Table E.4-11. Compactor facilities dose distribution by isotope for alternative A.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose) MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	7.08	6.13	11.21	8.56
Cesium-134	6.13	3.94	5.15	3.90
Cesium-137	19.81	28.86	25.85	19.39
Europium-154	≤1.0[d]	≤1.0[d]	1.51	≤1.0[d]
Tritium	18.44	18.31	11.37	12.11
Plutonium-238	31.18	29.68	33.96	41.53
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	1.35
Ruthenium-106	1.13	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	8.36	4.44	1.75	2.16
Uranium-234	3.99	4.37	5.57	6.87
Other[e]	3.88	4.28	3.62	4.13
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	1.55E-06	6.15E-05	6.01E-05	1.69E-03
Maximum	1.55E-06	6.15E-05	6.01E-05	1.69E-03
Minimum	1.55E-06	6.15E-05	6.01E-05	1.69E-03

TE

TC

Source: Blankenhorn (1994); Hess (1994f, g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE | **Table E.4-12.** Soil sort facility dose distribution by isotope for alternative A.[a]

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	7.08	6.13	11.21	8.56
Cesium-134	6.13	3.94	5.15	3.90
Cesium-137	19.81	28.86	25.85	19.39
Europium-154	≤1.0[d]	≤1.0[d]	1.51	≤1.0[d]
Tritium	18.44	18.31	11.37	12.11
Plutonium-238	31.18	29.68	33.96	41.53
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	1.35
Ruthenium-106	1.13	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	8.36	4.44	1.75	2.16
Uranium-234	3.99	4.37	5.57	6.87
Other[e]	3.88	4.28	3.62	4.13
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	2.58E-06	1.02E-04	9.95E-05	2.80E-03
Maximum	1.28E-05	5.08E-04	4.96E-04	1.40E-02
Minimum	6.96E-07	2.75E-05	2.69E-05	7.57E-04

TE | Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-13. Transuranic waste characterization/certification facility dose distribution by isotope for alternative A.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Plutonium-238	83.65	83.66	83.85	83.89
Plutonium-239	15.38	15.37	15.17	15.13
Other[d]	0.97	0.97	0.98	0.98
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem
Expected	0.111	4.19	4.68	161
Maximum	1.83	69.1	77	2.650
Minimum	0.0775	2.92	3.26	112

TE

TC

TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.

TE

TE **Table E.4-14.** Containment building dose distribution by isotope for alternative A.

Radionuclides	Atmospheric releases (percent of total dose) MEI[a]	Population[b]	*640-meter* uninvolved worker (2,100 feet)	*100-meter* uninvolved worker (328 feet)	Aqueous releases (percent of total dose) MEI[a]	Population[b]
Cobalt-60	7.08	6.13	11.21	8.56	≤1.0[c]	5.97
Cesium-134	6.13	3.94	5.15	3.90	81.85	21.81
Cesium-137	19.81	28.86	25.85	19.39	≤1.0[c]	≤1.0[c]
Europium-154	≤1.0[c]	≤1.0[c]	1.51	≤1.0[c]	≤1.0[c]	≤1.0[c]
Tritium	18.44	18.31	11.37	12.11	10.51	32.22
Plutonium-238	31.18	29.68	33.96	41.53	4.62	28.48
Plutonium-239	≤1.0[c]	≤1.0[c]	≤1.0[c]	1.35	≤1.0[c]	≤1.0[c]
Ruthenium-106	1.13	≤1.0[c]	≤1.0[c]	≤1.0[c]	≤1.0[c]	2.37
Strontium-90	8.36	4.44	1.75	2.16	≤1.0[c]	≤1.0[c]
Uranium-234	3.99	4.37	5.57	6.87	≤1.0[c]	≤1.0[c]
Other[d]	3.88	4.28	3.62	4.13	3.02	9.17
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem	Millirem	Person-rem
Expected	2.41E-06	9.56E-05	9.33E-05	0.00263	(g)	(g)
Maximum	8.26E-06	3.27E-04	3.19E-04	0.00899	2.07E-05	1.82E-04
Minimum	1.22E-06	4.83E-05	4.72E-05	0.00133	(g)	(g)

TE *Source: Blankenhorn (1994); Hess (1994g, h); Simpkins (1994a); and Chesney (1995).*

a. MEI = maximally exposed individual.
b. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS. For aqueous releases, the dose is to the people using the Savannah River from SRS to the Atlantic Ocean.
TE c. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
TE d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.
g. Routine operations are not expected to produce aqueous releases.

Table E.4-15. Mixed waste offsite vendor dose distribution by isotope for alternative A.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose) MEI[b]	Population[c]
Cesium-134	≤1.0[d]	1.62
Cesium-137	1.68	1.92
Tritium	75.92	32.52
Plutonium-238	13.54	44.04
Plutonium-239	≤1.0[d]	1.39
Strontium-90	1.49	≤1.0[d]
Uranium-234	3.68	12.12
Uranium-236	≤1.0[d]	2.13
Other[e]	3.69	4.26
Total dose[f,g]	**Millirem**	**Person-rem**
Expected	1.52E-05	6.93E-06
Maximum	3.88E-05	1.77E-05
Minimum	6.66E-06	3.03E-06

TC

TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE | **Table E.4-16.** Consolidated Incineration Facility dose distribution by isotope for alternative B.[a]

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	2.26	1.72	3.32	3.33
Cesium-134	19.92	10.88	15.99	15.78
Cesium-137	65.28	80.97	78.62	76.38
Strontium-90	7.50	2.80	≤1.0[d]	≤1.0[d]
Tritium	2.30	≤1.0[d]	≤1.0[d]	≤1.0[d]
Other[e]	2.74	3.63	2.06	4.48
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	0.318	18.8	6.28	18.1
Maximum	0.689	32.6	9.76	32.4
Minimum	0.255	15.1	5.07	14.6

TE | Source: Blankenhorn (1994); Hertel et al. (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose is to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-17. Onsite compactor facility dose distribution by isotope for alternative B.[a] TC TE

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	7.08	6.13	11.21	8.56
Cesium-134	6.13	3.94	5.15	3.90
Cesium-137	19.81	28.86	25.85	19.39
Europium-154	≤1.0[d]	≤1.0[d]	1.51	≤1.0[d]
Tritium	18.44	18.31	11.37	12.11
Plutonium-238	31.18	29.68	33.96	41.53
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	1.35
Ruthenium-106	1.13	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	8.36	4.44	1.75	2.16
Uranium-234	3.99	4.37	5.57	6.87
Other[e]	3.88	4.28	3.62	4.13
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	5.18E-08	2.05E-06	2.00E-06	5.64E-05
Maximum	5.18E-08	2.06E-06	2.00E-06	5.64E-05
Minimum	5.18E-08	2.05E-06	2.00E-06	5.64E-05

TE

TC

Source: Blankenhorn (1994); Hess (1994f, g); Simpkins (1994a); and Chesney (1995). TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" category. TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest. TE

TE **Table E.4-18.** Onsite vitrification facilities dose distribution by isotope for alternative B.[a]

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cesium-134	4.04	3.00	7.97	4.30
Cesium-137	13.21	22.25	39.07	20.75
Plutonium-238	67.42	61.29	42.37	61.47
Plutonium-239	12.26	11.16	7.80	11.16
Other[d]	3.07	2.30	2.79	2.31
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem
Expected	0.561	24.4	4.52	23.8
Maximum	8.08	330	48.8	323
Minimum	0.315	12.5	1.60	12.2

TE | TC

TE Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.

TE

Table E.4-19. Soil sort facility dose distribution by isotope for alternative B.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	7.08	6.13	11.21	8.56
Cesium-134	6.13	3.94	5.15	3.90
Cesium-137	19.81	28.86	25.85	19.39
Europium-154	≤1.0[d]	≤1.0[d]	1.51	≤1.0[d]
Tritium	18.44	18.31	11.37	12.11
Plutonium-238	31.18	29.68	33.96	41.53
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	1.35
Ruthenium-106	1.13	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	8.36	4.44	1.75	2.16
Uranium-234	3.99	4.37	5.57	6.87
Other[e]	3.88	4.28	3.62	4.13
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	2.87E-06	1.14E-04	1.11E-04	0.00312
Maximum	1.75E-05	6.93E-04	6.76E-04	0.0190
Minimum	8.17E-07	3.23E-05	3.16E-05	8.88E-04

TE | TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE **Table E.4-20.** Transuranic waste characterization/certification facility dose distribution by isotope for alternative B.[a]

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Plutonium-238	83.65	83.66	83.85	83.89
Plutonium-239	15.38	15.37	15.17	15.13
Other[d]	0.97	0.97	0.98	0.98
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem
Expected	0.111	4.19	4.68	161
Maximum	1.83	69.1	77.1	2,650
Minimum	0.0775	2.92	3.26	112

TE TC TE

TC Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. *Routine operations are not expected to produce aqueous releases.*
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.

TE

Table E.4-21. Containment building dose distribution by isotope for alternative B. | TE

	Atmospheric releases (percent of total dose)				Aqueous releases (percent of total dose)	
Radionuclides	MEI[a]	Population[b]	640-meter uninvolved worker (2,100 feet)	100 meter uninvolved worker (328 feet)	MEI[a]	Population[b]
Cobalt-60	7.08	6.13	11.21	8.56	≤1.0[c]	5.97
Cesium-134	6.13	3.94	5.15	3.90	81.85	21.81
Cesium-137	19.81	28.86	25.85	19.39	≤1.0[c]	≤1.0[c]
Europium-154	≤1.0[c]	≤1.0[c]	1.51	≤1.0[c]	≤1.0[c]	≤1.0[c]
Tritium	18.44	18.31	11.37	12.11	10.51	32.22
Plutonium-238	31.18	29.68	33.96	41.53	4.62	28.48
Plutonium-239	≤1.0[c]	≤1.0[c]	≤1.0[c]	1.35	≤1.0[c]	≤1.0[c]
Ruthenium-106	1.13	≤1.0[c]	≤1.0[c]	≤1.0[c]	≤1.0[c]	2.37
Strontium-90	8.36	4.44	1.75	2.16	≤1.0[c]	≤1.0[c]
Uranium-234	3.99	4.37	5.57	6.87	≤1.0[c]	≤1.0[c]
Other[d]	3.88	4.28	3.62	4.13	3.02	9.17
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem	Millirem	Person-rem
Expected	1.59E-06	6.31E-05	6.16E-05	1.78E-03	(g)	(g)
Maximum	5.55E-06	2.20E-04	2.14E-04	6.04E-03	1.41E-05	1.24E-04
Minimum	7.99E-07	3.16E-05	3.09E-05	8.69E-04	(g)	(g)

TE

TC

Source: Blankenhorn (1994); Hess (1994g, h); Simpkins (1994a); and Chesney (1995). | TE

a. MEI = maximally exposed individual.
b. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS. For aqueous releases, the dose is to the people using the Savannah River from SRS to the Atlantic.
c. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.
g. Routine operations are not expected to produce aqueous releases.

TE

TC TE **Table E.4-22.** Offsite supercompaction, sorting, repackaging dose distribution by isotope for alternative B.[a]

Radionuclides	Atmospheric releases (percent of total dose)	
	MEI[b]	Population[c]
Cesium-134	≤1.0[d]	1.62
Cesium-137	1.68	1.92
Tritium	75.92	32.52
Plutonium-238	13.54	44.04
Plutonium-239	≤1.0[d]	1.39
Strontium-90	1.49	≤1.0[d]
Uranium-234	3.68	12.12
Uranium-236	≤1.0[d]	2.13
Other[e]	3.69	4.26
Total dose[f,g]	Millirem	Person-rem
Expected	4.85E-04	2.21E-04
Maximum	6.86E-04	3.13E-04
Minimum	3.83E-04	1.74E-04

TC

TE Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
TE d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
TE e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-23. Offsite smelting, incineration, and metal melt dose distribution by isotope for alternative B.[a] TC TE

Radionuclides	Atmospheric releases (percent of total dose)	
	MEI[b]	Population[c]
Cesium-134	31.68	31.37
Cesium-137	44.16	36.07
Strontium-90	11.09	3.18
Uranium-234	9.24	21.21
Uranium-236	$\leq$1.0[d]	3.71
Other[e]	3.83	4.46
Total dose[f,g]	Millirem	Person-rem
Expected	0.0514	0.346
Maximum	0.0927	0.624
Minimum	0.0377	0.254

TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE | **Table E.4-24.** Consolidated Incineration Facility dose distribution by isotope for alternative C.[a]

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	2.26	1.72	3.32	3.35
Cesium-134	19.93	10.88	15.97	15.77
Cesium-137	65.45	81.11	78.67	76.46
Strontium-90	7.50	2.80	≤1.0[d]	≤1.0[d]
Other[e]	4.86	3.49	2.04	4.42
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	0.091	5.42	1.81	5.23
Maximum	0.215	12.60	4.12	12.00
Minimum	0.0667	3.95	1.32	3.81

TE | Source: Blankenhorn (1994); Hertel et al. (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose is to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-25. Compactor facilities dose distribution by isotope for alternative C.[a] | TE

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	7.08	6.13	11.21	8.56
Cesium-134	6.13	3.94	5.15	3.90
Cesium-137	19.81	28.86	25.85	19.39
Europium-154	≤1.0[d]	≤1.0[d]	1.51	≤1.0[d]
Tritium	18.44	18.31	11.37	12.11
Plutonium-238	31.18	29.68	33.96	41.53
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	1.35
Ruthenium-106	1.13	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	8.36	4.44	1.75	2.16
Uranium-234	3.99	4.37	5.57	6.87
Other[e]	3.88	4.28	3.62	4.13
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	2.40E-07	9.49E-06	9.27E-06	2.61E-04
Maximum	2.48E-07	9.82E-06	9.59E-06	2.70E-04
Minimum	1.99E-07	7.86E-06	7.67E-06	2.16E-04

TE

TC

Source: Blankenhorn (1994); Hess (1994f, g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE **Table E.4-26.** Onsite vitrification facilities dose distribution by isotope for alternative C.[a]

Radionuclides	Atmospheric releases (percent of total dose) MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	≤1.0[d]	≤1.0[d]	3.11	2.94
Strontium-90	6.41	2.51	≤1.0[d]	≤1.0[d]
Cesium-134	17.13	9.82	15.37	14.21
Cesium-137	56.08	22.99	75.48	68.69
Plutonium-238	13.96	9.81	3.99	9.93
Plutonium-239	2.54	≤1.0[d]	≤1.0[d]	≤1.0[d]
Other[e]	3.88	4.86	2.05	4.24
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	5.20	293	92	283
Maximum	118	6,790	2,190	6,580
Minimum	2.56	141	42.70	136

TE Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-27. Soil sort facility dose distribution by isotope for alternative C.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	8.37	8.14	19.89	15.29
Cesium-134	7.38	5.15	9.57	7.19
Cesium-137	24.12	38.23	46.91	34.70
Europium-154	≤1.0[d]	≤1.0[d]	2.78	2.15
Tritium	11.81	10.41	3.89	7.38
Plutonium-238	29.92	25.60	12.37	24.98
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Ruthenium-106	1.32	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	9.92	4.74	≤1.0[d]	≤1.0[d]
Uranium-234	3.34	3.49	≤1.0[d]	4.15
Other[e]	3.82	4.24	4.58	4.16
Total dose[f,g]	Millirem	Person-rem	Millirem	Millirem
Expected	2.03E-06	9.38E-05	2.48E-05	9.40E-05
Maximum	1.18E-05	5.47E-04	1.45E-04	5.47E-04
Minimum	5.52E-07	2.56E-05	6.76E-06	2.56E-05

TE

TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE **Table E.4-28.** Transuranic waste characterization/certification facility dose distribution by isotope for alternative C.[a]

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Plutonium-238	83.65	83.66	83.85	83.89
Plutonium-239	15.38	15.37	15.17	15.13
Other[d]	0.97	0.97	0.98	0.98
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem
Expected	0.111	4.19	4.68	161
Maximum	1.83	69.1	77	2,650
Minimum	0.0775	2.92	3.26	112

TC Source: Blankenhorn (1995); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.

Table E.4-29. Containment building dose distribution by isotope for alternative C.[a] | TE

	Atmospheric releases (percent of total dose)			
Radionuclides	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Cobalt-60	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Cesium-134	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Cesium-137	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Europium-154	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Tritium[e]	99	99	99	99
Plutonium-238	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Plutonium-239	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Ruthenium-106	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Strontium-90	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Uranium-234	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Other[f]	≤1.0[d]	≤1.0[d]	≤1.0[d]	≤1.0[d]
Total dose[g,h]	Millirem	Person-rem	Millirem	Millirem
Expected	2.17E-02	8.52E-01	5.16E-01	1.55E+01
Maximum	2.17E-02	8.52E-01	5.16E-01	1.55E+01
Minimum	2.17E-02	8.52E-01	5.16E-01	1.55E+01

TE

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. | TE
e. Tritium releases due to processing of tritium contaminated mercury pumps.
f. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
g. Dose refers to committed effective dose equivalent (see glossary). | TE
h. Total doses are for the 30-year period of interest.

TE | **Table E.4-30.** Mixed waste offsite vendor dose distribution by isotope for alternative C.[a]

	Atmospheric releases (percent of total dose)	
Radionuclides	MEI[b]	Population[c]
Cesium-134	≤1.0[d]	1.62
Cesium-137	1.68	1.92
Tritium	75.92	32.52
Plutonium-238	13.54	44.04
Plutonium-239	≤1.0[d]	1.39
Strontium-90	1.49	≤1.0[d]
Uranium-234	3.68	12.12
Uranium-236	≤1.0[d]	2.13
Other[e]	3.69	4.26
Total dose[f,g]	Millirem	Person-rem
Expected	1.52E-05	6.93E-06
Maximum	3.88E-05	1.77E-05
Minimum	6.66E-06	3.03E-06

TE | Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total.
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

Table E.4-31. Offsite smelter dose distribution by isotope for alternative C.[a] TE

Radionuclides	Atmospheric releases (percent of total dose) MEI[b]	Population[c]
Cesium-134	31.68	31.37
Cesium-137	44.16	36.07
Strontium-90	11.09	3.18
Uranium-234	9.24	21.21
Uranium-236	$\leq$1.0[d]	3.71
Other[e]	3.83	4.46
Total dose[f,g]	Millirem	Person-rem
Expected	0.0108	0.0728
Maximum	0.0284	0.191
Minimum	0.00607	0.0409

TC

Source: Blankenhorn (1994); Hess (1994g); Simpkins (1994a); and Chesney (1995). TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. The contribution from this radionuclide to the given receptor is less than or equal to 1.0 percent and is accounted for in the "Other" total. TE
e. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
f. Dose refers to committed effective dose equivalent (see glossary).
g. Total doses are for the 30-year period of interest.

TE

TE **Table E.4-32.** F/H-Area Effluent Treatment Facility dose distribution by isotope for all alternatives.[a]

Radionuclides	Aqueous releases (percent of total dose)	
	MEI[b]	Population[c]
Cesium-137	70.52	18.79
Tritium	28.95	79.91
Other[d]	.053	1.30
	Millirem	Person-rem
Total dose[e,f,g]	0.0208	0.203

TC

TE Source: Blankenhorn (1994); Hess (1994g, i); Poirier and Wiggins (1994), Simpkins (1994a); and Chesney (1995).

a. Routine operations are not expected to produce atmospheric releases.
b. MEI = maximally exposed individual.
c. For aqueous releases, the dose is to the people using the Savannah River from SRS to Atlantic Ocean.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.
g. Includes releases from processing of Defense Waste Processing Facility recycle. Remains essentially constant for all alternatives.

TE

Table E.4-33. M-Area Vendor Treatment Facility dose distribution by isotope for all alternatives.[a] | TE

Radionuclides	Atmospheric releases (percent of total dose)			
	MEI[b]	Population[c]	640-meter uninvolved worker (2,100 feet)	100-meter uninvolved worker (328 feet)
Uranium-234	32.67	31.49	32.10	32.31
Uranium-238	64.93	65.98	65.48	65.31
Other[d]	2.40	2.53	2.43	2.38
Total dose[e,f]	Millirem	Person-rem	Millirem	Millirem
All alternatives	0.00371	0.00851	0.00856	0.304

TE | TC

Source: Blankenhorn (1994); Hamby (1994); Hess (1994g, j); Simpkins (1994a); and Chesney (1995). | TE

a. Routine operations are not expected to produce aqueous releases.
b. MEI = maximally exposed individual.
c. For atmospheric releases, the dose to the population within 80 kilometers (50 miles) of SRS.
d. Refer to Table E.4-34 for a listing of the radionuclides included in "Other."
e. Dose refers to committed effective dose equivalent (see glossary).
f. Total doses are for the 30-year period of interest.

TE

TE | **Table E.4-34.** Radionuclides listed under "Other" in Tables E.4-9 through E.4-33.[a]

Silver-110	Curium-246	Promethium-147	Strontium-89
Silver-110m	Curium-248	Promethium-148	Strontium-90
Aluminum-26	Chromium-51	Promethium-148m	Tantalum-182
Americium-241	Europium-154	Praseodymium-143	Terbium-160
Americium-243	Europium-155	Praseodymium-144	Technetium-99
Barium-137m	Europium-156	Plutonium-238	Tellurium-125m
Barium-140	Iron-55	Plutonium-239	Tellurium-127
Carbon-14	Iron-59	Plutonium-240	Tellurium-127m
Cadmium-113	Tritium	Plutonium-241	Tellurium-129
Cerium-141	Hafnium-181	Plutonium-242	Tellurium-129m
Cerium-144	Iodine-129	Rhodium-106	Uranium-233
Cobalt-58	Indium-113m	Ruthenium-103	Uranium-234
Cobalt-60	Indium-114	Ruthenium-103m	Uranium-235
Cesium-134	Krypton-85	Ruthenium-106	Uranium-236
Cesium-135	Lanthanum-140	Antimony-125	Uranium-238
Cesium-137	Manganese-54	Scandium-46	Yttrium-90
Californium-249	Nickel-59	Selenium-79	Yttrium 91
Californium-251	Nickel-63	Samarium-151	Zinc-65
Californium-252	Niobium-94	Tin-113	Zirconium-93
Californium-242	Niobium-95	Tin-119m	Zirconium-95
Californium-243	Niobium-95m	Tin-121m	Other Alpha
Californium-244	Neptunium-237	Tin-123	Other B/G[b]
Californium-245	Palladium-107	Tin-126	

Source: Blankenhorn (1994), Hunt (1994), and Chesney (1995).

a. Each of the listed radionuclides contribute less than or equal to 1.0 percent of the total dose unless identified as a major contributor to total dose.

b. B/G = Unidentifiable beta/gamma emitting radionuclides.

SECTION 5

ENVIRONMENTAL JUSTICE

LOCAL AREA DOSES

Figure 4-6 is a map of the area around SRS out to a distance of 80 kilometers (50 miles). This map identifies annular sectors around SRS by a letter-number combination. Table E.5-1 uses these annular sector identifiers to show:

- The fraction of total population dose in each annular sector.
- The fraction of total population dose that the average person in each annular sector will receive (the per capita dose in each sector).

The total population dose for any of the alternatives and forecasts can be multiplied by the appropriate fraction associated with any annular sector to obtain the total population dose to the annular sector, or the per capita dose in that sector for any of the forecasts. TE TE

Tables E.5-2 through E.5-11 show the estimated per capita 30-year dose for identified types of communities within the 80 kilometer region for each of the alternatives and forecasts. TE

Table E.5-1. Annular sector factors for local dose evaluations.[a]

TE

Annular number and distance from center of SRS	Fraction of total population dose in annular sector					Fraction of total population dose that is dose to average person in annular sector				
	1 (5-10 mi)[b]	2 (10-20 mi)	3 (20-30 mi)	4 (30-40 mi)	5 (40-50 mi)	1 (5-10 mi)	2 (10-20 mi)	3 (20-30 mi)	4 (30-40 mi)	5 (40-50 mi)
Sector[c]										
A (N)	3.09E-04	2.79E-02	2.70E-02	8.63E-03	1.49E-02	1.19E-05	5.25E-06	2.69E-06	1.70E-06	1.22E-06
B (NNE)	5.86E-05	5.75E-03	4.71E-03	6.5-E-03	1.51E-02	9.77E-06	4.35E-06	2.28E-06	1.46E-06	1.05E-06
C (NE)	1.02E-05	1.35E-02	7.03E-03	8.33E-03	1.17E-02	1.02E-05	4.57E-06	2.40E-06	1.58E-06	1.15E-06
D (ENE)	2.76E-04	1.29E-02	9.56E-03	7.43E-03	4.15E-02	1.02E-05	4.12E-06	2.13E-06	1.39E-06	1.02E-06
E (E)	1.28E-03	2.21E-02	8.91E-03	9.67E-03	3.48E-03	8.27E-06	3.27E-06	1.68E-06	1.10E-06	8.02E-07
F (ESE)	2.55E-04	4.37E-03	2.79E-03	2.56E-03	2.24E-03	7.07E-06	2.81E-06	1.45E-06	9.44E-07	6.90E-07
G (SE)	1.29E-04	1.11E-03	6.78E-03	4.54E-03	4.25E-03	4.96E-06	2.02E-06	1.04E-06	6.79E-07	4.95E-07
H (SSE)	1.61E-04	6.63E-04	6.92E-04	8.10E-04	1.12E-03	4.04E-06	1.70E-06	9.00E-07	5.97E-07	4.40E-07
I (S)	2.25E-06	5.48E-04	7.24E-04	2.69E-03	9.34E-04	2.25E-06	9.83E-07	5.44E-07	3.71E-07	2.80E-07
J (SSW)	1.29E-05	2.42E-03	2.90E-03	4.11E-03	2.12E-03	6.46E-06	2.70E-06	1.45E-06	9.82E-07	7.22E-07
K (SW)	1.87E-04	4.17E-03	5.22E-03	4.06E-03	3.02E-03	1.10E-06	4.41E-06	2.33E-06	1.56E-06	1.14E-06
L (WSW)	5.18E-04	3.87E-03	1.32E-02	2.84E-03	5.31E-03	8.64E-06	3.50E-06	1.86E-06	1.24E-06	9.13E-07
M (W)	3.43E-04	8.52E-03	1.11E-02	7.51E-03	4.62E-03	6.24E-06	2.57E-06	1.40E-06	9.40E-07	6.82E-07
N (WNW)	2.89E-03	9.16E-03	1.57E-01	4.99E-02	8.33E-03	6.43E-06	2.74E-06	1.47E-06	9.92E-07	7.22E-07
O (NW)	2.23E-03	2.08E-02	1.57E-01	3.04E-02	2.48E-03	8.22E-06	3.52E-06	1.79E-06	1.14E-06	8.21E-07
P (NNW)	3.97E-03	8.47E-02	6.28E-02	9.74E-03	6.34E-03	1.09E-05	4.70E-06	2.31E-06	1.46E-06	1.04E-06

a. Source: Simpkins (1994b).
b. No population resides within 8 kilometers (5 miles) of the center of SRS.
c. Sector letter is letter shown on Figure 4-6. Letters in parentheses after the sector letter indicate the compass direction of the sector.

Table E.5-2. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for the no-action alternative.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	9.37E-08	8.49E-08	9.97E-08	8.67E-08	9.02E-08	9.55E-08
0-32 km (0-20 miles)	4.50E-08	3.54E-08	6.20E-08	4.10E-08	4.27E-08	4.57E-08
0-48 km (0-30 miles)	2.42E-08	1.89E-08	2.95E-08	2.49E-08	2.57E-08	2.37E-08
0-64 km (0-40 miles)	1.97E-08	1.73E-08	2.28E-08	1.94E-08	2.11E-08	1.93E-08
0-80 km (0-50 miles)	1.84E-08	1.59E-08	2.03E-08	1.88E-08	1.93E-08	1.82E-08

Total population dose = 0.0086 person-rem.

Table E.5-3. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative A – expected waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	1.85E-04	1.68E-04	1.97E-04	1.71E-04	1.78E-04	1.89E-04
0-32 km (0-20 miles)	8.89E-05	7.00E-05	1.22E-04	8.11E-05	8.45E-05	9.04E-05
0-48 km (0-30 miles)	4.78E-05	3.74E-05	5.84E-05	4.92E-05	5.09E-05	4.69E-05
0-64 km (0-40 miles)	3.89E-05	3.43E-05	4.51E-05	3.83E-05	4.17E-05	3.82E-05
0-80 km (0-50 miles)	3.64E-05	3.15E-05	4.01E-05	3.71E-05	3.81E-05	3.60E-05

Total population dose = 17 person-rem.

Table E.5-4. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative A – minimum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	8.93E-05	8.10E-05	9.51E-05	8.26E-05	8.60E-05	9.10E-05
0-32 km (0-20 miles)	4.29E-05	3.37E-05	5.91E-05	3.91E-05	4.07E-05	4.36E-05
0-48 km (0-30 miles)	2.30E-05	1.81E-05	2.82E-05	2.37E-05	2.45E-05	2.26E-05
0-64 km (0-40 miles)	1.88E-05	1.65E-05	2.17E-05	1.85E-05	2.01E-05	1.84E-05
0-80 km (0-50 miles)	1.76E-05	1.52E-05	1.94E-05	1.79E-05	1.84E-05	1.73E-05

Total population dose = 8.2 person-rem.

Table E.5-5. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative A – maximum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	1.12E-03	1.02E-03	1.19E-03	1.04E-03	1.08E-03	1.14E-03
0-32 km (0-20 miles)	5.39E-04	4.24E-04	7.42E-04	4.91E-04	5.12E-04	5.48E-04
0-48 km (0-30 miles)	2.89E-04	2.27E-04	3.54E-04	2.98E-04	3.08E-04	2.84E-04
0-64 km (0-40 miles)	2.36E-04	2.08E-04	2.73E-04	2.32E-04	2.53E-04	2.32E-04
0-80 km (0-50 miles)	2.21E-04	1.91E-04	2.43E-04	2.25E-04	2.31E-04	2.18E-04

Total population dose = 103 person-rem.

Table E.5-6. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative C – expected waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	3.29E-03	2.98E-03	3.50E-03	3.04E-03	3.17E-03	3.35E-03
0-32 km (0-20 miles)	1.58E-03	1.24E-03	2.18E-03	1.44E-03	1.50E-03	1.61E-03
0-48 km (0-30 miles)	8.49E-04	6.65E-04	1.04E-03	8.73E-04	9.04E-04	8.33E-04
0-64 km (0-40 miles)	6.92E-04	6.09E-04	8.01E-04	6.81E-04	7.41E-04	6.79E-04
0-80 km (0-50 miles)	6.47E-04	5.59E-04	7.13E-04	6.59E-04	6.76E-04	6.39E-04
Total population dose = 302 person-rem.						

Table E.5-7. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative C – minimum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	1.61E-03	1.46E-03	1.72E-03	1.49E-03	1.55E-03	1.64E-03
0-32 km (0-20 miles)	7.74E-04	6.09E-04	1.07E-03	7.06E-04	7.35E-04	7.87E-04
0-48 km (0-30 miles)	4.16E-04	3.26E-04	5.08E-04	4.28E-04	4.43E-04	4.08E-04
0-64 km (0-40 miles)	3.39E-04	2.99E-04	3.92E-04	3.34E-04	3.63E-04	3.33E-04
0-80 km (0-50 miles)	3.17E-04	2.74E-04	3.50E-04	3.23E-04	3.31E-04	3.13E-04
Total population dose = 148 person-rem.						

Table E.5-8. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative C – maximum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	7.49E-02	6.79E-02	7.98E-02	6.93E-02	7.22E-02	7.64E-02
0-32 km (0-20 miles)	3.60E-02	2.83E-02	4.96E-02	3.28E-02	3.42E-02	3.66E-02
0-48 km (0-30 miles)	1.93E-02	1.52E-02	2.36E-02	1.99E-02	2.06E-02	1.90E-02
0-64 km (0-40 miles)	1.58E-02	1.39E-02	1.82E-02	1.55E-02	1.69E-02	1.55E-02
0-80 km (0-50 miles)	1.47E-02	1.27E-02	1.62E-02	1.50E-02	1.54E-02	1.46E-02

Total population dose = 6,880 person-rem.

Table E.5-9. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative B – expected waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	5.01E-04	4.54E-04	5.33E-04	4.64E-04	4.83E-04	5.11E-04
0-32 km (0-20 miles)	2.41E-04	1.89E-04	3.31E-04	2.19E-04	2.29E-04	2.45E-04
0-48 km (0-30 miles)	1.29E-04	1.01E-04	1.58E-04	1.33E-04	1.38E-04	1.27E-04
0-64 km (0-40 miles)	1.05E-04	9.28E-05	1.22E-04	1.04E-04	1.13E-04	1.03E-04
0-80 km (0-50 miles)	9.85E-05	8.52E-05	1.09E-04	1.00E-04	1.03E-04	9.73E-05

Total population dose = 46 person-rem.

