^{-9}	7.00×10^{-10}	0.0000865	2.06×10^{-6}	5.15×10^{-9}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.685	Metal	2.47	0.247	28,800	685	19.2
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon							
Explosion (Hydrogen)	0.02	Metal	0.00068	0.00024	36.0	3.20	0.002
Explosion (Ion Exchange Column)	0.121	Metal-FB	0.00374	0.00133	193	18.1	0.0112
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.200	Metal	0.0068	0.0024	360	32.0	0.02
Spill	5.15×10^{-6}	Metal	1.75×10^{-7}	6.18×10^{-8}	0.00927	0.000824	5.15×10^{-7}
Earthquake	0.481	Metal	0.0443	0.00818	1,590	111	10.6
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon							
Explosion (Hydrogen)	0.02	Metal	0.00064	0.000192	32.0	3.00	0.002
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality (Liquid)	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.300	Metal	0.0096	0.00288	480	45.0	0.03
Spill	5.15×10^{-6}	Metal	1.65×10^{-7}	4.94×10^{-8}	0.00824	0.000773	5.15×10^{-7}
Earthquake	0.946	Metal	0.0653	0.0132	2,930	189	20.8

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–219 Summary of the Graphite Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	4.67×10^{-8}	4.67×10^{-9}	0.000545	0.000013	2.91×10^{-7}
Fire (Dock)	2.00×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Room)	0.008	1.44×10^{-13}	1.63×10^{-14}	2.02×10^{-9}	4.80×10^{-11}	9.60×10^{-14}

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Spill (Glovebox)	0.800	2.47×10^{-12}	2.80×10^{-13}	3.46×10^{-8}	8.24×10^{-10}	1.65×10^{-12}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	1.16×10^{-7}	1.16×10^{-8}	0.00135	0.0000322	7.21×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon						
Explosion (Hydrogen)	0.000015	5.10×10^{-12}	1.80×10^{-12}	2.70×10^{-7}	2.40×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.0001	1.87×10^{-10}	6.63×10^{-11}	9.64×10^{-6}	9.04×10^{-7}	4.48×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.07×10^{-9}	7.32×10^{-10}	0.00011	9.76×10^{-6}	4.88×10^{-9}
Spill	0.01	8.76×10^{-13}	3.09×10^{-13}	4.64×10^{-8}	4.12×10^{-9}	2.06×10^{-12}
Earthquake	0.000125	2.77×10^{-9}	5.11×10^{-10}	0.0000992	6.92×10^{-6}	5.29×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon						
Explosion (Hydrogen)	0.000015	4.80×10^{-12}	1.44×10^{-12}	2.40×10^{-7}	2.25×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.0001	2.10×10^{-10}	6.36×10^{-11}	0.0000103	1.02×10^{-6}	5.38×10^{-10}
Criticality (Liquid)	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.93×10^{-9}	8.78×10^{-10}	0.000146	0.0000137	7.32×10^{-9}
Spill	0.01	8.24×10^{-13}	2.47×10^{-13}	4.12×10^{-8}	3.86×10^{-9}	2.06×10^{-12}
Earthquake	0.000182	3.88×10^{-9}	7.88×10^{-10}	0.000174	0.0000113	1.98×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–220 Alternative 3 Accident Risks During the Mediated Electrochemical Oxidation Process at the Savannah River Site

Graphite Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Packaging of Residues for Shipment to Savannah River Site						
All Residues	0.22	3.70×10^{-8}	3.70×10^{-9}	0.000431	0.0000103	2.30×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon						
All Residues	0.42	2.34×10^{-9}	6.43×10^{-10}	0.0000985	8.07×10^{-6}	2.25×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon						
All Residues	0.42	3.14×10^{-9}	7.90×10^{-10}	0.000142	0.0000115	8.36×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.8.4 Alternative 4 – Combination of Processing Technologies

The graphite residue processing technology considered for this alternative is repackaging. All graphite residue can be processed using this technology. The repackaging process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.8.1, Alternative 1 - No Action. Refer to Section D.3.4.8.1 for details.

D.3.4.9 Inorganic Residues

D.3.4.9.1 Alternative 1 – No Action

The inorganic residues processing technology considered for this alternative is repackaging. Preparation of repackaging of residues will be conducted at Rocky Flats within glovebox lines in Modules D, E, and F in Building 707.

Table D–221 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of repackaging of inorganic residues at Rocky Flats. **Table D–222** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the repackaging of inorganic residues at Rocky Flats. The risks associated with this processing technology are summarized in **Table D–223** and **Table D–224**.

Table D–221 Inorganic Residue Accident Scenario Parameters for Repackaging at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Inorganic Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [b] 4 drums [c]	 2 0	 8,016 g 6,000 g
Spill: a. Room [d] b. Glovebox c. Loading Dock	 – 0.80 0.001	 – 1 feed prep container 1 drum [e]	 – 2 0	 – 83.5 g 3,000 g
Earthquake	0.0026	5-day supply [b]	0	8,016 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.10	1.0	Ground
Nuclear Criticality [f]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 1.0×10^{-6} [g] 1.0×10^{-6} [g]	 1.0 [g] 1.0 [g]	 2.0×10^{-6} 0.10	 Elevated Ground
Earthquake	1.0	0.001 [h]	0.10 [h]	0.10	Ground
Aircraft Crash [j]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content

[b] 3-day supply of feed and 2-day supply of product.

[c] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[d] Materials are opened in a glovebox. No room spill is considered.

[e] 1 drum at the maximum plutonium content level.

[f] The wet nuclear criticality is not a viable accident scenario for the repackaging process in Building 707.

[g] The product of ARF×RF = 1.0×10^{-6}.
[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[j] Consequences enveloped by the earthquake.

Table D–222 Summary of the Inorganic Residue Accident Analysis Doses for Repackaging at Rocky Flats

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0481	Metal	0.115	0.0125	2,020	48.1	1.35
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000075	Metal	0.00018	0.0000195	3.15	0.075	0.0021
Earthquake	0.234	Metal	0.562	0.0609	9,830	234	6.55

MEI = maximally exposed individual Met = meteorological data

Table D–223 Summary of the Inorganic Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for Repackaging at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	2.89×10^{-8}	3.13×10^{-9}	0.000505	0.000012	2.69×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	7.30×10^{-7}	7.91×10^{-8}	0.0128	0.000304	6.82×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–224 Alternative 1 Accident Risks During Inorganic Residue Processing

Inorganic Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
All Residues	0.043	3.37×10^{-8}	3.65×10^{-9}	0.000589	0.000014	3.14×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.9.2 Alternative 2 – Processing without Plutonium Separation

The inorganic residues processing technologies considered for this alternative are calcination/vitrification and blend down. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. The blend down process will be performed at Rocky Flats in Building 707, Module E. Building 371 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process.

Similar accidents are applicable to the calcination/vitrification and blend down technologies. **Table D–225** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of inorganic residues processing at Rocky Flats. **Table D–226** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of inorganic residues. The risks associated with these processing technologies are summarized in **Table D–227** and **Table D–228**.

Table D–225 Inorganic Residue Accident Scenario Parameters for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Inorganic Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				Calcination/ Vitrification Process [a]	*Blend Down Process* [b]
Explosion	0.00005	2 drums [c]	0/2 [d]	4,000 g	4,000 g
Nuclear criticality [e]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [f] 4 drums [h]	 2 0	 4,810 g feed + 3,206 g product [g] 6,000 g	 8,016 g 6,000 g
Spill: a. Room [j] b. Glovebox c. Loading Dock	 – 0.80 0.001	 – 1 feed prep container 1 drum [k]	 – 2 0	 – 83.5 g 3,000 g	 – 83.5 g 3,000 g
Earthquake: a. Building 707 b. Building 371	 0.0026 0.000094	 5-day supply [f] 5-day supply [f]	 0 0	 4,810 g feed + 3,206 g product [g] N/A	 8,016 g 8,016 g
Aircraft Crash: a. Building 707 b. Building 371	 0.00003 0.00004	 Consequences enveloped by the earthquake. The aircraft will not penetrate the building walls.	 – –	 – N/A	 – –

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion: a. Building 707 b. Building 371	 1.0 1.0	 0.001 0.001	 0.10 0.10	 1.0 2.0×10^{-6}	 Ground Elevated
Nuclear criticality [e]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 1.0×10^{-6} [l] 1.0×10^{-6} [l]	 1.0 [l] 1.0 [l]	 2.0×10^{-6} 0.10	 Elevated Ground
Earthquake	1.0	0.001 [m]	0.10 [m]	0.10	Ground
Aircraft Crash: a. Building 707 [n] b. Building 371 [p]	 – –	 – –	 – –	 – –	 – –

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Building 707, Modules D, E, and F.
[b] Building 707, Module E.
[c] 1 drum at the maximum plutonium content level (3,000 grams) and 1 drum at the administrative control level (1,000 grams) for plutonium content.
[d] Building 371 2 HEPA Banks; Building 707, 0 HEPA Banks.
[e] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification and blend down technology assessments.
[f] 3-day supply of feed and 2-day supply of product.
[g] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[h] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[j] Materials are opened in a glovebox. No room spill is considered.
[k] 1 drum at the maximum plutonium content level.
[l] The product of ARF×RF = 1.0×10^{-6}.
[m] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[n] Consequences enveloped by the earthquake.
[p] The aircraft will not penetrate the building walls.

Table D–226 Summary of the Inorganic Residue Accident Analysis Doses for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	***(grams)***	***Type***	***95% met***	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Calcination/Vitrification Process							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0289	Metal	0.0693	0.0075	1,210	28.9	0.808
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000075	Metal	0.00018	0.0000195	3.15	0.075	0.0021
Earthquake	0.140	Metal	0.337	0.0365	5,900	140	3.93
Blend Down Process—Building 707							
Explosion	0.400	Metal	0.960	0.104	16,800	400	11.2
Fire (Room)	0.0481	Metal	0.115	0.0125	2,020	48.1	1.35
Fire (Dock)	0.0018	Metal	0.00432	0.000468	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.000075	Metal	0.00018	0.0000195	3.15	0.075	0.0021
Earthquake	0.234	Metal	0.562	0.0609	9,830	234	6.55
Blend Down Process—Building 371							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.000800	2.00×10^{-6}
Fire (Room)	0.0481	Metal	0.173	0.0173	2,020	48.1	1.35
Fire (Dock)	0.00180	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	1.67×10^{-10}	Metal	5.01×10^{-10}	5.68×10^{-11}	7.01×10^{-6}	1.67×10^{-7}	4.18×10^{-10}
Spill (Dock)	0.0000750	Metal	0.000270	0.0000270	3.15	0.0750	0.00210
Earthquake	0.234	Metal	0.843	0.0843	9,830	234	6.55

MEI = maximally exposed individual Met = meteorological data

Table D–227 Summary of the Inorganic Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification Process and Blend Down Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Calcination/Vitrification Process						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	1.73×10^{-8}	1.88×10^{-9}	0.000303	7.22×10^{-6}	1.62×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	4.38×10^{-7}	4.75×10^{-8}	0.00767	0.000183	4.09×10^{-6}
Blend Down Process—Building 707						
Explosion	0.00005	2.40×10^{-8}	2.60×10^{-9}	0.00042	0.00001	2.24×10^{-7}
Fire (Room)	0.0005	2.89×10^{-8}	3.13×10^{-9}	0.000505	0.000012	2.69×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-12}	4.68×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	9.00×10^{-11}	9.75×10^{-12}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.0026	7.30×10^{-7}	7.91×10^{-8}	0.0128	0.000304	6.82×10^{-6}
Blend Down Process—Building 371						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	4.33×10^{-8}	4.33×10^{-9}	0.000505	0.0000120	2.69×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	2.00×10^{-13}	2.27×10^{-14}	2.81×10^{-9}	6.68×10^{-11}	1.34×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	3.96×10^{-8}	3.96×10^{-9}	0.000462	0.0000110	2.46×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–228 Alternative 2 Accident Risks During Inorganic Residue Processing

Inorganic Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Calcination/Vitrification Process						
All Residues	0.043	2.06×10^{-8}	2.23×10^{-9}	0.000361	8.59×10^{-6}	1.92×10^{-7}
Blend Down Process – Building 707						
All Residues	0.043	3.37×10^{-8}	3.65×10^{-9}	0.000589	0.000014	3.14×10^{-7}
Blend Down Process – Building 371						
All Residues	0.043	3.57×10^{-9}	3.57×10^{-10}	0.0000417	9.92×10^{-7}	2.22×10^{-8}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.9.3 Alternative 3 – Processing with Plutonium Separation

The inorganic residues processing technology considered for this alternative is mediated electrochemical oxidation. Processing of inorganic residues with the mediated electrochemical oxidation process may be performed at either Rocky Flats or the Savannah River Site. At Rocky Flats, most of the mediated electrochemical oxidation process will be performed in Building 371, Room 3701; the final calcination in the process will be performed in Building 707A, Module J. The packaging of the residues at Rocky Flats for processing at the Savannah River Site will be performed in Building 371, Room 371. The mediated electrochemical oxidation process will be performed in the canyon facilities at the Savannah River Site.