Table E.5-10. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative B – minimum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	3.27E-04	2.96E-04	3.48E-04	3.02E-04	3.15E-04	3.33E-04
0-32 km (0-20 miles)	1.57E-04	1.23E-04	2.16E-04	1.43E-04	1.49E-04	1.60E-04
0-48 km (0-30 miles)	8.43E-05	6.61E-05	1.03E-04	8.68E-05	8.98E-05	8.28E-05
0-64 km (0-40 miles)	6.87E-05	6.05E-05	7.95E-05	6.77E-05	7.36E-05	6.74E-05
0-80 km (0-50 miles)	6.43E-05	5.56E-05	7.09E-05	6.55E-05	6.72E-05	6.35E-05

Total population dose = 30 person-rem.

Table E.5-11. Estimated per capita 30-year dose for identified communities in 80-kilometer (50-mile) region for alternative B – maximum waste forecast.

Distance	All	Persons of color more than 50% of population	Persons of color 35% to 50% of population	Persons of color less than 35% of population	Low incomes more than 25% of population	Low incomes less than 25% of population
0-16 km (0-10 miles)	4.43E-03	4.02E-03	4.72E-03	4.10E-03	4.27E-03	4.52E-03
0-32 km (0-20 miles)	2.13E-03	1.67E-03	2.93E-03	1.94E-03	2.02E-03	2.16E-03
0-48 km (0-30 miles)	1.14E-03	8.97E-04	1.40E-03	1.18E-03	1.22E-03	1.12E-03
0-64 km (0-40 miles)	9.32E-04	8.21E-04	1.08E-03	9.18E-04	9.99E-04	9.15E-04
0-80 km (0-50 miles)	8.72E-04	7.54E-04	9.61E-04	8.89E-04	9.12E-04	8.61E-04

Total population dose = 407 person-rem.

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APPENDIX F

ACCIDENT ANALYSIS

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F.1 Introduction

The potential for facility accidents and the magnitude of their effects are important factors in evaluating the waste management alternatives addressed in this environmental impact statement (EIS). This appendix presents accident information related to the facilities that are or could be involved with the waste management alternatives. By using postulated accident scenarios associated with the existing and proposed waste processing, storage, and disposal facilities, this appendix describes the potential consequences and risks of waste management activities to workers, the public, and the environment.

Postulated accident scenarios were developed for each waste type under the alternatives evaluated in this EIS. This appendix considers the five waste types generated and managed at SRS: high-level radioactive waste, low-level radioactive waste, hazardous waste, mixed waste, and transuranic waste.

F.2 General Accident Information

An accident, as discussed in this appendix, is an inadvertent release of radioactive or hazardous material from its confinement to the environment resulting in serious physical injury or substantial property damage. Initiating events are typically defined in three broad categories:

- *External initiators* originate outside the facility and potentially affect the ability of the facility to keep the material confined. Examples of external initiators are aircraft crashes, nearby explosions, and hazardous chemical releases from nearby facilities that could affect the ability of personnel to properly manage the radioactive/hazardous materials facility and its contents.

- *Internal initiators* originate within a facility and are usually the result of facility operation. Examples of internal initiators are equipment failures and human error.

- *Natural phenomena initiators* are natural occurrences such as floods, tornadoes, and earthquakes.

Sabotage and terrorist activities (i.e., intentional human initiators) could be either external or internal initiators.

For this appendix, "facility accidents" are accidents associated with facilities that support or are involved in the treatment, storage, or disposal of the five waste types identified in Section F.1. Accident scenarios associated with waste management activities performed at a specific facility are also considered "facility accidents."

The probability of an accident (i.e., annual frequency) and its consequences depend on the type of initiator(s), how often that initiator occurs, and the frequency with which the resulting chain of events would lead to a release of material. Potential accidents (and their effects) are grouped into four categories -- anticipated accidents, unlikely accidents, extremely unlikely accidents, and beyond extremely unlikely accidents -- based on their estimated annual frequency. Table F-1 lists, in decreasing order, these accident categories and their corresponding frequency ranges. For example, if an earthquake of sufficient magnitude to cause a release of material to the environment is expected to occur once every 5,000 years, the frequency for this accident is presented as 1 in 5,000, or 0.0002 (expressed as 2.0E-04; see Acronyms, Abbreviations, and the Use of Scientific Notation) per year (i.e., it is an unlikely accident per Table F-1).

Table F-1. Accident frequency categories.[a]

Frequency category	Frequency range (accidents per year)
Anticipated accidents	Occurs between once in 10 years and once in 100 years
Unlikely accidents	Occurs between once in 100 years and once in 10,000 years
Extremely unlikely accidents	Occurs between once in 10,000 years and once in 1,000,000 years
Beyond extremely unlikely accidents	Occurs less than once in 1,000,000 years

TE | a. DOE (1994a).

TC | DOE does not consider events that are expected to occur less often than once every 10 years to be "accidents." This does not imply that undesirable releases of radioactive or hazardous materials cannot occur more than once every 10 years. However, events with a probability of occurring more than once every 10 years are considered "abnormal events" because their occurrence is expected during the life of the facility, and they usually do not result in substantial onsite or offsite consequences. Potential effects from these releases are addressed in the Occupational and Public Health sections of this EIS. DOE implements physical and administrative controls on facility operations and activities to minimize the likelihood and impacts of such events. Personnel are trained and drilled on how to respond to and mitigate potential releases from abnormal events.

Table F-2 presents the relative risk of a one-in-a-million chance of dying from several different commonplace activities (WSRC 1994a).

Table F-2. Activities that have a one-in-one-million chance of causing death.

Smoking 1.4 cigarettes (lung cancer)
Eating 40 tablespoons of peanut butter (aflatoxins)
Eating 100 charcoal-broiled steaks (carcinogens from charcoal broiling)
Spending 2 days in New York City (air pollution)
Driving 40 miles in a car (accident)
Flying 2,500 miles in a jet (accident)
Canoeing for 6 minutes (accident)

F.3 Historic Perspective

Many of the actions proposed under the waste management alternatives considered in this EIS are continuations or variations of past SRS operations. DOE studies historic nonroutine events, abnormal occurrences, and accidents so similar events in present or future operations can be minimized or prevented. Historic events at facilities in the DOE complex are documented and tracked in two different computer data bases maintained by the U.S. Department of Energy (DOE) Office of Nuclear Energy at the Idaho National Engineering Laboratory: the Occurrence Reporting and Processing System (ORPS) and the Safety Performance Measurement System (SPMS). In addition, Savannah River Site (SRS) maintains computer data bases, such as the Waste Management Fault Tree Data Storage and Retrieval System, which track historic occurrence information and lessons learned specific to SRS facilities and operations. TE TE

Since the implementation of the Site Item Reportability and Issue Management (SIRIM) program in 1991, which assigns the responsibilities and requirements for reporting abnormal events and accidents at SRS, more than 425 abnormal events involving waste management activities and operations have been documented (WSRC 1994b, c). These events were reviewed to determine whether (1) workers were physically injured, (2) radioactive or hazardous material was inadvertently released to the environment, or (3) the occurrence, if not resolved, could have caused significant consequences to workers, members of the public, or the environment. One event, involving a procedural violation of the nuclear criticality safety limits (maximum permissible plutonium inventory per waste container) established for the Solid Waste Disposal Facility, was considered to have the potential to have caused major impacts (an inadvertent criticality and potential worker fatality). The criticality limits were exceeded because the plutonium inventory placed in the waste containers was incorrectly calculated. As an immediate corrective action, DOE suspended all shipments of transuranic waste to the Solid Waste Disposal Facility from SRS facilities that generate transuranic waste. Before resuming shipments, DOE (1) ensured that TE no potential criticality hazards existed as a result of the limits being exceeded and (2) independently evaluated each facility that generates transuranic waste to ensure that the deficiencies had been resolved and that the facilities could correctly calculate the inventories of waste materials being sent to the Solid Waste Disposal Facility.

DOE also evaluated events that occurred prior to implementation of the Site Item Reportability and Issue Management System in 1991. The Waste Management Fault Tree Data Storage and Retrieval System data base documents several hundred events occurring between 1988 and 1991. Eight of the 13 events TE | involving the management of liquid high-level radioactive wastes (such as is done at the F- and H-Area tank farms) involved worker doses in excess of established DOE limits; 2 involved liquid releases of radioactive material to Fourmile Branch; 1 involved an airborne release of radioactive particulates to the atmosphere; and 2 involved personnel assimilations of radioactive particulates.

Most of the abnormal events resulting from nontank farm operations were nonradiological in nature, such as minor physical injuries (e.g., cuts, falls), or involved minor leaks of radioactive material that did not result in airborne releases to the environment or a measurable dose to personnel. However, one event involved the flooding of a shallow land disposal unit as a result of heavy rains over a period of several days. This event, which occurred in August 1990, caused several metal boxes containing low-level radioactive waste to flood. In addition, when the trench flooded, several of the boxes floated, causing the stacking configuration of waste containers in the disposal unit to change. DOE assessments concluded that there were no releases of radioactive material to the environment.

Abnormal events from the beginning of Solid Waste Disposal Facility and the tank farm facilities operations in early 1953 through 1988 are discussed in the safety analysis reports for these facilities. At the tank farms, 17 occurrences were noted as significant: 9 liquid releases to Fourmile Branch, 6 personnel assimilations, and 2 airborne releases of radioactive particulates to the atmosphere. At the Solid Waste Disposal Facility, events primarily involved spills or leaks of organic solvents and small fires (limited to only one or a few waste containers) attributed to spontaneous chemical combustion resulting from improper packaging and did not result in measurable or significant releases of radioactive material. Since 1981, no fires have occurred in the transuranic waste storage drums, culverts, or carbon steel boxes at the Solid Waste Disposal Facility.

F.4 Accident Analysis Methodology

TE | National Environmental Policy Act (NEPA) guidance issued by the DOE Office of NEPA Oversight (DOE 1993) recommends that accident impact analyses "...reference Safety Assessments and Safety

Analysis Reports, if available." Most of the facilities considered in this EIS have pre-existing safety documentation that analyzes the consequences and risks associated with operating the facilities. In accordance with this NEPA guidance, existing safety documentation was referred to during the preparation of the accident analysis portion of this EIS. This appendix used three Westinghouse Savannah River Company technical reports (WSRC 1994c, d, and e) as the basis for the accident analysis information presented. These technical reports used safety analysis reports, preliminary safety analysis reports, hazard assessment documents, basis for interim operations documents, safety assessments, and other safety evaluations.

This analysis assessed the effects of radiological releases on four receptor groups in order to compare results among the alternatives. They are:

- uninvolved worker[1] at 100 meters: an individual 100 meters (328 feet) from the point of a release
- uninvolved worker at 640 meters: an individual 640 meters (2,100 feet) from the point of a release
- offsite maximally exposed individual: a hypothetical member of the public who lives along the SRS boundary and who would receive the largest exposure from a release | TE
- offsite population within 80 kilometers (50 miles): all the people within an 80-kilometer (50-mile) radius of SRS

AXAIR89Q (WSRC 1994f), a computer code developed specifically for analyzing the consequences of accidental releases of airborne radioactive particulates from SRS, was used to calculate the consequences to the receptor groups identified above for each of the accident scenarios postulated in this appendix. Consequences for the uninvolved workers and the offsite maximally exposed individual were calculated using 50 percentile meteorological assumptions (meaning that half the time meteorological conditions such as wind speed and barometric pressure are better than the assumption, and half the time they are worse), in accordance with DOE guidance (DOE 1993). DOE believes that the 50 percentile meteorological assumptions provide an estimate of the consequences under more realistic exposure conditions than would be expected if one of the postulated accidents occurs. The AXAIR89Q computer code, which calculates population doses differently than doses for individuals, is not programmed to | TE

[1]An uninvolved worker is a worker 100 meters (328 feet) or more from where an accident occurs and is usually not directly involved in the activity or operation being evaluated.

determine the population dose for meteorological conditions not exceeded 50 percent of the time. Therefore, for the offsite population within 80 kilometers (50 miles), DOE assumed very conservative meteorological conditions within 99.5 percentile. As a result, the consequences from postulated accidents are higher than would normally be expected for the offsite population.

As noted above, uninvolved workers are evaluated at 100 and 640 meters (328 and 2,100 feet). Typically, uninvolved workers at 100 meters (328 feet) are in a facility's emergency planning zone, which generally extends to the facility's boundary. However, uninvolved workers at 640 meters (2,100 feet) are likely to be outside a facility's emergency planning zone, and it typically would take longer to notify these workers of an accident at the facility. The purpose of presenting accident impacts for the uninvolved workers at these two distances is to provide a comparison of results for uninvolved workers who are likely to be initially aware of an accident and those who are not. It should be noted that the methodology described in the following sections does not take credit for emergency responses to accidents (e.g., evacuating personnel to a safe distance or notifying the public to take shelter) in determining potential effects on workers or members of the public. To minimize the potential for human exposures and impacts to the environment if an accident occurs, SRS has established an emergency plan
TE (WSRC 1994d) that governs responses to accidents. Section F.8 summarizes the *SRS Emergency Plan*.

TE A maximum credible design basis earthquake at SRS, estimated to occur once every 5,000 years, could potentially impact multiple facilities within a single facility area, resulting in the release of radioactive and/or toxic materials. It is also possible, although probably less likely, that an earthquake of the same magnitude could damage facilities in more than one facility area (e.g., F- and H-Areas), resulting in
TE simultaneous releases to the environment. See Section F.6.

F.4.1 RADIOLOGICAL ACCIDENT ANALYSIS METHODOLOGY

This appendix presents quantitative impacts to SRS workers and members of the public from postulated radiological accidents using the following parameters: dose, accident frequency, latent fatal cancers, and risk of latent fatal cancers per year. These parameters were either referenced in or developed from information provided in the following technical reports: *Bounding Accident Determination for the Accident Input Analysis of the SRS Waste Management Environmental Impact Statement* (WSRC 1994e), *Solid Waste Accident Analysis in Support of the Savannah River Waste Management Environmental Impact Statement* (WSRC 1994c), and the *Liquid Waste Accident Analysis in Support of the Savannah River Waste Management Environmental Impact Statement* (WSRC 1994b). The quantities of radioactive materials and how these materials affect humans are important in determining health effects.

The International Commission on Radiological Protection has made specific recommendations for quantifying these health effects. Results are presented in terms of latent fatal cancers calculated using the ICRP-60 conversion factors of 0.0005 latent fatal cancers per rem for the public and 0.0004 latent fatal cancers per rem for workers if the dose is less than 20 rem. For doses of 20 rem or more, the ICRP-60 conversion factors are doubled (ICRP 1991).

A quantitative analysis of these facilities is not possible because some of the facilities proposed for waste management activities are in the pre-design or conceptual stage of development. Therefore, a qualitative discussion of accident impacts is provided for proposed facilities for which a quantitative accident analysis does not exist.

Additionally, this analysis presents potential impacts to involved workers[2] from postulated accidents qualitatively rather than quantitatively for several reasons, the most relevant being that no adequate methodology exists for calculating meaningful consequences at or near the location where the accidental release occurs. The following example illustrates this concept.

A typical method for calculating the dose to an involved worker is to assume that the material is released in a room occupied by the individual and that the material instantly disperses throughout the room. Because the involved worker is assumed to be in the room when the release occurs, this worker probably would breathe some fraction of the radioactive (or hazardous) materials for some number of seconds before leaving the room. Typically, estimates of exposure time are based on assumptions made about worker response to the incident (e.g., how long before the worker leaves the room, or whether during evacuation the worker passes through an area of higher airborne concentration). The uncertainty of estimation is extremely great, and no additional insight into the activity is available because the occurrence is assumed to be undesirable; therefore, it is not necessary to perform the calculations. Historical evidence indicates that room contaminations are nonfatal accidents with the potential for minor personnel contamination and assimilation.

DOE accepts that if the exposed individual is close enough to the location of the accident, it will be impossible to show acceptable dose consequences against typical guidelines. This is especially true if all accidents with a frequency as low as once in a million years -- beyond which it is not possible to statistically demonstrate protection of worker life from standard hazards in the workplace -- must be considered. For example, it is more likely that an employee would be fatally injured by falling

[2]An involved worker is a worker within 100 meters (328 feet) of a postulated accident who is usually directly involved in the activity or operation being evaluated.

equipment during an earthquake severe enough to occur only once every 5,000 years than from the radiological dose that individual would receive from materials released during the earthquake. Therefore, this appendix addresses potential consequences to involved workers qualitatively. DOE assumes that the immediate impacts of the accident (in this case an earthquake) to the worker would be from the facility in which the worker was located at the time of the accident; while the consequences from another facility affected during the earthquake would have little immediate impact upon an "involved" worker.

Many accident scenarios can be postulated for each SRS facility; to attempt to analyze all potential accident scenarios and their impacts would not be useful or meaningful. However, a broad spectrum of accidents can usually be identified and analyzed for a given facility to provide an understanding of the risks associated with performing activities in that facility. Safety analysis reports and other safety documentation usually analyze a broad spectrum of accidents that are considered credible (i.e., they are expected to occur at least once every one million years) and estimate their potential impacts on workers, the environment, and the public.

For this EIS, the term "representative bounding accident" means postulated events or accidents that have higher risks (i.e., consequences times frequencies) than other accidents postulated within the same TE frequency range. For example, the accident scenario within each frequency range (defined in Table F-1) that presents the highest risk (i.e., consequence times frequency) to the offsite maximally exposed individual is the representative bounding accident for that frequency range because its risk is higher than that of other accidents within the same frequency range. Determining the representative bounding accident is part of a "binning" process, whereby all the accident scenarios identified for a facility under a specific alternative would be assigned to a selected frequency range. The highest-risk accident scenario within each frequency range is then designated the representative bounding accident. It should be noted that the consequence value used to calculate risk is dose to the offsite maximally exposed individual.

Once the representative bounding accidents are identified, it is not necessary to further consider other accident scenarios for that particular alternative. The bounding accident scenarios are further evaluated to provide accident impacts for the receptor groups. An evaluation of the risks associated with the representative bounding accidents for facilities associated with a given alternative can establish an understanding of the overall risk to workers, members of the public, and the environment from operating facilities under a specific alternative. However, since some accident impacts are not represented in quantitative terms, the term "representative" must preface the phrase "bounding accident." This is because without a complete list of quantitative impacts from accidents for all facilities (existing and proposed), the true bounding accidents may not be absolutely defined. Figure F-1 shows the concept of

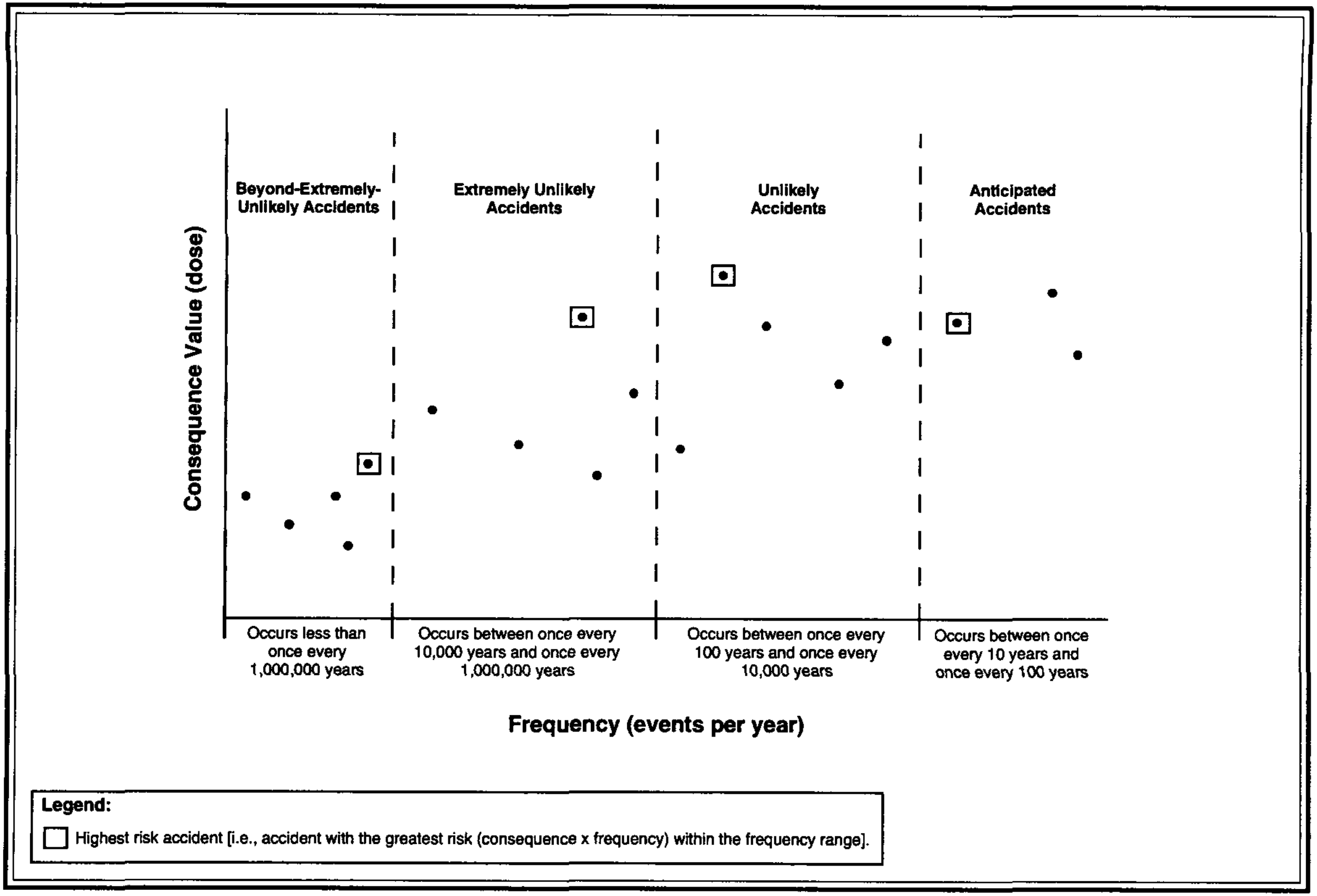

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Figure F-1. Illustration of methodology used to determine bounding risk accidents.

bounding risk accidents. Section F.5 identifies the representative bounding accidents postulated for the facilities considered in this EIS.

F.4.2 CHEMICAL HAZARDS ANALYSIS METHODOLOGY

To fully understand the hazards associated with SRS facilities associated with the alternatives considered in this EIS, it is necessary to analyze potential accidents involving hazardous as well as radiological materials. Because the long-term health consequences of human exposure to hazardous materials are not as well understood as those related to radiation exposure, a determination of potential health effects from exposures to hazardous materials is more subjective than a determination of health effects from exposure to radiation. Therefore, the consequences of accidents involving hazardous materials postulated in this appendix are presented in terms of airborne concentrations at various distances from the accident. The quantities and airborne concentrations at various receptor locations were extracted from technical reports (WSRC 1994b, c) supporting this EIS.

Because safety documentation exists for many of the facilities within the scope of this EIS, it was used whenever possible to determine potential events involving hazardous materials and the health effects that could result from inadvertent releases of these materials to the environment. However, because these safety documents were developed for different purposes, the methodologies used to analyze potential events at the facilities are sometimes different. In general, the methodology used to develop most of the existing safety documentation included: (1) identifying hazardous materials present in quantities greater than reportable quantities (40 CFR 302.4), threshold planning quantities (40 CFR 355), or threshold quantities (40 CFR 29:1910.1000, Subpart Z); (2) modeling an unmitigated release of those hazardous materials to the atmosphere to determine airborne concentrations at the various receptor locations [100 meters (328 feet), 640 meters (2,100 feet), and the nearest SRS boundary]; and (3) comparing those airborne concentrations to Emergency Response Planning Guideline (ERPG) values established by the American Industrial Hygiene Association (AIHA 1991).

Three ERPG values (ERPG-1, -2, or -3) are typically assigned to hazardous materials or chemicals in terms of airborne concentration (milligrams per cubic meter or parts per billion). The types of emergency response actions required to minimize worker and public exposure are determined by considering which of the three ERPG values is exceeded. The three types of ERPG values defined are:

- ERPG-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.

- ERPG-2: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.

- ERPG-3: The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

The American Industrial Hygiene Association has not established ERPG values for some hazardous materials. When such materials would be present at SRS facilities in substantial quantities (exceeding the various threshold criteria), airborne concentrations of these materials at the various receptor locations were compared to the most restrictive exposure limits established by other recognized organizations to control worker exposures to hazardous materials. Table F-3 lists the hierarchy of exposure limits that DOE used in place of ERPG values to determine potential health effects resulting from the postulated hazardous material releases.

For facilities for which safety documentation was not developed in accordance with the methodology described above, the typical difference in the methodology involved which hazardous materials were required to be evaluated, not how the evaluations were performed. In the case of the Defense Waste Processing Facility's Organic Waste Storage Tank, for example, which was recently evaluated in the *Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility* (DOE 1994b), hazardous materials designated "Extremely Hazardous Substances" in accordance with the Emergency Planning and Community Right-to-Know Act of 1986 were evaluated, rather than materials that exceed the reportable, threshold, or threshold planning quantities.

The potential events at the various facilities analyzed in this EIS that could release hazardous materials to the environment were evaluated using one of the methodologies described above. DOE further analyzes potential events involving hazardous materials at the Consolidated Incineration Facility and E-, B-, and N-Areas (WSRC 1994c). DOE further discusses the analysis methodology for events | TE
involving hazardous materials at the F/H-Area Effluent Treatment Facility, the F/H-Area tank farms, the Defense Waste Processing Facility's Organic Waste Storage Tank, and waste storage tanks at the Savannah River Technology Center (WSRC 1994b). | TE

Although safety documentation exists for most of the facilities and facility areas that perform waste management activities, there is no safety documentation that analyzes potential events involving hazardous materials in M-Area. Using the second methodology described above, it was determined that

Table F-3. Hierarchy of established limits and guidelines used to determine impacts from postulated hazardous material accidents.[a]

Primary airborne concentration guideline	Hierarchy of alternative guidelines (if primary guidelines are unavailable)	Reference of alternative guideline
ERPG-3	EEGL[b] (30-minute exposure)	NAS (1985)
	IDLH[c]	NIOSH (1990)
ERPG-2	EEGL (60-minute exposure)	NAS (1985)
	LOC[d]	EPA (1987)
	PEL-C[e]	CFR (1990)
	TLV-C[f]	ACGIH (1992)
	TLV-TWA[g] multiplied by 5	ACGIH (1992)
ERPG-1	TWA-STEL[h]	CFR (1990)
	TLV-STEL[i]	ACGIH (1992)
	TLV-TWA multiplied by 3	ACGIH (1992)

a. This table is based on information presented in the *Toxic Chemical Hazard Classification and Risk Acceptance Guidelines for Use in DOE Facilities* (WSRC 1992).

b. Emergency Exposure Guidance Level (EEGL): "A concentration of a substance in air (as a gas, vapor, or aerosol) that may be judged by the Department of Defense to be acceptable for the performance of specific tasks during emergency conditions lasting for a period of 1 to 24 hours. Exposure at an EEGL might produce reversible effects that do not impair judgment and do not interfere with proper responses to an emergency." The EEGL is "...a ceiling guidance level for a single emergency exposure, usually lasting from 1 to 24 hours -- an occurrence expected to be infrequent in the lifetime of a person."

c. Immediately Dangerous to Life and Health (IDLH): "The maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing (e.g., severe eye irritation) or irreversible health effects."

d. Level of Concern (LOC): "The concentration of an extremely hazardous substance in air above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time."

e. Permissible Exposure Limit - Ceiling (PEL-C): "The employee's exposure which shall not be exceeded during any part of the work day."

f. Threshold Limit Value - Ceiling (TLV-C): "The concentration that should not be exceeded during any part of the working exposure."

g. Threshold Limit Value - Time Weighted Average (TLV-TWA): "The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect."

h. Time Weighted Average - Short-Term Exposure Limit (TWA-STEL): "The employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified...."

i. Threshold Limit Value - Short-Term Exposure Limit (TLV-STEL): "The concentration to which workers can be exposed continuously for a short period of time without suffering from (1) irritation, (2) chronic or irreversible tissue damage, or (3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded."

sulfuric acid would be the only chemical present in M-Area in sufficient quantities to warrant further evaluation in this EIS. Consistent with the methodologies, DOE analyzed an unmitigated release of the entire sulfuric acid inventory in M-Area using a commercially available computer code called EPICode (Homann 1988) that models the atmospheric dispersion of chemicals released to the environment. DOE then compared the resulting airborne concentrations against the ERPG values for sulfuric acid to determine the potential health effects.

F.5 Accident Analysis by Waste Type

This section presents potential impacts from postulated radiological and chemical accidents at the facilities that are or could be involved in the management of waste materials at SRS. This section has been organized according to waste type, with an analysis for each of the alternatives presented in this EIS. Each of the following sections includes a list of the facilities, postulated radiological accident impacts, and postulated chemical accident impacts associated with the waste type.

F.5.1 HIGH-LEVEL WASTE

The following sections address the impacts of postulated accidents associated with the alternatives considered in this EIS for the management of liquid high-level waste.

F.5.1.1 Facilities and Accidents: High-Level Waste

The accident analyses considered all facilities and processes involved in the management of liquid high-level waste. The facilities were identified from the information on high-level waste provided in Chapter 2 of this EIS. The facilities involved in the management of high-level waste for all alternatives considered in this EIS are the F/H-Area Evaporators, the Replacement High-Level Waste Evaporator, the New Waste Transfer Facility, the F/H-Area tank farms, and the F/H-Area Effluent Treatment Facility. Descriptions of these facilities are provided in Appendix B. For each of these facilities, a list of postulated accident scenarios was developed to support high-level waste accident analyses for each alternative.

Table F-4 lists potential accidents associated with the management of high-level waste. These accidents were extracted from the technical reports supporting this EIS (WSRC 1994b, c, and e). TE

Table F-4. List of potential accidents associated with the management of high-level waste.

No.	Accident description	Annual freq.	Dose[a] (rem)	Risk (rem/yr)
1	RHLWE[b] release due to a feed line break	7.00E-02	2.73E-03	1.91E-04
2	H-Area airborne release due to waste tank filter fire	2.50E-02	3.68E-03	9.20E-05
3	RHLWE[b] release due to design basis earthquake	2.00E-04	8.16E-02	1.63E-05
4	F-Area airborne release due to waste tank filter fire	2.50E-02	6.39E-04	1.60E-05
5	RHLWE[b] release due to evaporator pressurization and breach	5.09E-05	2.03E-01	1.04E-05
6	RHLWE[b] release due to hydrogen explosion	1.71E-04	4.58E-02	7.83E-06
7	H-Area airborne release due to organic fire - waste tank	5.00E-03	1.35E-03	6.75E-06
8	RHLWE[b] release due to HEPA[c] filter fire	1.00E-02	4.55E-04	4.55E-06
9	H-Area airborne release due to hydrogen fire - waste tank	5.00E-03	7.37E-04	3.69E-06
10	F-Area liquid release due to waste tank overflow	9.00E-02	2.37E-05	2.13E-06
11	H-Area liquid release due to waste tank overflow	9.00E-02	2.00E-05	1.80E-06
12	F-Area airborne release due to organic fire - waste tank	5.00E-03	2.34E-04	1.17E-06
13	H-Area liquid release due to earthquake	2.00E-04	3.41E-03	6.82E-07
14	F-Area airborne release due to hydrogen fire - waste tank	5.00E-03	1.28E-04	6.40E-07
15	H-Area airborne release due to hydrogen explosion - pump tank	2.00E-05	1.13E-02	2.26E-07
16	F-Area airborne release due to hydrogen explosion - pump tank	2.00E-05	7.80E-03	1.56E-07
17	H-Area airborne release due to waste tank overpressurization	1.00E-01	9.80E-07	9.80E-08
18	RHLWE[b] release due to design basis tornado	4.00E-05	6.20E-04	2.50E-08
19	Normal processing with tritium ETF[d] airborne release due to straight wind	1.20E-03	1.47E-05	1.76E-08
20	Normal processing other than tritium ETF[d] airborne release due to straight wind	1.20E-03	1.46E-05	1.75E-08
21	F-Area airborne release due to waste tank overpressurization	1.00E-01	1.70E-07	1.70E-08
22	Normal processing with tritium ETF[d] liquid release due to straight wind	1.20E-03	9.40E-06	1.13E-08
23	F-Area liquid release due to hydrogen explosion - pump tank	2.00E-05	5.47E-04	1.09E-08
24	Normal processing other than tritium ETF[d] liquid release due to straight wind	1.20E-03	7.70E-06	9.24E-09
25	Normal processing with tritium ETF[d] airborne release due to tornado	4.50E-05	2.04E-04	9.18E-09
26	Normal processing other than tritium ETF[d] airborne release due to tornado	4.50E-05	2.03E-04	9.14E-09
27	F-Area liquid release due to earthquake	2.00E-04	3.38E-05	6.76E-09
28	Normal processing with tritium ETF[d] airborne release due to earthquake	2.00E-04	2.77E-05	5.54E-09
29	H-Area liquid release due to hydrogen explosion - pump tank	2.00E-05	2.57E-04	5.14E-09
30	H-Area liquid release due to vehicle crash (scenario A; see #63)	3.50E-05	1.36E-04	4.76E-09
31	H-Area waste release from feed pump riser	1.90E-04	1.87E-05	3.55E-09
32	F-Area waste release from feed pump riser	1.90E-04	1.10E-05	2.09E-09
33	Normal processing with tritium ETF[d] liquid release due to earthquake	2.00E-04	9.40E-06	1.88E-09
34	Normal processing other than tritium ETF[d] liquid release due to earthquake	2.00E-04	7.70E-06	1.54E-09
35	H-Area airborne release due to hydrogen explosion - evaporator	5.00E-06	2.93E-04	1.47E-09
36	H-Area airborne release due to hydrogen explosion - CTS[e] tank	5.00E-06	2.93E-04	1.47E-09
37	H-Area liquid release due to waste tank overpressurization	1.00E-01	9.34E-09	9.34E-10
38	F-Area liquid release due to waste tank overpressurization	1.00E-01	5.52E-09	5.52E-10
39	H-Area liquid release due to tank leak	3.00E-02	1.76E-08	5.28E-10
40	Normal processing other than tritium ETF[d] airborne release due to earthquake	2.00E-04	2.50E-06	5.00E-10
41	Design basis ETF[d] liquid release due to straight wind	9.84E-06	4.70E-05	4.62E-10

Table F-4. (continued).

No.	Accident description	Annual freq.	Dose[a] (rem)	Risk (rem/yr)
42	Normal processing with tritium ETF[d] liquid release due to tornado	4.50E-05	9.40E-06	4.23E-10
43	Normal processing other than tritium ETF[d] liquid release due to tornado	4.50E-05	7.70E-06	3.47E-10
44	H-Area airborne release due to tornado	3.00E-05	9.90E-06	2.97E-10
45	F-Area liquid release due to tank leak	3.00E-02	8.82E-09	2.65E-10
46	F-Area airborne release due to tornado	3.50E-05	6.00E-06	2.10E-10
47	F-Area airborne release due to hydrogen explosion - evaporator	5.00E-06	3.25E-05	1.63E-10
48	F-Area airborne release due to hydrogen explosion - CTS[e] tank	5.00E-06	3.25E-05	1.63E-10
49	F-Area liquid release due to hydrogen explosion - CTS[e] tank	5.00E-06	3.04E-05	1.52E-10
50	H-Area liquid release due to hydrogen explosion - CTS[e] tank	5.00E-06	2.57E-05	1.29E-10
51	F-Area liquid release due to hydrogen explosion - evaporator	5.00E-06	2.37E-05	1.19E-10
52	Design basis ETF[d] airborne release due to straight wind	9.84E-06	1.12E-05	1.10E-10
53	Design basis ETF[d] airborne release due to tornado	3.69E-07	2.83E-04	1.04E-10
54	H-Area liquid release due to a hydrogen explosion - evaporator	5.00E-06	2.00E-05	1.00E-10
55	Normal processing with tritium ETF[d] airborne release due to transfer error	1.80E-02	4.46E-09	8.03E-11
56	Design basis ETF[d] liquid release due to earthquake	1.64E-06	4.70E-05	7.71E-11
57	Normal processing with tritium ETF[d] airborne release due to corrosion damage	8.80E-02	8.75E-10	7.70E-11
58	F-Area liquid release during catherization	7.00E-02	6.76E-10	4.73E-11
59	H-Area liquid release during catherization	7.00E-02	5.70E-10	3.99E-11
60	Normal processing other than tritium ETF[d] airborne release due to transfer error	1.80E-02	1.72E-09	3.10E-11
61	Normal processing other than tritium ETF[d] airborne release due to corrosion damage	8.80E-02	3.38E-10	2.97E-11
62	Design basis ETF[d] airborne release due to leaks	2.13E-02	1.35E-09	2.88E-11
63	H-Area liquid release due to a vehicle crash (scenario B; see #30)	3.50E-05	7.10E-07	2.49E-11
64	Design basis ETF[d] airborne release due to overflow	1.48E-03	1.44E-08	2.13E-11
65	Design basis ETF[d] liquid release due to tornado	3.69E-07	4.70E-05	1.73E-11
66	Design basis ETF[d] airborne release due to earthquake	1.64E-06	8.40E-06	1.38E-11
67	Normal processing with tritium ETF[d] airborne release due to a siphoning incident	2.60E-03	1.12E-09	2.91E-12
68	Design basis ETF[d] airborne release due to spill	1.48E-03	1.88E-09	2.78E-12
69	Normal processing other than tritium ETF[d] airborne release due to siphoning incident	2.60E-03	4.34E-10	1.13E-12
70	Design basis ETF[d] airborne release due to transfer error	1.48E-04	6.86E-09	1.02E-12
71	Design basis ETF[d] airborne release due to corrosion damage	7.22E-04	1.35E-09	9.75E-13
72	Design basis ETF[d] airborne release due to a siphoning incident	2.13E-05	1.73E-09	3.68E-14

a. The dose given is for the offsite maximally exposed individual using 99.5 percentile meteorology.
b Replacement High-Level Waste Evaporator.
c. High efficiency particulate air.
d. Effluent Treatment Facility.
e. Concentrate transfer system.

F.5.1.2 Accident Analysis for the High-Level Waste No-Action Alternative

This section addresses the effects of postulated accidents associated with the no-action alternative
TE considered for high-level waste.

Impacts from Postulated Radiological Accidents

DOE identified the representative bounding accident scenarios for the no-action alternative from the list of potential radiological accidents presented in Table F-4. Figure F-2 identifies the highest-risk accident
TE scenarios in each frequency range. As shown in Figure F-2, for all but the lowest frequency range, the representative bounding accidents are associated with the operation of the Replacement High-Level Waste Evaporator. Table F-5 lists the high-level waste representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public.

Accident Scenario 1 – Replacement High-Level Waste Evaporator release due to a feed line break: A break in the feed line to the Replacement High-Level Waste Evaporator could occur if feed was pumped after the feed line became plugged. The feed line can become plugged due to excess sludge and suspended solids collecting and solidifying in stagnation points within the feed line. If feed pumping continued, the excess pressure would eventually cause a rupture in the feed line or jumper connection. Numerous indicators would alert the operator of a feed line rupture. In the event of a break, the automatic level control system in the evaporator would indicate decreased lift activity as the level of liquid in the evaporator dropped. Because supernatant would now be accumulating in the evaporator cell, the evaporator sump and differential pressure sensors in the ventilation system would also indicate leakage. Finally, the radiation monitor in the stack would register an increase in the radiation level of material leaving the ventilation system.

The Replacement High-Level Waste Evaporator is planned to operate from 1999 to 2018, when DOE expects to have completed high-level waste management activities. Between 1994 and 1999 -- before the Replacement High-Level Waste Evaporator is operational -- the highest-risk accident in the
TC anticipated accident range would be Accident Scenario 2: H-Area airborne release due to waste tank filter fire.

Accident Scenario 3 – Replacement High-Level Waste Evaporator release due to a design basis
TE earthquake: Studies reported in the supporting technical report (WSRC 1994c) indicate that SRS is located in an area where moderate damage could occur from earthquakes. In this accident scenario, an earthquake is assumed to disrupt the operation of the evaporator facility. The feed input and bottoms

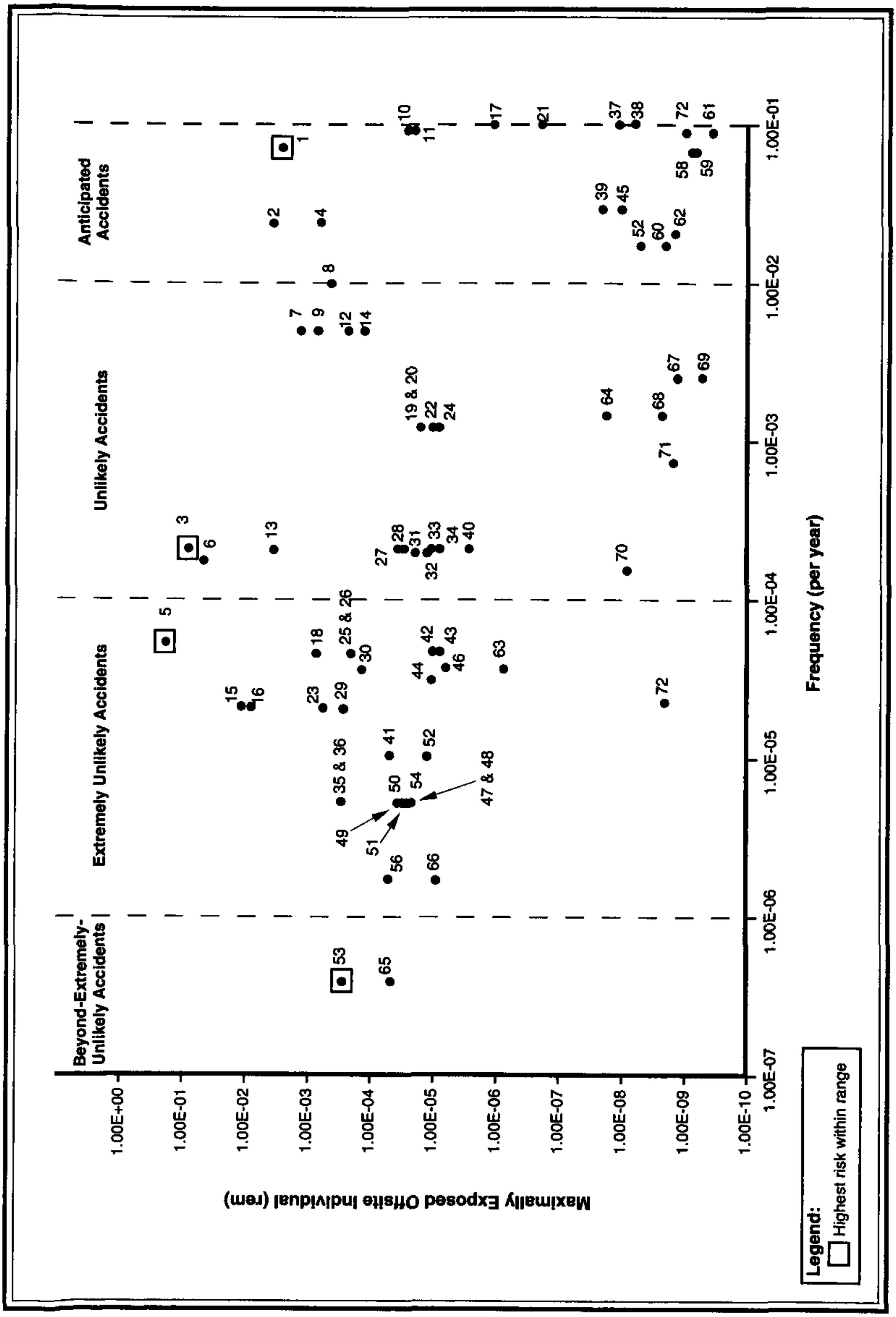

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Figure F-2. Accidents that were analyzed for all alternatives for high-level waste facilities.

Table F-5. Representative bounding radiological accidents under the no-action alternative.

			Accident consequences				Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] Latent fatal cancers			
No.	Accident description	Frequency per year (accident range)	Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	RHLWE[d] release due to a feed line break	7.00E-02[e] (anticipated)	6.41E-01	2.28E-02	3.76E-04	1.81E+01	1.79E-05 (2.56E-04)	6.38E-07 (9.12E-06)	1.32E-08 (1.88E-07)	6.34E-04 (9.05E-03)
3	RHLWE[d] release due to a design basis earthquake	2.00E-04 (unlikely)	1.92E+01	6.83E-01	1.12E-02	5.43E+02	1.54E-06 (7.68E-03)	5.46E-08 (2.73E-04)	1.12E-09 (5.60E-06)	5.43E-05 (2.72E-01)
5	RHLWE[d] release due to evaporator pressurization and breach	5.09E-05 (extremely unlikely)	4.79E+01	1.70E+00	2.80E-02	1.35E+03	1.95E-06 (3.83E-02)	3.46E-08 (6.80E-04)	7.13E-10 (1.40E-05)	3.44E-05 (6.75E-01)
53	Design basis ETF[e] airborne release due to tornado	3.69E-07 (beyond-extremely-unlikely)	2.17E-03	6.91E-05	3.90E-05	3.44E-04	3.20E-13 (8.68E-07)	1.02E-14 (2.76E-08)	7.20E-15 (1.95E-08)	6.35E-14 (1.72E-07)

TE

a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Replacement High-Level Waste Evaporator.
TE e. Effluent Treatment Facility.

output are assumed not to be affected during the earthquake, and the steam supply is assumed to continue to flow at the normal rate; therefore, the evaporator contents continue to be boiled off as normal. However, the demister is assumed to be damaged and its performance is degraded. The accident results in a release to the environment through a broken process line between the evaporator vessel demister and condenser. The highest-risk accident in this frequency range between 1994 and 1999 would be Accident Scenario 7: H-Area airborne release due to waste tank organic fire. TE TC

Accident Scenario 5 – Replacement High-Level Waste Evaporator release due to evaporator pressurization and breach: An evaporator breach would be possible if the internal pressure in the evaporator exceeded the design pressure, which could be caused by demister mesh pad blockage; excessive levels of condensate and vent line blockage; or steam bundle failures. A breach of the evaporator would result in an energetic release of the vessel contents into the evaporator cell and a subsequent unfiltered airborne release of waste into the atmosphere when the high efficiency particulate air filters become overloaded. The associated pressure increase would be detected by independent bubble tube pressure sensors within the evaporator vessel. These sensors are tied to interlocks that would provide for mitigation of the event. These devices must fail for an overpressurization to occur. From 1994 to 1999 -- before the Replacement High-Level Waste Evaporator is operational -- the highest-risk accident in this frequency range would be Accident Scenario 15: H-Area airborne release due to pump tank hydrogen explosion.

Accident Scenario 53 – Design basis F/H-Area Effluent Treatment Facility airborne release due to a tornado: Damage to equipment that would result in a release of radioactivity could occur during a sustained wind or tornado. The F/H-Area Effluent Treatment Facility is designed for a sustained wind speed of 137 kilometers (85 miles) per hour. Outside tanks and piping would be subjected to the full force of the wind and could be struck by windblown objects, either of which could result in a release of radioactivity. Equipment and piping located inside a process building could be damaged by roof debris and falling portions of the upper structure. Some of the liquid released would evaporate and become airborne and some would drain to surface water streams. No credit is taken for tank dikes, high efficiency particulate air filtration, or for a release from an elevated stack.

F.5.1.3 Accident Analysis for the High-Level Waste for Minimum, Expected, and Maximum Waste Forecasts

This section addresses the impacts of postulated accidents associated with alternatives A, B, and C considered for high-level waste. The facilities that support alternative A, alternative B, and alternative C and their periods of operation are identical to the facilities and periods of operation that support the TE

TE no-action alternative. Thus, postulated radiological accident scenarios and their impacts are the same as described in Section F.5.1.2.

DOE assumes that conclusions for representative bounding accident scenarios for high-level waste management under the alternatives would not be changed by the minimum, maximum, and expected waste forecasts. Since the accident analysis for each accident scenario is based on a conservative assumption of peak utilization of the facility, differences between minimum, maximum, and expected waste forecast would only affect how long the facility would operate. Therefore, while consequence or frequency for postulated accidents are not changed, the expected duration of risk from a facility-specific accident scenario could be longer or shorter, as appropriate. Impacts for these cases are addressed in the representative bounding accident descriptions.

F.5.1.4 Impacts to Involved Workers from Accidents Involving High-Level Waste

The highest risk accident scenarios for high-level waste involve releases from the Replacement High-Level Waste Evaporator, tank farm tanks, or the F/H-Area Effluent Treatment Facility. These releases would be due to feed line breaks, overpressurizations and breaches, explosions, or natural disasters. Of these accident scenarios and their postulated releases, the ones associated with the Replacement High-Level Waste Evaporator are assumed to have the greatest potential for adverse effects on involved workers. This assumption is based on the higher consequences for the Replacement High-Level Waste Evaporator accident scenarios than those for the tank farm or F/H-Area Effluent Treatment Facility. While some exposure to involved workers could occur due to an accidental release, timely evacuation as the result of monitoring activities would prevent substantial radiological exposure. DOE assumes no fatalities would be likely from radiological consequences.

F.5.1.5 Impacts from High-Level Waste Chemical Accidents

The results of the chemical hazards assessment completed for chemicals stored or processed in facilities
TE located in the area of the F/H-Area tank farms as addressed in the *Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility* are presented in Table F-6. The calculated 100-meter (328-foot), 640-meter (2,100-foot), and offsite chemical concentrations are compared to the appropriate ERPG-1, -2, and -3 guideline concentrations. A nitric acid release from Building 241-61H is the only accident with calculated concentrations that exceed the ERPG-3 limit at 100 and 640 meters (328 and 2,100 feet).

Table F-6. Chemical hazards analysis results for the F/H-Area tank farm facilities.

Chemical	Release location	Quantity (kg)[a]	100-meter (328-foot) concentration (mg/m^3)[b]	640-meter (2,100-foot) concentration (mg/m^3)[b]	Offsite concentration (mg/m^3)[b]	ERPG-1[c] (mg/m^3)[b]	ERPG-2 (mg/m^3)[b]	ERPG-3 (mg/m^3)[b]
Nitric acid	Bldg. 241-61H	42,620.90	8.30E+02	1.00E+02	2.00E+00	5.20E+00	3.9E+01	7.70E+01
Phosphorous pentoxide	Bldg. 241-84H	0.45	7.50E-02	2.90E-02	3.10E-04	5.00E+00	2.50E+01	1.00E+02
Ammonia	Bldg. 242-24H	13.6	4.50E-03	1.80E-03	2.40E-05	1.70E+01	1.40E+02	7.00E+02
Hydrochloric acid	Bldg. 280-1H	22.7	7.60E-03	3.00E-03	3.90E-05	4.50E+00	3.00E+01	1.50E+02
Sulfuric acid	Bldg. 280-1F	3,828.80	3.70E-06	2.20E-07	3.20E-09	2.00E+00	1.00E+01	3.00E+01

a. Kilograms. To convert to pounds multiply by 2.2046.

b. Milligrams per cubic meters of air.

c. Emergency Response Planning Guideline. See Table F-3.

TE Because the concentrations calculated for the SRS boundary for every chemical do not exceed the respective ERPG-1 concentrations (even assuming a total unmitigated release of all chemicals), specific accident scenarios (i.e., an accident initiator and resulting accident progression resulting in a release to the environment) were not developed, nor were corresponding frequencies of occurrence identified. More realistic accident scenarios and associated frequencies were not necessary because the bounding consequences for the unmitigated release of the entire inventory, however improbable, were within established guidelines.

The nitric acid concentrations that exceed the ERPG-3 limit could pose a risk of major reversible tissue damage. Because the chemical concentration in air decreases with distance from the release location, offsite individuals would be exposed to chemical concentrations less than the ERPG-1 limit. However, onsite personnel in the immediate area of a release could encounter concentrations that exceed the ERGP-3 limit. While perhaps not instantly lethal, even short exposures could be extremely dangerous.

The F/H-Area Effluent Treatment Facility is classified as a low-hazard facility based on the chemical hazards assessment contained in the *Effluent Treatment Facility Hazards Assessment Document* (WSRC 1993). Table F-7 lists the results of this chemical assessment. The calculated 100-meter (328-foot), 640-meter (2,100-foot), and offsite chemical concentrations are compared to the appropriate ERPG-1, -2, and -3 guideline concentrations. A nitrogen dioxide release from the storage area and a nitric acid release from process chemical storage tanks are the only postulated accidents with calculated concentrations that exceed the ERPG-3 limit at 100-meters (328-feet). However, no accidents resulted in air concentrations at 640-meters (2,100-feet) or the SRS boundary that exceeded ERPG-3 guidelines. Additionally, the nitrogen dioxide release scenario had a calculated concentration at the SRS boundary that exceeded the ERPG-1 guideline but remained under the ERPG-2 guideline.

No chemical hazards analysis or accident consequence analysis exist for the chemicals at the Replacement High-Level Waste Evaporator. However, it is assumed that the chemical hazards posed by this facility would be bounded by those posed by existing evaporators in the F/H-Area tank farms.

F.5.2 LOW-LEVEL WASTE

This section evaluates the impacts of postulated accidents associated with the alternatives considered in this EIS for the management of low-level waste.

Table F-7. F/H-Area Effluent Treatment Facility chemical hazards analysis results.

Segment description	Chemical	Quantity (kg)[a]	Onsite concentration 100 meters (328 feet) (mg/m^3)[b]	Onsite concentration 640 meters (2,100 feet) (mg/m^3)[b]	Offsite concentration (mg/m^3)[b]	ERPG-1[c] (mg/m^3)[b]	ERPG-2[c] (mg/m$_3$)[b]	ERPG-3[c] (mg/m^3)[b]
Waste water collection tanks	Lead	4.41E-01	1.07E-02	4.24E-04	2.15E-05	1.50E-01	2.50E-01	7.00E+02
Waste water collection tanks	Ammonia	5.51E+01	1.34E+00	5.31E-02	2.68E-03	1.74E+01	1.39E+02	6.95E+02
Treatment building chemicals	Ammonia	5.85E+01	1.42E+00	5.36E-02	2.85E-03	1.74E+01	1.39E+02	6.95E+02
Treatment building chemicals	Lead	3.39E-01	8.24E-03	3.27E-04	1.65E-05	1.50E-01	2.50E-01	7.00E+02
Treatment building chemicals	Mercury	5.79E+00	1.41E-01	5.59E-03	2.82E-04	1.50E-01	2.00E-01	2.80E+01
Outside tanks and HEPA[d] filters	Mercury	3.09E+00	7.53E-01	2.99E-02	1.50E-03	1.50E-01	2.00E-01	2.80E+01
Storage area	Nitrogen dioxide	3.30E+01	7.96E+01	3.16E+00	1.59E-01	8.00E-02	1.88E+00	5.64E+01
Storage area	Sodium hydroxide	3.02E+02	7.34E-02	2.91E-03	1.47E-04	2.00E+00	4.00E+01	1.00E+02
Storage area	Nitric acid	2.12E+02	5.17E+00	2.05E-01	1.03E-02	5.15E+00	3.87E+01	7.73E+01
Storage area	Oxalic acid	1.13E+04	2.76E+02	1.09E+01	5.52E-01	2.00E+00	5.00E+00	5.00E+02
Process chemical storage tanks	Sodium hydroxide	2.81E+03	6.83E-01	2.71E-02	1.37E-03	2.00E+00	4.00E+01	1.00E+02
Process chemical storage tanks	Nitric acid	7.41E+03	1.81E+02	7.18E-00	3.61E-01	5.15E+00	3.87E+01	7.73E+01
Acid and caustic tanks	Nitric acid	(e)	5.87E+00	2.33E-01	1.17E-02	5.15E+00	3.87E+01	7.73E+01
Acid and caustic tanks	Sodium hydroxide	4.01E+00	9.90E+00	3.93E-01	1.98E-02	2.00E+00	4.00E+01	1.00E+02

a. Kilograms. To convert to pounds multiply by 2.2046.
b. Milligrams per cubic meters of air.
c. Emergency Response Planning Guideline. See Table F-3.
d. High efficiency particulate air.
e. Quantity not available but is assumed to be bounded by the quantity for nitric acid in the Process Chemical Storage Tanks based upon comparison of airborne concentrations at 100 meters (328 feet).

F.5.2.1 Facilities and Accidents: Low-Level Waste

The accident analyses considered all facilities and processes involved in the management of low-level waste. The facilities were identified from the low-level waste information provided in Chapter 2 of this EIS. Table F-8 lists the facilities associated with each of the alternatives. Descriptions of these facilities are provided in Appendix B. For each facility, a list of postulated accident scenarios was developed to support the low-level waste accident analysis for each alternative.

Table F-8. Low-level waste facilities identified by alternative.

	List of facilities	No action	Alternative A (limited treatment configuration)	Alternative C (extensive treatment configuration)	Alternative B (moderate treatment configuration)
TE	E-Area vaults[a]	X	X	X	X
	Reactor compactor	X	X	X[b]	X[b]
TE	253-H compactor	X	X	X[b]	X[b]
	M-Area compactor	X	X	X[b]	X[b]
TC	Soil sort facility[c]				X
	Non-alpha vitrification facility[c]			X	
	Consolidated Incineration Facility			X	X
	Offsite smelter			X	X
	Shallow land disposal[d]	X	X	X	X

a. E-Area vaults includes low-activity waste vaults, intermediate-level tritium vaults, intermediate-level nontritium vaults; long-lived waste storage buildings.
b. These facilities are assumed to remain in operation until proposed facilities come on line.
c. Proposed facility.
d. Shallow land disposal includes the engineered low-level trenches, greater confinement disposal (boreholes and engineered trenches), and naval reactor hardware storage.

Table F-9 lists potential accidents associated with the management of low-level waste. This list was
TE extracted from the technical reports supporting this EIS (WSRC 1994b, c, d, and e). All the accidents listed in Table F-9 are supported by quantitative analyses. It should be noted that because accident impacts for proposed facilities are mainly qualitative, they are not listed in the table.

Table F-9. List of potential accidents associated with the management of low-level waste.

No.	Accident description	Annual frequency	Dose[a] (rem)	Risk (rem/yr)
1	Container breach at the EAV/ILNTV[b]	2.00E-02	2.60E-01	5.20E-03
2	Fire at the EAV/LLWSB[c]	8.30E-02	4.70E-02	3.90E-03
3	Fire at the EAV/LAWV[d]	8.30E-02	2.10E-02	1.74E-03
4	Fire at the EAV/ILTV[e]	8.30E-02	1.90E-02	1.58E-03
5	Container breach at the EAV/LAWV[d]	2.00E-02	4.00E-02	8.00E-04
6	Container breach at the EAV/ILTV[e] (scenario A; see #8)	2.00E-02	3.60E-02	7.20E-04
7	Fire at the EAV/ILNTV[b]	8.30E-02	8.60E-03	7.14E-04
8	Container breach at the EAV/ILTV[e] (scenario B; see #6)	2.00E-02	3.10E-02	6.20E-04
9	Container breach at the EAV/LLWSB[c]	2.00E-02	3.10E-02	6.20E-04
10	Explosion at CIF[g] - tank farm sump and diked area	1.90E-07	6.85E-03	1.30E-04
11	Fire at the ELLT[f]	8.30E-02	5.35E-05	4.44E-06
12	Large fire at CIF[g]	2.34E-04	1.07E-02	2.50E-06
13	High wind at the EAV/ILNTV[b]	1.00E-03	3.04E-04	3.04E-07 TC
14	Earthquake at CIF[g]	1.00E-03	2.65E-04	2.65E-07
15	Tornado at the EAV/ILNTV[b]	2.00E-05	1.18E-02	2.36E-07
16	Explosion at CIF[g] - Rotary Kiln	1.50E-04	1.57E-03	2.36E-07
17	High velocity straight winds at CIF[g]	2.00E-02	5.23E-06	1.05E-07
18	Tornado at the EAV/LAWV[d]	2.00E-05	4.90E-03	9.80E-08
19	Tornado at the EAV/ILTV[e]	2.00E-05	4.40E-03	8.80E-08
20	Unintentional exhumation of ELLT[f]	8.30E-02	3.90E-07	3.24E-08
21	Explosion at CIF[g] - backhoe housing	4.00E-04	5.64E-05	2.26E-08
22	High wind at the EAV/ILTV[e]	1.00E-03	2.00E-05	2.00E-08
23	High wind at the EAV/LAWV[d]	1.00E-03	1.50E-05	1.50E-08
24	Explosion at CIF[g] - tank farm tank	3.40E-07	5.36E-03	1.82E-09

a. The dose given is for the offsite maximally exposed individual (MEI) using 99.5 percentile meteorology.
b. E-Area Vaults/Intermediate-Level Nontritium Vault.
c. E-Area Vaults/Long-Lived Waste Storage Buildings.
d. E-Area Vaults/Low-Activity Waste Vault.
e. E-Area Vaults/Intermediate-Level Tritium Vault.
f. Engineered low-level trenches.
g. Consolidated Incineration Facility.

F.5.2.2 Accident Analysis for the Low-Level Waste No-Action Alternative

This section addresses the effects of postulated accidents associated with the no-action alternative for low-level waste. The postulated accidents provide a baseline for comparison of the effects of the
TE postulated accidents associated with the other alternatives.

Impacts from Postulated Radiological Accidents

From the list of potential radiological accidents presented in Table F-9, the representative bounding accident scenarios were identified for the no-action alternative through the binning process described in Section F.4.1. Figure F-3 identifies the highest-risk accident scenarios for the four frequency ranges. As shown in Figure F-3, most of the accidents were in the anticipated frequency range. This distribution of accidents is due to the levels of radioactivity associated with low-level waste. At the lower accident frequency ranges, the risks become quite small compared with those in the anticipated accident frequency range. Consequently, for the no-action alternative, it was not necessary to analyze an accident scenario beyond the extremely unlikely accident frequency range. Table F-10 lists the low-level waste representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public.

The low-level waste representative bounding accidents and their impacts, as identified in Table F-10, are described below:

TE Accident Scenario 1 – Container breach at the intermediate-level nontritium vault (two containers, noncombustible waste): The intermediate-level nontritium vault would contain both combustible waste (paper, plastics, cloth, etc.) and noncombustible waste (scrap hardware) contaminated with mixed fission products. Accidents involving this scrap could result in the airborne release of this contamination. The major contributor to the dose would be the waste material, which becomes airborne as a result of the accident. In order to estimate the consequences of this accident, the following conservative assumptions were made:

- Two waste containers were breached. This assumption is based on the hypothetical situation in
TE which one waste container was being placed (by crane) into the intermediate-level nontritium vault cell and was inadvertently dropped (through either human error or crane malfunction) on a
TE second waste container already within the intermediate-level nontritium vault cell, resulting in a breach of both containers.

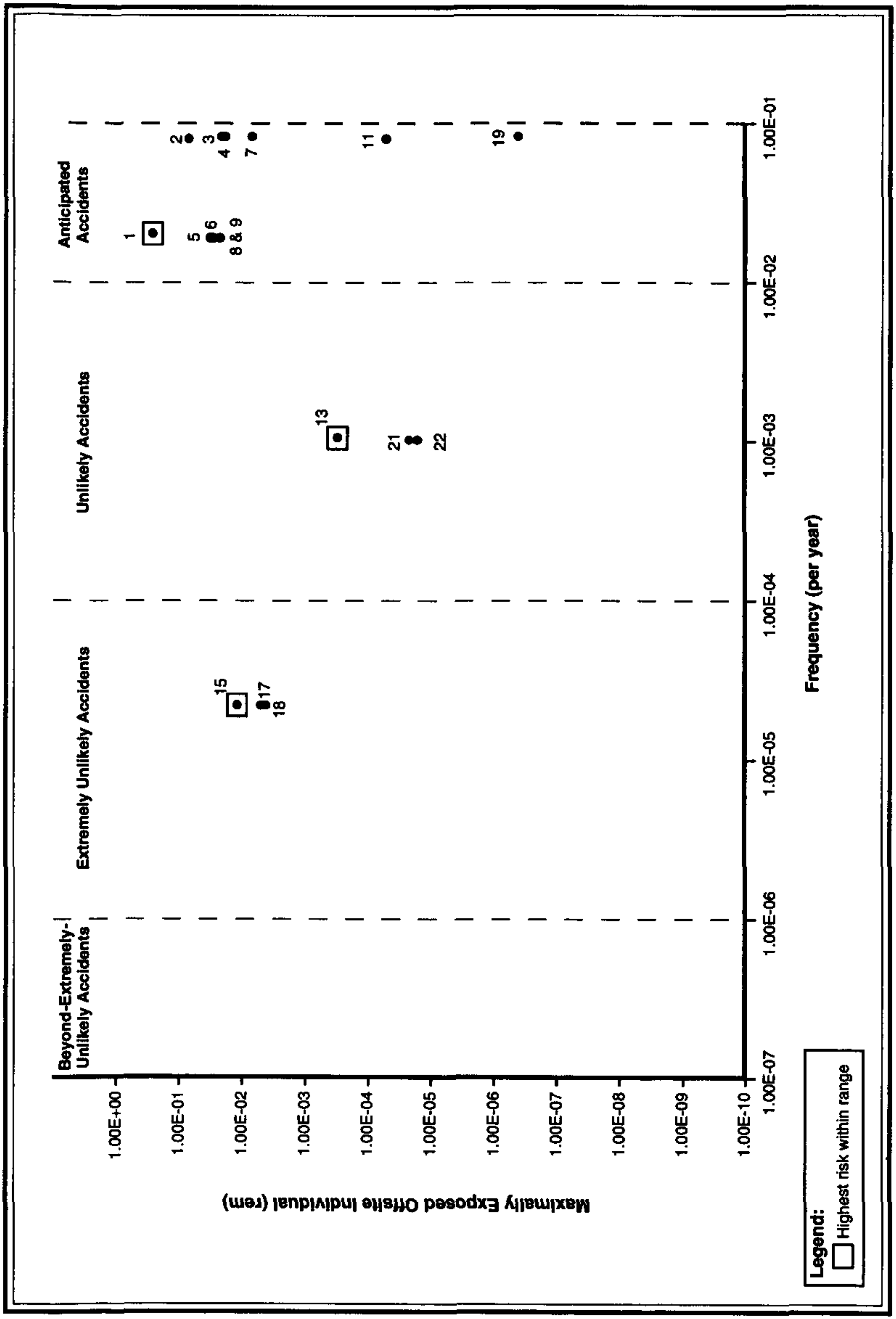

Figure F-3. Accidents that were analyzed for the no-action alternative and alternative A for low-level waste facilities.