At each site similar accidents are applicable for the selected processes. **Table D–229** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of processing inorganic residues using mediated electrochemical oxidation technology at Rocky Flats. **Table D–230** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of inorganic residues at Rocky Flats. The risks associated with this processing technology at Rocky Flats are summarized in **Table D–231** and **Table D–232**.

Table D–229 Inorganic Residue Accident Scenario Parameters for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Inorganic Residues*	*HEPA Banks*	*Material at Risk (grams) — Mediated Electrochemical Oxidation Process*	
				Building 371	*Building 707A* [a]
Explosion (Acetylene)	0.00005	2 drums	2/0 [b]	4,000 g [c]	1,966 g
Explosion (Ion Exchange Column)	0.0001	Solution	2	0.245 mg [d]	N/A
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [e]
Fire:					
a. Room	0.0005	5-day supply [f]	2	5,376 g	5,898 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [g]	3,932 g
Spill:					
a. Room [h]	–	–	–	–	–
b. Glovebox	0.80	1 feed prep container	2	194 g	983 g
c. Loading Dock	0.001	1 drum	0	3,000 g [j]	983 g
Earthquake:					
a. Building 371	0.000094	5-day supply [f]	0	5,376 g	N/A
b. Building 707A	0.0026	5-day supply [f]	0	N/A	5,898 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion (Acetylene):					
a. Building 707A	1.0	0.001	0.010	1.0	Ground
b. Building 371	1.0	0.001	1.0	2.0×10^{-6}	Elevated
Explosion (Ion Exchange Column) [k]	1.0	1.0	1.0	1.0	Elevated
Nuclear Criticality [e, l]	–	–	–	–	Elevated

Accident Scenario	DR	ARF	RF	LPF	Release Point
Fire:					
a. Room	1.0	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [m]	1.0 [m]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [m]	1.0 [m]	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.001 [d]	0.10 [d]	0.10	Ground
Aircraft Crash:					
a. Building 707A [n]	–	–	–	–	–
b. Building 371 [p]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 983-g product drums are transported from Building 371 to Building 707A for processing.
[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[d] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[e] The wet nuclear criticality is not a viable accident scenario for the mediated electrochemical oxidation process in Building 707A.
[f] 3-day supply of feed and 2-day supply of product.
[g] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[h] Materials are opened in a glovebox. No room spill is considered.
[j] 1 drum at the maximum plutonium content level.
[k] Respirable source term value in milligrams of plutonium released up the stack.
[l] Refer to Table D–28 for Building 371 mediated electrochemical oxidation criticality accident source term.
[m] The product of ARF×RF = 1.0×10^{-6}.
[n] Consequences enveloped by the earthquake.
[p] The aircraft will not penetrate the building walls.

Table D–230 Summary of the Inorganic Residue Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Building 371							
Explosion (Acetylene)	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Explosion (Ion Exchange Column)	0.000245	Metal	0.000735	0.0000833	10.3	0.245	0.000613
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321
Fire (Room)	0.0323	Metal	0.116	0.0116	1,350	32.3	0.903
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	3.88×10^{-10}	Metal	1.16×10^{-9}	1.32×10^{-10}	0.0000163	3.88×10^{-7}	9.70×10^{-10}
Spill (Dock)	0.0000750	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.157	Metal	0.565	0.0565	6,590	157	4.40
Building 707A							
Explosion (Acetylene)	0.197	Oxide	0.236	0.0256	4,920	118	4.13
Fire (Room)	0.0354	Oxide	0.0425	0.0046	895	21.2	0.743
Fire (Dock)	0.00118	Oxide	0.00142	0.000153	29.5	0.708	0.0248

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Spill (Glovebox)	1.97×10^{-9}	Oxide	3.15×10^{-10}	1.18×10^{-10}	0.0000171	8.85×10^{-7}	2.75×10^{-10}
Spill (Dock)	0.0000246	Oxide	0.0000295	3.19×10^{-6}	0.614	0.0147	0.000516
Earthquake	0.172	Oxide	0.207	0.0224	4,310	103	3.62

MEI = maximally exposed individual   Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–231 Summary of the Inorganic Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Building 371						
Explosion (Acetylene)	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Explosion (Ion Exchange Column)	0.0001	3.68×10^{-11}	4.17×10^{-12}	5.15×10^{-7}	1.23×10^{-8}	2.45×10^{-11}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	2.90×10^{-8}	2.90×10^{-9}	0.000339	8.06×10^{-6}	1.81×10^{-7}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	4.66×10^{-13}	5.28×10^{-14}	6.52×10^{-9}	1.55×10^{-10}	3.10×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	2.66×10^{-8}	2.66×10^{-9}	0.00031	7.38×10^{-6}	1.65×10^{-7}
Building 707A						
Explosion (Acetylene)	0.00005	5.90×10^{-9}	6.39×10^{-10}	0.000123	2.95×10^{-6}	8.26×10^{-8}
Fire (Room)	0.0005	1.06×10^{-8}	1.15×10^{-9}	0.000221	5.31×10^{-6}	1.49×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.42×10^{-12}	1.53×10^{-13}	2.95×10^{-8}	7.08×10^{-10}	1.98×10^{-11}
Spill (Glovebox)	0.80	1.26×10^{-13}	4.72×10^{-14}	6.84×10^{-9}	3.54×10^{-10}	8.81×10^{-14}
Spill (Dock)	0.001	1.47×10^{-11}	1.60×10^{-12}	3.07×10^{-7}	7.37×10^{-9}	2.06×10^{-10}
Earthquake	0.0026	2.69×10^{-7}	2.91×10^{-8}	0.00560	0.000134	3.76×10^{-6}

MEI = maximally exposed individual   LCF = latent cancer fatality   Met = meteorological data

Table D–232 Alternative 3 Accident Risks During Mediated Electrochemical Oxidation Processing at Rocky Flats

Inorganic Residue	Process Duration (yr)	Risks [a] MEI (LCF) 95% Met	MEI (LCF) 50% Met	Population (LCF) 95% Met	Population (LCF) 50% Met	Worker (LCF) 50% Met
Building 371						
All Residues	0.063	6.00×10^{-9}	6.98×10^{-10}	0.000063	1.77×10^{-6}	2.27×10^{-8}
Building 707A						
All Residues	0.058	1.65×10^{-8}	1.79×10^{-9}	0.000345	8.27×10^{-6}	2.32×10^{-7}

Inorganic Residue	*Process Duration (yr)*	*Risks [a]*				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Buildings 371 and 707A						
All Residues	–	2.25×10^{-8}	2.49×10^{-9}	0.000408	0.00001	2.54×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

Table D–233 provides the applicable accident scenarios, assumptions, and parameters used in determining the impacts of packaging the inorganic residues at Rocky Flats and of processing the residues using the mediated electrochemical oxidation technology at the Savannah River Site. **Table D–234** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from accidental releases associated with packaging the inorganic residues at Rocky Flats and processing the inorganic residues at the Savannah River Site. The risks associated with the packaging at Rocky Flats and the mediated electrochemical oxidation processing technology at the Savannah River Site are summarized in **Table D–235** and **Table D–236**. The processes at the Savannah River Site could be performed in either the F-Canyon and FB-Line or the H-Canyon and HB-Line. Data are presented in Table D–228, Table D–229, Table D–230, and Table D–231 for both options.

Table D–233 Inorganic Residue Accident Scenario Parameters for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	*Frequency (per year)*	*Inorganic Residues*	*HEPA Banks*	*Material at Risk (grams)*
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site				
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 6,636 g 6,000 g
Spill: a. Room [e] b. Glovebox c. Loading Dock	 – 0.80 0.001	 – 1 feed prep container 1 drum [f]	 – 2 0	 – 79 g 3,000 g
Earthquake	0.000094	5-day supply [c]	0	6,636 g
Aircraft Crash	0.000040	The aircraft will not penetrate the building wall.	–	–

Rocky Flats Packaging of Residue for Shipment to the Savannah River Site					
Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.10	2.0×10^{-6}	Elevated
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Glovebox b. Loading Dock	 1.0 0.25	 1.0×10^{-6} [g] 1.0×10^{-6} [g]	 1.0 [g] 1.0 [g]	 2.0×10^{-6} 0.10	 Elevated Ground
Earthquake	1.0	0.001 [h]	0.10 [h]	0.10	Ground

Rocky Flats Packaging of Residue for Shipment to the Savannah River Site					
Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Aircraft Crash [j]	–	–	–	–	–

Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon

Accident Scenario	*Frequency (per year)*	*Material at Risk (grams)*
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001	 4,000 g 120.5 mg [k]
Nuclear Criticality [l]	0.0001	1.0×10^{19} fissions
Fire	0.00061	4,000 g
Spill	0.01	79 g
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Molten Metal Liquid	0.000125	 12,000 g 1,000 g 1,000 g 1,000 g

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.0010 1.0	 0.0050 1.0	 Elevated Elevated
Nuclear Criticality [l]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Molten Metal Liquid	 1.0 1.0 1.0 1.0	 0.000047 0.002 0.0022 0.000047	 0.10 0.10 0.10 0.10	 Ground Ground Ground Ground

Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon

Accident Scenario	*Frequency (per year)*	*Material at Risk (grams)*
Explosion: a. Hydrogen b. Ion Exchange Column	 0.0000150 0.0001	 4,000 g 241 mg [k, m]
Nuclear Criticality [l]	0.0001	1.0×10^{19} fissions
Fire	0.00061	6,000 g
Spill	0.01	79 g
Earthquake: a. H-Canyon Liquid b. HB-Line Powder Liquid	0.000182	 27,000 g 4,000 g [m] 4,000 g [m]

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Nuclear Criticality [l]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated
Earthquake: a. H-Canyon Liquid b. HB-Line Powder Liquid	 1.0 1.0 1.0	 0.000047 0.002 0.000047	 0.10 0.10 0.10	 Ground Ground Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[b] The wet nuclear criticality is not a viable accident scenario for the residue packaging process in Building 371.
[c] 3-day supply of feed and 2-day supply of product.
[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[e] Materials are opened in a glovebox. No room spill is considered.
[f] 1 drum at the maximum plutonium content level.
[g] The product of ARF×RF = 1.0×10^{-6}.
[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[j] The aircraft will not penetrate the building walls.
[k] Respirable source term value in milligrams of plutonium released up the stack.
[l] Refer to Table D–28 for criticality accident source term.
[m] Duty cycle = 60%.