Table F-10. Representative bounding radiological accidents for low-level waste under the no-action alternative.

							Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b]			
			Accident consequences				Latent fatal cancers			
No.	Accident description	Frequency per year (accident range)	Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	Container breach at the ILNTV[d]	2.00E-02 (anticipated)	6.47E+01	2.30E+00	3.31E-02	1.68E+03	1.04E-03 (5.18E-02)	1.84E-05 (9.20E-04)	3.31E-07 (1.66E-05)	1.68E-02 (8.40E-01)
13	High wind at the ILNTV[d]	1.00E-03 (unlikely)	1.01E-03	6.08E-04	3.04E-04	2.11E+01	4.04E-10 (4.04E-07)	2.43E-10 (2.43E-07)	1.52E-10 (1.52E-07)	1.06E-05 (1.06E-02)
15	Tornado at the ILNTV[d]	2.00E-05 (extremely unlikely)	4.07E-04	7.73E-02	1.18E-02	1.18E+01	3.26E-12 (1.63E-07)	6.18E-10 (3.09E-05)	1.18E-10 (5.90E-06)	1.18E-07 (5.90E-03)

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a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
TE | d. Intermediate-Level Non-Tritium Vault.

- Analysis has shown that the radionuclide release due to rupture of a waste container in the intermediate-level nontritium vault that contains a noncombustible waste form would conservatively bound the release of an intermediate-level nontritium vault container that contains a combustible waste form. Therefore, it is conservatively assumed for this analysis that the two damaged waste containers have noncombustible waste as their contents.

- Radiological container inventory for the intermediate-level nontritium vault is based on 120 percent of the maximum estimated value.

Accident Scenario 13 – High wind at the intermediate-level nontritium vault (one container): In a moderate hazard facility, DOE (LLNL 1990) specifies a maximum wind speed of 175 kilometers (109 miles) per hour and a wind-driven missile in the form of a two-by-four plank weighing 6.8 kilograms (15 pounds) and traveling with a horizontal speed of 80 kilometers (50 miles) per hour at a maximum height of 9 meters (30 feet). The accident analyzed for this high-wind event is the breach of one container as the result of a wind-driven missile entering the open top of the intermediate-level nontritium vault and striking a waste container. It is assumed that 0.1 percent of the waste material becomes airborne. Analysis has shown that the radionuclide release would be the same as that for the container breach accident described above. Therefore, it is conservatively assumed that the high-wind-driven missile strikes containers that contain noncombustible waste.

Accident Scenario 15 – Tornado (220 kilometers per hour) at the intermediate-level nontritium vault (two containers): The accident analyzed for the 220-kilometer (137-mile) per hour tornado is the breach of two containers as the result of two tornado-driven missiles entering the open top of the intermediate-level nontritium vault and each striking one waste container, for a total of two failed containers. Analysis has shown that the radionuclide release would be the same as that for the container breach accident described above. Therefore, it is conservatively assumed that the tornado-driven missiles strike containers that contain noncombustible waste.

F.5.2.3 Accident Analysis for the Low-Level Waste Under Alternative B

This section addresses the impacts of postulated accidents for low-level waste associated with alternative B.

F.5.2.3.1 Impacts from Postulated Radiological Accidents

This section presents the potential effects of postulated radiological accidents at facilities identified in Table F-8 for the low-level waste management described in alternative B. Figure F-4 shows the highest-risk accident scenarios for the four frequency ranges. As shown in Figure F-4, most of the accidents analyzed were in the anticipated accident frequency range. The distribution of accidents analyzed is indicative of the levels of radioactivity associated with low-level waste. At the lower accident frequency ranges, the risks become quite small compared to those in the anticipated accident frequency range. Accidents associated with the Consolidated Incineration Facility occur in the less frequent accident ranges. Table F-11 lists the representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public. DOE assumes that conclusions regarding representative bounding accident scenarios could change as a result of the minimum, maximum, or expected waste forecasts. The accident analysis for each accident scenario is based on a conservative assumption of peak utilization of facilities. That is, the minimum, maximum, and expected waste forecasts would only affect how long the facilities would operate. Therefore, while the consequence or frequency of postulated accidents do not change, the expected duration of risk from a facility-specific accident scenario could be longer or shorter, depending on the case. The number of new facilities needed to meet the low-level waste management requirements could be affected by the minimum, maximum, and expected waste forecasts. Thus, the consequence or frequency of specific accident scenarios could be increased or decreased, depending on the case. Impacts for these cases will be addressed in the representative bounding accident descriptions.

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TE Accident Scenario 1 – Container breach at the intermediate-level nontritium vault (two containers, noncombustible waste): This accident scenario is detailed in Section F.5.1.2. This accident scenario is considered the representative bounding accident for the anticipated accident range. Under the expected waste forecast, four additional intermediate-level waste vaults are expected to be required. For the minimum waste forecast with two additional intermediate-level waste vaults, it could be assumed that the frequency of this accident would be less than for the expected waste forecast. For the maximum waste forecast with nine additional intermediate-level waste vaults, it could be assumed that the frequency would be greater than for the expected waste forecast (i.e., more containers are at risk of a breach). TE

Accident Scenario 12 – Large fire at the Consolidated Incineration Facility: Most fires at the Consolidated Incineration Facility would be caused by welding, electrical shorts, friction, materials in contact with hot process equipment, and smoking. Other causes would include lightning and explosions. The consequences of such fires would be monetary losses, injuries and death to personnel, and

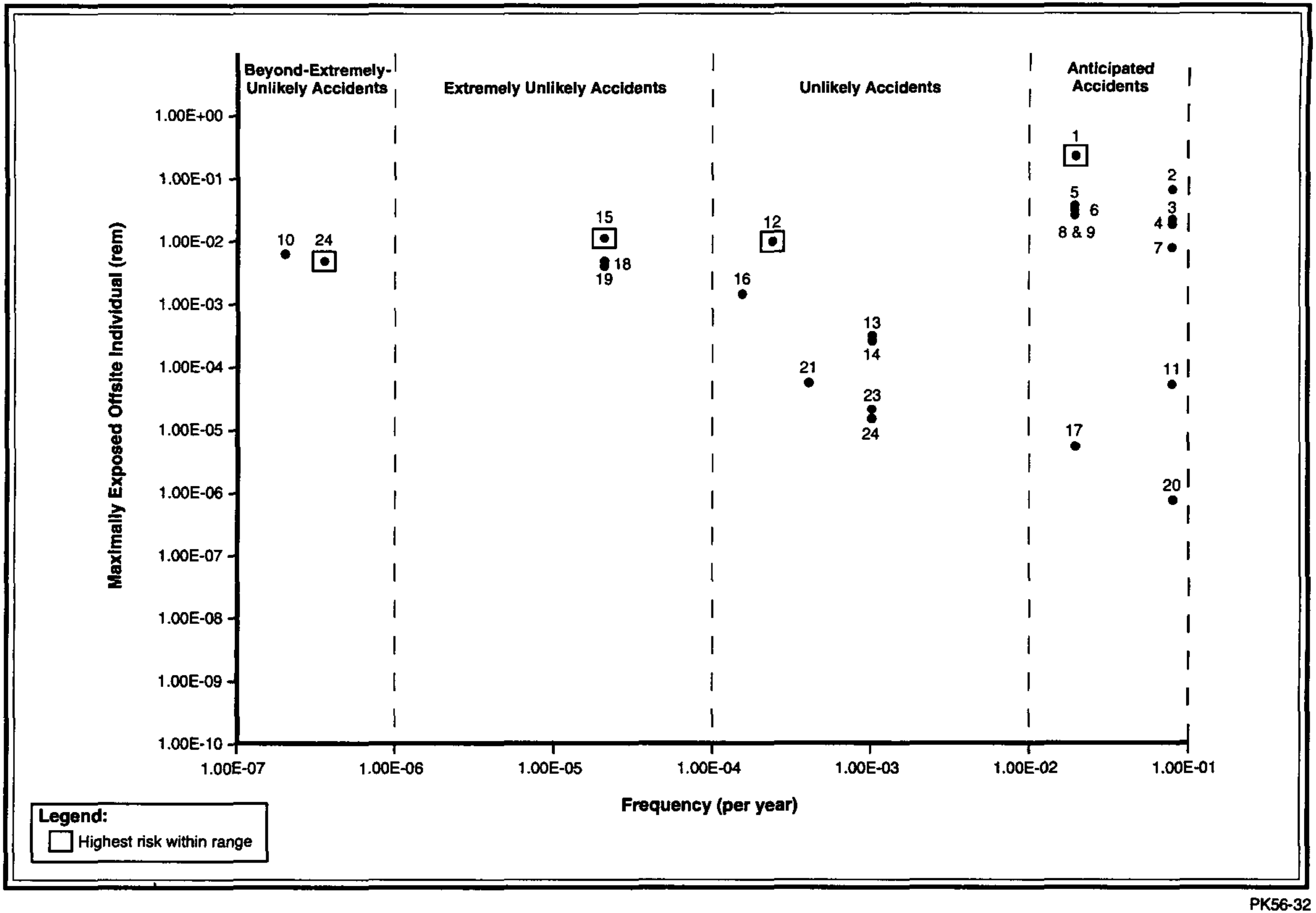

Figure F-4. Accidents that were analyzed for alternative B for low-level waste facilities.

Table F-11. Representative bounding radiological accidents for low-level waste under alternative B.

				Accident consequences				Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] Latent fatal cancers			
	No.	*Accident description*	Frequency per year (accident range)	Uninvolved worker at 100 meters *(rem)*	Uninvolved worker at 640 meters *(rem)*	Offsite maximally exposed individual *(rem)*	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
TC	1	Container breach at the ILNTV[d]	2.00E-02 (anticipated)	6.47E+01	2.30E+00	3.31E-02	1.68E+03	1.04E-03 (5.18E-02)	1.84E-05 (9.20E-04)	3.31E-07 (1.66E-05)	1.68E-02 (8.40E-01)
TE	12	Large fire at CIF[e]	2.34E-04 (unlikely)	2.55E+00	8.15E-02	1.40E-03	9.58E+01	2.39E-07 (1.02E-03)	7.63E-09 (3.26E-05)	1.64E-10 (7.00E-07)	1.12E-05 (4.79E-02)
TE	15	Tornado at the ILNTV[d]	2.00E-05 (extremely unlikely)	4.07E-04	7.73E-02	1.18E-02	1.18E+01	3.26E-12 (1.63E-07)	6.18E-10 (3.09E-05)	1.18E-10 (5.90E-06)	1.18E-07 (5.90E-03)
	24	Explosion at CIF[e] - tank farm	3.40E-07 (beyond-extremely-unlikely)	1.28E+00	4.07E-02	7.01E-04	4.79E+01	1.74E-10 (5.12E-04)	5.54E-12 (1.63E-05)	1.19E-13 (3.51E-07)	8.14E-09 (2.40E-02)

a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. *Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.*
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Intermediate-Level Non-Tritium Vault.
TE e. Consolidated Incineration Facility.

radiological doses. This accident scenario is considered the representative bounding accident for the unlikely accident range.

For alternative B – minimum, maximum, and expected waste forecasts, the Consolidated Incineration Facility would operate from 1996 to 2024 and the highest-risk accident in this frequency range would be Accident Scenario 13: High wind at the intermediate-level nontritium vault.

Accident Scenario 15 – Tornado [220 kilometers (137 miles) per hour] at the intermediate-level nontritium vault: This accident scenario is detailed in Section F.5.2.2 and is considered the representative bounding accident for the extremely unlikely accident range. TE

Accident Scenario 24 – Explosion of tanks associated with the Consolidated Incineration Facility: Tanks located in the vicinity of the Consolidated Incineration Facility include two liquid waste blend tanks. These 16-cubic-meter (4,200-gallon) tanks receive wastes from various sources and blend them to a proper viscosity and heating value prior to feeding into the rotary kiln. Each tank is fitted with an agitator that continually mixes the waste and a heater that maintains the temperature. Fuel in the form of liquid waste is always present in the tanks. Potential ignition sources include a malfunction of the agitator or heater. Such a malfunction would have to include disintegration of an agitator impeller or an electrical short in the heater that overrode thermostatic control. A transfer error could also be an ignition source if highly incompatible materials were introduced into a tank. Lightning could be an ignition source if the tank was not properly grounded. Simultaneously, a nitrogen blanketing system would have to fail and oxygen would have to be introduced into the tank head space for an explosion to occur. Failure of the nitrogen blanketing system initiates visual and audible alarms and stops all tank-feed and transfer operations. Once the blanketing system failed, there would be a period of time before enough oxygen could diffuse into the tank head space to cause an explosion. This accident scenario is considered the representative bounding accident for the beyond-extremely-unlikely accident range.

For alternative B – minimum, maximum, and expected waste forecasts, the Consolidated Incineration Facility is expected to operate from 1996 to 2024. Technical reports identified no accidents from 1994 to 1996.

F.5.2.3.2 Impacts from New or Proposed Facilities

TC Table F-8 identifies two proposed facilities under alternative B for which no quantitative accident analyses exist. These facilities are listed and briefly described below. Because these facilities are TE proposed and their designs are not necessarily complete, quantitative analyses at this time would provide non-meaningful risk information (because the designs could be changed) that could be compared to the risk information available for existing facilities. However, DOE will perform quantitative analyses TE throughout the design, construction, and operation phases of the soil sort facility in accordance with requirements, and DOE will ensure that the risks associated with operating these facilities are within established regulatory guidelines.

TC

Soil sort facility – The soil sort facility would sort and segregate clean and contaminated soils. This facility would provide standard sand-and-gravel-handling equipment with instrumentation for monitoring radiation. Radiation detectors would divert contaminated material traveling along a conveyer system in a different direction from the clean soil. By locating small particles of radioactive material dispersed throughout the soil, contaminants could be isolated and removed. It is assumed that the accidents at the soil sort facility would be bounded by the accidents selected for alternative B.

Offsite smelter – DOE is currently studying the use of an offsite smelter to determine the economic feasibility of recycling low-level contaminated stainless-steel scrap obtained during the decommissioning of retired SRS facilities. The intended end products of the stainless-steel recycling process are containers [2.83-cubic meter (100-cubic foot) boxes and 55-gallon drums] for the disposal or storage of radioactive waste originating within the DOE complex. Since no decisions on siting, configuration of equipment, or even whether the project would be completed have been made at this time, DOE assumes that accidents involving an offsite smelter would be bounded by the accidents selected for alternative B.

TC Offsite low-level waste volume reduction – DOE plans to use an offsite vendor to supercompact, repackage, or incinerate low-level waste. None of the potential accidents involving low-level waste identified in Table F-9 occurred at the compactor facilities. Accidents identified for low-level waste at the Consolidated Incineration Facility were not representative bounding accidents. Therefore, DOE assumes that accidents involving an offsite volume-reduction facility would be bounded by the accidents selected for alternative B.

F.5.2.4 Accident Analysis for Low-Level Waste Under Alternative A

Alternative A emphasizes a limited treatment configuration. Its accident analysis is the same as that for the no-action alternative. The facilities under alternative A are identical to the facilities identified to support the no-action alternative. The impacts from the postulated radiological accident scenarios are the same as described in Section F.5.2.2 (Figure F-3).

F.5.2.5 Accident Analysis for Low-Level Waste Under Alternative C

Alternative C emphasizes an extensive treatment configuration. The facilities listed in Table F-8 for alternative C are similar to those that support alternative B for low-level waste, except that alternative C includes a proposed non-alpha vitrification facility. Since this facility does not present a representative bounding accident, the effects from the postulated radiological accident scenarios for alternative C are identical to those for alternative B, as described in Section F.5.2.3 (Figure F-4). A qualitative evaluation of the impacts associated with the non-alpha vitrification facility is as follows: TC

Non-alpha vitrification facility – The non-alpha vitrification facility would prepare waste for vitrification, vitrify it, and treat the secondary waste gases and liquids generated by the vitrification process. The waste would fall in the following treatability groups: soils, job-control waste, and equipment. The facility would consist of a thermal pretreatment unit, a melter, and an offgas treatment unit. The afterburner would enhance destruction of any remaining hazardous organic compounds prior to treatment in the offgas system. It can be assumed that the accident initiators for the non-alpha vitrification facility would be similar to those for the Defense Waste Processing Facility vitrification facility. However, the releases would be minor in comparison. It is also assumed that the offgas treatment unit accidents would be similar to those for the F/H-Area Effluent Treatment Facility.

F.5.2.6 Impacts to Involved Workers from Accidents Involving Low-Level Waste

The representative bounding accident scenarios for low-level waste involve the intermediate level nontritium waste vaults, the long-lived waste storage buildings, and the Consolidated Incineration Facility. For the intermediate level nontritium vaults, scenarios involve a container rupture, a tornado, and a high wind accident scenario. For the container-rupture scenario, dose contribution from direct radiation exposure is not considered major because operations are carried out remotely. The following features are provided to control exposure and limit injuries to workers due to container rupture:

- The crane operator is shielded from waste containers.
- The crane operator has dosimetry with an audible alarm that sounds when a preset dose is reached.
- The waste container lifting-fixtures are remotely controlled from the crane control cab.
- Cell covers are installed over partially filled cells to provide radiation shielding.
- The cell cover lifting-fixture is remotely controlled from the crane control cab and the shielding plugs are remotely engaged and disengaged.

Because high winds and tornadoes can usually be predicted and proper precautions taken before major damage occurs, radiological and/or chemical effects to the facility workers due to high winds or tornadoes are considered to be minor. Procedures exist to discontinue operation and place waste containers in safe temporary storage areas in cases of inclement weather.

For the long-lived waste storage buildings accident scenario, a fire involving a dropped deionizer vessel was identified as the representative bounding accident. Although workers would only be expected to be in the immediate vicinity of the long-lived waste storage buildings during waste handling operations, they would be exposed to occupational and industrial types of injuries associated with a fire and could possibly receive a dose due to exposure to radioactive materials.

The accident scenarios for the Consolidated Incineration Facility involve a fire or explosion. The consequences to facility workers from either a fire or explosion in the immediate area include occupational and industrial types of injuries (possibly including death) as well as doses resulting from contact with radioactive materials.

While some exposure to involved workers could occur due to an accidental release of radioactive materials in all scenarios, DOE assumes no fatalities to workers would be likely from radiological consequences.

F.5.2.7 Impacts from Low-Level Waste Chemical Accidents

No chemical hazards assessment was performed for the low-level radioactive waste facilities. The chemical inventories for each facility that has hazard assessment documentation were compared to the reportable quantities as listed in 40 CFR Part 302.4. None of the facilities has sufficient quantities of hazardous chemicals to warrant a complete chemical analysis.

F.5.3 HAZARDOUS WASTE

Identification of Hazardous Waste Facilities

The accident analyses considered facilities and processes that support the management of hazardous waste. The facilities were identified from the hazardous waste information provided in Chapter 2. Table F-12 lists the facilities associated with each of the alternatives. Descriptions of these facilities are provided in Appendix B. | TE

Table F-12. Hazardous waste facilities identified by alternative. | TE

List of facilities	No-action alternative	Alternative A (limited treatment configuration)	Alternative C (extensive treatment configuration)	Alternative B (moderate treatment configuration)
Hazardous waste storage facilities	X	X	X	X
M-Area Air Stripper	X	X	X	X
Recycle units[a]	X	X	X	X
Containment building[b,c]			X	
Non-alpha vitrification facility[b]			X	
Consolidated Incineration Facility		X	X[d]	X

a. Recycle units include silver recovery, refrigerant recycle, lead melter, and solvent distillation. These units do not have quantitative or qualitative accident analyses available. Accidents for recycle units are assumed to be bounded by the accident scenarios selected for this alternative.
b. Proposed facility.
c. Accidents for the containment building are assumed to be the same as those identified for the Hazardous Waste/Mixed Waste Treatment Building identified in the technical report presenting accident analyses for solid wastes (WSRC 1994c).
d. Facility operates until proposed facility comes on line. | TE

TE Although Table F-12 identifies several nuclear facilities (e.g., Consolidated Incineration Facility), there are no radiological accidents associated with hazardous waste. Radiological material with a hazardous waste component was identified as mixed waste and is addressed in Section F.5.4.

Since mixed waste facilities contain radioactive materials with a hazardous chemical component, and in some cases, results of the accident scenarios for mixed waste bound the chemical hazards at hazardous waste facilities, impacts from chemical hazards for hazardous waste are addressed in Section F.5.4.7 for mixed waste.

F.5.4 MIXED WASTE

The following evaluation addresses the impacts of postulated accidents associated with the alternatives considered in this EIS for the management of mixed waste.

F.5.4.1 Facilities and Accidents: Mixed Waste

The accident analyses considered facilities and processes that support the management of mixed waste. TE The facilities were identified from the mixed waste information provided in Chapter 2. Table F-13 lists the facilities associated with each of the alternatives. Descriptions of these facilities are provided in Appendix B. For each facility, a list of postulated-accident scenarios was developed to support the accident analysis for each mixed waste alternative. Accidents for RCRA disposal are assumed to be the same as those identified for the Hazardous Waste/Mixed Waste Disposal Facility vaults. The design of these vaults (concrete vaults with temporary steel covers) and their operations (waste containers are transferred from trucks to the vaults via overhead crane) are similar to that of the intermediate-level waste vaults. The postulated-accident scenarios for the intermediate-level nontritium vaults are assumed to bound the impacts of postulated accidents for RCRA disposal.

TE Table F-14 lists potential accidents. This information was extracted from the technical reports supporting this EIS (WSRC 1994b, c, and e). While all the accidents listed in Table F-14 are supported by quantitative analyses, they are not listed in this table because accident impacts for proposed facilities are mainly qualitative.

Table F-13. Mixed-waste facilities identified by alternative. TE

List of facilities area[a]	No-action alternative	Alternative A (limited treatment configuration)	Alternative C (extensive treatment configuration)	Alternative B (moderate treatment configuration)
Organic waste storage tank	X	X	X	X
F/H-Area Effluent Treatment Facility	X	X	X	X
Mixed waste storage facilities	X	X	X	X
Solvent storage tanks S29-S30 and S33-S36	X	X	X	X
Aqueous and organic waste storage tanks	X			
SRTC mixed waste storage tanks (ion exchange)	X	X	X	X
M-Area Vendor Treatment Facility	X	X	X	X
RCRA disposal[a]	X	X	X	X
Process Waste Interim Treatment Facility (Bldg. 341-1M)		X	X	X
Containment building[b,c]		X	X	X
Non-alpha vitrification facility[b]			X	X
Soil sort facility[b]		X		
Consolidated Incineration Facility		X	X[d]	X
Dilute Effluent Treatment Facility (Bldg. 341-M)		X	X	X

a. Accidents for Resource Conservation and Recovery Act (RCRA) disposal are assumed to be the same as those identified for the Hazardous Waste/Mixed Waste Disposal Facility vaults identified in the technical report (WSRC 1994c). TE
b. Proposed facility.
c. Accidents for the containment building are assumed to be the same as those identified for the Hazardous Waste/Mixed Waste Treatment Building identified in the technical report presenting accident analyses for solid wastes (WSRC 1994c). TE
d. Facility operates until proposed facility comes on line.

F.5.4.2 Accident Analysis for the Mixed Waste No-Action Alternative

This section addresses the impacts of postulated accidents associated with the no-action alternative for treating mixed waste. The postulated accidents provide a baseline for comparison of the effects of the postulated accident associated with the action alternatives.

TE | **Table F-14.** List of potential accidents associated with the management of mixed waste.

No.	Accident description	Annual frequency	Dose[a] (rem)	Risk (rem/yr)
1	Container breach at the EAV/ILNTV[b]	2.00E-02	2.63E-01	5.26E-03
2	Fire at the EAV/ILNTV[b]	8.30E-02	8.60E-03	7.14E-04
3	Excessive open containers at the containment building	1.00E-02	5.68E-02	5.68E-04
4	Release due to multiple open containers at the containment building	3.00E-03	6.81E-02	2.04E-04
5	Excessive inventory at the containment building	5.00E-03	3.20E-02	1.60E-04
6	Earthquake at the containment building	1.50E-03	6.20E-02	9.30E-05
7	Drum spill and tritium release at the containment building	5.00E-03	1.60E-02	8.00E-05
8	Tornado at the containment building	2.00E-02	3.05E-03	6.10E-05
9	Release due to one open container at the containment building	7.74E-03	6.20E-03	4.80E-05
10	Evaporation/dispersal of two to ten containers at the containment building	2.00E-04	6.00E-02	1.20E-05
11	Earthquake at the SRTC[c] storage tanks	2.00E-04	5.84E-02	1.17E-05
12	F2 tornado at Building 316-M	1.12E-04	5.67E-02	6.35E-06
13	Earthquake (0.04g) at Building 316-M	2.00E-03	1.65E-03	3.30E-06
14	F3 tornado at Building 316-M	2.80E-05	1.18E-01	3.30E-06
15	High wind at the containment building	2.00E-02	1.53E-04	3.06E-06
16	Large fire for entire CIF[d]	2.34E-04	1.07E-02	2.50E-06
17	F4 tornado at Building 316-M	3.50E-06	4.72E-01	1.65E-06
18	Drop/Spill/Leak at the SRTC[c] storage tanks	1.50E-02	6.52E-05	9.77E-07
19	High wind at the EAV/ILNTV[b]	1.00E-03	3.40E-04	3.40E-07
20	Earthquake at CIF[d]	1.00E-03	2.65E-04	2.65E-07
21	Explosion at CIF[d] - rotary kiln	1.50E-04	1.57E-03	2.36E-07
22	Tornado at the EAV/ILNTV[b]	2.00E-05	1.18E-02	2.36E-07
23	High velocity straight winds at CIF[d]	2.00E-02	5.23E-06	1.05E-07
24	Explosion at the containment building releasing 50 percent of tritium inventory	1.00E-06	5.58E-02	5.58E-08
25	Fire at the containment building releasing 50 percent of tritium inventory	1.00E-06	5.58E-02	5.58E-08
26	Release at Building 341-1M Building due to earthquake	2.00E-04	1.54E-04	3.08E-08
27	Explosion at CIF[d] - backhoe housing	4.00E-04	5.64E-05	2.26E-08
28	Normal processing with tritium ETF[e] airborne release due to straight wind	1.20E-03	1.47E-05	1.76E-08
29	Normal processing other than tritium ETF[e] airborne release due to straight wind	1.20E-03	1.46E-05	1.75E-08
30	Rainwater flooding at the containment building	1.00E-06	1.60E-02	1.60E-08
31	Normal processing with tritium ETF[h] liquid release due to straight wind	1.20E-03	9.40E-06	1.13E-08
32	Aircraft crash into the containment building	1.60E-07	6.78E-02	1.08E-08
33	Normal processing other than tritium ETF[e] liquid release due to straight wind	1.20E-03	7.70E-06	9.24E-09
34	Normal processing with tritium ETF[e] airborne release due to tornado	4.50E-05	2.04E-04	9.18E-09
35	Normal processing other than tritium ETF[e] airborne release due to tornado	4.50E-05	2.03E-04	9.14E-09
36	Normal processing with tritium ETF[e] airborne release due to earthquake	2.00E-04	2.77E-05	5.54E-09

Table F-14. (continued).

TE

No.	Accident description	Annual frequency	Dose[a] (rem)	Risk (rem/yr)
37	Normal processing with tritium ETF[e] liquid release due to earthquake	2.00E-04	9.40E-06	1.88E-09
38	Explosion at CIF[d] - tank farm tank	3.40E-07	5.36E-03	1.82E-09
39	Normal processing other than tritium ETF[e] liquid release due to earthquake	2.00E-04	7.70E-06	1.54E-09
40	Explosion at CIF[d] - tank farm sump and diked area	1.90E-07	6.85E-03	1.30E-09
41	Normal processing other than tritium ETF[e] airborne release due to earthquake	2.00E-04	2.50E-06	5.00E-10
42	Design basis ETF[e] liquid release due to straight wind	9.84E-06	4.70E-05	4.62E-10
43	Normal processing with tritium ETF[e] liquid release due to tornado	4.50E-05	9.40E-06	4.23E-10
44	Normal processing other than tritium ETF[e] liquid release due to tornado	4.50E-05	7.70E-06	3.47E-10
45	Design basis ETF[e] airborne release due to straight wind	9.84E-06	1.12E-05	1.10E-10
46	Design basis ETF[e] airborne release due to tornado	3.69E-07	2.83E-04	1.04E-10
47	Normal processing with tritium ETF[e] airborne release due to transfer error	1.80E-02	4.46E-09	8.03E-11
48	Design basis ETF[e] liquid release due to earthquake	1.64E-06	4.70E-05	7.71E-11
49	Normal processing with tritium ETF[e] airborne release due to corrosion damage	8.80E-02	8.75E-10	7.70E-11
50	Normal processing other than tritium ETF[e] airborne release due to transfer error	1.80E-02	1.72E-09	3.10E-11
51	Normal processing other than tritium ETF[e] airborne release due to corrosion damage	8.80E-02	3.38E-10	2.97E-11
52	Design basis ETF[e] airborne release due to leaks	2.13E-02	1.35E-09	2.88E-11
53	Release at DETF[f] due to earthquake	2.00E-03	1.17E-08	2.34E-11
54	Design basis ETF[e] airborne release due to overflow	1.48E-03	1.44E-08	2.13E-11
55	Design basis ETF[e] liquid release due to tornado	3.69E-07	4.70E-05	1.73E-11
56	Design basis ETF[e] airborne release due to earthquake	1.64E-06	8.40E-06	1.38E-11
57	Normal processing with tritium ETF[e] airborne release due to a siphoning incident	2.60E-03	1.12E-09	2.91E-12
58	Design basis ETF[e] airborne release due to spill	1.48E-03	1.88E-09	2.78E-12
59	Normal processing other than tritium ETF[e] airborne release due to siphoning incident	2.60E-03	4.34E-10	1.13E-12
60	Design basis ETF[e] airborne release due to transfer error	1.48E-04	6.86E-09	1.02E-12
61	Design basis ETF[e] airborne release due to corrosion damage	7.22E-04	1.35E-09	9.75E-13
62	Design basis ETF[e] airborne release due to a siphoning incident	2.13E-05	1.73E-09	3.68E-14

a. The dose given is for the offsite maximally exposed individual using 99.5 percentile meteorology.
b. Intermediate-level nontritium vault.
c. Savannah River Technology Center.
d. Consolidated Incineration Facility.
e. F/H-Area Effluent Treatment Facility.
f. Dilute Effluent Treatment Facility (Bldg. 341-M).

F.5.4.2.1 Impacts from Postulated Radiological Accidents

TE From the list of potential radiological accidents presented in Table F-14, the representative bounding accident scenarios were identified for the no-action alternative using the binning process described in Section F.4.1. Figure F-5 shows the highest-risk accident scenarios for the various frequency ranges for the no-action alternative. As shown in Figure F-5, the accidents associated with mixed waste are analyzed over a broad spectrum of consequences and frequencies. The accident scenarios postulated for the F/H-Area Effluent Treatment Facility generally present lower consequences, while accident scenarios postulated for vault disposal facilities generally present higher consequences. Table F-15 lists the representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public.

TE Accident Scenario 1 – Container breach at the intermediate-level nontritium vault (two containers, noncombustible waste): This accident scenario is detailed in Section F.5.2.2 and is assumed to be representative of a mixed waste accident for vault disposal.

Accident Scenario 11 – Earthquake at the Savannah River Technology Center storage tanks: The earthquake (greater than 0.2*g*) is assumed to impose reaction loads on the above-grade confinement structure and damage the structure. The below-grade structures, including the tank cells, are expected to respond with the ground motion, so major damage is considered unlikely. Similarly, because of their wall thickness [1.27 centimeters (0.5 inch) stainless steel], short height [3.35 to 3.96 meters (11 to 13 feet)], and small diameter [3 to 3.66 meters (10 to 12 feet)], it is unlikely that the tanks would rupture. However, in this scenario, the tank and cell exhaust filtration is assumed to be disrupted. This disruption is accounted for by assuming that the inventory of two 13.6-cubic-meter (3,600-gallon) high-activity waste tanks is available for airborne release. It is estimated that 0.1 percent of the radionuclides contained in the tank becomes airborne.

Accident Scenario 14 – F3 tornado at Building 316-M: Building 316-M (mixed waste storage building) is an outdoor storage area on a concrete base, with a roof and no sidewalls. Waste is stored in approved containers, generally 55-gallon drums and large steel boxes. Based on a similar analysis for the Burial Ground, an F3 tornado [a tornado with rotational windspeeds of 254 to 331 kilometers (158 to 206 miles) per hour] is assumed to rupture 25 percent of the drums. It is assumed that 100 percent of the drum contents could be scattered.

Accident Scenario 46 – Design basis F/H-Area Effluent Treatment Facility airborne release due to tornado: This accident scenario is detailed in Section F.5.1.2.1.

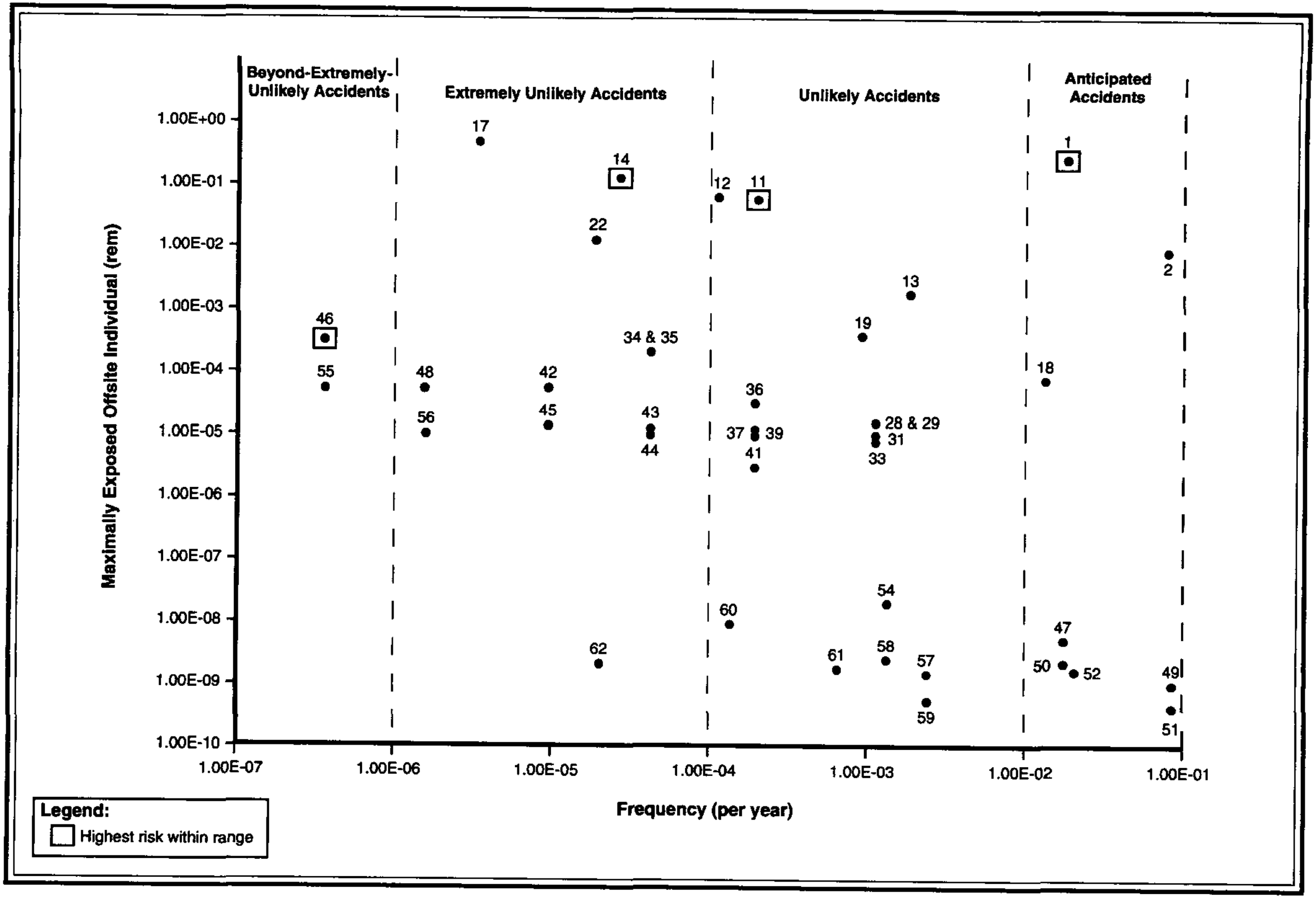

Figure F-5. Accidents that were analyzed for the no-action alternative for mixed waste facilities.

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TE | **Table F-15.** Representative bounding radiological accidents for the no-action alternative for mixed wastes.

No.	Accident description	Frequency per year (accident range)	Accident consequences: Uninvolved worker at 100 meters (rem)	Accident consequences: Uninvolved worker at 640 meters (rem)	Accident consequences: Offsite maximally exposed individual (rem)	Accident consequences: Population within 80 kilometers[c] (person-rem)	Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] — Latent fatal cancers: Uninvolved worker at 100 meters	Latent fatal cancers: Uninvolved worker at 640 meters	Latent fatal cancers: Offsite maximally exposed individual	Latent fatal cancers: Population within 80 kilometers
1	Container breach at the ILNTV[d]	2.00E-02 (anticipated)	6.47E+01	2.30E+00	3.31E-02	1.68E+03	1.04E-03 (5.18E-02)	1.84E-05 (9.20E-04)	3.31E-07 (1.66E-05)	1.68E-02 (8.40E-01)
11	Earthquake at the SRTC[e] Storage Tanks	2.00E-04 (unlikely)	6.00E+00	1.92E-01	8.06E-03	3.60E+01	4.80E-07 (2.40E-03)	1.54E-08 (7.68E-05)	8.06E-10 (4.03E-06)	3.60E-06 (1.80E-02)
14	F3 tornado[f] at Building 316-M	2.80E-05 (extremely unlikely)	4.78E-04	1.15E-01	1.18E-01	7.98E-02	5.35E-12 (1.91E-07)	1.29E-09 (4.60E-05)	1.65E-09 (5.90E-05)	1.12E-09 (3.99E-05)
46	Design basis ETF[g] airborne release due to tornado	3.69E-07 (beyond-extremely-unlikely)	2.17E-03	6.91E-05	3.90E-05	3.44E-04	3.20E-13 (8.68E-07)	1.02E-14 (2.76E-08)	7.20E-15 (1.95E-08)	6.35E-14 (1.72E-07)

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a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Intermediate-Level Non-Tritium Vault.
e. Savannah River Technology Center.
f. F3 tornadoes have rotational wind speeds of 254 to 331 kilometers (158 to 206 miles) per hour.
g. Effluent Treatment Facility.

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F.5.4.2.2 Impacts from New or Proposed Facilities

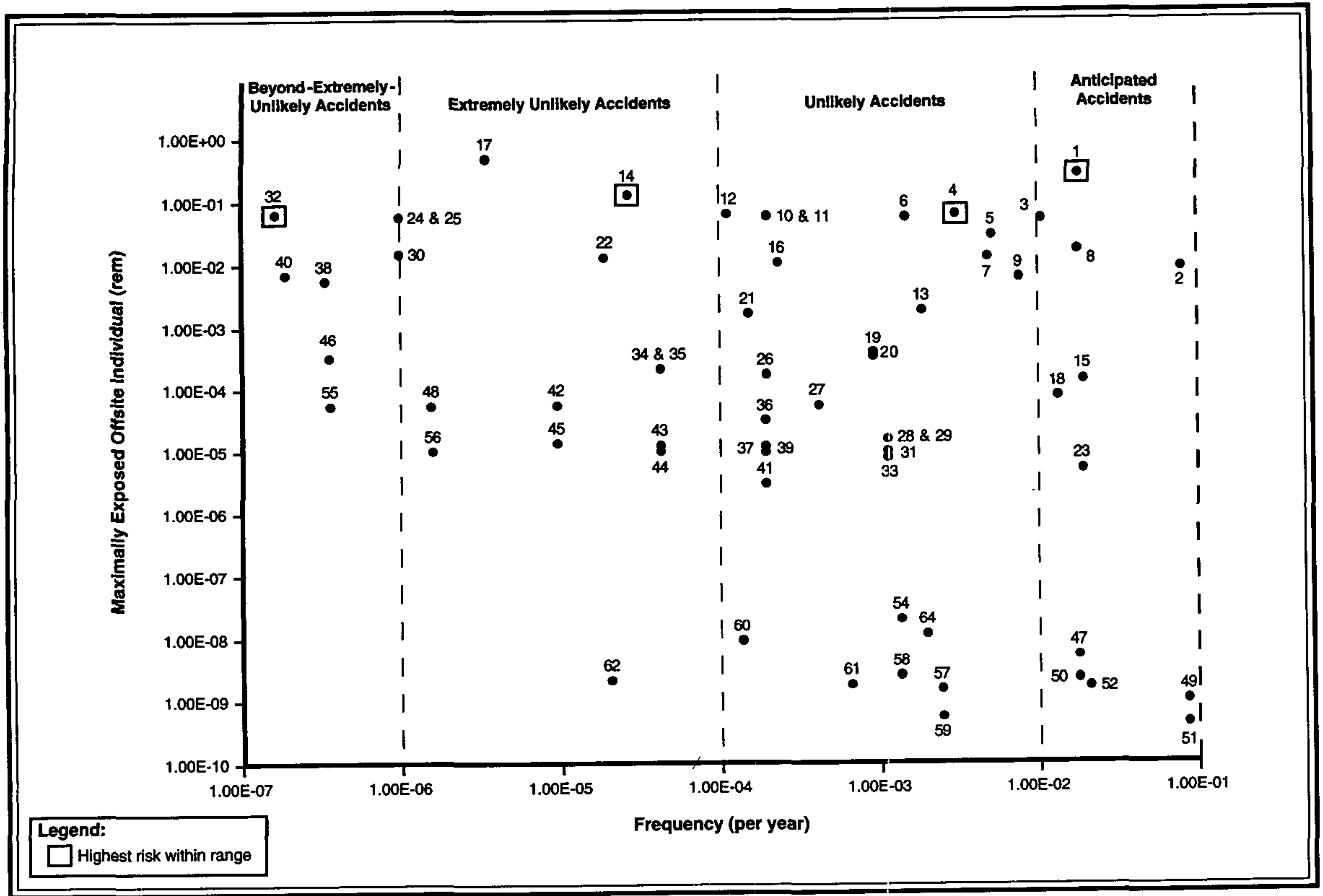
Table F-13 identifies no new or proposed facilities for the hazardous and mixed waste no-action alternative. TE

F.5.4.3 Accident Analysis for the Mixed Waste Under Alternative B

This section addresses the impacts of postulated accidents associated with alternative B for mixed wastes.

F.5.4.3.1 Impacts from Postulated Radiological Accidents

This section presents potential effects from postulated radiological accidents at facilities identified in Table F-13 for the management of mixed waste under alternative B. Figure F-6 shows the highest-risk accident scenarios for the various frequency ranges. As shown in Figure F-6, the accidents associated with mixed waste are analyzed over a broad spectrum of consequences and frequencies. The accident scenarios postulated for the F/H-Area Effluent Treatment Facility generally present lower consequences, while accident scenarios postulated for vault disposal facilities generally present higher consequences. Table F-16 lists the representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public for alternative B. DOE assumes that conclusions regarding representative bounding accident scenarios could change based on the minimum, maximum, and expected waste forecasts. The accident analyses for the accident scenarios are based on a conservative assumption of peak utilization of facilities [i.e., the minimum, maximum, and expected waste forecasts would only affect how long the facilities (e.g., the Consolidated Incineration Facility)] would operate. Therefore, while the consequence or frequency for postulated accidents do not change, the expected duration of risk from a facility-specific accident scenario could be longer or shorter, depending on the case. The number of new facilities needed to meet the mixed waste management requirements could be affected by the minimum, maximum, and expected waste forecasts. Thus, the consequence or frequency for specific accident scenarios could be increased or decreased, depending on the case. Impacts for the three cases are addressed in the representative bounding accident descriptions. TE TE



TE | **Figure F-6.** Accidents that were analyzed for alternative B and alternative A for mixed waste facilities.

Table F-16. Representative bounding radiological accidents for mixed wastes under alternative B. TE

No.	Accident description	Frequency per year (accident range)	Accident consequences: Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] — Latent fatal cancers: Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	Container breach at the ILNTV[d]	2.00E-02 (anticipated)	6.47E+01	2.30E+00	3.31E-02	1.68E+03	1.04E-03 (5.18E-02)	1.85E-05 (9.20E-04)	3.31E-07 (1.66E-05)	1.68E-02 (8.40E-01)
4	Release due to multiple open containers at the containment building	3.00E-03 (unlikely)	3.91E-01	5.76E-01	8.13E-03	3.80E+02	4.69E-07 (1.56E-04)	6.91E-07 (2.30E-04)	1.22E-08 (4.07E-06)	5.70E-04 (1.90E-01)
14	F3 tornado[e] at Building 316-M	2.80E-05 (extremely unlikely)	4.78E-04	1.15E-01	1.18E-01	7.98E-02	5.35E-12 (1.91E-07)	1.29E-09 (4.60E-05)	1.65E-09 (5.90E-05)	1.12E-09 (3.99E-05)
32	Aircraft crash at the containment building	1.60E-07 (beyond-extremely-unlikely)	1.52E+01	5.41E-01	8.32E-03	3.99E+02	9.73E-10 (6.08E-03)	3.46E-11 (2.16E-04)	6.66E-13 (4.16E-06)	3.19E-08 (2.00E-01)

TE

a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Intermediate-Level Non-Tritium Vault.
e. F3 tornadoes have rotational wind speeds of 254 to 331 kilometers (158 to 206 miles) per hour. TE

The representative bounding accidents and their impacts under the alternative B are briefly described below:

TE Accident Scenario 1 – Container breach at the intermediate-level nontritium vault (two containers, noncombustible waste): This accident scenario is described in Section F.5.2.2 and is considered to be the representative bounding accident for the anticipated accident range.

Accident Scenario 4 – Release due to multiple (2 to 10) open containers at the containment building: The consequences of this accident scenario are bounded by the worst unmitigated accident scenario where the ventilation and scrubber systems of the containment building are assumed to fail. This accident scenario is considered the representative bounding accident for the unlikely accident range. Under the minimum, maximum, and expected waste forecasts, the containment building is expected to operate from 2006 to 2024. From 1994 to 2006 -- when the containment building is not operational -- the highest-risk accident in this frequency range would be Accident Scenario 18: Earthquake at the Savannah River Technology Center Storage Tanks.

Accident Scenario 14 – F3 tornado at Building 316-M: This accident scenario is detailed in Section F.5.4.2.1 and is considered the representative bounding accident for the extremely unlikely accident range. Utilization of this facility is expected to be the same under the minimum, maximum, and expected waste forecasts.

Accident Scenario 32 – Aircraft crash at the containment building: An aircraft could breach only that part of the containment building into which it crashes. DOE assumes that the consequences associated with this event are the same as for the worst unmitigated accident event for the entire containment building. Thus, whether one or all segments in the containment building are breached due to an aircraft crash, the consequences listed for this scenario are considered to be bounding. This accident scenario is considered the representative bounding accident for the beyond-extremely-unlikely-accident range. Under the minimum, maximum, and expected waste forecasts, the containment building is expected to operate from 2006 to 2024. From 1994 to 2006, the next highest risk accident in this frequency range would be Accident Scenario 50: Explosion at the Consolidated Incineration Facility tank farm sump and diked area.

F.5.4.3.2 Impacts from New or Proposed Facilities

Table F-13 identifies three proposed facilities under alternative B for which no quantitative accident analyses exist. Accidents associated with the soil sort facility are described in Section F.5.2.3.2 and with the non-alpha vitrification facility in Section F.5.2.5. | TE

F.5.4.4 Accident Analysis for Mixed Waste Under Alternative A

The facilities listed in Table F-13 for alternative A are identical to those that support alternative B, except that alternative A does not include the non-alpha vitrification facility. Since this facility was not involved in the representative bounding accident, the effects from the postulated radiological accident scenarios for alternative A are identical to those described in Section F.5.4.3. | TE

F.5.4.5 Accident Analysis for Mixed Waste Under Alternative C

The facilities listed in Table F-13 for alternative C are similar to those that support alternative B for mixed waste, except that the Consolidated Incineration Facility does not operate for the entire 30-year period under alternative C. Since this facility was not involved in the representative bounding accident, the effects from the postulated radiological accident scenarios for alternative C are identical to those described in Section F.5.4.3. | TE

F.5.4.6 Impacts to Involved Workers from Accidents Involving Mixed Waste

The mixed waste accidents that have the highest risks involve the containment building. The accident initiators (aircraft crash, explosion, or tornado) are considered to be more dangerous to the worker than the resulting release of contaminants. The other accident scenarios (transfer errors or container damage) are not expected to cause serious injury to workers, because the operators will be equipped with a breathing supply via an air compressor airflow. An emergency supply of breathing air is provided for each worker from high pressure breathing air cylinders permanently connected to the breathing air systems.

F.5.4.7 Impacts from Mixed Waste Chemical Accidents

Because the mixed waste facilities contain radioactive materials with a hazardous chemical component, the results of the mixed waste accident scenarios bound the chemical hazards at hazardous waste facilities. This section discusses the chemical hazards for mixed wastes, as well as those for hazardous wastes.

A chemical hazards analysis was performed for the Consolidated Incineration Facility as part of a safety analysis report. The basis for this analysis was that the chemical inventory would be such that an unmitigated release of all the material in one section of the facility would result in concentrations of chemicals at 100 meters (328 feet) less than one-half the concentration that is immediately dangerous to life and health (IDLH). The Consolidated Incineration Facility is considered a low hazard facility. The criteria for being a low hazard facility include the requirement that the nonradiological consequences associated with the highest accident frequencies are no greater than the specified IDLH value at 100 meters and 10 percent of the specified IDLH value at the SRS boundary. As reported in the technical report (WSRC 1994c), if releases are maintained below the IDLH onsite criterion, the releases are automatically below the IDLH offsite criterion. Since chemical inventories are controlled such that the worst-case nonradiological consequences can be no greater than 50 percent of the specified IDLH value at 100 meters (328 feet), both criteria are satisfied for the Consolidated Incineration Facility. As a result, further analysis is not necessary.

Preliminary chemical hazards analyses were performed for the E-Area mixed waste storage building, the N-Area mixed waste and hazardous waste storage buildings, and the B-Area hazardous waste storage building to determine the hazard categorization for each facility. The N-Area mixed waste and hazardous waste storage buildings have an inventory that bounds the E-Area mixed waste storage building and the B-Area hazardous waste storage building. The N-Area chemicals requiring further analysis to determine the potential consequences of their accidental release are listed in Table F-17. This table provides the maximum onsite and offsite airborne concentrations resulting from a postulated release of chemical inventory.

The Organic Waste Storage Tank associated with the Defense Waste Processing Facility would be the primary facility for the storage of benzene mixed waste. Benzene that has been separated from a precipitate slurry by distillation in the Defense Waste Processing Facility would be transferred approximately 112.7 meters (370 feet) to the Organic Waste Storage Tank in an above-ground pipe. Consequently, an explosion could occur in either the inner or outer tank or as a result of a benzene leak during a transfer. An explosion in either tank would occur if the oxygen concentration in the tank vapor space reaches the minimum required for combustion and the benzene vapor is ignited. A benzene release from the transfer line would form a pool on the ground, which would evaporate and form a vapor cloud. If ignited, the explosion of the vapor cloud could cause the Organic Waste Storage Tank to explode.

Table F-17. Mixed/hazardous waste chemical hazards analysis results.[a] | TE

Chemical	Quantity (kg)[b]	Onsite concentration 100 meters (328 feet) (mg/m³)[c]	Offsite Concentration (mg/m³)[c]	ERPG-1[d] (mg/m³)[c]	ERPG-2[d] (mg/m³)[c]	ERPG-3[d] (mg/m³)[c]
Arsenic	1.03E+03	4.5E-01	2.8E-04	6.00E-01	1.00E+00	1.00E+02
Benzene	3.0E+03	6.7E+02	4.2E-01	1.60E+01	1.60E+02	9.58E+03
Beryllium	1.0E+01	4.4E-03	2.8E-06	5.00E-03	1.00E-02	1.00E+01
Cadmium	6.0E+03	2.7E+00	1.7E-03	1.50E-01	2.50E-01	5.00E+02
Chromium	6.1E+03	2.7E+00	1.7E-03	1.50E+00	2.50+00	(e)
Lead	3.6E+05	1.6E+02	1.0E-01	1.50E-01	2.50E-01	7.00E+02
Mercury	3.4E+04	1.5E+01	9.4E-03	1.50E-01	2.00E-01	2.80E+01
Methyl chloride	6.5E+02	2.9E+02	1.8E-01	2.07E+02	4.13E+02	2.07E+04
Methyl ethyl ketone	8.0E+03	1.8E+03	1.1E+00	8.85E+02	2.95E+03	8.85E+03
Nickel	2.8E+01	4.4E-02	2.8E-05	3.00E+00	5.00E+00	(e)
Silver	1.1E+03	4.7E-01	3.0E-04	3.00E-01	5.00E-01	(e)
Trichloroethane	7.8E+04	3.5E+02	2.2E-01	1.91E+03	5.46E+03	1.64E+04
Xylene	3.3E+03	1.6E+01	9.9E-03	4.34E+02	8.69E+02	4.34E+03

a. The chemicals presented in this table are those for which concentration guidelines were available.
b. Kilograms. To convert to pounds, multiply by 2.2046.
c. Milligrams per cubic meter of air.
d. Emergency Response Planning Guideline. See Table F-3.
e. No equivalent value found.

In a tornado scenario, the Organic Waste Storage Tank is assumed to catastrophically fail as the result of a tornado-generated missile. As the benzene leaves the tank, "splashing" occurs, causing a fraction of the benzene to become an aerosol. The released benzene forms a pool [122 meters by 122 meters (400 feet by 400 feet)] bounded by the drainage ditch that surrounds the organic waste storage tank site. The tornado is assumed to remain in the vicinity of the pool for one minute. The evaporation rate from the pool during this minute is based on a tornado wind speed of 177 kilometers (110 miles) per hour.

Following the tornado, evaporation from the pool continues over the next 4 minutes under normal wind conditions of 10 miles per hour. It is assumed that after 5 minutes from the initial failure of the Organic Waste Storage Tank, the released benzene has completely drained to the drainage ditch. It is also assumed that normal wind conditions continue for the remainder of the event. Table F-18 presents the results for the two postulated Organic Waste Storage Tank chemical accident scenarios. | TE

TE | **Table F-18.** Chemical hazards accidents analysis results for the Organic Waste Storage Tank.

Accident description	Annual frequency	100-meter concentration (mg/m3)[a]	640-meter concentration (mg/m3)	Offsite concentration (mg/m3)	ERPG-1[b] (mg/m3)	ERPG-2 (mg/m3)	ERPG-3 (mg/m3)
Explosion at the OWST[c]	2.70E-04	1.40E+04	6.10E+02	5.70E+00	1.60E+01	1.60E+02	9.60E+03
Tornado at the OWST	1.00E-04	1.02E+04	1.21E+03	1.54E+01	1.60E+01	1.60E+02	9.60E+03

a. Milligrams per cubic meter of air.
b. Emergency Response Planning Guideline. See Table F-3.
c. Organic Waste Storage Tank.

Safety documentation does not analyze potential events involving hazardous materials at M-Area facilities. Using the methodology described in Section F.4.2 for M-Area facilities, it was determined that the inventory of sulfuric acid located in the Dilute Effluent Treatment Facility (341-M) would be the only chemical present in sufficient quantities to warrant further evaluation. This accident scenario assumed an unmitigated liquid spill of the entire inventory of sulfuric acid at 341-M, with a resulting pool covering 77 square meters (829 square feet) at a depth of 1 centimeter (0.39 inch). The evaporation rate for this liquid spill was estimated to be 2.01E-05 grams per second at standard pressure and temperature. The results of this chemical analysis are presented in Table F-19. TE

TE | **Table F-19.** Chemical hazards analysis results for the 341-M facility.

Chemical	Inventory (kilograms)[a]	100-meter concentration (mg/ m)[b]	640-meter concentration (mg/ m)[b]	Offsite concentration (mg/ m)[b]	ERPG-1[c] (mg/ m)[b]	ERPG-2[c] (mg/ m)[b]	ERPG-3[c] (mg/ m)[b]
Sulfuric acid	1.52E+04	9.10E-06	7.70E-07	2.70E-07	2.00E+00	1.00E+01	3.00E+01

a. To convert to pounds, multiply by 2.2046.
b. Milligrams per cubic meter of air.
c. Emergency Response Planning Guideline. See Table F-3.

F.5.5 TRANSURANIC AND ALPHA WASTE

The following sections address the impacts of postulated accidents associated with the alternatives considered in this EIS for the management of transuranic and alpha waste.

F.5.5.1 Facilities and Accidents: Transuranic and Alpha Waste

The accident analyses considered all facilities and processes involved in the management of transuranic and alpha waste. The facilities were identified from the transuranic waste information provided in Chapter 2. Table F-20 lists the facilities associated with each of the alternatives. Descriptions of these facilities are provided in Appendix B. For each facility, a list of postulated accident scenarios was developed to support the accident analysis for transuranic waste for each alternative. TE

Table F-20. Transuranic and alpha waste facilities identified by alternative. TE

List of facilities area	No-action alternative	Alternative A (limited treatment configuration)	Alternative C (extensive treatment configuration)	Alternative B (moderate treatment configuration)	
Low-activity waste vaults	X	X	X	X	TC
Transuranic and alpha waste storage pads	X	X	X	X	
Experimental Transuranic Waste Assay Facility/ Waste Certification Facility	X				
RCRA disposal[a]		X	X	X	
Alpha vitrification facility[b]			X	X	
Consolidated Incineration Facility			X		TC
Transuranic waste characterization/certification facility[b,c]		X	X	X	

a. Accidents for Resource Conservation and Recovery Act (RCRA) disposal are assumed to be bounded by the accident scenarios associated with the transuranic waste storage pads.

b. Proposed facility.

c. Accidents for the transuranic waste characterization/certification facility are assumed to be the same as the accident scenarios described in the Transuranic Waste Facility Preliminary Safety Analysis Report identified in the WSRC technical report presenting accident analyses for solid wastes (WSRC 1994c). TE

Table F-21 lists potential accidents. This information was extracted from the technical reports supporting this EIS (WSRC 1994b, c, and e). While all the accidents listed in Table F-21 are supported by quantitative analyses, accident impacts for proposed facilities are not listed in the table because they are mainly qualitative. TE

TE **Table F-21.** List of potential accidents associated with the management of transuranic waste.

No.	Accident description	Annual frequency	Dose[a] (rem)	Risk (rem/yr)
1	Deflagration in culvert during TRU[b] retrieval activities	1.00E-02	4.56E-01	4.56E-03
2	Fire at the EAV/LAWV[c]	8.30E-02	3.55E-02	2.95E-03
3	Fire in culvert - TRU[b] storage pads	8.10E-04	1.94E+00	1.57E-03
4	Drum breach due to culvert overturn during TRU retrieval activities	4.00E-02	2.28E-02	9.12E-04
5	Container breach at the EAV/LAWV[c]	2.00E-02	4.00E-02	8.00E-04
6	Fire from all causes - TRU[b] storage pads	2.60E-03	7.52E-02	1.96E-04
7	Vehicular crash - TRU[b] storage pads	2.60E-03	6.84E-02	1.78E-04
8	Drum rupture on the TRU[b] storage pads (internally induced)	2.10E-02	5.70E-03	1.20E-04
9	Drum breach/fall of unlined drums during TRU[b] retrieval activities	7.20E-02	1.10E-01	7.92E-05
10	Fire in the TRU[b] waste characterization/certification facility w/o HEPA[d] bypass	6.00E-03	9.50E-03	5.70E-05
11	Drum breach/fall during TRU[b] retrieval activities	4.00E-02	1.10E-03	4.40E-05
12	Multiple drum deflagration during TRU[b] retrieval activities	1.50E-04	2.30E-02	3.45E-06
13	Vehicle crash/fire on the TRU[b] storage pads	6.50E-05	3.51E-01	2.28E-05
14	Explosion with fire in the TRU[b] waste characterization/ certification facility	4.20E-03	9.10E-04	3.82E-06
15	Large fire for entire CIF[e]	2.34E-04	1.07E-02	2.50E-06
16	Vehicle crash during TRU[b] retrieval activities	2.00E-04	4.60E-03	9.20E-07
17	Earthquake at CIF[e]	1.00E-03	2.65E-04	2.65E-07
18	Explosion at CIF[e] - rotary kiln	1.50E-04	1.57E-03	2.36E-07
19	High winds - TRU[b] storage pads	3.80E-03	5.50E-05	2.10E-07
20	Drum fire due to vehicle crash during TRU[b] retrieval activities	5.00E-06	2.30E-02	1.15E-07
21	High velocity straight winds at CIF[e]	2.00E-02	5.23E-06	1.05E-07
22	Tornado at the EAV/LAWV[c]	2.00E-05	4.90E-03	9.80E-08
23	Earthquake - TRU[b] storage pads	2.00E-04	2.28E-04	4.56E-08
24	F2 tornado on TRU[b] storage pads	4.50E-05	7.00E-04	3.20E-08
25	Explosion at CIF[e] - backhoe housing	4.00E-04	5.64E-05	2.26E-08
26	Earthquake at the TRU[b] waste characterization/certification facility	2.00E-04	8.10E-05	1.62E-08
27	High wind at the EAV/LAWV[c]	1.00E-03	1.50E-05	1.50E-08
28	F3 tornado on TRU[b] storage pads	8.00E-06	1.50E-03	1.20E-08
29	Fire in the TRU[b] waste characterization/certification facility w/ HEPA[d] bypass	6.00E-06	6.52E-04	3.91E-09
30	High winds on the TRU[b] storage pads	4.00E-05	7.20E-05	2.90E-09
31	Explosion at CIF[e] - tank farm tank	3.40E-07	5.36E-03	1.82E-09
32	Explosion at CIF[e] - tank farm sump and dike area	1.90E-07	6.85E-03	1.30E-09
33	Criticality in the TRU[b] waste characterization/certification facility	1.00E-06	1.29E-03	1.29E-09
34	HEPA[d] filter bypass in the TRU[b] waste characterization/certification facility	2.00E-03	1.00E-09	2.00E-12

a. The dose given is for the offsite maximally exposed individual using 99.5 percentile meteorology.
b. Transuranic.
c. E-Area Vaults low-activity waste vault.
d. High efficiency particulate air.
TE e. Consolidated Incineration Facility.

F.5.5.2 Accident Analysis for Transuranic and Alpha Waste No-Action Alternative

This section addresses the effects of postulated accidents associated with the no-action alternative considered for transuranic wastes. The postulated accidents provide a baseline for comparison of the effects of the postulated accidents associated with the other alternatives. TE

F.5.5.2.1 Impacts from Postulated Radiological Accidents

From the list of potential radiological accidents presented in Table F-21, the representative bounding accident scenarios were identified for the no-action alternative. Figure F-7 shows the highest-risk TE
accident scenarios for the four frequency ranges. As shown in Figure F-7, the accidents associated with the transuranic waste storage pads and the low-activity waste vaults are scattered over the three highest TC
accident frequency ranges. However, there are no accidents identified in the technical reports for the beyond-extremely-unlikely accident range. Table F-22 lists the representative bounding accidents, TE
accident consequences, and latent fatal cancers for exposed workers and the public.

Accident Scenario 1 – Deflagration in culvert during transuranic drum handling activities: The culverts are concrete containers used to store up to 14 transuranic waste drums. Transuranic waste drum handling activities would require the movement of some culverts and other waste containers to gain access to the waste drums. Because the drums inside a culvert are not vented, a flammable mixture of hydrogen and air could exist (due to the radiolysis of the polyethylene wrappings inside the drum). Ignition of this TC
flammable gas mixture would most likely occur due to a shift in the material while moving the culverts. Although the curie content of the drums inside the culverts is much higher than that in drums stored directly on transuranic waste storage pads, it is assumed that the amount of curies released to the atmosphere due to a drum deflagration inside a culvert would be mitigated somewhat by the culvert. This accident scenario is considered the representative bounding accident for the anticipated accident range.

Accident Scenario 3 – Fire in a culvert at the transuranic and alpha waste storage pads (one drum): Culverts are concrete containers used to store up to 14 transuranic 55-gallon drums. Transuranic drums stored in concrete culverts potentially generate hydrogen gas through radiolytic decomposition of organics that could be in the drums. As a consequence, a fire hazard is associated with the storage of transuranic and alpha waste in drums. A postulated fire in a concrete culvert is assumed to involve only one drum, since other drums are sealed with gaskets and the lids are secured with metal ring clamps.