Table D–234 Summary of the Inorganic Residue Accident Analysis Doses for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residues for Shipment to the Savannah River Site							
Explosion	8.00×10^{-7}	Metal	2.40×10^{-6}	2.72×10^{-7}	0.0336	0.0008	2.00×10^{-6}
Fire (Room)	0.0398	Metal	0.143	0.0143	1,670	39.8	1.11
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	1.58×10^{-10}	Metal	4.74×10^{-10}	5.37×10^{-11}	6.64×10^{-6}	1.58×10^{-7}	3.95×10^{-10}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.194	Metal	0.698	0.0698	8,140	194	5.43
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon							
Explosion (Hydrogen)	0.02	Metal	0.00068	0.00024	36.0	3.20	0.002
Explosion (Ion Exchange Column)	0.121	Metal-FB	0.00374	0.00133	193	18.1	0.0112
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.200	Metal	0.0068	0.0024	360	32.0	0.02
Spill	3.95×10^{-6}	Metal	1.34×10^{-7}	4.74×10^{-8}	0.00711	0.000632	3.95×10^{-7}
Earthquake	0.481	Metal	0.0443	0.00818	1,590	111	10.6
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon							
Explosion (Hydrogen)	0.02	Metal	0.00064	0.000192	32.0	3.00	0.002
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality (Liquid)	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.300	Metal	0.0096	0.00288	480	45.0	0.03
Spill	3.95×10^{-6}	Metal	1.26×10^{-7}	3.79×10^{-8}	0.00632	0.000593	3.95×10^{-7}
Earthquake	0.946	Metal	0.0653	0.0132	2,930	189	20.8

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–235 Summary of the Inorganic Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Mediated Electrochemical Oxidation Process at the Savannah River Site

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residues for Shipment to the Savannah River Site						
Explosion	0.00005	6.00×10^{-14}	6.80×10^{-15}	8.40×10^{-10}	2.00×10^{-11}	4.00×10^{-14}
Fire (Room)	0.0005	3.58×10^{-8}	3.58×10^{-9}	0.000418	9.95×10^{-6}	2.23×10^{-7}
Fire (Dock)	2.00×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.800	1.90×10^{-13}	2.15×10^{-14}	2.65×10^{-9}	6.32×10^{-11}	1.26×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	3.28×10^{-8}	3.28×10^{-9}	0.000383	9.11×10^{-6}	2.04×10^{-7}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon						
Explosion (Hydrogen)	0.000015	5.10×10^{-12}	1.80×10^{-12}	2.70×10^{-7}	2.40×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.0001	1.87×10^{-10}	6.63×10^{-11}	9.64×10^{-6}	9.04×10^{-7}	4.48×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.07×10^{-9}	7.32×10^{-10}	0.00011	9.76×10^{-6}	4.88×10^{-9}
Spill	0.01	6.72×10^{-13}	2.37×10^{-13}	3.56×10^{-8}	3.16×10^{-9}	1.58×10^{-12}
Earthquake	0.000125	2.77×10^{-9}	5.11×10^{-10}	0.0000992	6.92×10^{-6}	5.29×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon						
Explosion (Hydrogen)	0.000015	4.80×10^{-12}	1.44×10^{-12}	2.40×10^{-7}	2.25×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.0001	2.10×10^{-10}	6.36×10^{-11}	0.0000103	1.02×10^{-6}	5.38×10^{-10}
Criticality (Liquid)	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.93×10^{-9}	8.78×10^{-10}	0.000146	0.0000137	7.32×10^{-9}
Spill	0.01	6.32×10^{-13}	1.90×10^{-13}	3.16×10^{-8}	2.96×10^{-9}	1.58×10^{-12}
Earthquake	0.000182	3.88×10^{-9}	7.88×10^{-10}	0.000174	0.0000113	1.980×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–236 Alternative 3 Accident Risks During the Mediated Electrochemical Oxidation Process at the Savannah River Site

Inorganic Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residues for Shipment to Savannah River Site						
All Residues	0.051	3.51×10^{-9}	3.51×10^{-10}	0.0000409	9.74×10^{-7}	2.18×10^{-8}
Mediated Electrochemical Oxidation Process at the Savannah River Site F-Canyon						
All Residues	0.42	2.34×10^{-9}	6.43×10^{-10}	0.0000985	8.07×10^{-6}	2.25×10^{-7}
Mediated Electrochemical Oxidation Process at the Savannah River Site H-Canyon						
All Residues	0.42	3.14×10^{-9}	7.90×10^{-10}	0.000145	0.0000115	8.36×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.9.4 Alternative 4 – Combination of Processing Technologies

The inorganic residue processing technology considered for this alternative is repackaging. All inorganic residue can be processed using this technology. The repackaging process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.9.1, Alternative 1 - No Action. Refer to Section D.3.4.9.1 for details.

D.3.4.10 Scrub Alloy

D.3.4.10.1 Alternative 1 – No Action

The scrub alloy processing technology considered for this alternative is repackaging. Repackaging of residues will be conducted within glovebox lines in Modules D, E, and F in Building 707 at Rocky Flats.

Table D–237 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of repackaging of scrub alloy at Rocky Flats. **Table D–238** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with repackaging scrub alloy at Rocky Flats. The risks associated with this processing technology are summarized in **Table D–239** and **Table D–240**.

Table D–237 Scrub Alloy Accident Scenario Parameters the Repackaging at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Scrub Alloy*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [b]	2	34,800 g
b. Loading Dock	2.0×10^{-6}	4 drums [c]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the maximum limit [d]	2	3,000 g
b. Glovebox	0.80	1 feed prep container	2	725 g
c. Loading Dock	0.001	1 drum [e]	0	3,000 g
Earthquake	0.0026	5-day supply [b]	0	34,800 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:	0.01	0.00001	1.0	1.0	Ground
Nuclear Criticality [f]	–	–	–	–	–
Fire:					
a. Room	0.01	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Room	0.01	1.0×10^{-6} [g]	1.0 [g]	2.0×10^{-6}	Elevated
b. Glovebox	0.01	1.0×10^{-6} [g]	1.0 [g]	2.0×10^{-6}	Elevated
c. Loading Dock	0.01	1.0×10^{-6} [g]	1.0 [g]	0.10	Ground
Earthquake	0.01	0.001 [h]	0.10 [h]	0.10	Ground
Aircraft Crash [j]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] 3-day supply of feed and 2-day supply of product.

[c] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[d] 1 container per drum of feed.

[e] 1 drum at the maximum plutonium content level.

[f] The wet nuclear criticality is not a viable accident scenario for the direct repackaging process in Building 707.

[g] The product of ARF×RF + 1.0×10^{-6}.

[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).

[j] Consequences enveloped by the earthquake.

Table D–238 Summary of the Scrub Alloy Accident Analysis Doses for Repackaging at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.0004	Salt-O	0.0056	0.0006	104	2.48	0.068
Fire (Room)	0.00209	Salt-O	0.0292	0.00313	543	12.9	0.355
Fire (Dock)	0.0018	Salt-O	0.0252	0.0027	468	11.2	0.306
Spill (Room)	6.00×10^{-11}	Salt-O	1.14×10^{-10}	4.32×10^{-11}	5.40×10^{-6}	2.76×10^{-7}	7.20×10^{-11}
Spill (Glovebox)	1.45×10^{-11}	Salt-O	2.76×10^{-11}	1.04×10^{-11}	1.31×10^{-6}	6.67×10^{-8}	1.74×10^{-11}
Spill (Dock)	3.00×10^{-6}	Salt-O	0.0000420	4.50×10^{-6}	0.780	0.0186	0.00051
Earthquake	0.0102	Salt-O	0.142	0.0152	2,640	63.0	1.73

MEI = maximally exposed individual Met = meteorological data Salt-O = oxide salt

Table D–239 Summary of the Scrub Alloy Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for Repackaging at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.00005	1.40×10^{-10}	1.50×10^{-11}	2.60×10^{-6}	6.20×10^{-8}	1.36×10^{-9}
Fire (Room)	0.0005	7.31×10^{-9}	7.83×10^{-10}	0.000136	3.24×10^{-6}	7.10×10^{-8}
Fire (Dock)	2.0×10^{-6}	2.52×10^{-11}	2.70×10^{-12}	4.68×10^{-7}	1.12×10^{-8}	2.45×10^{-10}
Spill (Room)	0.008	4.56×10^{-16}	1.73×10^{-16}	2.16×10^{-11}	1.10×10^{-12}	2.30×10^{-16}
Spill (Glovebox)	0.80	1.10×10^{-14}	4.18×10^{-15}	5.22×10^{-10}	2.67×10^{-11}	5.57×10^{-15}
Spill (Dock)	0.001	2.10×10^{-11}	2.25×10^{-12}	3.90×10^{-7}	9.30×10^{-9}	2.04×10^{-10}
Earthquake	0.0026	1.85×10^{-7}	1.98×10^{-8}	0.00343	0.0000819	1.80×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–240 Alternative 1 Accident Risks During Scrub Alloy Processing

Scrub Alloy	*Process Duration (yr)*	*Risks [a]*				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
All Scrub Alloy	0.11	2.12×10^{-8}	2.27×1^{-9}	0.000393	9.37×10^{-6}	2.06×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality

[a] Sum of postulated accident scenario risks

D.3.4.10.2 Alternative 2 – Processing without Plutonium Separation

The scrub alloy processing technology considered for this alternative is calcination/vitrification. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D, E, and F. **Table D–241** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of scrub alloy processing at Rocky Flats. **Table D–242** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of scrub alloy. The risks associated with this processing technology are summarized in **Table D–243** and **Table D–244**.

Table D–241 Scrub Alloy Accident Scenario Parameters for the Calcination/Vitrification Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Scrub Alloy*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [e]	 2 0	 1,043 g supply + 695 g product [d] 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.80 0.001	 1 container at the limit [f] 1 feed prep container [f] 1 drum [g]	 2 2 0	 3,000 g 725 g 3,000 g
Earthquake	0.0026	5-day supply [c]	0	1,043 g supply + 695 g product [d]
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	0.01	0.00001	1.0	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 0.01 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 0.01 0.01 0.01	 1.0×10^{-6} [h] 1.0×10^{-6} [h] 1.0×10^{-6} [h]	 1.0 [h] 1.0 [h] 1.0 [h]	 2.0×10^{-6} 2.0×10^{-6} 0.10	 Elevated Elevated Ground
Earthquake	0.01	0.001 [j]	0.10 [j]	0.10	Ground
Aircraft Crash [k]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 grams) and 1 drum at the administrative control level (1,000 grams) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification technology assessment.

[c] 3-day supply of feed and 2-day supply of product.

[d] The product is glass. The effect of the vitrified product on the accident source term is negligible.

[e] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[f] 1 container per drum of feed.

[g] 1 drum at the maximum plutonium content level.

[h] The product of ARF×RF = 1.0×10^{-6}.

[j] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[k] Consequences enveloped by the earthquake.

Table D–242 Summary of the Scrub Alloy Accident Analysis Doses for the Calcination/Vitrification Process at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Explosion	0.0004	Salt-O	0.0056	0.0006	104	2.48	0.068
Fire (Room)	0.0000626	Salt-O	0.000876	0.0000939	16.3	0.388	0.0106
Fire (Dock)	0.0018	Salt-O	0.0252	0.0027	468	11.2	0.306
Spill (Room)	6.00×10^{-11}	Salt-O	1.14×10^{-10}	4.32×10^{-11}	5.40×10^{-6}	2.76×10^{-7}	7.20×10^{-11}
Spill (Glovebox)	1.45×10^{-11}	Salt-O	2.76×10^{-11}	1.04×10^{-11}	1.31×10^{-6}	6.67×10^{-8}	1.74×10^{-11}
Spill (Dock)	3.00×10^{-6}	Salt-O	0.000042	4.50×10^{-6}	0.780	0.0186	0.00051
Earthquake	0.000305	Salt-O	0.00426	0.000457	79.2	1.89	0.0518

MEI = maximally exposed individual Met = meteorological data Salt-O = oxide salt

Table D–243 Summary of the Scrub Alloy Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Vitrification Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Explosion	0.00005	1.40×10^{-10}	1.50×10^{-11}	2.60×10^{-6}	6.20×10^{-8}	1.36×10^{-9}
Fire (Room)	0.0005	2.19×10^{-10}	2.35×10^{-11}	4.07×10^{-6}	9.70×10^{-8}	2.13×10^{-9}
Fire (Dock)	2.0×10^{-6}	2.52×10^{-11}	2.70×10^{-12}	4.68×10^{-7}	1.12×10^{-8}	2.45×10^{-10}
Spill (Room)	0.008	4.56×10^{-16}	1.73×10^{-16}	2.16×10^{-11}	1.10×10^{-12}	2.30×10^{-16}
Spill (Glovebox)	0.80	1.10×10^{-14}	4.18×10^{-15}	5.22×10^{-10}	2.67×10^{-11}	5.57×10^{-15}
Spill (Dock)	0.001	2.10×10^{-11}	2.25×10^{-12}	3.90×10^{-7}	9.30×10^{-9}	2.04×10^{-10}
Earthquake	0.0026	5.54×10^{-9}	5.94×10^{-10}	0.000103	2.45×10^{-6}	5.38×10^{-8}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–244 Alternative 2 Accident Risks During Scrub Alloy Processing

Scrub Alloy	Process Duration (yr)	Risks [a] MEI (LCF) 95% Met	MEI (LCF) 50% Met	Population (LCF) 95% Met	Population (LCF) 50% Met	Worker (LCF) 50% Met
All Scrub Alloy	2.21	1.31×10^{-8}	1.41×10^{-9}	0.000244	5.82×10^{-6}	1.28×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.10.3 Alternative 3 – Processing with Plutonium Separation

The scrub alloy processing technology considered for this alternative is the Purex/plutonium metal (or oxide) recovery process at the Savannah River Site. The scrub alloy will be packaged at Rocky Flats and shipped to the Savannah River Site for processing. The packaging of the residues at Rocky Flats will be performed in Building 371, Room 3701. The Purex process will be performed in the canyon facilities at the Savannah River Site.