TC

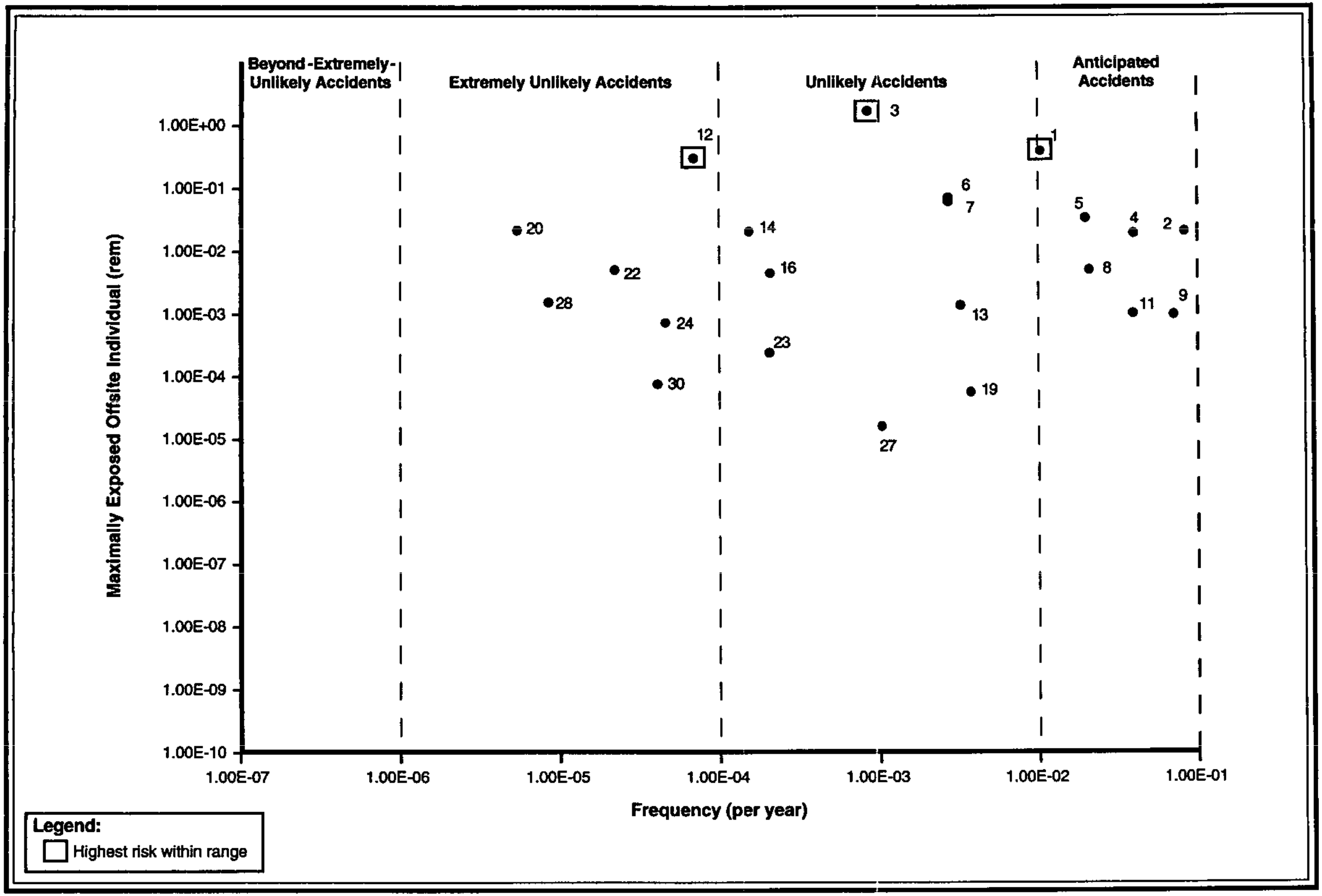


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Figure F-7. Accidents that were analyzed for the no-action alternative for transuranic waste facilities.

Table F-22. Representative bounding radiological accidents for transuranic waste under the no-action alternative. TE

			Accident consequences				Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] Latent fatal cancers			
No.	Accident description	Frequency (per year)	Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	Deflagration in culvert during TRU[d] drum retrieval activities	1.00E-02 (anticipated)	1.12E+02	3.97E+00	5.72E-02	2.90E+03	8.96E-04 (8.96E-02)	1.59E-05 (1.59E-03)	2.86E-07 (2.86E-05)	1.45E-02 (1.45E+00)
3	Fire in culvert at the TRU[d] waste storage pads (one TRU drum in culvert)	8.10E-04 (unlikely)	4.74E+02	1.69E+01	2.43E-01	1.23E+04	3.07E-04 (3.79E-01)	5.48E-06 (6.76E-03)	9.84E-08 (1.22E-04)	4.98E-03 (6.15E+00)
13	Vehicle crash with resulting fire at the TRU[d] waste storage pads	6.50E-05 (extremely unlikely)	8.59E+01	3.06E+00	4.40E-02	2.23E+03	4.47E-06 (6.87E-02)	7.96E-08 (1.22E-03)	1.43E-09 (2.20E-05)	7.25E-05 (1.12E+00)

TE

a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Transuranic.

Accident Scenario 12 – Vehicle crash with resulting fire at the transuranic waste storage pads: The frequency of a vehicle crash into a transuranic pad impacting waste containers is estimated as 2.60E-03 event per year. Approximately 2.5 percent of vehicle crashes result in fires. Therefore, the frequency of a vehicle crashing into a transuranic pad and causing a fire is estimated to be 6.50E-05 event per year. It is estimated that a vehicle crash into a transuranic pad followed by a fire would affect 7 pallets (28 drums) of transuranic waste.

F.5.5.2.2 Impacts from New or Proposed Facilities

Table F-20 identifies no new or proposed facilities under the no-action alternative for transuranic waste.

F.5.5.3 Accident Analysis for the Transuranic and Alpha Waste Under Alternative B

This section addresses the impacts of postulated accidents associated with alternative B considered for the transuranic waste stream.

F.5.5.3.1 Impacts from Postulated Radiological Accidents

This section presents potential effects from postulated radiological accidents at facilities identified in Table F-20 for alternative B. Figure F-8 shows the highest-risk accident scenarios for the four frequency ranges. As shown in Figure F-8, this alternative consists of many more accident scenarios than the no-action alternative. There are no accidents listed in the technical reports for the beyond-extremely-unlikely accident range. Table F-23 lists the representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public. Although alternative B has additional facilities associated with it, the representative bounding radiological accident scenarios are the same as those for the no-action alternative (Table F-23). However, DOE assumes that the conclusions regarding the representative bounding accident scenarios could be affected by alternative B minimum, maximum, and expected waste forecasts. The accident analyses for the accident scenarios are based on a conservative assumption of peak utilization of facilities, [i.e., the minimum, maximum, and expected waste forecasts would only affect how long the facilities (e.g., the Experimental Transuranic Waste Assay Facility/Waste Certification Facility), would operate]. Therefore, while consequences or frequencies for postulated accidents do not change, the expected duration of risk from a facility-specific accident scenario could be longer or shorter, depending on the case. However, the number of new facilities needed to meet the transuranic waste management requirements could be affected by the

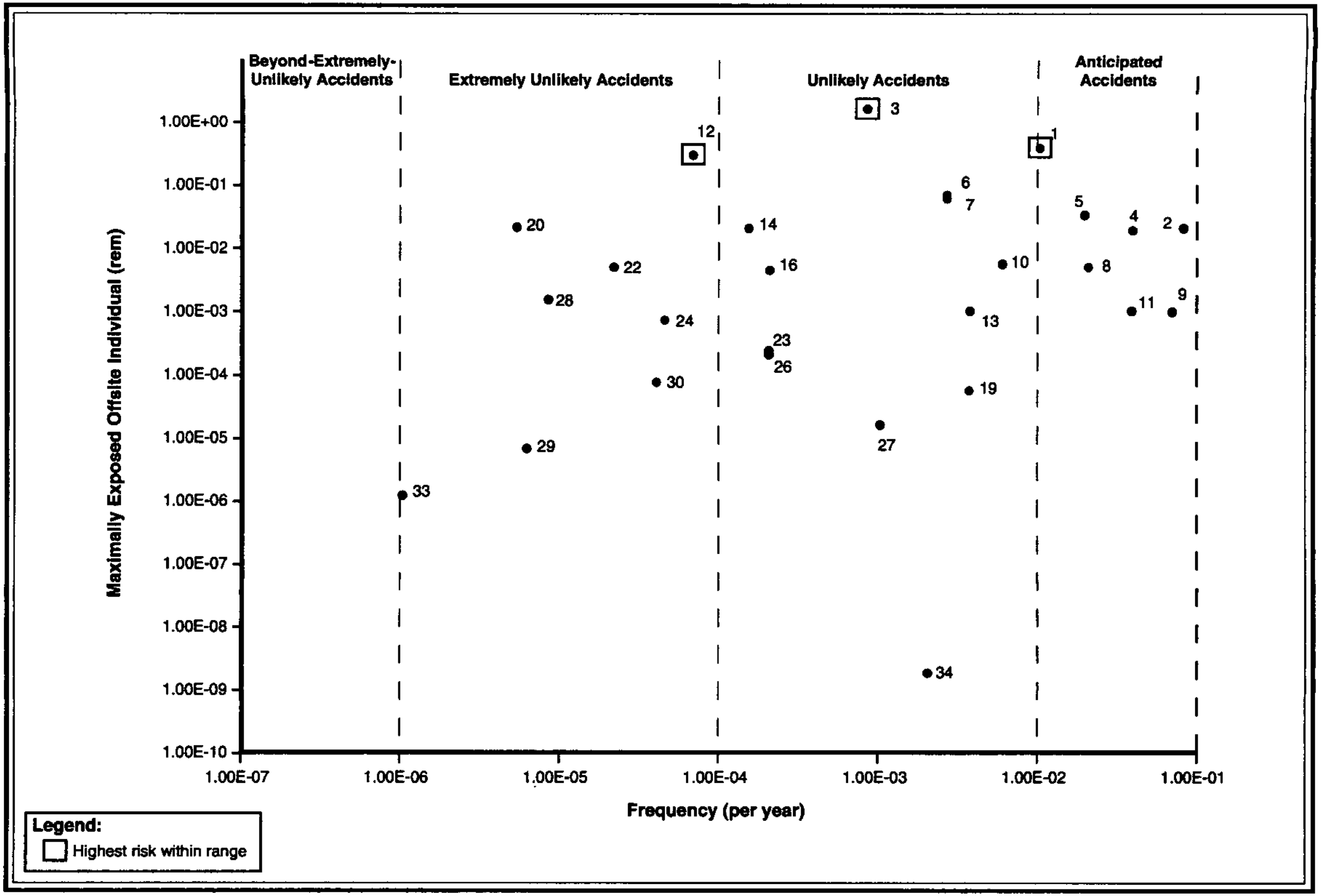

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Figure F-8. Accidents that were analyzed for alternative B and alternative A for transuranic waste facilities.

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TE | **Table F-23.** Representative bounding radiological accidents for transuranic waste under alternative B.

			Accident consequences				Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] Latent fatal cancers			
No.	Accident description	Frequency (per year)	Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	Deflagration in culvert during TRU[d] drum retrieval activities	1.00E-02 (anticipated)	1.12E+02	3.97E+00	5.72E-02	2.90E+03	8.96E-04 (8.96E-02)	1.59E-05 (1.59E-03)	2.86E-07 (2.86E-05)	1.45E-02 (1.45E+00)
3	Fire in culvert at the TRU[d] waste storage pads (one TRU drum in culvert)	8.10E-04 (unlikely)	4.74E+02	1.69E+01	2.43E-01	1.23E+04	3.07E-04 (3.79E-01)	5.48E-06 (6.76E-03)	9.84E-08 (1.22E-04)	4.98E-03 (6.15E+00)
13	Vehicle crash with resulting fire at the TRU[d] waste storage pads	6.50E-05 (extremely unlikely)	8.59E+01	3.06E+00	4.40E-02	2.23E+03	4.47E-06 (6.87E-02)	7.96E-08 (1.22E-03)	1.43E-09 (2.20E-05)	7.25E-05 (1.12E+00)

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a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Transuranic.

minimum, maximum, and expected waste forecasts. Thus, the consequences or frequencies for specific accident scenarios could be increased or decreased, depending on the case. Impacts for these cases are addressed in the representative bounding accident descriptions in Section F.5.5.2.1. TE TE

Under the expected waste forecast, 14 additional transuranic and alpha waste storage pads would be required. However, for the minimum waste forecast (6 additional transuranic and alpha waste storage pads), it could be assumed that the frequency of this accident scenario occurring would be less than the expected waste forecast, because fewer containers are at risk due to a deflagration. For the maximum waste forecast (1,173 additional transuranic and alpha waste storage pads), it could be assumed that the frequency of this accident scenario occurring would be much greater than the expected waste forecast, because a great many more containers are at risk due to a deflagration. TE

Accident Scenario 3 – Fire in transuranic culvert at the transuranic and alpha waste storage pads (one transuranic drum): This accident scenario is detailed in Section F.5.5.2.1 and is considered the representative bounding accident for the unlikely accident range.

Accident Scenario 12 – Vehicle crash with resulting fire at the transuranic and alpha waste storage pads: This accident scenario is detailed in Section F.5.5.2.1 and is considered the representative bounding accident for the extremely unlikely accident range. Impacts regarding the alternative B minimum, maximum, and expected waste forecasts would be similar in terms of decreasing and increasing risk, as discussed in the preceding representative bounding accident description. TC

F.5.5.3.2 Impacts from New or Proposed Facilities

Table F-20 identifies one proposed facility for which quantitative or qualitative accident analyses do not exist. This facility is described below. Because the facility is proposed and its design is not complete, quantitative analyses at this point would provide non-meaningful risk information (because the design could be changed) that could be compared to the risk information available for existing facilities. However, DOE will perform quantitative analyses throughout the design, construction, and operation phases of proposed facilities in accordance with requirements, and DOE will ensure that the risks associated with operating these facilities are within established regulatory guidelines. TE

Alpha vitrification facility – The alpha vitrification facility would prepare waste for vitrification, vitrify it, and treat the secondary waste gases and liquids generated by the vitrification process. The waste would include newly generated alpha-contaminated waste and mixed waste, alpha-contaminated waste and mixed waste in storage, and some mixed waste soils. This waste would fall in the following treatability groups: 10 to 100 nanocuries per gram nonmixed; 10 to 100 nanocuries per gram mixed; and greater than 100 nanocuries per gram transuranic waste. All waste would enter this facility in drums transported from the transuranic waste characterization/certification facility. The final vitrified and low-temperature stabilized waste forms would be sent back through the transuranic waste characterization/ certification facility for final certification. The vitrification facility would consist of a thermal pretreatment unit, a melter, an afterburner, and an offgas treatment unit. The afterburner would enhance destruction of any remaining hazardous organic compounds prior to treatment in the offgas system. The offgas system would scrub the gases and minimize the release of any hazardous materials or particulates to the atmosphere. It can be assumed that the accidents initiated by the alpha vitrification facility would be similar to those for the Defense Waste Processing Facility vitrification facility. However, the releases would be minor in comparison. It is also assumed that the offgas treatment unit accidents would be similar to those for the F/H-Area Effluent Treatment Facility.

F.5.5.4 Accident Analysis for Transuranic and Alpha Waste Under Alternative A

The facilities under alternative A are identical to the facilities identified to support alternative B, except that alternative A does not include the alpha vitrification facility. Because the alpha vitrification facility is a proposed facility and as such did not contribute to the representative bounding accidents, it is assumed that the impacts from the postulated radiological scenarios for alternative A are the same as described in Section F.5.5.3.

F.5.5.5 Accident Analysis for Transuranic and Alpha Waste Under Alternative C

This section addresses the impacts of the postulated accidents associated with alternative C considered for the transuranic waste stream.

This section presents potential effects from postulated radiological accidents at facilities identified in Table F-20 for alternative C. Figure F-9 shows the highest risk accident scenarios for the four frequency ranges. As shown in Figure F-9, this alternative consists of many more accident scenarios than the no-action alternative, with a substantial addition of accidents in the unlikely and beyond-extremely-unlikely accident frequency ranges. Table F-24 lists the representative bounding accidents, accident consequences, and latent fatal cancers for exposed workers and the public. DOE assumes that the conclusions regarding the representative bounding accident scenarios could be affected by alternative C minimum, maximum, and expected waste forecasts. The accident analyses for the accident scenarios are based on the conservative assumption of peak utilization of facilities [i.e., the minimum, maximum, and expected waste forecasts would only affect how long the facilities (e.g., Experimental Transuranic Waste

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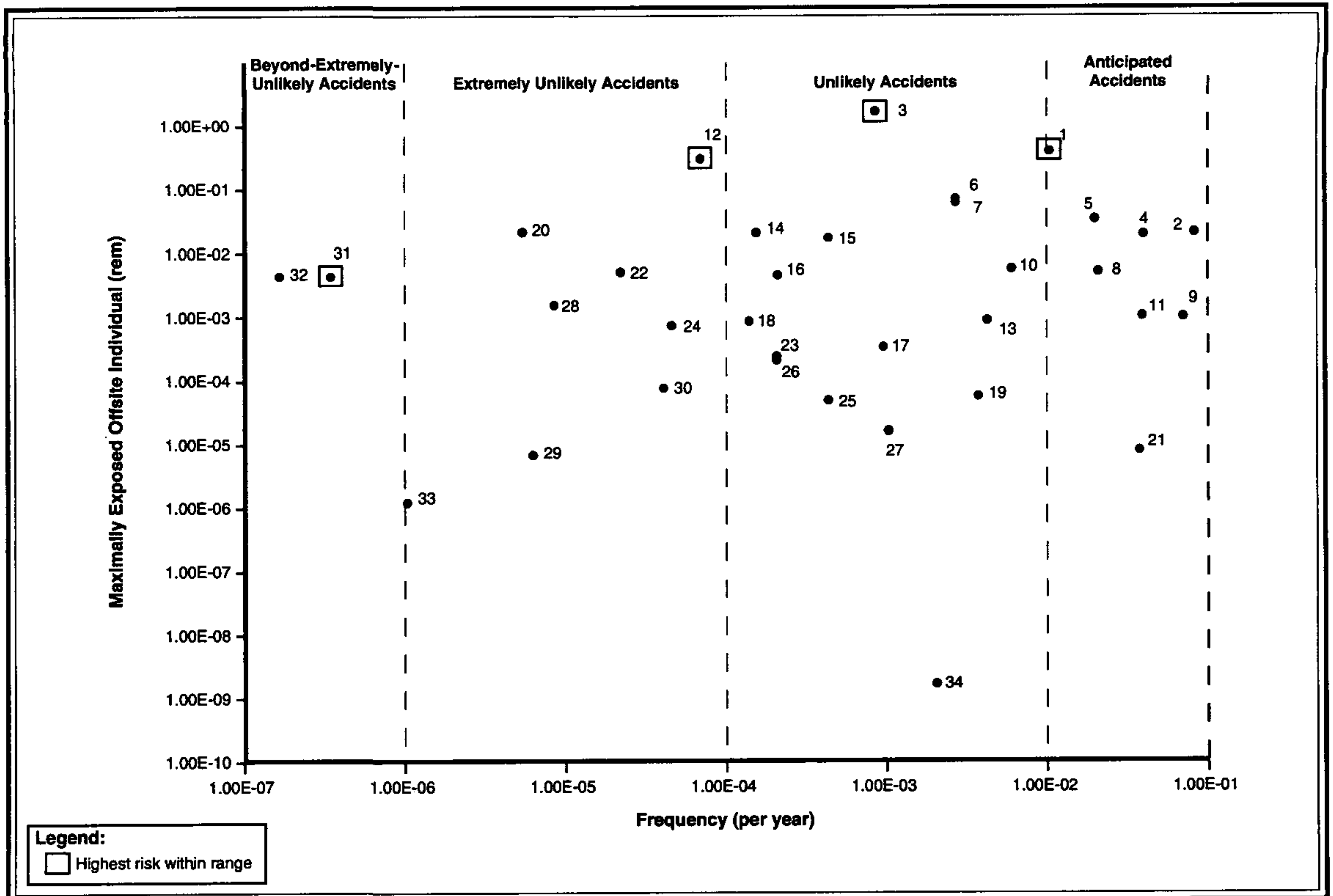

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Figure F-9. Accidents that were analyzed for alternative C for transuranic waste facilities.

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Table F-24. Representative bounding radiological accidents for transuranic waste under alternative C.

			Accident consequences				Point estimate of increased risk per year[a] (increased risk of fatal cancers per occurrence)[b] — Latent fatal cancers			
No.	Accident description	Frequency per year (accident range)	Uninvolved worker at 100 meters (rem)	Uninvolved worker at 640 meters (rem)	Offsite maximally exposed individual (rem)	Population within 80 kilometers[c] (person-rem)	Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Offsite maximally exposed individual	Population within 80 kilometers
1	Deflagration in culvert during TRU[d] drum retrieval activities	1.00E-02 (anticipated)	1.12E+02	3.97E+00	5.72E-02	2.90E+03	8.96E-04 (8.96E-02)	1.59E-05 (1.59E-03)	2.86E-07 (2.86E-05)	1.45E-02 (1.45E+00)
3	Fire in culvert at the TRU[d] waste storage pads (one TRU drum in culvert)	8.10E-04 (unlikely)	4.74E+02	1.69E+01	2.43E-01	1.23E+04	3.07E-04 (3.79E-01)	5.48E-06 (6.76E-03)	9.84E-08 (1.22E-04)	4.98E-03 (6.15E+00)
12	Vehicle crash with resulting fire at the TRU[d] waste storage pads	6.50E-05 (extremely unlikely)	8.59E+01	3.06E+00	4.40E-02	2.23E+03	4.47E-06 (6.87E-02)	7.96E-08 (1.22E-03)	1.43E-09 (2.20E-05)	7.25E-05 (1.12E+00)
	Explosion at CIF[e] - tank farm	3.40E-07 (beyond-extremely-unlikely)	1.28E+00	4.07E-02	7.01E-04	4.79E+01	1.74E-10 (5.12E-04)	5.54E-12 (1.63E-05)	1.19E-13 (3.51E-07)	8.14E-09 (2.40E-02)

a. Point estimate of increased risk per year is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor ¥ annual frequency.
b. Increased risk of fatal cancers per occurrence is calculated by multiplying the consequence (dose) ¥ latent cancer conversion factor.
c. A conservative assumption of 99.5 percentile meteorology was assumed for determining accident consequences for the exposed population within 80 kilometers. A less conservative meteorology (50 percentile) was used to determine the accident consequences for exposed individuals.
d. Transuranic.
e. Consolidated Incineration Facility.

Assay Facility/Waste Certification Facility) would operate]. Therefore, while consequences or frequencies for postulated accidents do not change, the expected duration of risk from a facility-specific accident scenario could be longer or shorter, depending on the case. However, the number of new facilities needed to meet the transuranic waste management requirements could be affected by the minimum, maximum, and expected waste forecasts. Impacts for these cases are addressed in the representative bounding accident descriptions.

Accident Scenario 1 – Deflagration in culvert during drum handling activities. This accident scenario is detailed in Section F.5.5.3.1 and is considered the representative bounding accident for the anticipated accident range.

Accident Scenario 3 – Fire in transuranic culvert at the transuranic and alpha waste storage pads (one transuranic drum): This accident scenario is detailed in Section F.5.5.2.1 and is considered the representative bounding accident for the unlikely accident range. TC

Accident Scenario 12 – Vehicle crash with resulting fire at the transuranic and alpha waste storage pads: This accident scenario is detailed in Section F.5.5.2.1 and is considered the representative bounding accident for the extremely unlikely accident range. Impacts regarding alternative B minimum, maximum, and expected waste forecasts would be similar in terms of decreasing and increasing risk, as discussed in the preceding representative bounding accident description.

Accident Scenario 31 – Explosion of tanks associated with the Consolidated Incineration Facility: This accident scenario is detailed in Section F.5.2.3.1 and is considered the representative bounding accident for the beyond extremely unlikely accident range.

F.5.5.6 Impacts to Involved Workers from Accidents Involving Transuranic and Alpha Waste

While it is not a representative bounding accident in this analysis, a criticality in the transuranic waste characterization/certification facility could be the most dangerous accident scenario for the involved worker. Direct radiation could affect personnel in the facility, depending on their proximity to the accident location and the degree of shielding in place. Potentially lethal radiation doses (approximately 400 rem) could be received by a person about 7 meters (23 feet) from an unshielded event producing 2.0E+17 fissions. Because 2.0E+18 fissions are assumed for a criticality in the transuranic waste characterization/certification facility, it is estimated that the dose at 7 meters (23 feet) would be approximately 4,000 rad. The 12-inch-thick concrete walls of the waste preparation cell would reduce the radiation dose by a factor of approximately 10, although cell windows would probably provide less protection. Personnel adjacent to the walls of the waste preparation cell could receive fatal doses.

If the high efficiency particulate air filters were bypassed, as assumed in the transuranic waste characterization/certification facility fire scenario, the combustion products would be exhausted to the atmosphere via the sand filter. Thus, DOE assumes no fatalities to workers from radiological consequences. Additionally, operators in the waste preparation cell of the transuranic waste characterization/certification facility would be equipped with respiratory protection and would follow facility-specific and SRS safety procedures.

Accident scenarios involving transuranic waste drum retrieval operations are not expected to result in serious injury or fatalities to involved workers due to radiological consequences. There would be a containment structure for the vent and purge station to protect workers from injury due to a deflagration in a waste drum. Portable air monitors would be required for this operation, in addition to a contamination control hut with a carbon high efficiency particulate air filter exhaust, which would prevent serious injury to adjacent workers due to exposure. Workers inside the contamination hut would be required to wear protective equipment, including respirators, when there is a potential for an airborne contamination.

F.5.5.7 Impacts from Transuranic and Alpha Waste Chemical Accidents

A chemical hazards analysis was performed for the transuranic and alpha waste storage pads. For a discussion of the hazard analysis methodology, refer to Section F.4.2. In the hazards assessment document prepared for the transuranic waste storage pads, specific accidents were not analyzed. Instead, the entire quantity of chemicals in each segment was assumed to be released. Table F-25 lists the results of this chemical assessment. Because the concentrations do not exceed the ERPG-1 limits, no further analyses were performed. The preliminary chemical hazards analysis performed in conjunction with the initial hazard categorization of the transuranic and alpha waste storage pads provides a bounding chemical analysis for the transuranic and alpha waste. The transuranic waste storage pads are representative of the entire transuranic and alpha waste inventory contained in E-Area. Other facilities such as the transuranic waste characterization/certification facility, alpha vitrification facility, and transuranic waste retrieval activities involve the manipulation of the transuranic and alpha waste inventory, including chemicals contained on the transuranic and alpha waste storage pads.

Table F-25. Transuranic and alpha waste storage pads chemical hazards analysis results.[a]

Chemical	Quantity (kg)[b]	Onsite concentration 100 meters (328 feet) (mg/m^3)[c]	Offsite concentration (mg/m^3)[c]	ERPG-1[d] (mg/m^3)[c]	ERPG-2[d] (mg/m^3)[c]	ERPG-3[d] (mg/m^3)[c]
Beryllium	3.74E+04	1.67E+01	8.23E-03	5.00E-03	1.00E-02	1.00E+01
Cadmium	7.50E+05	3.33E+02	1.65E-01	1.50E-01	2.50E-01	5.00E+01
Chloroform	3.75E+04	8.33E+03	4.11E+00	1.47E+02	4.88E+02	4.88E+03
Chromium	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.50E+00	(e)
Copper	1.50E+05	6.67E+01	3.29E-02	3.00E+00	5.00E+00	(e)
Lead	1.50E+06	6.67E+02	3.29E-01	1.50E-01	2.50E-01	7.00E+02
Lead nitrate	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.50E-01	7.00E+02
Mercuric nitrate	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.00E-01	2.80E+01
Mercury	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.00E-01	2.80E+01
Methyl isobutyl ketone	3.75E+04	1.67E+02	8.23E-02	3.07E+02	1.02E+03	1.23E+04
Nickel nitrate	3.75E+04	1.67E+01	8.23E-03	3.00E+00	5.00E+00	(e)
Silver nitrate	3.75E+04	1.67E+01	8.23E-03	3.00E-01	5.00E-01	(e)
Sodium chromate	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.50E-01	3.00E+01
Toluene	3.75E+04	8.33E+03	4.11E+00	3.77E+02	7.54E+02	7.54E+03
Trichlorotrifluoro-ethane	3.75E+04	1.67E+01	8.23E-03	9.58E+03	1.15E+04	3.45E+04
Uranyl nitrate	3.75E+04	1.67E+01	8.23E-03	1.50E-01	2.50E-01	3.00E+01
Xylene	3.75E+04	1.67E+02	8.23E-02	4.34E+02	8.69E+02	4.34E+03
Zinc	3.75E+04	1.67E+01	8.23E-03	3.00E+01	5.00E+01	(e)
Zinc nitrate	3.75E+04	1.67E+01	8.23E-03	3.00E+01	5.00E+01	(e)

a. The chemicals presented in this table are those for which concentration guidelines were available.
b. Kilograms. To convert to pounds, multiply by 2.2046.
c. Milligrams per cubic meter of air.
d. Emergency Response Planning Guideline. See Table F-3.
e. No equivalent value found.

While the chemical analysis did not address frequencies associated with chemical releases, some qualitative statements concerning the frequency of chemical releases can be made. Because the chemical inventory contained on the transuranic and alpha waste storage pads is widely dispersed, it is difficult to identify a credible accident scenario that could liberate the entire or even a large portion of the chemical inventory. More probable are the accident scenarios identified in Section F.5.3, which would release small amounts of hazardous chemicals along with radionuclides.

TE A chemical hazards analysis was performed for the Consolidated Incineration Facility. The results of this analysis are described in Section F.5.4.7.

F.6 Cumulative Impacts from Postulated Accidents

A severe seismic event was identified as the only reasonably foreseeable accident that has the potential to initiate simultaneous releases of radioactive or toxic materials from multiple facilities at SRS. A design-basis earthquake, which has an estimated ground acceleration of 0.2 times the acceleration of gravity (0.2*g*) potentially could impact multiple facilities. An earthquake of this magnitude is estimated to have TC TE a 2.0×10^{-4} annual probability of occurrence (1 in 5,000 years). Analyses estimating the cumulative impacts from multiple facility releases caused by a severe earthquake at SRS have not been included in TE the list of potential accidents (Tables F-4, F-9, F-14, and F-21). Such analyses would be based on the assumption that the earthquake breaches all of the buildings and their materials are released. Even accounting for release fractions and taking credit for existing facility design parameters, this type of analysis is considered too conservative because it is not expected that an earthquake of 0.2*g* would cause equivalent amounts of damage at multiple locations. Trying to realistically estimate impacts from multiple facilities at different locations would inherently include a margin of error of sufficient magnitude to compromise the confidence in the resulting estimate.

The illustration below is based on the unlikely assumption that an earthquake would cause each postulated accident scenario initiated by an earthquake to occur simultaneously. However, the analysis TC shows that the cumulative risk of these simultaneous accidents would be less than the highest-risk accident (Table F-26). Table F-26 lists the risk of each earthquake-initiated accident and the sum of TC those risks. The highest-risk event is more than 10 times the cumulative seismic-event risk for each corresponding waste type.

The synergistic effects of chemical hazards from simultaneous releases from a common accident initiator were not evaluated due to the scarcity of information about the effects of concurrent exposure to various chemical combinations. DOE is not aware of synergistic effects resulting from simultaneous exposures to radiation and a carcinogenic chemical, such as benzene, each of which is known to result in an increased incidence of cancer. Indeed, synergistic effects of radiation and other agents have been identified in only a few instances, most notably the combined effects of radiation exposure and smoking causing lung cancer among uranium miners. Radioactivity released simultaneously with hazardous chemicals could affect the clean-up or mitigation of the resulting hazard that could have a greater impact than if the releases were separate.

Table F-26. Conservative estimate of risk from seismic accidents.

	High-level waste[a]		Hazardous and mixed waste[b]		Low-level waste[c]		Transuranic waste[d]	
	Accident number	Risk (rem/yr)	Accident number	Risk (rem/yr)	Accident number	Risk (rem/yr)	Accident number	Risk (rem/yr)
	3	1.63 E-05	6	9.30E-05	14	2.65E-07	17	2.65E-07
	13	6.82E-07	11	1.17E-05			23	4.56E-08
	27	6.76E-09	13	3.30E-06			26	1.62E-08
	28	5.54E-09	20	2.65E-07				
	33	1.88E-09	26	3.08E-08				
	34	1.54E-09	36	5.54E-09				
	40	5.00E-10	37	1.88E-09				
	56	7.71E-11	39	1.54E-09				
	66	1.38E-11	41	5.00E-10				
			48	7.71E-11				
			53	2.34E-11				
			56	1.38E-11				
Total seismic risk		1.70E-05		1.08E-04		2.65E-07		3.27E-07
Highest risk accident		1.91E-04		5.26E-03		5.20E-03		4.56E-03

a. See Table F-4.
b. See Table F-14.
c. See Table F-9.
d. See Table F-21.

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F.7 Secondary Impacts from Postulated Accidents

The primary focus of accident analyses performed to support the operation of a facility is to determine the magnitude of the consequences of postulated-accident scenarios on public and worker health and safety. DOE recognizes that accidents involving releases of materials can also adversely affect the surrounding environment. To determine the greatest impact that could occur to the environment from the postulated accidents, DOE evaluated each radiological accident scenario to determine potential secondary impacts.

F.7.1 BIOTIC RESOURCES

The consequences of a postulated accident on biotic resources have not been studied. DOE believes that the area of contamination from the postulated-accident scenarios would be localized. Terrestrial biota in or near the contaminated area could be exposed to small quantities of radioactive materials and ionizing radiation until the affected areas could be decontaminated. Effects on aquatic biota would be minor, since no waste management facilities are near any major bodies of water.

F.7.2 WATER RESOURCES

No adverse impacts on water quality from the postulated-accident scenarios are considered likely. Contamination of the groundwater or surface water due to the postulated releases would be minor. Contamination would migrate slowly to the groundwater, so the clean-up efforts that would follow a release incident would capture the contaminants before they reached groundwater.

F.7.3 ECONOMIC IMPACTS

With the exception of the economic effects generated by severe-accident scenarios, such as those initiated by severe earthquakes, limited economic effects would occur as a result of accident scenarios postulated in this appendix. Clean-up of contamination would be localized at the facility where the accident occurred, and DOE expects that the current workforce could perform the clean-up activities. In addition, DOE expects that offsite contamination would be limited or nonexistent.

F.7.4 NATIONAL DEFENSE

The postulated-accident scenarios considered for SRS waste management facilities would not affect national defense.

F.7.5 ENVIRONMENTAL CONTAMINATION

Contamination of the environment from the postulated accidents for SRS waste management facilities would be limited to the immediate area surrounding the facility where the accident occurred. It is unlikely that the postulated accidents would result in offsite contamination.

F.7.6 THREATENED AND ENDANGERED SPECIES

Habitats of Federally listed threatened or endangered species have not been identified in the immediate vicinity of the SRS waste management facilities. Because the accident scenarios postulated in this appendix would result only in localized contamination, DOE does not expect these accidents to affect threatened or endangered species.

F.7.7 LAND USE

Because the accidents postulated in this appendix would result in only localized contamination around the facility where an accident occurred, and no measurable offsite contamination is likely, DOE expects no impacts on land use.

F.7.8 TREATY RIGHTS

The environmental impacts of accidents postulated in this appendix would be within the SRS boundaries. Because there are no Native American lands within SRS boundaries, treaty rights would not be affected. TE

F.8 Accident Mitigation

An important part of the accident analysis process is to identify actions that can mitigate consequences from accidents if they occur.[3] This section summarizes the SRS emergency plan, which governs responses to accident situations that affect SRS employees or the offsite population. TE

The *Savannah River Site Emergency Plan* defines appropriate response measures for the management of site emergencies (e.g., radiological or hazardous material accidents). It incorporates into one document a TE

[3]It should be noted that no credit was taken for accident response under the SRS emergency plan in determining the potential consequences and risks to workers or members of the public presented in earlier sections of this appendix.

description of the entire process designed to respond to and mitigate the consequences of an accident. For example, protective actions guidelines are established for accidents involving chemical releases to keep onsite and offsite exposures as low as possible. Exposure is minimized or prevented by limiting the time spent in the vicinity of the hazard or the release plume, keeping personnel as far from the hazard or plume as possible (e.g., physical barricades and evacuation), and taking advantage of available shelter. Emergencies that could cause activation of this plan or part of it include the following:

- Events (operational, transportation, etc.) with the potential to cause releases above allowable limits of radiological or hazardous materials.

- Events such as fires, explosions, tornadoes, hurricanes, earthquakes, dam failures, etc., that affect or could affect safety systems designed to protect SRS and offsite populations and the environment. TE

- TE Events such as bomb threats, hostage situations, etc., that threaten the security of SRS.

- Events created by proximity to other facilities, such as the Vogtle Electric Generating Plant (a commercial nuclear power plant across the Savannah River from SRS) or nearby commercial chemical facilities. TE

Depending on the types of accidents and the potential impacts, emergencies are classified into one of several categories in accordance with requirements defined in the DOE 5500 series of orders. Incidents classified as "alerts" are expected to be confined within the affected facility boundary. Measurable impacts to workers outside the facility boundary or members of the public would be expected from incidents classified as alerts. Incidents classified as "Site Area Emergencies" represent events that are in progress or have occurred and involve actual or likely major failures of facility safety or safeguards systems needed for the protection of onsite personnel, the public, the environment, or national security. Because Site Area Emergencies have the potential to impact workers at nearby facilities or members of the public in the vicinity of SRS, these emergency situations require notification of and coordination of responses with the appropriate local authorities. Incidents classified as "General Emergencies" are events expected to produce consequences that require protective actions to minimize impacts to both workers and the public. Under General Emergencies, full mobilization of available onsite and offsite resources is usually required to deal with the event and its consequences.

TE In accordance with the *Savannah River Site Emergency Plan*, drills and exercises are conducted frequently at SRS to develop, maintain, and test response capabilities and validate the adequacy of emergency facilities, equipment, communications, procedures, and training. For example, drills for the following accident scenarios are conducted periodically in the facilities or facility areas: facility/area evacuations; shelter protection; toxic gas releases; nuclear incident monitor alarms (which activate following an inadvertent nuclear criticality); fire alarms; medical emergencies; and personnel accountability (to ensure that all personnel have safely evacuated a facility or area following an emergency). Periodic drills are also conducted with the following organizations or groups and independently evaluated by the operating contractor and DOE to ensure that they continue to maintain (from both a personnel and equipment standpoint) the capability to adequately respond to emergency situations: first aid teams; rescue teams; fire wardens and fire-fighting teams; SRS medical and health protection personnel, as well as personnel from the nearby Eisenhower Army Medical Center; SRS and local communications personnel and systems; SRS security forces; and SRS health protection agencies.

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APPENDIX G

SRS FEDERAL FACILITY AGREEMENT APPENDIXES

G.1 Introduction

This appendix provides a list of Resource Conservation and Recovery Act (RCRA) facilities, units, and sites referred to in the EIS. Section G.1 lists the RCRA/ Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) units identified in Appendix C "RCRA/CERCLA Units List" of the Savannah River Site (SRS) Federal Facility Agreement (EPA 1993). Section G.2 lists the RCRA-regulated units identified in Appendix H "RCRA-Regulated Units List" of the SRS Federal Facility Agreement. Section G.3 lists the Site Evaluation units identified in Appendix G "Site Evaluation List" of the SRS Federal Facility Agreement. DOE is required to conduct RCRA Facility Investigation/Remedial Investigations for the units listed in Section G.1 and remedial or removal evaluations for the sites listed in Section G.3. Section G.4 lists references. The EIS waste forecasts were developed based on the May 11, 1992, version of the SRS Federal Facility Agreement's Appendixes. TE TE TE TE

This section lists the RCRA/CERCLA units identified in Appendix C, "RCRA/CERCLA Units List," of the SRS Federal Facility Agreement.

108-4R Overflow Basin
211-FB Pu-239 Release
716-A Motor Shop Seepage Basin
A-Area Burning/Rubble Pits
A-Area Coal Pile Runoff Basin
A-Area Miscellaneous Rubble Pile
A-Area Rubble Pit
Burial Ground Complex
Burma Road Rubble Pit
C-Area Burning/Rubble Pit
C-Area Coal Pile Runoff Basin
C-Area Reactor Seepage Basins
Central Shops Burning/Rubble Pit (631-6G)
Central Shops Burning/Rubble Pit (631-5G)
Central Shops Burning/Rubble Pit (631-1G, 3G)
Central Shops Sludge Lagoon
CMP Pits
D-Area Ash Basin
D-Area Burning/Rubble Pits
D-Area Coal Pile Runoff Basin

D-Area Oil Seepage Basin

D-Area Waste Oil Facility

F-Area Burning/Rubble Pits

F-Area Coal Pile Runoff Basin

F-Area Inactive Process Sewer Lines from Building to the Security Fence

F-Area Retention Basin

Fire Department Hose Training Facility

Ford Building Seepage Basin

Ford Building Waste Site

G-Area Oil Seepage Basin

Gas Cylinder Disposal Facility

Grace Road Site

Gunsite 113 Access Road

Gunsite 218 Rubble Pile

Gunsite 720 Rubble Pit

H-Area Coal Pile Runoff Basin

H-Area Inactive Process Sewer Lines from Building to the Security Fence

H-Area Retention Basin

Hydrofluoric Acid Spill

K-Area Bingham Pump Outage Pits

K-Area Burning/Rubble Pit

K-Area Coal Pile Runoff Basin

K-Area Reactor Seepage Basin

K-Area Rubble Pile

K-Area Sludge Land Application Site

L-Area Bingham Pump Outage Pits

L-Area Burning/Rubble Pit

L-Area Hot Shop

L-Area Oil/Chemical Basin and L-Area Acid/Caustic Basin

L-Area Rubble Pit (131-1L)

L-Area Rubble Pit (131-3L)

M-Area Settling Basin Inactive Process Sewers to Manhole 1

M-Area West

Miscellaneous Chemical Basin/Metals Burning Pits

New TNX Seepage Basin

Old F-Area Seepage Basin

Old TNX Seepage Basin

P-Area Bingham Pump Outage Pits

P-Area Burning/Rubble Pit

P-Area Coal Pile Runoff Basin

Par Pond

Par Pond Sludge Land Application Site

R-Area Acid/Caustic Basin

R-Area Bingham Pump Outage Pits

R-Area Burning/Rubble Pits

R-Area Reactor Seepage Basins

Road A Chemical Basin

Silverton Road Waste Site

SRL 904-A Process Trench

SRL Oil Test Site

SRL Seepage Basins

Tank 16

Tank 37 CTS Line Leak

TNX Burying Ground

TNX Groundwater

Warner's Pond

West of SREL "Georgia Fields" Site

G.2

This section lists the RCRA-regulated units identified in Appendix H, "RCRA-Regulated Units List," of the SRS Federal Facility Agreement.

Met Lab Basin/Carolina Bay
Acid/Caustic Basins, F-, H-, K-, and P-Areas (4 units)
Burial Ground Solvent Tanks (S23 - S30) (8 units)
DWPF Organic Storage Tank
F-Area Hazardous Waste Management Facility (3 units)
H-Area Hazardous Waste Management Facility (4 units)
Hazardous Waste Storage Buildings (including Solid Waste Storage Pads) (4 units)
Low Level Radioactive Waste Disposal Facility (RCRA regulated portions)
M-Area Hazardous Waste Management Facility (2 units)
M-Area Interim Treatment/Storage Facility
Mixed Waste Management Facility
Mixed Waste Storage Building (643-29E)
Mixed Waste Storage Building (643-43E)
Mixed Waste Storage Tank (S-32)
New TNX Seepage Basin
Sanitary Landfill
SRL Mixed Waste Storage Tanks
SRL Seepage Basins (4 units)
TRU Waste Storage Pads 1 through 6 (6 units)
TRU Waste Storage Pads 7 through 17 (11 units)

G.3

This section lists the Site Evaluation units identified in Appendix G, "Site Evaluation List," of the SRS Federal Facility Agreement.

R-Area Asbestos Pit
D-Area Asbestos Pit
C-Area Asbestos Pit (080-21G)
C-Area Asbestos Pit (080-22G)
H-Area Erosion Control Site
L-Area Erosion Control Site
Substation 51 Erosion Control Site
F-Area Erosion Control Site
Gunsite 051 Rubble Pile
Gunsite 102 Rubble Pile
Gunsite 072 Rubble Pile
C-Area Disassembly Basin
K-Area Disassembly Basin
L-Area Disassembly Basin
P-Area Disassembly Basin
R-Area Disassembly Basin
Cooling Water Effluent Sump
Purge Water Storage Basin
C-Area Erosion Control Site
P-Area Erosion Control Site
Gas Cylinder Disposal Facility
R-Area Rubble Pit
L-Area Rubble Pit
Concrete Lake (R-Area)
C-Area Reactor Cooling Water System
K-Area Reactor Cooling Water System
L-Area Reactor Cooling Water System
P-Area Reactor Cooling Water System
C-Area Ash Pile
K-Area Ash Basin
L-Area Ash Basin

P-Area Ash Basin

R-Area Ash Basin

C-Area Ash Pile (188-1C)

C-Area Ash Pile (188-2C)

F-Area Separations Facilities and Associated Spills

H-Area Separations Facilities and Associated Spills

F-Area Scrap Lumber Pile

F-Area Tank Farm

H-Area Tank Farm (except Tank 16)

RBOF (Receiving Basin for Offsite Fuels)

H-Area Retention Basin (281-1H)

H-Area Retention Basin (281-2H)

F-Area Retention Basin

H-Area Retention Basin (281-8H)

F-Area Ash Basin (288-0F)

H-Area Ash Basin

F-Area Ash Basin (288-1F)

Underground Sump 321-M #001

Underground Sump 321-M #002

D-Area Rubble Pit

D-Area Waste Oil Facility

D-Area Ash Basin (488-1D)

D-Area Ash Basin (488-2D)

Rubble Pile - Cemetery Road

Rubble Pile - Bragg Bay Road and Cemetery Road

Rubble Pile - Road 781.1

Rubble Pile - Bragg Bay Road

Gunsite 113 Rubble Pile

Risher Road Open Metal Pit

Scrap Metal Pile

R-Area Rubble Pile

L-Area Rubble Pile

Central Shops Scrap Lumber Pile

Miscellaneous Rubble Pile

3G Pumphouse Erosion Control Site

SRFS Rubble Pile

Neutralization Sump

L-Area Hot Shop

Salvage Yard

New Salvage Yard

40-Acre Hardwood Site

Lower Kato Road Site

Orangeburg Site

Lucy Site

Kato Road Site

Road F Site

Second Par Pond Site

SREL Rubble Pile

Spill on 4/24/91 of 0.11 Ci of Pu-239

Low Level Radioactive Drain Lines

A-Area Ash Pile (788-0A)

A-Area Ash Pile (788-2A)

P-Area Reactor Seepage Basin (904-061G)

P-Area Reactor Seepage Basin (904-062G)

P-Area Reactor Seepage Basin (904-063G)

L-Area Reactor Seepage Basin

C-Area Reactor Seepage Basin (904-066G)

C-Area Reactor Seepage Basin (904-067G)

C-Area Reactor Seepage Basin (904-068G)

K-Area Containment Basin

Fire Department Hose Training Facility

313-M and 320-M Inactive Clay Process Sewers to Tims Branch

Advanced Tactical Training Area (ATTA) Firing Ranges

Arsenic Treated Wood Storage Area

B-Area Sanitary Treatment Plant Rubble Pile

B-Area Tower Foundation

Beaver Dam Creek

Central Shops Area of Concern

D-F Steamline Erosion Control Site

Ditch to Outfall H-12 (Tributary to Four Mile Creek)

Diversion Box - Radioactivity from 907-1H

DWPF Concrete Batch Plant

F-Area Railroad Crosstie Pile

F-Area Sanitary Sludge Land Application Site

Fire Training Pit at 709-1F

Four Mile Branch

Groundwater, F-, H-, K-, P-Area Acid/Caustic Basin

Groundwater, R-Area

Gun Emplacement 407A and 407B Rubble Pile

Gunsite 012 Rubble Pile

H-Area Burning Pit

H-Area Sanitary Sludge Land Application Site

IMHOFF Tank Rubble Pile

Indian Grave Branch

K-Area Area of Concern

L-Area Scrap Metal and Wood

L-Lake

Lower Three Runs Creek

Meyers Mill Siding Rubble Pile

Miscellaneous Rubble at Dunbarton

Miscellaneous Trash at Snapp

Old Ellenton Rubble Pile

Old R-Area Discharge Canal

Parking Lot Type Lights on Wilson Road

Patterson Mill Road Rubble Pile

Pen Branch

Pile of Telephone/Light Poles

Pond B Dam Rubble Pile

Potential Release of Caustic/HNO_3 from 312-M

Potential Release of Diesel Fuel and Benzene from 730-M

Potential Release of $NaOH/H_2SO_4$ from 183-2L

Potential Release of $NaOH/H_2SO_4$ from 183-2R

Potential Release of $NaOH/H_2SO_4$ from 280-1F

Potential Release of TCT, TET CE, HNO_3, U, Heavy Metals from 321-M Abandoned Sewer Line

Process and Sewer Lines as Abandoned

Reactor Areas Cask Car Railroad Tracks as Abandoned

Recreation Area #002 Rubble Pile

Risher Road Rubble Pile

Risher Road Rubble Pile #2

Road 3 Foundation Rubble Pile

Road 9 at Gate 23 Rubble Pile

Road 9 Rubble Pile

Robbins Station Road Rubble Pile

Rubble Pile Across from Gunsite 012

Rubble Pile Near Junction U.S. 278 and GE Road 103

Rubble Pile North of SRL

S-Area Erosion Control Site

Sandblast Areas

Savannah River

Savannah River Swamp

Silverton Road Waste Tank Plugs

Small Arms Training Area (SATA)

Stadia Lights with Poles

Steed Pond

Steel Creek

Steel Creek Swamp

Stormwater Outfall A-002

Stormwater Outfall A-024

Stormwater Outfall H-013

Stormwater Outfall K-011

Stormwater Outfall L-012

Stormwater Outfall P-010

TCU Rubble Pile

Tims Branch

TNX Rubble Pile

Unnamed Tributary of Four Mile Branch South of C-Area

Unnumbered Gun Emplacement Rubble Pile

Upper Three Runs Creek

Warners Pond (Spill on 9/24/56 of Beta-Gamma)

Combined Spills from 105-C, 106-C, and 109-C

Combined Spills from 105-K, 106-K, and 109-K

Combined Spills from 105-P, 106-P, and 109-P

Combined Spills from 105-R, 106-R, and 109-R

Combined Spills from 183-2

Combined Spills from 183-2K

Combined Spills from 183-2P

Combined Spills from 211-H

Combined Spills from 241-84H

Combined Spills from 241-H (H-Area Tank Farm)

Combined Spills from 242-F

Combined Spills from 242-H

Combined Spills from 483-D and Associated Areas

Combined Spills from 643-G

Combined Spills from 672-T

Combined Spills from 674-T (Boneyard)

Combined Spills from 679-T

Combined Spills from 701-1T

Spill of Mercury Adjacent to Building 780-2A

Spill of Mercury in Building 232-H

Spill of Uranyl Nitrate (1/2 Ton)

Spill of Pu-239 from 221-FB

Spill of Retention Basin Pipe Leak

Spill of Beta-Gamma (<1 Ci)

Spill of Beta-Gamma (<1 Ci)

Spill of Seepage Basin Pipe Leak from 904-44G

Spill of Rad Liquid from Solvent Trailer

Spill of Seepage Basin Pipe Leak Between 904-42G and 904-43G

Spill of Segregated Solvent from 211-F

Spill of Flush Water - Rad (500 square feet)

Spill of Waste Tank Spill

Spill of Seepage Basin Pipe Leak

Spill of Flush Water - Rad (100 square feet)

Spill of Rad Water from 773-A

Spill of Waste Water - Rad (50 gallons)

Spill of Waste Water - Rad (3 gallons)

Spill of Rad Contaminated Soil

Spill of PCE

Spill of 50% Nitric Acid (200 gallons)

Spill of 50% Sodium Hydroxide (600 pounds)

Spill of 50% Sodium Hydroxide (50 gallons)

Spill of H-Area Process Sewer Line Cave-In

Spill of Seepage Basin Pipe Leak in H-Area Seepage Basin

Spill of Sump Overflow

Spill of Diversion Box Overflow from 281-1H

Spill of Contaminated Water

Spill of Contaminated Liquid

Spill of Acid in D-Area

Spill of 50% Nitric Acid (5,600 pounds)

Spill of Waste Water - Rad (less than 5 gallons)

Spill of Chromated Water from H-Area Pump House

Spill of Nitric Acid (3 gallons)

Spill of Chromated Water from Valve House 3

Spill of 34% Aluminum Nitrate

Spill of Uranyl Nitrate (100 pounds)

Spill of Contaminated Flush Water

Spill of Hydrogen Sulfide

Spill of Chromated Water

Spill of Low Level Waste from Trailer

Spill of Chromated Water from 243-H

Spill of Hydrogen Sulfide

Spill of Acid Solution

Spill of 31.5% Hydrochloric Acid from 183-P

Spill of Radioactive Spill

Spill of Oil - Rad

Spill of Fine-Organic #101 from 8307Z

Spill of Low Level Water Near 105-C

Spill of Tritiated Water in C-Area

Spill of Sodium Hydroxide

Spill of Simulated Salt Solution, Pizzolith 122R in 643-7G

Spill of Chromated Water from 221-F

Spill of Chilled Water

Spill of Process Solution

Spill of Water - Rad (200 gallons)

Spill of 6% Potassium Permanganate

Spill of Aluminum Nitrate

Spill of Caustic (50 gallons)

Spill of Acid Mixture from S-Area Trailer S-16

Spill of Water Vapor - Rad

Spill of 64% Nitric Acid from 221-F

Spill of Sulfuric Acid (25 milliliters)

Spill of Alcohol from 779-A

Spill of Cooling Water from Tank Farm

Spill of Process Water from 106-P

Spill of Mercury Near 284-F

Spill of Hydrochloric Acid From S-Area

Spill of Uranyl Nitrate (500 gm)

Spill of Mercury from 748-A

Spill of Nitric Acid (1 1/2 gallons)

Spill of Nitric Acid at Barricade 10

Spill of Aropol from 690-G

Spill of Chromated Water from Between 702-A and 708-A

Spill of Phosphoric Acid

Spill of 50% Sodium Hydroxide (2 gal)

Spill of Plating Solution

Spill of Water - Rad from 106-1C

Spill of 50% NaOH from 341-M

Spill of Acid (10 gallons)

Spill of Caustic (6 gallons)

Spill of Nitric Acid (10 gallons)

Spill of Water - Rad (1/2 pint)

Spill of Water - Rad (less than 1 gallon)

Spill of 50% Sodium Hydroxide (2 gal)

Spill of Nitric Acid (2 gallons)

Spill of Neutralization System Water

Spill of Tritiated Waste Oil from 110-P

Spill of Water - Rad (20 gallons)

Spill of Water - Rad (1 gallon)

Spill of 50% Sodium Hydroxide (5 gal) 01/01/87

Spill of Potassium Permanganate

Spill of Caustic (20 gallons)

Spill of Mercury North of 211-H

Spill of Sulfuric Acid Between 704-8F and 703-F Parking Lot

Caustic (1 gallon)

Chromated Water from 241-24H

Acidic Water (15 gallons)

Cr III Ligno - Sulfonate

Chromated Water from 772-F

Water - Rad (15 gallons)

Water from 300-M

Caustic from 295-H

50% Sodium Hydroxide

Water - Rad (~1 gallon)

Bromocide Solution from 607-14D

Water - Rad

Bromocide Solution from 607-22P

KOH, SMBS, $NaPO_4$ from 784-A

64% Nitric Acid at Barricade 1

Sulfuric Acid (less than 1 gallon)

Acidic Water (15 gallons)

Ethylene Glycol-Rad from 772-F

64% Nitric Acid in F-Area

Cs-137 from 254-8H

G.4 Reference

EPA (U.S. Environmental Protection Agency), 1993, Federal Facility Agreement between the U.S. Environmental Protection Agency, Region IV, the U.S. Department of Energy, and the South Carolina Department of Health and Environmental Control, Docket No. 89-05-FF, August 16.

APPENDIX H

ALTERNATIVE APPROACHES TO LOW-LEVEL WASTE REGULATION

APPENDIX H
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APPENDIX H
ALTERNATIVE APPROACHES TO LOW-LEVEL WASTE REGULATION

The U.S. Department of Energy (DOE) received comments during the scoping process requesting several analyses and comparisons of potential alternative regulatory regimes for low-level radioactive wastes. Among these was the suggestion that DOE consider the regulation of its low-level radioactive waste disposal activities by an independent organization, presumably the Nuclear Regulatory Commission, which regulates disposal of low-level radioactive wastes from their licensees. Comparison of current DOE low-level radioactive waste vault designs with a vault designed to meet the U.S. Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act (RCRA) requirement and the Nuclear Regulatory Commission's commercial low-level radioactive waste disposal standards, and comparison of DOE's current low-level radioactive waste vault design with its current methods for shallow land disposal were also requested. DOE is bound by existing law (Atomic Energy Act) to regulate its low-level radioactive waste disposal activities. A change in regulatory authority for these activities would constitute a major change in approach, including changes in legislation. Such considerations are well beyond the scope of this EIS and are not discussed further. This appendix focuses instead on the comparison of alternative regulatory regimes as requested by the commentor.

The first analysis identifies the similarities and differences in the requirements established by DOE and the Nuclear Regulatory Commission for the disposal of low-level radioactive waste. This comparison permits an assessment of the potential for substantive differences in the impacts of such disposal operations. This section also presents a description of the RCRA hazardous waste landfill design requirements (40 CFR 264.301) to which Savannah River Site (SRS) vault designs can be compared. Comparisons of the performance of existing shallow land disposal at SRS with alternative engineered disposal systems were presented in an earlier EIS [*Waste Management Activities for Groundwater Protection, Savannah River Plant* (DOE 1987)] and are not repeated here. TE

H.1 DOE and Nuclear Regulatory Commission Technical Regulatory Requirements for Low-Level Radioactive Waste

The basic DOE requirements for low-level radioactive waste management are established in DOE Order 5820.2A (9/26/88), and those of the Nuclear Regulatory Commission in 10 CFR 61 (12/27/82). Several basic factors shape the nature and extent of the respective sets of requirements:

- DOE is a major generator of low-level radioactive waste at a number of its operating facilities and has substantial technical and research and development resources and expertise in its staff and those of its operating contractor/waste generator organizations. DOE's requirements extend to the waste generator as well as to the operator of disposal facilities which, for its major sites, are staffed by the same contractor organization and are under DOE's direction.

- DOE's requirements implicitly recognize that its major waste-generating sites tend to be diverse in the scope of their activities, materials handled, and wastes produced. DOE's requirements also recognize that these sites tend to be large in size and relatively isolated in location (compared to typical commercial, industrial, or academic licensees of the Nuclear Regulatory Commission). As
TE a result, DOE's policy explicitly requires that low-level radioactive waste be disposed of at its site of origin to the extent possible.

- Nuclear Regulatory Commission regulations are more detailed, prescriptive, and process-oriented than those of DOE, consistent with the legal role of the agency as a purely regulatory organization, and the adversarial nature of its licensing and hearing processes. The regulations are also supported by such other documents as Regulatory Guides, Standard Review Plans, and
TE Technical Positions that further expand the direction of and guidance to applicants and licensees.

- Nuclear Regulatory Commission regulations recognize the responsibility of the States for disposal of low-level radioactive waste under the Low Level Radioactive Waste Policy Act, their likely role as site owners and landlords of the operating licensees, and eventual responsibility for
TE institutional control. Thus, the Nuclear Regulatory Commission regulations provide a role for the host and affected States in the licensing process.

A side-by-side comparison of the requirements of DOE Order 5820.2A and the corresponding requirements of the Nuclear Regulatory Commission in Part 61 is presented in Table H-1. Selecting this basis for comparison has eliminated from the table the substantial portions of Part 61 that deal with

Table H-1. Low-level radioactive waste regulations: DOE and Nuclear Regulatory Commission requirements.

DOE citation	DOE requirement	NRC citation	NRC requirement
Order 5820.2A (9/26/88)	Establishes policies, guidelines, and minimum requirements for management of radioactive wastes, including low-level radioactive wastes	10 CFR 61 12/27/82	Licensing requirements for land disposal of radioactive wastes; procedures, criteria, and terms and conditions for licensing of disposal of wastes received from others. Does not apply to (1) high-level waste, (2) uranium or thorium tailings, or (3) disposal of licensed material by licensees under Part 20
Attachment 2 Definitions:	Low-Level Waste. Radioactive waste not classified as high-level waste, transuranic waste, or spent nuclear fuel, or uranium or thorium tailings and waste Transuranic Waste. Waste contaminated with alpha-emitting nuclides with atomic number greater than 92, half-life greater than 20 years, and concentrations greater than 100 nanocuries per gram	§ 61.2 Definitions	"Low-level radioactive wastes containing source, special nuclear, or byproduct material that are acceptable for disposal in a land disposal facility...not classified as high-level waste, transuranic waste, spent nuclear fuel, or...uranium or thorium tailings and waste." TE
III. Management of low-level waste: 3. Requirements a. Performance objectives	(1) Protect public health and safety in accordance with other Environment, Safety and Health and DOE Orders	Subpart C- Performance objectives § 61.40 General Requirement	Land disposal facilities to be sited, designed, operated, closed, and controlled after closure to provide reasonable assurance that human exposures are within the limits established in the performance objectives.
	(2) Limit effective dose equivalent resulting from external exposure to the waste and concentrations in water, soil, plants, and animals resulting from releases to less than or equal to 25 millirem per year; atmospheric releases to meet 40 CFR 61 requirements; reasonable effort to maintain releases as low as reasonably achievable	§ 61.41 Protection of the general population from releases of radioactivity	Concentrations of radioactive material which may be released...in...water, air, soil, plants or animals...less than or equal to 25 millirem per year to whole body, less than or equal to 75 millirem per year to thyroid, and less than or equal to 25 millirem per year to any other organ. Reasonable effort to maintain releases as low as reasonably achievable to the environment in general. TE
	(3) Committed effective dose equivalent to inadvertent intruders after loss of institutional control (100 years) of less than or equal to 100 millirem per year (continuous exposure) or less than or equal to 500 millirem (single acute exposure)	§ 61.42 Protection of individuals from inadvertent intrusion	"Design, operation, and closure of the land disposal facility must ensure protection of any individual inadvertently intruding into...the site or contacting the waste at any time after institutional controls...are removed."
		§ 61.7(4) Concepts	Institutional control of access to the site is required for up to 100 years; permits disposal of Class A and Class B waste without special provisions for intruder protection.
		§ 61.7(5)	"Waste that will not decay to levels which present an acceptable hazard to an intruder within 100 years is designated as Class C waste." Disposed of at greater depth or with intruder barriers with an effective life of 500 years. Maximum concentrations of radionuclides are specified (§ 61.55) to ensure no unacceptable intruder hazard after 500 years.