Similar accidents are applicable to the facilities at both sites. **Table D–245** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of scrub alloy processing at the Savannah River Site. **Table D–246** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of scrub alloy. The risks associated with this processing technology are summarized in **Table D–247** and **Table D–248**. The processes at the Savannah River Site could be performed either in the F-Canyon and FB-Line or in the H-Canyon and HB-Line. Data are presented in Table D–252, Table D–253, Table D–254, and Table D–255 for both options.

Table D–245 Scrub Alloy Accident Scenario Parameters for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

Accident Scenario	*Frequency (per year)*	*Scrub Alloy*	*HEPA Banks*	*Material at Risk (grams)*
Rocky Flats Packaging of Residues for Shipment to the Savannah River Site				
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 20,412 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.80 0.001	 1 container at the maximum limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 3,000 g 725 g 3,000 g
Earthquake	0.000094	5-day supply [c]	0	20,412 g
Aircraft Crash	0.00004	The aircraft will not penetrate the building wall.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	0.01	0.00001	1.0	2.0×10^{-6}	Elevated
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 0.01 0.01	 0.006 0.006	 0.01 0.01	 0.10 0.50	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 0.01 0.01 0.01	 1.0×10^{-6} [g] 1.0×10^{-6} [g] 1.0×10^{-6} [g]	 1.0 [g] 1.0 [g] 1.0 [g]	 2.0×10^{-6} 2.0×10^{-6} 0.10	 Elevated Elevated Ground
Earthquake	0.01	0.001 [h]	0.10 [h]	0.10	Ground
Aircraft Crash [j]	–	–	–	–	–

Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon		
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001	 8,000 g 241 mg [k]
Nuclear Criticality [l]	0.0001	1.0×10^{19} fissions
Fire	0.00061	8,000 g
Spill [m]	–	–
Earthquake: a. F-Canyon Liquid b. FB-Line: Powder Molten Metal Liquid	0.000125	 24,000 g 2,000 g 2,000 g 2,000 g

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [l]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [m]	–	–	–	–
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Molten Metal Liquid	 1.0 1.0 1.0 1.0	 0.000047 0.002 0.0022 0.000047	 0.10 0.10 0.10 0.10	 Ground Ground Ground Ground

Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon		
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001	 6,000 g 241 mg [m]
Nuclear Criticality [l]	0.0001	1.0×10^{19} fissions
Fire	0.00061	6,000 g
Spill [m]	–	–
Earthquake: a. H-Canyon Liquid b. HB-Line Powder Liquid	0.000182	 18,000 g 4,000 g 4,000 g

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [l]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [m]	–	–	–	–

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Earthquake:				
a. H-Canyon				
Liquid	1.0	0.000047	0.10	Ground
b. HB-Line				
Powder	1.0	0.002	0.10	Ground
Liquid	1.0	0.000047	0.10	Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[b] The wet nuclear criticality is not a viable accident scenario for the residue packaging process in Building 371.
[c] 3-day supply of feed and 2-day supply of product.
[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[e] 1 container per drum of feed.
[f] 1 drum at the maximum plutonium content level.
[g] The product of ARF×RF = 1.0×10^{-6}.
[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[j] The aircraft will not penetrate the building walls.
[k] Respirable source term value in milligrams of plutonium released up the stack.
[l] Refer to Table D–28 for criticality accident source term.
[m] Powder spill is not a viable accident scenario for processing scrub alloy at the Savannah River Site.

Table D–246 Summary of the Scrub Alloy Accident Analysis Doses for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residues for Shipment to the Savannah River Site							
Explosion	8.00×10^{-10}	Salt-O	1.44×10^{-8}	1.68×10^{-9}	0.000208	4.88×10^{-6}	1.28×10^{-8}
Fire (Room)	0.00122	Salt-O	0.0269	0.00269	318	7.59	0.208
Fire (Dock)	0.0018	Salt-O	0.0396	0.00396	468	11.2	0.306
Spill (Room)	6.00×10^{-11}	Salt-O	1.08×10^{-9}	1.26×10^{-10}	0.0000156	3.66×10^{-7}	9.60×10^{-10}
Spill (Glovebox)	1.45×10^{-11}	Salt-O	2.61×10^{-10}	3.05×10^{-11}	3.77×10^{-6}	8.85×10^{-8}	2.32×10^{-10}
Spill (Dock)	3.00×10^{-6}	Salt-O	0.000066	6.60×10^{-6}	0.780	0.0186	0.00051
Earthquake	0.00596	Salt-O	0.131	0.0131	1,550	37.0	1.01
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon							
Explosion (Hydrogen)	0.04	Salt-M	0.0088	0.00328	480	40.0	0.0264
Explosion (Ion Exchange Column)	0.241	Salt-FB	0.00747	0.00265	386	36.2	0.0224
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.400	Salt-M	0.088	0.0328	4,800	400	0.264
Earthquake	0.962	Salt-M	0.577	0.106	20,200	1,440	144
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon							

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Explosion (Hydrogen)	0.03	Salt-M	0.0063	0.00189	330	28.8	0.0198
Explosion (Ion Exchange Column)	0.241	Salt-HB	0.00747	0.00205	354	34.7	0.0231
Criticality (Liquid)	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.300	Salt-M	0.063	0.0189	3,300	288	0.198
Earthquake	0.903	Salt-M	0.407	0.0813	18,100	1,170	136

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-O = oxide salt
Salt-FB = salt generated in FB area Salt HB = salt generated in HB area
[a] 1.0×10^{19} fissions.

Table D–247 Summary of the Scrub Alloy Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Packaging of Residues for Shipment to the Savannah River Site						
Explosion	0.00005	3.60×10^{-16}	4.20×10^{-17}	5.20×10^{-12}	1.22×10^{-13}	2.56×10^{-16}
Fire (Room)	0.0005	6.74×10^{-9}	6.74×10^{-10}	0.0000796	1.90×10^{-6}	4.16×10^{-8}
Fire (Dock)	2.0×10^{-6}	3.96×10^{-11}	3.96×10^{-12}	4.68×10^{-7}	1.12×10^{-8}	2.45×10^{-10}
Spill (Room)	0.008	4.32×10^{-15}	5.04×10^{-16}	6.24×10^{-11}	1.46×10^{-12}	3.07×10^{-15}
Spill (Glovebox)	0.80	1.04×10^{-13}	1.22×10^{-14}	1.51×10^{-9}	3.54×10^{-11}	7.42×10^{-14}
Spill (Dock)	0.001	3.30×10^{-11}	3.30×10^{-12}	3.90×10^{-7}	9.30×10^{-9}	2.04×10^{-10}
Earthquake	0.000094	6.16×10^{-9}	6.16×10^{-10}	0.0000728	1.74×10^{-6}	3.81×10^{-8}
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon						
Explosion (Hydrogen)	0.000015	6.60×10^{-11}	2.46×10^{-11}	3.60×10^{-6}	3.00×10^{-7}	1.58×10^{-10}
Explosion (Ion Exchange Column)	0.0001	3.74×10^{-10}	1.33×10^{-10}	0.0000193	1.81×10^{-6}	8.97×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.68×10^{-8}	1.00×10^{-8}	0.00146	0.000122	6.44×10^{-8}
Earthquake	0.000125	3.61×10^{-8}	6.62×10^{-9}	0.00126	0.0000902	0.0000144

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon						
Explosion (Hydrogen)	0.000015	4.73×10^{-11}	1.42×10^{-11}	2.48×10^{-6}	2.16×10^{-7}	1.19×10^{-10}
Explosion (Ion Exchange Column)	0.0001	3.74×10^{-10}	1.02×10^{-10}	0.0000177	1.74×10^{-6}	9.25×10^{-10}
Criticality (Liquid)	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.92×10^{-8}	5.76×10^{-9}	0.00101	0.0000878	4.83×10^{-8}
Earthquake	0.000182	3.70×10^{-8}	7.40×10^{-9}	0.00164	0.000107	0.0000197

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–248 Alternative 3 Accident Risks During the Purex/Metal or Oxide Recovery Process at the Savannah River Site

Scrub Alloy	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Packaging of Residues for Shipment to Savannah River Site						
All Scrub Alloy	0.12	1.56×10^{-9}	1.56×10^{-10}	0.0000184	4.39×10^{-7}	9.62×10^{-9}
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon						
All Scrub Alloy	0.50	3.20×10^{-8}	8.50×10^{-9}	0.00138	0.000108	7.25×10^{-6}
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon						
All Scrub Alloy	0.50	2.85×10^{-8}	6.71×10^{-9}	0.00134	0.0000991	9.89×10^{-6}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.10.4 Alternative 4 - Combination of Processing Technologies

Scrub alloy is not under consideration for Alternative 4.

D.3.4.11 Storage Following Processing and Packaging

D.3.4.11.1 Alternative 1 – No Action

Table D–249 presents a summary of the stored material vulnerability to the postulated set of accidents. **Table D–250** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues and scrub alloy following processing and packaging using Alternative 1 processing technologies. The storage risks associated with Alternative 1 are presented in **Table D–251**.

Table D–249 Stored Material Location Vulnerability to Postulated Accidents

Accident	Butler Building	Building 371 Vault
High Wind	Yes	No
Small Aircraft Crash	Yes	No
Room/Vault Fire	Yes	Yes
Earthquake and Building Collapse	Yes	Yes

Table D–250 Alternative 1 Storage Accident Consequences

Material	Building Source Term		Doses				
			MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
High Wind Accident – Butler Building							
Combustible Residue	2.32×10^{-6}	Metal	5.57×10^{-6}	6.03×10^{-7}	0.0974	0.00232	0.0000650
Fluoride Residue	0.00016	Metal-O	0.000192	0.0000208	4.00	0.0960	0.00336
Filter Media Residue	2.32×10^{-6}	Metal	5.57×10^{-6}	6.03×10^{-7}	0.0974	0.00232	0.0000650
Sludge Residue	0.0000928	Metal	0.000223	0.0000241	3.90	0.0928	0.00260
Small Aircraft Crash – Butler Building							
Combustible Residue	0.0695	Metal	0.167	0.0181	2,920	69.5	1.95
Fluoride Residue	0.000240	Metal-O	0.000288	0.0000312	6.00	0.144	0.00504
Filter Media Residue	0.00834	Metal	0.0200	0.00217	350	8.34	0.234
Sludge Residue	0.00834	Metal	0.0200	0.00217	350	8.34	0.234
Room Fire – Butler Building							
Combustible Residue	0.0116	Metal	0.0278	0.00302	487	11.6	0.325
Fluoride Residue	0.0000400	Metal-O	0.0000480	5.20×10^{-6}	1.00	0.0240	0.000840
Filter Media Residue	0.00696	Metal	0.0167	0.00181	292	6.96	0.195
Sludge Residue	0.00278	Metal	0.00668	0.000724	117	2.78	0.0780
Vault Fire – Building 371							
Scrub Alloy	0.0000435	Metal-O	0.0000783	7.83×10^{-6}	1.09	0.0261	0.000914
Earthquake and Building Collapse – Butler Building							
Combustible Residue	0.00411	Metal	0.00987	0.00107	173	4.11	0.115
Fluoride Residue	0.0000928	Metal-O	0.000111	0.0000121	2.32	0.0557	0.00195

Material	Building Source Term		Doses				
			MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Filter Media Residue	0.0216	Metal	0.519	0.00562	908	21.6	0.605
Sludge Residue	0.00612	Metal	0.0147	0.00159	257	6.12	0.171
Earthquake and Building Collapse – Building 371 Vault							
Fluoride Residue Reside	0.112	Metal-O	0.201	0.0201	2,790	67.0	2.35
Scrub Alloy	0.0584	Metal-O	0.105	0.0105	1,460	35.0	1.23

MEI = maximally exposed individal Met = meteorological data Metal-O = metal oxide

Table D–251 Alternative 1 Storage Accident Risks in Terms of Latent Cancer Fatalities per Year

Material	Accident Frequency (per yr)	Risks				
		MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
High Wind Accident – Butler Building						
Combustible Residue	0.000814	2.27×10^{-12}	2.46×10^{-13}	3.97×10^{-8}	9.44×10^{-10}	2.12×10^{-11}
Fluoride Residue	8.89×10^{-6}	8.53×10^{-13}	9.25×10^{-14}	1.78×10^{-8}	4.27×10^{-10}	1.19×10^{-11}
Filter Media Residue	0.00429	1.19×10^{-11}	1.29×10^{-12}	2.09×10^{-7}	4.98×10^{-9}	1.11×10^{-10}
Sludge Residue	0.00101	1.12×10^{-10}	1.22×10^{-11}	1.97×10^{-6}	4.69×10^{-8}	1.05×10^{-9}
Small Aircraft Crash – Butler Building						
Combustible Residue	2.44×10^{-7}	2.03×10^{-11}	2.2×10^{-12}	3.56×10^{-7}	8.48×10^{-9}	1.90×10^{-10}
Fluoride Residue	2.67×10^{-7}	3.84×10^{-14}	4.17×10^{-15}	8.01×10^{-10}	1.92×10^{-11}	5.38×10^{-13}
Filter Media Residue	1.29×10^{-6}	1.29×10^{-11}	1.40×10^{-12}	2.26×10^{-7}	5.38×10^{-9}	1.20×10^{-10}
Sludge Residue	3.03×10^{-7}	3.03×10^{-12}	3.29×10^{-13}	5.31×10^{-8}	1.26×10^{-9}	2.83×10^{-11}
Room Fire – Butler Building						
Combustible Residue	0.00001	1.39×10^{-10}	1.51×10^{-11}	2.44×10^{-6}	5.80×10^{-8}	1.30×10^{-9}
Fluoride Residue	0.00001	2.40×10^{-13}	2.60×10^{-14}	5.00×10^{-9}	1.20×10^{-10}	3.36×10^{-12}
Filter Media Residue	0.00001	8.35×10^{-11}	9.05×10^{-12}	1.46×10^{-6}	3.48×10^{-8}	7.80×10^{-10}

Material	***Accident Frequency (per yr)***	***Risks***				
		MEI (LCF/yr)		***Population (LCF/yr)***		***Worker (LCF/yr)***
		95% Met	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Sludge Residue	0.00001	3.34×10^{-10}	3.62×10^{-12}	5.85×10^{7}	1.39×10^{-8}	3.12×10^{-10}
Vault Fire – Building 371						
Scrub Alloy	1.0×10^{-6}	3.92×10^{-14}	3.92×10^{-15}	5.44×10^{-10}	1.31×10^{-11}	3.65×10^{-13}
Earthquake and Building Collapse – Butler Building						
Combustible Residue	0.002	9.87×10^{-9}	1.07×10^{-9}	0.000173	4.11×10^{-6}	9.21×10^{-8}
Fluoride Residue	0.002	1.11×10^{-10}	1.21×10^{-11}	2.32×10^{-6}	5.57×10^{-8}	1.56×10^{-9}
Filter Media Residue	0.002	5.19×10^{-8}	5.62×10^{-9}	0.000908	0.0000216	4.84×10^{-7}
Sludge Residue	0.002	1.47×10^{-8}	1.59×10^{-9}	0.000257	6.12×10^{-6}	1.37×10^{-7}
Earthquake and Building Collapse – Building 371 Vault						
Fluoride Residue	0.000094	9.45×10^{-9}	9.45×10^{-10}	0.000131	3.15×10^{-6}	8.82×10^{-8}
Scrub Alloy	0.000094	4.94×10^{-9}	4.94×10^{-10}	0.0000686	1.65×10^{-6}	4.61×10^{-8}
Alternative 1 Storage Risk per Year						
N/A	N/A	9.14×10^{-8}	9.78×10^{-9}	0.00155	0.0000369	8.53×10^{-7}
Alternative 1 20-Year Storage Risk						
N/A	N/A	1.83×10^{-6}	1.96×10^{-7}	0.0309	0.000738	0.0000171

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality N/A = not applicable

D.3.4.11.2 Alternative 2 – Processing Without Plutonium Separation

Table D–252 indicates that, with the exception of filter media residue, following processing and packaging under Alternative 2 stored plutonium residue and scrub alloy are not vulnerable to the postulated set of accidents. Filter media residue processed using the blend down technology is vulnerable to the postulated set of accidents because the processed residue is not stored in drummed pipe components. **Table D–253** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of filter media residue following blend down processing and packaging. The associated storage risks are presented in **Table D–254**. As discussed in Section D.3.3.4.1, the annual frequency for the large aircraft crash is in the non-foreseeable range and the accident consequences and risks are not evaluated.

Table D–252 Alternative 2 Storage Accident Consequences

Residue	Building Source Term (grams)	Building Source Term Type	Doses: MEI (rem) 95% Met	Doses: MEI (rem) 50% Met	Doses: Population (person-rem) 95% Met	Doses: Population (person-rem) 50% Met	Doses: Worker (rem) 50% Met
High Wind Accident – Butler Building							
Filter Media	2.32×10^{-6}	Metal	5.57×10^{-6}	6.03×10^{-7}	0.0974	0.00232	0.0000650
Small Aircraft Crash – Butler Building							
Filter Media	0.00834	Metal	0.0200	0.00217	350	8.34	0.234
Room Fire – Butler Building							
Filter Media	0.00696	Metal	0.0167	0.00181	292	6.96	0.195
Earthquake and Building Collapse – Butler Building							
Filter Media	0.0216	Metal	0.0519	0.00562	908	21.6	0.605

MEI = maximally exposed individual Met = meteorological data

Table D–253 Alternative 2 Storage Accident Risks in Terms of Latent Cancer Fatalities per Year

Residue	Accident Frequency (per yr)	Risks: MEI (LCF/yr) 95% Met	Risks: MEI (LCF/yr) 50% Met	Risks: Population (LCF/yr) 95% Met	Risks: Population (LCF/yr) 50% Met	Risks: Worker (LCF/yr) 50% Met
High Wind Accident – Butler Building						
Filter Media	0.00429	1.19×10^{-11}	1.29×10^{-12}	2.09×10^{-7}	4.98×10^{-9}	1.11×10^{-10}
Small Aircraft Crash – Butler Building						
Filter Media	1.29×10^{-6}	1.29×10^{-11}	1.40×10^{-12}	2.26×10^{-7}	5.38×10^{-9}	1.20×10^{-10}
Room Fire – Butler Building						
Filter Media	0.00001	8.35×10^{-11}	9.05×10^{-12}	1.46×10^{-6}	3.48×10^{-8}	7.80×10^{-10}
Earthquake and Building Collapse – Butler Building						
Filter Media	0.002	5.19×10^{-8}	5.62×10^{-9}	0.000908	0.0000216	4.84×10^{-7}
Alternative 2 Storage Risk per Year						
Filter Media	N/A	5.20×10^{-8}	5.63×10^{-9}	0.000910	0.0000217	4.85×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality N/A = not applicable

D.3.4.11.3 Alternative 3 – Processing With Plutonium Separation

Alternative 3 storage assessments address the following issues:

- Storage after processing with plutonium separation at Rocky Flats,

- Storage at Rocky Flats after preprocessing and/or packaging for offsite processing at the Savannah River Site or the Los Alamos National Laboratory,
- Storage after processing with plutonium separation at the Savannah River Site, and
- Storage after processing with plutonium separation at the Los Alamos National Laboratory.

❒ **Storage After Processing With Plutonium Separation at Rocky Flats—Table D–254** presents a summary of the stored material vulnerability to the postulated set of accidents. **Table D–255** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues following processing with plutonium separation and packaging of the product at Rocky Flats. The associated storage risks are presented in **Table D–256**.

Table D–254 Stored Material Location Vulnerability to Postulated Accidents

Accident	*Butler Building*	*Building 371 Vault*
High Wind	Yes	No
Small Aircraft Crash	Yes	No
Room/Vault Fire	Yes	No
Earthquake and Building Collapse	Yes	Yes

Table D–255 Storage Accident Consequences

			Doses				
	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Residue	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
High Wind Accident – Butler Building							
ER & MSE Salt	1.50×10^{-6}	Salt-O	0.0000211	2.26×10^{-6}	0.391	0.00932	0.000256
DOR Salt	1.55×10^{-6}	Salt-O	0.0000217	2.33×10^{-6}	0.404	0.00962	0.000264
Fluoride	0.000158	Metal-O	0.000190	0.0000206	3.96	0.0950	0.00333
Sludge	0.000212	Metal-O	0.0000254	2.76×10^{-6}	0.530	0.0127	0.000445
Small Aircraft Crash – Butler Building							
ER & MSE Salt	0.0677	Salt-O	0.948	0.102	17,600	420	11.5
DOR Salt	0.0698	Salt-O	0.978	0.105	18,200	433	11.9
Fluoride	0.000238	Metal-O	0.000286	0.0000309	5.95	0.143	0.00500
Sludge	0.00191	Metal-O	0.00229	0.000248	47.7	1.14	0.0401
Room Fire – Butler Building							
DOR Salt	0.0116	Salt-O	0.163	0.0175	3,030	72.2	1.98
Fluoride	0.0000396	Metal-O	0.0000475	5.15×10^{-6}	0.990	0.0238	0.000832
Sludge	0.000318	Metal-O	0.000382	0.0000413	7.95	0.191	0.00668
Earthquake and Building Collapse – Butler Building							
ER & MSE Salt	0.00461	Salt-O	0.0645	0.00691	1,200	28.6	0.783
DOR Salt	0.00115	Salt-O	0.0161	0.00173	300	7.14	0.196

Residue	Building Source Term		Doses				
			MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Fluoride	0.0000928	Metal-O	0.000111	0.0000121	2.32	0.0557	0.00195
Sludge	0.0000232	Metal-O	0.0000278	3.20×10^{-6}	0.580	0.0139	0.000487
Earthquake and Building Collapse – Building 371 Vault							
ER & MSE Salt	0.0618	Salt-O	1.36	0.136	16,100	383	10.5
DOR Salt	0.0144	Salt-O	0.317	0.0317	3,750	89.4	2.45
Combustible	0.00610	Metal-O	0.0110	0.00110	153	3.66	0.128
Fluoride	0.112	Metal-O	0.201	0.0201	2,790	67.0	2.35
Filter Media	0.0863	Metal-O	0.155	0.0155	2,160	51.8	1.81
Sludge	0.0200	Metal-O	0.356	0.0356	4,950	119	4.16
Glass	0.00143	Metal-O	0.00258	0.000258	35.8	0.858	0.0300
Graphite	0.0278	Metal-O	0.0501	0.00501	696	16.7	0.584
Inorganic	0.00499	Metal-O	0.00899	0.000899	125	3.00	0.105

MEI = maximally exposed individual   Met = meteorological data   DOR = direct oxide reduction salt residue
ER & MSE = electrorefining and molten salt extraction salt residue   Salt-O = salt oxide   Metal-O = metal oxide

Table D–256 Storage Accident Risks

Residue	Accident Frequency (per yr)	Risks				
		MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
High Wind Accident – Butler Building						
ER & MSE Salt	0.000112	1.18×10^{-12}	1.26×10^{-13}	2.19×10^{-8}	5.22×10^{-10}	1.15×10^{-11}
DOR Salt	0.0000275	2.99×10^{-13}	3.20×10^{-14}	5.55×10^{-9}	1.32×10^{-10}	2.90×10^{-12}
Fluoride	8.88×10^{-6}	8.44×10^{-13}	9.14×10^{-14}	1.76×10^{-8}	4.22×10^{-10}	1.18×10^{-11}
Sludge	0.0000169	2.15×10^{-13}	2.33×10^{-14}	4.48×10^{-9}	1.07×10^{-10}	3.01×10^{-12}
Small Aircraft Crash – Butler Building						
ER & MSE Salt	3.35×10^{-8}	1.59×10^{-11}	1.70×10^{-12}	2.95×10^{-7}	7.03×10^{-9}	1.54×10^{-10}
DOR Salt	8.25×10^{-9}	4.03×10^{-12}	4.32×10^{-13}	7.49×10^{-8}	1.79×10^{-9}	3.92×10^{-11}
Fluoride	2.66×10^{-9}	3.80×10^{-16}	4.12×10^{-17}	7.91×10^{-12}	1.90×10^{-13}	5.32×10^{-15}
Sludge	5.05×10^{-9}	5.78×10^{-15}	6.26×10^{-16}	1.20×10^{-10}	2.89×10^{-12}	8.09×10^{-14}
Room Fire – Butler Building						
DOR Salt	0.00001	8.15×10^{-10}	8.73×10^{-11}	0.0000151	3.61×10^{-7}	7.92×10^{-9}

Residue	Accident Frequency (per yr)	Risks				
		MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Fluoride	0.00001	2.38×10^{-13}	2.57×10^{-14}	4.95×10^{-9}	1.19×10^{-10}	3.33×10^{-12}
Sludge	0.00001	1.91×10^{-12}	2.07×10^{-13}	3.98×10^{-8}	9.54×10^{-10}	2.67×10^{-11}
Earthquake and Building Collapse – Butler Building						
ER & MSE Salt	0.002	6.45×10^{-8}	6.91×10^{-9}	0.00120	0.0000286	6.27×10^{-7}
DOR Salt	0.002	1.61×10^{-8}	1.73×10^{-9}	0.000300	7.14×10^{-6}	1.57×10^{-7}
Fluoride	0.002	1.11×10^{-10}	1.21×10^{-11}	2.32×10^{-6}	5.57×10^{-8}	1.56×10^{-9}
Sludge	0.002	2.78×10^{-11}	3.02×10^{-12}	5.80×10^{-7}	1.39×10^{-8}	3.90×10^{-10}
Earthquake and Building Collapse – Building 371 Vault						
ER & MSE Salt	0.000094	6.39×10^{-8}	6.39×10^{-9}	0.000755	0.0000180	7.90×10^{-7}
DOR Salt	0.000094	1.49×10^{-8}	1.49×10^{-9}	0.000176	4.20×10^{-6}	1.84×10^{-7}
Combustible	0.000094	5.16×10^{-10}	5.16×10^{-11}	7.17×10^{-6}	1.72×10^{-7}	9.64×10^{-9}
Fluoride	0.000094	9.45×10^{9}	9.45×10^{-10}	0.000131	3.15×10^{-6}	1.76×10^{-7}
Filter Media	0.000094	7.30×10^{-9}	7.30×10^{-10}	0.000101	2.43×10^{-6}	1.36×10^{-7}
Sludge	0.000094	1.68×10^{-8}	1.68×10^{-9}	0.000233	5.58×10^{-6}	3.13×10^{-7}
Glass	0.000094	1.21×10^{-10}	1.21×10^{-11}	1.68×10^{-6}	4.03×10^{-8}	2.26×10-9
Graphite	0.000094	2.35×10^{-9}	2.35×10^{-10}	0.0000327	7.85×10^{-7}	4.39×10^{-8}
Inorganic	0.000094	4.22×10^{-10}	4.22×10^{-11}	5.87×10^{-6}	1.41×10^{-7}	7.89×10^{-9}
Storage Risk per Year						
N/A	N/A	1.96×10^{-7}	2.02×10^{-8}	0.00294	0.0000703	2.45×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality N/A = not applicable
DOR = direct oxide reduction salt residue ER & MSE = electrorefining and molten salt extraction salt residue

❒ **Storage at Rocky Flats After Preprocessing and/or Repackaging for Offsite Processing—Table D–257** presents a summary of the stored material vulnerability to the postulated set of accidents. **Table D–258** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues and scrub alloy following preprocessing and/or packaging at Rocky Flats for processing with plutonium separation at either the Savannah River Site or the Los Alamos National Laboratory. The associated storage risks are presented in **Table D–259**.

Table D–257 Stored Material Location Vulnerability to Postulated Accidents

Accident	*Butler Building*	*Building 371 Vault*
High Wind	No	No
Small Aircraft Crash	No	No
Room/Vault Fire	No	No
Earthquake and Building Collapse	No	Yes

Table D–258 Storage Accident Consequences

Material	*Building Source Term*		*Doses*				
			MEI (rem)		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – Building 371 Vault							
Ash	0.0873	Metal-O	0.157	0.0157	2,180	52.4	1.83
ER & MSE Salt	0.0671	Salt-O	1.48	0.148	17,400	416	11.4
DOR Salt	0.00927	Salt-O	0.204	0.0204	2,410	57.5	1.48
Fluoride	0.00272	Metal	0.00980	0.000980	114	2.72	0.0762
Graphite	0.00186	Metal	0.00670	0.000670	78.1	1.86	0.0521
Inorganic	0.000338	Metal	0.00122	0.000122	14.2	0.338	0.00946
Scrub Alloy	0.0000584	Metal-O	0.000105	0.0000105	1.46	0.0350	0.00123

MEI = maximally exposed individual Met = meteorological data DOR = direct oxide reduction salt residue
ER & MSE = electrorefining and molten salt extraction salt residue Metal-O = metal oxide Salt-O = salt oxide

Table D–259 Storage Accident Risks

Material	*Accident Frequency (per yr)*	*Risks*				
		MEI (LCF/yr)		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – Building 371 Vault						
Ash	0.000094	7.38×10^{-9}	7.38×10^{-10}	0.000103	2.46×10^{-6}	6.89×10^{-8}
ER & MSE Salt	0.000094	6.94×10^{-8}	6.94×10^{-9}	0.000820	0.0000195	4.29×10^{-7}
DOR Salt	0.000094	9.58×10^{-9}	9.58×10^{-10}	0.000113	2.70×10^{-6}	5.92×10^{-8}
Fluoride	0.000094	4.60×10^{-10}	4.60×10^{-11}	5.37×10^{-6}	1.28×10^{-7}	2.86×10^{-9}
Graphite	0.000094	3.15×10^{-10}	3.15×10^{-11}	3.67×10^{-6}	8.74×10^{-8}	1.96×10^{-9}
Inorganic	0.000094	5.71×10^{-11}	5.71×10^{-12}	6.67×10^{-7}	1.59×10^{-8}	3.56×10^{-10}
Scrub Alloy	0.000094	4.94×10^{-12}	4.94×10^{-13}	6.86×10^{-8}	1.65×10^{-9}	4.61×10^{-11}
Storage Risk per Year						
N/A	N/A	8.72×10^{-8}	8.72×10^{-9}	0.00105	0.0000249	5.62×10^{-7}

MEI = maximally exposed individal Met = meteorological data LCF = latent cancer fatality N/A = not applicable
DOR = direct oxide reduction salt residue ER & MSE = electrorefining and molten salt extraction salt residue

- **Storage After Processing With Plutonium Separation at the Savannah River Site—Table D–260** presents a summary of the stored material vulnerability to the postulated set of accidents. **Table D–261** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues following processing with plutonium separation and packaging of the product at the Savannah River Site F-Canyon or H-Canyon. The product for storage from the F-Canyon will be plutonium metal and plutonium oxide powder from the H-Canyon. The associated storage risks are presented in **Table D–262**.

Table D–260 Stored Material Location Vulnerability to Postulated Accidents

Accident	*APSF Vault*
High Wind	No
Small Aircraft Crash	No
Vault Fire	No
Earthquake and Building Collapse	Yes

Table D–261 Storage Accident Consequences

Material	*Building Source Term*		*Doses*				
			MEI (rem)		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – APSF Vault							
F-Canyon Product (plutonium metal)	0.000736	Oxide	0.0000368	6.92×10^{-6}	1.47	0.103	0.0125
H-Canyon Product (plutonium oxide powder)	2.00	Oxide	0.0998	0.0188	3,990	280	33.9

MEI = maximally exposed individual   Met = meteorological data   APSF = Actinide Packaging and Storage Facility

Table D–262 Storage Accident Risks

Material	*Accident Frequency (per yr)*	*Risks*				
		MEI (LCF/yr)		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – APSF Vault						
F-Canyon Product (plutonium metal)	0.00001	1.84×10^{-13}	3.46×10^{-14}	7.36×10^{-9}	5.15×10^{-10}	5.01×10^{-11}
H-Canyon Product (plutonium oxide powder)	0.00001	4.99×10^{-10}	9.38×10^{-11}	0.0000200	1.40×10^{-6}	2.72×10^{-7}

MEI = maximally exposed individual   Met = meteorological data   LCF = latent cancer fatality   N/A = not applicable
APSF = Actinide Packaging and Storage Facility

- **Storage After Processing With Plutonium Separation at the Los Alamos National Laboratory—Table D–263** presents a summary of the stored material vulnerability to the postulated set of accidents. **Table D–264** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues following processing with plutonium separation and packaging of the product at the Los Alamos National Laboratory. The associated storage risks are presented in **Table D–265**.

Table D–263 Stored Material Location Vulnerability to Postulated Accidents

Accident	*TA-55 Plutonium Vault*
High Wind	No
Small Aircraft Crash	No
Vault Fire	No
Earthquake and Building Collapse	Yes

Table D–264 Storage Accident Consequences

Material	*Building Source Term*		*Doses*				
			MEI (rem)		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – TA-55 Plutonium Vault							
ER & MSE Salt	0.627	Salt-O	23.8	3.07	31,400	3,200	257
DOR Salt	0.149	Salt-O	5.66	0.730	7,440	759	61.0
Earthquake and Building Collapse – TA-55 Waste Storage Area							
ER & MSE Salt	0.00974	Salt-O	0.370	0.0477	487	49.7	3.99

MEI = maximally exposed individual Met = meteorological data TA = technical area
DOR = direct oxide reduction salt residue ER & MSE = electrorefining and molten salt extraction salt residue
Salt-O = salt oxide

Table D–265 Storage Accident Risks

Residue	*Accident Frequency (per yr)*	*Risks*				
		MEI (LCF/yr)		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake and Building Collapse – TA-55 Plutonium Vault						
ER & MSE Salt	0.0000190	4.53×10^{-7}	$2.92\text{x}10^{-8}$	0.000298	0.0000304	3.91×10^{-6}
DOR Salt	0.0000190	1.08×10^{-7}	$6.93\text{x}10^{-9}$	0.0000707	$7.21\text{x}10^{-6}$	9.28×10^{-7}
Earthquake and Building Collapse – TA-55 Waste Storage Area						
ER & MSE Salt	0.0000190	7.03×10^{-9}	4.53×10^{-10}	4.63×10^{-6}	4.72×10^{-7}	6.07×10^{-8}
Storage Risk per Year						
N/A	N/A	5.67×10^{-7}	3.66×10^{-8}	0.000373	0.0000381	4.90×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality N/A = not applicable
TA = technical area DOR = direct oxide reduction salt residue
ER & MSE = electrorefining and molten salt extraction salt residue

D.3.4.11.4 Alternative 4 – Combination of Processing Technologies

Table D–266 presents a summary of the stored residue vulnerability to the postulated set of accidents. **Table D–267** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the storage of residues following processing and packaging using Alternative 4 processing technologies. The storage risks associated with Alternative 4 are presented in **Table D–268**.

Table D–266 Stored Material Location Vulnerability to Postulated Accidents

Accident	*Butler Building*
High Wind	Yes
Small Aircraft Crash	Yes
Room Fire	Yes
Earthquake and Building Collapse	Yes

Table D–267 Alternative 4 Storage Accident Consequences

Material	*Building Source Term*		*Doses*				
			MEI (rem)		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
High Wind Accident							
Combustible Residue	2.32×10^{-6}	Metal	5.57×10^{-6}	6.03×10^{-7}	0.0974	0.00232	0.0000650
Filter Media Residue[a]	2.32×10^{-6}	Metal	5.57×10^{-6}	6.03×10^{-7}	0.0974	0.00232	0.0000650
Sludge Residue[b]	0.0000928	Metal	0.000223	0.0000241	3.90	0.0928	0.00260
Small Aircraft Crash							
Combustible Residue	0.0695	Metal	0.167	0.0181	2,920	69.5	1.95
Filter Media Residue[a]	0.00834	Metal	0.0200	0.00217	350	8.34	0.234
Sludge Residue[b]	0.00834	Metal	0.0200	0.00217	350	8.34	0.234
Room Fire							
Combustible Residue	0.0116	Metal	0.0278	0.00302	487	11.6	0.325
Filter Media Residue[a]	0.00696	Metal	0.0167	0.00181	292	6.96	0.195
Sludge Residue[b]	0.00278	Metal	0.00668	0.000724	117	2.78	0.0780
Earthquake and Building Collapse							
Combustible Residue	0.00411	Metal	0.00987	0.00107	173	4.11	0.115
Filter Media Residue[a]	0.0179	Metal	0.0431	0.00467	754	17.9	0.503
Sludge Residue[b]	0.00589	Metal	0.0141	0.00153	247	5.89	0.165

MEI = maximally exposed individal   Met = meteorological data

[a] Ful Flo filter media IDC 331 is excluded from Alternative 4.

[b] IDCs 089, 099, and 332 are excluded from Alternative 4.

Table D–268 Alternative 4 Storage Accident Risks in Terms of Latent Cancer Fatalities per Year

Material	Accident Frequency (per yr)	Risks				
		MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
High Wind Accident						
Combustible Residue	0.000813	2.26×10^{-12}	2.45×10^{-13}	3.96×10^{-8}	9.43×10^{-8}	2.11×10^{-11}
Filter Media Residue[a]	0.00421	9.91×10^{-12}	1.07×10^{-12}	1.73×10^{-7}	4.13×10^{-9}	9.25×10^{-11}
Sludge Residue[b]	0.000972	1.08×10^{-10}	1.17×10^{-11}	1.89×10^{-6}	4.51×10^{-8}	1.01×10^{-9}
Small Aircraft Crash						
Combustible Residue	2.44×10^{-7}	2.03×10^{-11}	2.20×10^{-12}	3.56×10^{-7}	8.48×10^{-9}	1.90×10^{-10}
Filter Media Residue[a]	1.26×10^{-6}	1.07×10^{-11}	1.16×10^{-12}	1.87×10^{-7}	4.46×10^{-9}	9.99×10^{-12}
Sludge Residue[b]	2.91×10^{-7}	2.91×10^{-12}	3.16×10^{-13}	5.10×10^{-8}	1.21×10^{-9}	2.72×10^{-11}
Room Fire						
Combustible Residue	0.00001	1.39×10^{-10}	1.51×10^{-11}	2.44×10^{-6}	5.80×10^{-8}	1.30×10^{-9}
Filter Media Residue[a]	0.00001	8.35×10-11	9.05×10^{-12}	1.46×10^{-6}	3.48×10^{-8}	7.80×10^{-10}
Sludge Residue[b]	0.00001	3.34×10^{-11}	3.62×10^{-12}	5.85×10^{-7}	1.39×10^{-8}	3.12×10^{-10}
Earthquake and Building Collapse						
Combustible Residue	0.002	9.87×10^{-9}	1.07×10^{-9}	0.000173	4.11×10^{-6}	9.21×10^{-8}
Filter Media Residue[a]	0.002	4.31×10^{-8}	4.67×10^{-9}	0.000754	0.0000179	4.02×10^{-7}
Sludge Residue[b]	0.002	1.41×10^{-8}	1.53×10^{-9}	0.000247	5.89×10^{-6}	1.32×10^{-7}
Alternative 4 Storage Risk per Year						
N/A	N/A	6.75×10^{-8}	7.31×10^{-9}	0.00118	0.0000281	6.30×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality N/A = not applicable

[a] Ful Flo filter media IDC 331 is excluded from Alternative 4.

[b] IDCs 089, 098, and 332 are excluded from Alternative 4.

D.3.5 Secondary Impacts of Accidents

The primary impact of accidents are measured in terms of public and worker exposures to radiation and toxic chemicals. The secondary impacts of accidents affect elements of the environment other than humans. For example, a radiological release may contaminate farmland, surface and underground water, recreational areas, industrial parks, historical sites, or the habitat of an endangered species. As a result, farm products may have to be destroyed; the supply of drinking water may be lowered; recreational areas may be closed; industrial parks may suffer economic losses during shutdown for decontamination; historical sites may have to be closed to visitors; and the endangered species may move closer to extinction.

Accidents during the processing of salts at Rocky Flats, the Savannah River Site, and Los Alamos National Laboratory were selected to assess secondary impacts of accidents. Doses to the public maximally exposed individual at the site boundary, attributable to ground contamination from the highest consequence accident, were calculated. In all cases, the dose to the maximally exposed individual at the site boundary attributable to ground contamination was less than 1 mrem per year. The GENII computer code model for the maximally exposed individual assumes that the maximally exposed individual is exposed to soil contamination for 0.7 years. The soil contamination level at the site boundary was estimated based on the maximally exposed individual dose. The soil contamination level at the site boundaries for Rocky Flats, the Savannah River Site, and Los Alamos National Laboratory was less than 1 mrem per year.

D.4 IMPACTS OF EXPOSURES TO HAZARDOUS CHEMICALS ON HUMAN HEALTH

The potential impacts of exposure to hazardous chemicals released to the atmosphere as a result of the processing of plutonium residues and scrub alloy were evaluated for the routine operation of processing facilities.

The receptors considered in these evaluations include the offsite population living within an 80-km (50-mi) radius of the sites and noninvolved workers located onsite at Rocky Flats and the Savannah River Site. Impacts were also evaluated for the maximally exposed individual member of the offsite population. The maximally exposed individual is the hypothetical person in the population who has the highest potential exposure. Impacts of exposures to hazardous chemicals for workers directly involved in processing plutonium residues and scrub alloy were not quantitatively evaluated because the use of personal protective equipment and engineering process controls will limit their exposure to levels within applicable Occupational Safety and Health Administration Permissible Exposure Limits or American Conference of Governmental Industrial Hygienists Threshold Limit Values.

As a result of releases from routine processing facility operations, receptors are expected to be potentially exposed to concentrations of hazardous chemicals that are below those that could cause acutely toxic health effects. Acutely toxic health effects generally result from short-term exposure to relatively high concentrations of contaminants, such as those that may be encountered during facility accidents. Long-term exposure to relatively lower concentrations of hazardous chemicals can produce adverse chronic health effects that include both carcinogenic and noncarcinogenic effects. The health effect endpoints evaluated in this analysis include excess incidences of latent cancers for carcinogenic chemicals and a spectrum of chemical-specific noncancer health effects (primarily respiratory system toxicity) for noncarcinogens.

D.4.1 Methodology

Estimates of airborne concentrations of hazardous chemicals were developed using the Industrial Source Complex (ISC) air dispersion model. This model was developed by the EPA for regulatory air dispersion modeling applications. ISC3 is the most recent version of the model and is approved for use for a wide variety of emission sources and conditions. The Industrial Source Complex model estimates atmospheric concentrations based on the airborne emissions from the processing facility for each block in a circular grid comprising 16 directional sectors (e.g., north, north-northeast, northeast) at radial distances out to 80 km (50 mi) from the point of release, producing a distribution of atmospheric concentrations. The maximally exposed individual is located in the block with the highest estimated concentration.

The long-term version of the model (ISCLT3) was run for Rocky Flats to estimate annual onsite and offsite concentrations in order to determine long-term (chronic) exposure and to assess compliance with annual ambient air quality standards. The short-term version of the model (ISCST3) was run for Savannah River to estimate annual concentrations in order to determine long-term exposure and to estimate both annual and short-term (30-day, 24-hour, and 12-hour) offsite concentrations to assess compliance with corresponding ambient air quality standards (EPA 1995b, EPA 1995c). The meteorological data used as input to the models include short-term surface and upper data and joint frequency (STAR) data. Onsite surface and joint frequency data for Rocky Flats and the Savannah River Site used as input to the models were obtained from DOE. Additional information about the processing of model input data can be found in the technical support document (SAIC 1998b).

This EIS estimates noncancer health risks by comparing modeled air concentrations of contaminants produced by ISC3 to EPA Reference Concentrations (RfCs), as published in the Integrated Risk Information System (IRIS).

For each noncarcinogenic chemical, potential health risks are estimated by dividing the estimated airborne concentration by the chemical-specific RfC value to obtain a noncancer hazard quotient:

$$\text{Noncancer Hazard Quotient} = \text{Air Concentration} / \text{RfC}$$

Note that the modeled annual airborne concentrations produced by ISC are converted to daily equivalents for comparison to RfC values.

Reference Concentrations are estimates, with uncertainty spanning perhaps an order of magnitude, of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime. Hazard Quotients are calculated for each hazardous chemical to which receptors may be exposed. Hazard Quotients for each chemical are summed to generate a Hazard Index. For example, **Table D–269** lists the Hazard Quotient values that were summed to develop the Hazard Index estimates for the Purex and mediated electrochemical oxidation processes at the Savannah River Site. The Hazard Index is an estimate of the total noncancer toxicity from exposure to hazardous chemicals. According to EPA risk assessment guidelines (EPA 1989), if the Hazard Index value is less than or equal to 1.0, the exposure is unlikely to produce adverse toxic effects. If the Hazard Index exceeds 1.0, adverse noncancer health effects may result from the exposure.

For carcinogenic chemicals, risk is estimated by the following equation:

$$\text{Risk} = \text{CA} \times \text{URF}$$

where

Risk = a unitless probability of cancer incidence
CA = contaminant concentration in air (in $\mu g/m^3$)
URF = cancer inhalation unit risk factor (in units of cancers per $\mu g/m^3$)

CA is estimated by multiplying the output of the ISC3 model by the process duration to obtain estimates of total airborne exposure for each process.

Cancer unit risk factors are used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen.

The proposed action processes involve emissions of carcinogenic chemicals only at Rocky Flats. For the Rocky Flats region of influence, offsite population cancer incidences were estimated by multiplying the estimated cancer incidences for each radial sector by the population living within that sector.

D.4.2 Assumptions

The airborne pathway is assumed to be the principal exposure route by which the offsite public and noninvolved workers are exposed to hazardous chemicals released from processing facilities. Under routine operating conditions, hazardous chemicals are released from processing facilities only to the atmosphere; no releases are assumed to occur to surface water, groundwater, or soil. The noninvolved worker is assumed to be located onsite downwind of the release source at a distance corresponding to the point of maximum exposure.

Table D–269 Savannah River Site Noncancer Risk Estimates (Hazard Quotient and Hazard Index Values)

	Purex Process										*Mediated Electrochemical Oxidation Process*					
	Ash Residues		*Fluoride Residues*		*Existing Scrub Alloy*		*Salt Scrub Alloy*		*Sand, Slag, and Crucible Residue*		*Ash Residue*		*Graphite Residues*		*Inorganic Residues*	
Chemical	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*	*Worker HQ*	*Offsite MEI HQ*
Phosphoric acid	2×10^{-8}	1×10^{-9}	2×10^{-8}	1×10^{-9}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}	7×10^{-9}	5×10^{-10}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}
Ammonium nitrate	2×10^{-9}	1×10^{-10}	2×10^{-9}	1×10^{-10}	4×10^{-9}	3×10^{-10}	4×10^{-9}	3×10^{-10}	4×10^{-9}	3×10^{-10}	1×10^{-9}	8×10^{-11}	4×10^{-9}	3×10^{-10}	4×10^{-9}	3×10^{-10}
Hazard Index [a]	2×10^{-8}	1×10^{-9}	2×10^{-8}	1×10^{-9}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}	8×10^{-9}	6×10^{-10}	2×10^{-8}	2×10^{-9}	2×10^{-8}	2×10^{-9}

MEI = maximally exposed individual HQ = hazard quotient

[a] Sum of Hazard Quotients

No synergistic or antagonistic effects are assumed to occur from exposure to the hazardous chemicals released from processing facilities. Synergistic effects among released contaminants may result in adverse health effects that are greater than those estimated, whereas, antagonistic effects among released chemicals may result in less severe health effects than those estimated.

The source term that was used for phosphoric acid was reported as phosphoric acid/tributyl phosphate. Since inhalation toxicity information is not available for tributyl phosphate, all of the source term was assumed to be phosphoric acid. This assumption produces conservative estimates of Hazard Quotients for this compound and for Hazard Index estimates developed using these Hazard Quotients.

In a similar manner, all of the source term for ammonium nitrate was assumed to be ammonia. This assumption also produces conservative estimates of the Hazard Quotients for this compound and for the Hazard Index estimates produced using these Hazard Quotients.

D.4.3 Hazardous Chemical Source Terms

Emissions from the proposed action processes at Rocky Flats and the Savannah River Site were modeled so that individual source contributions to potential receptors could be estimated. At Rocky Flats, all hazardous chemicals were released from the Building 371 stack. At the Savannah River Site, emissions were from one stack located in the F-Area. To develop conservative estimates of exposure, all modeled emissions assumed no plume rise. The proposed action processes at the Los Alamos National Laboratory do not involve emissions of hazardous chemicals; therefore, contaminant ambient air concentrations were not modeled for this site.

The hazardous chemical source terms for the processes proposed for Rocky Flats are presented in **Table D–270**. **Table D–271** presents the source term data for the Savannah River Site.

D.4.4 Health Risks from Routine Operation Chemical Exposures

The results of the health risk analyses for routine operation chemical exposures are presented in Chapter 4 of this EIS. As discussed in Section 4.1, not all of the chemicals potentially released from the proposed action processing at Rocky Flats and the Savannah River Site were used to estimate health risks. Some of the chemicals are inert (e.g., argon) some are innocuous (e.g., calcium and calcium oxide), and some are toxic only by ingestion exposure (e.g., fluorides). The toxicity of some chemicals (e.g., n-dodecane and tributyl phosphate) is not well characterized, and some chemicals are addressed as air pollutants in Section 4.12 (e.g., volatile organic compounds, nitrogen oxide gases).

D.4.5 Facility Accident Chemical Exposure Impacts

The potential health risks resulting from exposure to hazardous chemicals released as a result of accidents at processing facilities were not quantitatively evaluated in this EIS. The impacts of chemical exposures from relevant facility accidents at Building 371 at Rocky Flats and at the F-Area separation facilities of the Savannah River Site have been evaluated in other investigations, such as the *Rocky Flats Draft Cumulative Impacts Document (DOE 1997a), the Rocky Flats Environmental Technology Site, Basis for Interim Operation, Building 371/374 complex* (KHC 1997a) and the Savannah River Site *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE 1995a). The results of these analyses, which are incorporated by reference, indicate that the consequences for the most exposed member of the offsite population and onsite noninvolved workers would be low and could be mitigated by emergency response actions. Workers involved in the facility processes may experience serious injury or fatalities as a result of their proximity to the release sources. The impacts of chemical releases as a result of accidents at the proposed plutonium residue and scrub alloy processing facilities at Building 371 and the F-Area are expected to be bounded by the impacts estimated

Table D–270 Chemical Emissions from the Processing of Plutonium Residues and Scrub Alloy at Rocky Flats

	Process Emissions (kg/process duration)										
	Sonic Washing Process		*Thermal Desorption Process*	*CCO Process*	*Acid Dissolution Process*		*Mediated Electrochemical Oxidation Process*				
Chemicals Released [a]	*Filter Media Residues*	*Combustible Residues*	*Combustible Residues*	*Combustible Residues*	*Sludge Residues*	*Fluoride Residues*	*Inorganic Residues*	*Filter Media Residues*	*Graphite Residues*	*Raschig Ring Residues*	*Combustible Residues*
Carbon Tetrachloride	1	1	1	–	–	–	–	–	–	–	–
Hydrochloric Acid	–	–	–	0.04	–	–	–	–	–	–	–
Nitrogen Oxide Gases	–	–	–	–	0.3	0.2	2	2.9	5	0.3	2.2

CCO = catalytic chemical oxidation

[a] In addition to these chemicals, several of the proposed action processes at Rocky Flats would release various amounts of water vapor, carbon dioxide, and oxygen. Emissions of these compounds were not modeled in this EIS because their contribution to concentrations in ambient air would be negligible.

Table D–271 Chemical Emissions from the Processing of Plutonium Residues and Scrub Alloy at the Savannah River Site

	Process Emissions (tons/batch)Chemicals							
	Purex Process					*Mediated Electrochemical Oxidation Process*		
Released	*Ash Residues*	*Fluoride Residues*	*Existing Scrub Alloy*	*Salt Scrub Alloy*	*SSC Residues*	*Ash Residues*	*Graphite Residues*	*Inorganic Residues*
Nitric Acid	0.029	0.029	0.0387	0.0387	0.0387	0.0114	0.0449	0.0483
Nitrogen Oxide Gases	0.0824	0.0824	0.1098	0.1098	0.1098	0.0324	0.0001	0.1373
Nitrous Oxide	0.0005	0.0005	0.0007	0.0007	0.0007	0.0002	0.0008	0.0009
Phosphoric Acid/Tributyl Phosphate	0.00008	0.00008	0.0001	0.0001	0.0001	0.00003	0.0001	0.0001
VOCs	0.0033	0.0033	0.0045	0.0045	0.0045	0.0013	0.0052	0.0056
Ammonium Nitrate	0.0001	0.0001	0.0002	0.0002	0.0002	0.00005	0.0002	0.0002
Hydrogen Fluoride	0.00001	0.00002	0.000005	0.000005	0.000005	0.0014	0	0
Argon	0.00007	0.00007	0.0002	0.0002	0.0001	0.00007	0.00007	0.00007
Calcium	0.000005	0.000005	0.00002	0.00002	0.00001	0.000005	0.000005	0.000005
Calcium Fluoride	0.00002	0.00002	0.00005	0.00005	0.00003	0.00002	0.00002	0.00002
Calcium Oxide	0.000004	0.000004	0.00001	0.00001	0.000008	0.000004	0.000004	0.000004
N-Dodecane	0.000003	0.000004	0.00001	0.00001	0.000007	0.000003	0.000003	0.000003

SSC = sand, slag, and crucible VOCs = volatile organic compounds in these other investigations. These analyses are representative of potential chemical accident risks for the proposed actions because they address the same or similar facilities using similar chemicals in relevant scenarios. Because chemical inventories for the H-Area separation facilities of the Savannah River Site are similar to those estimated for the F-Area, potential impacts also are expected to be similar. For example, these analyses estimate the airborne concentrations of hazardous chemical releases from a number of different accident scenarios. Potential human health effects are evaluated by comparing these estimated airborne concentrations to community exposure guidelines known as Emergency Response Planning Guidelines (ERPGs) developed by the American Industrial Hygiene Association (AIHA). ERPGs are defined as follows:

- ERPG-1 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild, transient adverse health effects or perceiving a clearly defined objectionable odor.
- ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
- ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effects.

The results of selected analyses for chemicals and facilities common to the proposed action processing of plutonium residues and scrub alloy are summarized in **Table D–272** below.

Table D–272 Impacts of Nitric Acid Storage Tank Release at Rocky Flats Building 371/374*

		Worst Case Meteorology	Average Case Meteorology
Involved Worker	Parts per million (ppm) concentration	141	46
	Level of Concern	>ERPG-3	>ERPG-3
	Potential Health Effects	life threatening	life threatening
Noninvolved Worker	Parts per million (ppm) concentration	18	4.2
	Level of Concern	>ERPG-2	>ERPG-1
	Potential Health Effects	Irreversible	Mild, transient
Offsite Maximally Exposed Individual (MEI)	Parts per million (ppm) concentration	0.1	0.02
	Level of Concern	<ERPG-1	<ERPG-1
	Potential Health Effects	None	None

*From *Rocky Flats Cumulative Impacts Document* (DOE 1997a). Location of offsite MEI is 1580 meters.

At Rocky Flats, the estimated airborne concentrations of nitric acid at 30 meters following release from the storage tank exceed the ERPG-3 guideline of 30 parts per million (ppm), and are potentially life threatening to the involved worker. For the noninvolved worker, the 18 ppm concentration exceeds the ERPG-2 guideline of 15 ppm, which suggests potential for irreversible health effects if exposures are experienced for up to one hour without evacuation or other emergency response action. The 4 ppm concentration exceeds the ERPG-1 guideline of 2 ppm, which suggests potential for reversible adverse health effects. For the offsite MEI, the estimated airborne concentrations are less than the ERPG-1 guideline, which suggests that the offsite public should not experience any adverse health effects as a result of the release (DOE 1997a).

Table D–273 Impacts of Potential Nonseismic Initiated Releases of Hazardous Chemicals in F-Area of the Savannah River Site*

Chemical	Noninvolved Worker (640 m)	Offsite MEI (site boundary)	ERPG-1	ERPG-2	ERPG-3
Hydrochloric acid	0.0063	0.000085	4.5	30	150
Hydrofluoric acid	220	2.9	4	16	41
Nitric acid	14	3.6	5.2	39	77

*From *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE 1995b). Concentrations are in units of milligrams per cubic meter.

Table D–274 Impacts of Potential Seismic Initiated Releases of Hazardous Chemicals in F-Area of the Savannah River Site*

Chemical	Noninvolved Worker (640 m)	Offsite MEI (site boundary)	ERPG-1	ERPG-2	ERPG-3
Hydrochloric acid	0.019	0.00026	4.5	30	150
Hydrofluoric acid	220	2.9	4	16	41
Nitric acid	390	14	5.2	39	77

*From *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE 1995b). Concentrations are in units of milligrams per cubic meter.

Table D–275 Impacts of Potential Nonseismic Initiated Releases of Hazardous Chemicals in H-Area of the Savannah River Site*

Chemical	Noninvolved Worker (640 m)	Offsite MEI (site boundary)	ERPG-1	ERPG-2	ERPG-3
Hydrochloric acid	0.00050	5.7×10^{-6}	4.5	30	150
Hydrofluoric acid	0.00043	4.9×10^{-6}	4	16	41
Nitric acid	95	1.9	5.2	39	77

*From *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE 1995b). Concentrations are in units of milligrams per cubic meter.

Table D–276 Impacts of Potential Seismic Initiated Releases of Hazardous Chemicals in H-Area of the Savannah River Site*

Chemical	Noninvolved Worker (640 m)	Offsite MEI (site boundary)	ERPG-1	ERPG-2	ERPG-3
Hydrochloric acid	0.0021	0.000024	4.5	30	150
Hydrofluoric acid	0.00067	7.6×10^{-6}	4	16	41
Nitric acid	230	5.7	5.2	39	77

*From *Final Environmental Impact Statement, Interim Management of Nuclear Materials* (DOE 1995b). Concentrations are in units of milligrams per cubic meter.

At the Savannah River Site, accidental releases of hazardous chemicals in F-Area were estimated to exceed the ERPG-3 guideline for noninvolved workers for hydrofluoric acid and the ERPG-1 guideline for nitric acid following nonseismic-initiated accidents, and the ERPG-3 guideline concentrations for both chemicals following seismic-initiated releases **(Tables D–273 and D–274)**. For H-Area accidents, nitric acid concentrations were estimated to exceed the ERPG-3 guideline concentration for noninvolved workers following nonseismic-initiated events, and ERPG-3 and ERPG-1 guidelines for noninvolved workers and offsite MEI, respectively, following seismic-initiated events **(Tables D–275 and D–276)**. No long-term or life threatening health effects are expected for noninvolved workers under these scenarios because individuals could be notified and evacuated to safe locations within one hour of an inadvertent release. Some individuals could experience significant short-term health effects, such as burning of the lungs and skin irritation. For involved workers, there is a potential for serious injury or fatality because the high airborne concentrations expected at locations close to the point of release might hinder emergency response actions (DOE 1995b).

At Los Alamos National Laboratory, no hazardous chemicals are used in the proposed distillation of pyrochemical salts, and only relatively small amounts of hydrochloric acid are used in the proposed water leach and acid dissolution processing of direct oxide reduction pyrochemical salts. Therefore, the potential impacts of chemical exposures from facility accidents at this site were not quantitatively evaluated in this EIS. Additional information about chemical accidents is presented in the *Draft Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory* (LANL 1998).

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