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
a. Performance objectives (cont.)	(4) Protect groundwater resources, consistent with Federal, State and local requirements.		No specific parallel in Part 61
b. Performance assessment	(1) ...Prepare and maintain a site-specific radiological performance assessment for disposal of waste to demonstrate compliance with 3.a.	§ 61.13 Technical Analyses	...Analyses to demonstrate performance objectives of Subpart C will be met, including: (a) pathways to general population must include air, soil, ground- and surface water, plant uptake, and exhumation by burrowing animals, identifying differentiated roles played by natural site characteristics and design features; (b) protection of intruders afforded by meeting segregation requirements and barriers; (c) protection of individuals during operations, including likely accidents; and (d) analyses of long-term site stability
	(2) ...For each DOE reservation, prepare and maintain an overall waste management systems performance assessment supporting combination of waste management practices used in generation reduction, segregation, treatment, packaging, storage and disposal.		No specific parallel - not applicable
	(3) ...Where practical, make monitoring measurements to evaluate actual and prospective performance within and outside each facility and disposal site.	§ 61.53 Environmental Monitoring	...Requires an environmental monitoring program to evaluate potential health and environmental impacts during construction, operation and after closure, and capable of providing early warning, if migration is indicated, before it leaves the site
c. Waste generation	(1) ...Controls shall be directed to reducing the gross volume of waste generated and/or the amount of radioactivity requiring disposal.		No specific parallel - not applicable
	(2) Generation Reduction...low-level waste generators shall establish auditable programs to assure minimization of the amount of low-level waste generated and/or shipped for disposal.		No specific parallel - not applicable
	(3) Segregation...low-level waste generators shall separate uncontaminated waste from low-level waste.		No specific parallel - not applicable
	(4) Minimization...new process or process change designs shall incorporate principles to minimize generation of low-level waste.		No specific parallel - not applicable

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
d. Waste characterization	(1) Low-level waste shall be characterized...to permit proper segregation, treatment, storage and disposal...characterization shall ensure that actual physical and chemical characteristics and major radionuclide content are recorded and known during the entire waste management process.	§ 61.55(a) Waste Classification	(1) *Considerations.* Wastes are to be classified for near-surface disposal to permit consideration of, first, limiting concentrations of long-lived radionuclides with hazards persisting after institutional controls, improved waste form, and deeper disposal are no longer effective; and, second, concentrations of shorter-lived radionuclides for which those protective measures are effective.
			(2) *Classes of waste.* Defines Class A, Class B and Class C wastes in terms of nuclide concentrations and stability requirements
	(2) Waste characterization data to be recorded on a waste manifest include (a) physical and chemical characteristics; (b) volume; (c) weight; (d) major radionuclides and concentrations; (e) packaging date, weight, volume.	Appendix F to §20.1001-20.2401 Requirements for Low-Level-Waste Transfer for Disposal at Land Disposal Facilities and Manifests	*I. Manifest*...requires physical description of waste, volume, radionuclide identity and quantity, total radioactivity, and principal chemical form; solidification agent to be specified; waste with greater than or equal to 0.1 percent chelating agents by weight to be identified and the agent estimated
	(3) Radionuclide concentration determined by direct or correlatable indirect methods (i.e., scaling factors)		No specific parallel - not applicable
e. Waste acceptance criteria	(1) Waste shipped to a site for treatment, storage or disposal shall meet the requirements of the receiving site.		No specific parallel - not applicable
	(2) Waste acceptance criteria shall be established for each low-level waste treatment, storage, and disposal facility.		No specific parallel - not applicable
	(3) Generators shall implement low-level waste certification program to ensure waste acceptance criteria are met; generators and receiving facilities jointly responsible for compliance with waste acceptance criteria	Appendix F to §20.1001-20.2401	*II. Certification*...requires generator to include with shipment, certification of proper waste classification and packaging.
	(4) Generator low-level waste certification programs shall be audited periodically.		No specific parallel - not applicable

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
e. Waste acceptance *criteria* (cont.)	(5) Waste acceptance criteria for storage, treatment, or disposal facilities shall address: (a) allowable quantities/concentrations of specific radionuclides to be handled; (b) criticality safety requirements; (c) restrictions for classified low-level waste; (d) external radiation and internal heat generation; (e) restrictions on generation of harmful gases, vapors or liquids in waste; (f) chemical and structural stability of waste packages, radiation effects, microbial activity, chemical reactions, and moisture; (g) restrictions for chelating and complexing agents; and (h) quantity of free liquids.	§ 61.56 Waste Characteristics	(a) Establishes minimum requirements for all waste classes, including (1) no cardboard or fiberboard box packaging for disposal; (2) liquid waste to be solidified, or packaged with adequate absorbent material; (3) restrictions on free liquid to less than 1 percent of volume; (4) not readily capable of detonation or explosive reactions at normal temperature and pressure; (5) restrictions on generation of toxic gases, vapors, or fumes harmful to personnel; (6) not pyrophoric; (7) gaseous waste to be packaged at less than 1.5 atmospheres at normal temperature and pressure and total less than 100 curies per container; and (8) waste containing chemically or biologically hazardous material to be treated to reduce hazard to the extent practical.
			(b) Requires structural stability of waste by (1) a stable waste form and/or container; (2) limiting free-standing and corrosive liquids to less than 1 percent of waste volume in a stable container, or 0.5 percent of volume for waste processed to a stable form; and (3) minimize void spaces within the waste and its package
f. Waste treatment	(1) Waste shall be treated by appropriate methods to enable disposal site to meet performance objectives.		No specific parallel - not applicable
	(2) ...Methods such as incineration, shredding, and compaction to reduce volume and increase form stability shall be implemented as necessary to meet performance criteria. Use to increase life of disposal facility and improve performance to the extent it is cost effective.		No specific parallel - not applicable
	(3) Large scale waste treatment facility development requires support by National Environmental Policy Act documentation plus (a) site waste stream analysis and treatment process evaluation; (b) construction design report; and (c) a Safety Analysis Report.		No specific parallel - not applicable
	(4) Operation of treatment facilities requires support by (a) operations and management procedures; (b) personnel training and qualification procedures; (c) monitoring and emergency response plans; and (d) records of each low-level waste package entering and leaving the facility.		No specific parallel - not applicable
g. Shipment	Offsite shipment of low-level waste shall comply with DOE 1540.1.	10 CFR 71 and DOT 49 CFR 173	Define transport requirements for radioactive materials

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
h. Long-term storage	(1) Shall be stored by appropriate methods to achieve performance objectives of 3.a.		No specific parallel - not applicable
	(2) Records shall be maintained for all low-level waste that enters and leaves the facility.		No specific parallel - not applicable
	(3) Documentation requirements include (a) needs analysis; (b) construction design report; (c) Safety Analysis Report and NEPA documentation; and (d) operational procedures and plans.		No specific parallel - not applicable
	(4) Storage to allow decay and to await disposal by approved methods are acceptable	§ 20.2001(a)(2)	A licensee shall dispose of licensed material...by any one of four methods including decay in storage.
i. Disposal	(1) Low-level waste shall be disposed of to meet the performance objectives of 3.a., consistent with the site radiological performance assessment in 3.b.	Part 61	...Establishes requirements to assure compliance with Subpart C Performance Objectives
	(2) "Engineered modifications (stabilization, packaging, burial depth, barriers) for specific waste types and for specific waste compositions (fission products; induced radioactivity; uranium, thorium, radium) for each disposal site shall be developed through the performance assessment model." ...in the process, site specific waste classification limits may also be developed if operationally useful for specific wastes.	§ 61.51 Disposal site design for land disposal	(1) Site design features for near-surface disposal to focus on long-term isolation and avoidance of need for continuing maintenance; (2) design to be compatible with closure and stabilization plan; (3) design to complement and improve natural site features; (4) covers designed to minimize water infiltration, diverting percolation and surface water from waste and resist degradation; (5) diverted water not to produce erosion requiring maintenance; and (6) minimize contact between water and waste during storage, disposal or post-disposal
	(3) Establishes an Oversight and Peer Review Panel of DOE, contractor and other specialists in performance assessment to ensure consistency and quality		No specific parallel - not applicable
	(4) Disposition of waste designated as greater-than-class C (10 CFR 61.55) must be handled as special case, including special performance assessment through the NEPA process.	§ 61.55(2)(iv) Waste classification	Waste for which form and disposal methods must be more stringent than those specified for Class C waste are not generally acceptable for near-surface disposal.
		§ 61.7(b)(5) Concepts	There may be some instances where waste with concentrations greater than permitted for Class C would be acceptable for near-surface disposal with special processing or design. These would be evaluated on a case-by-case basis.

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
i. Disposal (cont.)	(5) Additional disposal requirements include: (a) no cardboard or fiberboard boxes not meeting Department of Transportation *requirements with stabilized waste and minimum voids; (b) no* liquid exceeding 1 percent of waste volume in disposal container, or 0.5 percent of waste processed to stable form; (c) waste not readily capable of detonation or explosive decomposition or reaction at normal temperature and pressure, or explosive reaction with water; (d) waste not contain or generate quantities of toxic gases, vapors, or fumes harmful to workers; (e) gaseous waste packaged at pressure less than or equal to 1.5 atmospheres at 20°C; and (f) no pyrophoric waste.	§ 61.56 Waste characteristics	See previous entry for this Section (page H-6)
TE	(6) Wastes containing amounts of radionuclides below regulatory concern, as defined by Federal regulations, can be disposed without regard to radioactivity.	§ 20.2005 Disposal of specific wastes	Identifies specific licensed material that may be disposed of "as if it were not radioactive"
	(7) Disposal Site Selection shall (a) have criteria developed for new low-level waste disposal sites, based on planned confinement technology; (b) be based on evaluation of site and confinement technology in accordance with NEPA process; (c) provide a site with hydrogeologic characteristics which, with confinement technology, will protect groundwater resource; (d) consider natural hazards; and (e) have criteria which address impacts on populations, land use, resource development plans and public facilities, transport and utility accessibility, and location of waste generation.	§ 61.50 Disposal site suitability for near-surface disposal	(1) ...Specifies minimum acceptable site characteristics with primary emphasis on isolation of wastes; (2) capable of being characterized, modeled, analyzed and monitored; (3) consider projected population growth relative to performance objectives; (4) avoid natural resource areas whose exploitation might compromise achievement of performance objectives; (5) avoid flooding and poorly drained areas; (6) minimize upstream drainage area; (7) provide sufficient depth to water table; (8) hydrogeologic disposal unit shall not discharge groundwater to the surface within the site; (9) avoid areas with sufficient tectonic activity to challenge the performance objectives; (10) avoid areas where surface geologic processes may adversely affect performance or modeling and prediction; and (11) avoid areas where nearby activities could impact performance objective achievement or mask the ability to monitor that performance.
		§ 61.7(a)(2) Concepts	...Site characteristics should be considered in terms of the indefinite future and evaluated for at least a 500 year time frame.
	(8) Disposal Facility and Site Design (a) require design criteria based on analyses of physiographic, environmental and hydrogeological data, as well as assessments of projected waste volumes and characteristics to assure Order policy and requirements can be met; and (b) disposal units shall be designed in accordance with criteria and NEPA process	§ 61.51 Disposal site design for land disposal	See previous entry for this Section (page H-7)

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
i. Disposal (cont.)	(9) Disposal Facility Operations (a) requires operating procedures that protect the environment, health and safety of the public and facility personnel; ensure facility security; minimize need for long-term control; and meet closure/post-closure plan requirements; (b) emplacement of permanent markers; (c) training requirements, emergency plans and the unusual occurrence reporting system; (d) minimize voids in disposal units between waste containers; and (e) conduct operations such that active disposal operations will not adversely affect filled disposal units	§ 61.52 Land disposal facility operation and disposal site closure	(a)(1) requires segregation of Class A wastes; (2) requires disposal of Class C wastes greater than or equal to 5 meters below top surface of cover or with intruder barriers designed to resist inadvertent intrusion for greater than or equal to 500 years; (3)-(11) provides specific requirements on maintenance of package integrity, void minimization, cover placement to minimize surface radiation dose rate, marking of boundaries of disposal units, maintenance of buffer zone, closure and stabilization of units as they are filled, prevent adverse effects of active disposal operations on closed units, and no disposal of non-radioactive materials
j. Disposal site closure/post-closure	(1) Requires development of site-specific closure plans for new and existing sites addressing closure within a 5-year period after filling, and conformance with NEPA process. Performance objectives for existing disposal sites developed on a case-by-case basis as part of NEPA process.	§ 61.12(g) Specific technical information (license application)	Requires a description of the disposal site closure plan, including design features intended to facilitate disposal site closure and to eliminate the need for ongoing maintenance
	(2) During closure/post closure, residual radioactivity levels for surface soils shall comply with existing DOE decommissioning guidelines.		No specific parallel - not applicable
	(3) Corrective measures shall be applied to new sites or individual units if conditions occur or are forecast that jeopardize attainment of performance objectives.	§ 61.12(l) Specific technical information (license application)	Requires a description of the plan for taking corrective measures if migration of radionuclides is indicated by monitoring program
	(4) Manage inactive sites in conformance with Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation, and Liability Act and Superfund Amendment and Reauthorization Act; or if mixed waste, may be included in permit applications for operation of contiguous disposal facilities.		No specific parallel - not applicable
	(5) Closure plans to be reviewed and approved by appropriate field organization		No specific parallel - not applicable
	(6) Termination of monitoring and maintenance activities to be based on analysis of site performance at end of institutional control period	§ 61.29 Post-closure observation and maintenance	Responsibility for the disposal site, including observing, monitoring and necessary maintenance and repairs, shall be maintained for five years; a shorter or longer period for post-closure observation and maintenance may be established.

Table H-1. (continued).

DOE citation	DOE requirement	NRC citation	NRC requirement
k. Environmental monitoring	(1) Each low-level waste treatment, storage and disposal facility (operational or not) to be monitored by a program conforming with DOE 5484.1 and k(2) and k(3)	§ 61.53(c) Environmental monitoring	See previous entry for this Section (Page 4)
	(2) Program shall measure (a) operational effluent releases; (b) migration of radionuclides; (c) disposal unit subsidence; and (d) changes in facility and site parameters that may affect long-term site performance		See previous entry
	(3) Based on facility characteristics, program may include surface soil, air, surface water, and subsurface soil and water both in the saturated and unsaturated zones		See previous entry
	(4) Program shall be capable of detecting trends in performance far enough in advance to permit any needed corrective action, and able to ascertain compliance with Environment, Safety and Health Orders		See previous entry
TC l. Quality assurance	Consistent with DOE 5700.6C, conduct in accordance with American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 and other appropriate consensus standards	§ 61.12(j) Specific technical information	Requires a description of the quality assurance program during site qualification, design, construction, operation and closure of the facility
m. Records and Reports	(1) Defines record-keeping requirements for field organizations based on waste manifest data	§ 61.80 Maintenance of records, reports and transfers	Establishes requirements for maintenance of records and their transfer to State and local governmental agencies, and other agencies as designated by the Commission at license termination
	(2) Waste Manifest records shall contain data specified in 3.d.(2) and be kept as permanent records.		See previous entry

the licensing process requirements (e.g., the contents of the license application, financial responsibility, etc.) that are judged not to affect the substantive requirements that determine waste disposal impacts. The two sets of requirements were divided for comparison into eight major categories: performance objectives; performance assessment; waste characterization and acceptance criteria; disposal site selection; facility and site design; disposal facility operation; disposal site closure/post-closure; and environmental monitoring. TE

H.2 DOE - Nuclear Regulatory Commission Requirement Comparisons

H.2.1 PERFORMANCE OBJECTIVES

The basic performance objectives for the protection of the general public in DOE and Nuclear Regulatory Commission regulations are essentially identical: requiring maintenance of releases as low as reasonably achievable, and setting a limit of 25 millirem/year to any individual from all exposure pathways as a consequence of releases from the disposal site. In addition, the DOE Order limits atmospheric releases of radioactivity from a site to no more than 10 millirem/year as stipulated in the EPA National Emission Standards for Hazardous Air Pollutants regulation, 40 CFR 61.

An apparent difference exists in the approaches specified for protection of a hypothetical future inadvertent intruder by each of the agencies. Nuclear Regulatory Commission requirements for intruder protection are to be met by a combination of defined concentration limits on those wastes that will not decay to acceptable levels within 100 years (Class C wastes) and emplacement at depths greater than 5 meters or with 500-year-effective intruder barriers. DOE requires assurance that the specified dose limits will not be exceeded after the 100-year institutional control period and requires the specification of the quantities/concentrations of wastes in waste acceptance criteria for each treatment, storage and disposal facility.

The Nuclear Regulatory Commission initially proposed a rule that included both a 500-millirem intruder dose limit and concentration limits conservatively calculated to achieve that dose. In the final rule, the Nuclear Regulatory Commission removed the dose limit as a requirement for future performance because a licensee could not demonstrate compliance or monitor that future performance; however, that dose value was used as the basis for calculating the concentration limits for Class C wastes. Thus, the apparent difference between the requirements is only superficial and more a consequence of the formal nature of the Nuclear Regulatory Commission regulatory process than a substantive difference in protection afforded the hypothetical future inadvertent intruder, since both agencies use the same dose as a basis for protection features. TE

H.2.2 PERFORMANCE ASSESSMENT

Both agencies require a radiological performance assessment to demonstrate the compliance of proposed disposal activities with the performance objectives. DOE also requires a performance assessment for the overall waste management system at each site covering activities from the reduction of wastes generated through treatment to their disposal. In keeping with their nature as licensing requirements, Nuclear Regulatory Commission regulations are more explicit in the details of the performance assessment to be provided. Both DOE and the Nuclear Regulatory Commission require monitoring to assess actual and prospective performance.

H.2.3 WASTE CHARACTERIZATION AND ACCEPTANCE CRITERIA

Nuclear Regulatory Commission waste characterization and classifications apply only to the wastes delivered to the disposal site, whereas DOE characterization applies to all aspects of waste management, from its initial segregation at the waste generator, through treatment and interim storage, to its final disposal. The transfer documents, or manifests, specified by each agency (by the Nuclear Regulatory Commission in Appendix F to Part 20) require essentially the same information.

Characteristics of waste packages acceptable for disposal are essentially the same for the two agencies, although the requirements set by the Nuclear Regulatory Commission in 10 CFR 61 Part 56 are specified
TE by DOE in two parts of DOE 5820.2A [3.e.(5) Waste Characterization and 3.i.(5) Disposal]. Because of the nature of the materials handled by DOE in the course of its diverse missions, DOE also requires waste acceptance criteria for criticality safety and for (security) classified low-level radioactive waste not applicable to Nuclear Regulatory Commission licensees.

H.2.4 DISPOSAL SITE SELECTION

For new disposal sites, DOE requires the development of selection criteria that recognize the intended confinement technology, and the selection of a site considering both site and confinement technology characteristics. DOE requirements include consideration of natural hazards and of environmental impacts as well as protection of groundwater resources. Nuclear Regulatory Commission site-selection requirements focus exclusively on site characteristics and require their evaluation for at least a 500-year time frame, reflecting the greater reliance for protection placed by the Nuclear Regulatory Commission on site (as opposed to facility design) features.

H.2.5 FACILITY AND SITE DESIGN

DOE requires facility and site design criteria, the specifications for which (including such factors as stabilization, packaging, burial depth, and barriers) are left for definition by each disposal site [3.i.(2)]; design criteria are to be based on site features as well as expected waste volumes and characteristics [3.i.(8)]. Nuclear Regulatory Commission site design requirements are general with respect to their objectives, except for the specification of the effective life of intruder barriers as 500 years where Class C wastes cannot be buried at depths greater than 5 meters. In addition to the fundamental site specifications common to both DOE and Nuclear Regulatory Commission requirements, the latter also identifies as requirements the ability of a site to be characterized, modeled, analyzed, and monitored, and the avoidance of areas where nearby activities could adversely impact achievement of performance objectives or substantially mask the monitoring program.

H.2.6 DISPOSAL FACILITY OPERATION

DOE requirements under this title are similar to but less specific than those of the Nuclear Regulatory Commission, particularly with respect to the segregation of Class A wastes (determined by concentration of short- and long-lived radionuclides) and the Nuclear Regulatory Commission requirement for deeper TE disposal of Class C wastes or the use of a 500-year effective intruder barrier. Both are intended to limit worker and public exposures to those specified in the performance objectives (identical for both agencies) and to promote long-term site stability.

H.2.7 DISPOSAL SITE CLOSURE/POST-CLOSURE

DOE and the Nuclear Regulatory Commission requirements for closure and post/closure activities are TE similar. Both require site-specific closure plans; the Nuclear Regulatory Commission requires plans for corrective measures, while the DOE requirement is for their application if the attainment of performance objectives is threatened or occurs.

H.2.8 ENVIRONMENTAL MONITORING

DOE and the Nuclear Regulatory Commission requirements for environmental monitoring are quite TE similar in substance and objectives; both require programs that will demonstrate compliance with public health and safety standards and provide early warning of migration of radioactivity from the disposal sites.

H.3 Nuclear Regulatory Commission - DOE Comparison Summary

Apart from the licensing procedural elements of the Nuclear Regulatory Commission regulations, the most substantial distinctions between the requirements of the Nuclear Regulatory Commission and DOE affecting the disposal of low-level radioactive waste are in the specificity of the Nuclear Regulatory Commission regulations in 10 CFR 61, which are not reflected in DOE Order 5820.2A. To a considerable extent that is the result of the formal regulatory process prescribed for the Nuclear Regulatory Commission and its licensees. Additionally, the more general nature of the DOE Order reflects the greater flexibility required to manage the diversity of waste materials and forms which are produced by the wide variety of missions and activities carried out by and for DOE, as well as the broad range of existing DOE site characteristics that are not reflected at likely licensed disposal sites.

Despite these distinctions, the performance objectives specified for the protection of the public and workers from the operation of low-level radioactive waste disposal facilities are essentially identical, and the means specified for demonstrating compliance (i.e., performance assessments) are also essentially identical in approach. Accordingly, there are no substantive differences in the degree of protection afforded public health and safety inherent in the different agency regulations.

H.4 EPA Hazardous Waste Landfill Requirements

As indicated in the previous discussion, Nuclear Regulatory Commission and DOE design requirements for low-level radioactive waste disposal facilities are prescribed in terms of their performance requirements (i.e., basically their ability to limit radiological dose to meet the respective regulations). In contrast, the EPA regulations governing landfill facilities for hazardous wastes under RCRA (40 CFR 264.301), although not applicable to low-level radioactive waste disposal, prescribe facility design features themselves. These include, for example:

- Each new landfill must have two or more liners and a leachate collection and removal system between the liners. The liners must be designed and constructed to prevent migration of wastes out of the landfill to the adjacent subsurface soil or groundwater or surface water during the active period of the landfill (including the closure period).

- The liners must be constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure, be placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients, and must be installed to cover surrounding earth likely to be in contact with the waste or leachate.

- The liner system must include a top and bottom liner. The bottom liner must include two components, the lower of which must be constructed of at least 90 cm (3 feet) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec (2×10^{-7} ft/min).

- The leachate collection and removal system immediately above the top liner must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period to ensure the leachate depth over the liner does not exceed 30 cm (1 foot).

- The leachate collection and removal system between the liners is also a leak detection system. The requirements for a leak detection system include: constructed of granular drainage materials with a hydraulic conductivity of 1×10^{-2} cm/sec (2×10^{-2} ft/min) or more and a thickness of 30 cm (1 foot) or constructed of synthetic or geonet drainage materials with a transmissivity of 3×10^{-5} m^2/sec (2×10^{-2} ft^2/min); constructed of materials that are chemically resistant to the waste and leachate and of expected strength and thickness to prevent collapse; and designed and operated to minimize clogging; constructed with sumps and liquid removal methods. TE TE

- A run-on control system capable of preventing flow into the active portion of the landfill during peak discharge from at least a 25-year storm, and a runoff management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm must be in place.

Thus, the EPA requirements for a hazardous waste landfill do not specify or require "vaults" as such, nor do they specify performance requirements (e.g., environmental exposure or concentration limits), or appear to contemplate that such landfills would consist of more than a trench excavated in the earth with relatively sophisticated engineered systems for leachate collection and infiltration protection. The vaults proposed for disposal of low-level radioactive waste at SRS, as described in Appendix B, greatly surpass the EPA hazardous waste landfill requirements described above.

H.5 Reference

DOE (U.S. Department of Energy), 1987, *Waste Management Activities for Groundwater Protection, Savannah River Plant*, DOE/EIS-0120, Savannah River Operations Office, Aiken, South Carolina, December.

APPENDIX I

PUBLIC COMMENTS AND DOE RESPONSES

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APPENDIX I. PUBLIC COMMENTS AND DOE RESPONSES

I.1 Introduction

DOE completed the draft Environmental Impact Statement (EIS) for Waste Management at the Savannah River Site (SRS) in January 1995, and on January 27, 1995, the U.S. Environmental Protection Agency (EPA) published a Notice of Availability for the document in the Federal Register (60 FR 5386). EPA's notice started the public comment period on the draft EIS and announced an ending date of March 13, 1995. At a request from the public, DOE extended the comment period through March 31, 1995. This appendix presents the comments received from government agencies and the public during the comment period and DOE's responses to those comments.

Comments by letter, telephone (voice mail), facsimile, and in formal statements made at public hearings were accepted. The hearings, which included the opportunity for informal discussions with SRS personnel involved with waste management, were held in Barnwell, South Carolina on February 21, 1995; Columbia, South Carolina on February 22, 1995; North Augusta, South Carolina on February 23, 1995; Savannah, Georgia on February 28, 1995; Beaufort, South Carolina on March 1, 1995; and Hilton Head, South Carolina on March 2, 1995. DOE received comments from a total of 15 individuals, government agencies, or other organizations including five written or oral statements at the hearing sessions. Ten letters were received. No one submitted comments by facsimile or voice mail. The statements made at the hearings were documented in official transcripts. Each of these comments were assigned unique number codes as follows for reference in this Final EIS:

Hearings	HH001 through HH002 (Statements made at the Hilton Head meeting)
	NA001 (Statement made at the North Augusta meeting)
	S001 through S002 (Statements made at one of the Savannah meetings)
Letters	L001 through L010

Specific comments by each commentor were numbered sequentially (i.e., 001, 002, etc.) to provide unique identifiers. The individuals, government agencies, and other organizations that submitted comments and their unique identifiers are provided in Table I-1.

The comments DOE received reflect a broad range of concerns and opinions about topics addressed in this EIS. The topics most frequently raised by commentors were concerns about specific facilities, including the Consolidated Incineration Facility; the various waste types this EIS addresses; public participation; and potential impacts on human health. Comments received from government agencies consisted primarily of statements of no conflict or requests for clarification. The EPA endorsed the proposed action in their response and gave the Draft EIS a rating of EC-2. This rating indicated that the agency has environmental concerns about the project and that EPA needs more information to fully assess the impacts.

DOE also received numerous comments that raised issues outside the scope of this EIS; many of them involved proposed actions that are being evaluated in other National Environmental Policy Act (NEPA) reviews. DOE considered those comments it received during the comment period that were within the scope of this EIS in the preparation of the final EIS. Individual comments received and DOE's responses, identified by the numbering system described above, are provided in Parts 1, 2, and 3 of this appendix. Where appropriate, DOE revised the EIS in response to these comments. In such cases, the revision is indicated in the margin of the page with a change bar and the number of the comment that prompted the revision.

Table I-1. Public Comments on the Draft Environmental Impact Statement.

Statements Made at the Public Hearings

Comment Source No.	Commentor	Page No.
NA	**North Augusta, SC, February 23, 1995**	
NA001	Bob Overman	I-5
S	**Savannah, GA, February 28, 1995**	
S001	Jean O. Brown	I-9
S002	Fred Nadelman Coastal Citizens for a Cleaner Environment	I-11
HH	**Hilton Head, SC, March 2, 1995**	
HH001	George Minot	I-14
HH002	Charlotte Marsala	I-18

Correspondence Received from Government Agencies and the Public

Comment Source No.	Commentor	Page No.
L001	James E. Bolen	I-22
L002	W. F. Lawless Citizens Advisory Board	I-24
L003	Andreas Mager, Jr. National Marine Fisheries Service	I-26
L004	Kenneth W. Holt Dept. Of Health and Human Services	I-29
L005	Shirley Dennis	I-37
L006	Robert H. Wilcox	I-39
L007	Debra K. Hasan Citizens for Environmental Justice	I-42
L008	Heinz J. Mueller U.S. Environmental Protection Agency, Region IV	I-53
L009	Mary T. Kelly League of Women Voters	I-57
L010	W. F. Lawless Citizens Advisory Board	I-59

I.2 Statements Made at the Public Hearings

PUBLIC CITIZEN-2: Can I make a formal comment?

MR. POPE: Yes, sir. You bet.

PUBLIC CITIZEN-2: Okay. My name is Bob Overman. I'm not representing any company. As I said before, I contributed to all this stuff. I don't like the idea of leaving this low-level waste buried. That's not being disposed of. I don't want my great-grandchildren pointing a finger at me and saying why didn't you take care of that garbage. It's bad enough that my grandchildren are saying that now.

In my opinion, the only satisfactory way of disposing of waste is to reduce it to the least chemically active form. That means all of your organic material, lab coats and shoes, that's going to decompose. That's going to give trouble in the burial ground. Let's get that stuff out of there, put it in the incinerator, and then get an agreement on what you're going to do with the ash. NA-001-01

The ash is not the most stable form. It can migrate. Vitrification seems to be acknowledged as the one way to stabilize low-level waste for any activity. You're talking about a vitrifier for M-Area. Wonderful. Let's get some vitrifiers in there.

As you dig up that stuff, take care of it, vitrify it after you incinerate, if you have to incinerate, but let's don't do another halfway job and expect our grandchildren to have to come back, dig up what we left, and do it again. I shudder to hear that you're not planning on digging up all of the lab coats that I helped put in there. I didn't bury them, but I sure got some dirty.

Compactors, only temporary. They do absolutely no good. The organics were decomposed in these little boxes. You get gas formation, you may get leaks, but that's not a final way to store them. So I was glad to hear that you're talking about vitrifying it, you're talking

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about smelters. We have an awful lot of contaminated metal stored -- buried out there, old mixer settlers, old tanks. Chop those things up, melt them, get them into ingots or billets, and if you can't sell it, bury the stuff.

NA001-01 (cont.)

The thing about a billet, the activity inside there is going to be exposed as the billet rusts. But the rust on the surface of the billet will also capture the radioactivity, the elements that are radioactive, the cesium and all the rest of that. Rust is a very good scavenger for that stuff, so if you have released any activity, that rust will keep it from migrating into the soil.

So think in terms vitrifying and smelting. Let's stabilize this stuff. I won't be around another 100 years, but maybe my great-grandchildren will. Thank you.

MR. POPE: Thank you.

PUBLIC CITIZEN-2: The minimum is Alternate C.

MR. POPE: Well, there's a minimum waste forecast for each of the alternatives.

PUBLIC CITIZEN-2: No, I meant the minimum thing you do with that is C.

MR. POPE: Yes, sir?

PUBLIC CITIZEN-1: You are not including the spent fuel you're receiving from the European reactors and temporarily storing that? That's not part of this; is that right?

MR. POPE: No, that is the subject of another environmental impact statement that's going on.

PUBLIC CITIZEN-2: You have to get rid of that before you do the basin water, though.

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MR. POPE: Yeah. Any other questions or would someone else like to stand up and make a comment?

(No response.)

MR. POPE: Well, thank you so much for coming. If you'd like to come up and talk with any of the crew here afterwards, please feel free to. Thank you.

(Meeting adjourned at 2:02 p.m.)

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Comment NA-001. (page 3 of 3)

Response to Comment NA001-1

The comment suggests that DOE should address the hazards of the decomposition of organic materials present in low-level wastes previously sent to shallow land disposal at SRS by excavating these wastes and treating them to destroy the organic fraction by incineration. Additionally, the commentor recommended that the incinerator ash be vitrified, and that buried contaminated metals be retrieved and processed by smelting before sale or reburial. These techniques are generally consistent with the extensive treatment configuration described in alternative C. However, the Waste Management EIS does not establish what type of environmental restoration activities should be implemented for the various waste sites at SRS. The SRS low-level waste disposal facilities are being investigated in accordance with the SRS Federal Facility Agreement. A formal risk assessment and remedial investigation will be performed for the Burial Ground Complex under Resource Conservation and Recovery Act (RCRA) Section 3004(u)/Comprehensive Environmental Response, Compensation, and Liability Act Section 120(e) to determine the facility's closure and post-closure performance objectives and requirements. These analyses will consider the hazards presented by the wastes, including the potential for gas formation as a result of the decomposition of organic materials and the potential for migration of contaminants on buried organic and metal wastes, to establish appropriate remediation requirements. These hazards will be weighed against the risks posed by the remediation alternatives, including worker exposure during excavation of the wastes and the emissions associated with any treatment performed on the excavated materials.

Comment Sheet

Savannah River Site Waste Management Draft Environmental Impact Statement

Please use this sheet if you wish to provide written comments on potential environmental issues concerning the Draft Environmental Impact Statement.

B.S.

Why should we believe your charts?

You get my vote of NO CONFIDENCE S001-01

Your Name Jean O. Brown
Address 443 Tattnall St.
Company, Agency, or Organization
Street Address Savannah, GA 31401
City / State / Zip Code

IMPORTANT: Please fold and tape bottom edge before mailing. ***Thank you.***

PK56-37

Letter S001.

Response to Comment S001-01

DOE believes that the charts and other technical information that were presented at the public hearings on the SRS Waste Management Draft EIS accurately describe the waste management alternatives and their impacts. Because the alternatives in the EIS include new facilities that have not been operated at SRS, DOE studied similar existing facilities and used validated analytical techniques and models to estimate impacts. In their review of the EIS, federal and state agencies examined the results of DOE analyses and provided their comments as presented in this Appendix and Appendix J. The EIS has also been subject to independent peer review, as discussed in the response to comment L002-02. The analytical procedures and models used to determine the impacts presented on the charts are discussed in the EIS. For example, refer to Section 4.1.3 for groundwater resources, Section 4.1.5 for air resources, Section 4.1.12 for health effects, and Section 4.1.13 and Appendix F for further detail on accidents.

The fallacy of the Safe Waste Management of Nuclear Materials

by Fred Nadelman

Can nuclear materials, namely. Plutonium, the deadliest of all such materials be stored safely? Definitely not. Not only are we, the taxpayers, being asked to subsidize an overage nuclear weapons plant, a relic of the cold war, that leaks radioactive gas into the air and poisons the ground water serving Savannah and South Georgia with leaks from its cooling system, but we are now asked to institutionalize those inadequacies by allowing Westinghouse and the Department of Energy to store those materials in the ground--until these agencies find a way to store the materials somewhere else in pieces of glass. S002-01

The fact remains that any storage of nuclear materials--anywhere and under any of the proposed circumstances is unreliable. For this reason we should not accept the storage of any such materials in this area. The question of how to "permanently" store such materials safely has not been solved. What is the answer? That is still a good question. We have such recent accidents as Three-Mile-Island, Chernobyl, and the December 1992 Plutonium leaks at the Savannah River Site as guides. S002-02

Can any deadly material going into "cold storage" in the ground be invulnerable to changes resulting from natural ground movement as well as disasters such as floods and earthquakes. Remember--the Savannah River Site is located over a fault in the earth. Thus the devastation resulting from an earthquake is too horrendous for anyone to conceive--given the haunting factor of the release of nuclear waste throughout the Georgia and South Carolina countryside and cities. S002-03

Fellow Savannahians! Do not accept the false proposition that you are not in danger from the DOE proposal. Until we adequately solve the problem of nuclear waste we should not lull ourselves into believing that our lives are not being risked under the current proposed solution.

PK56-37

Letter S002.

Response to Comment S002-01

Plutonium storage is out of the scope of this EIS. The response to comment L007-07 provides additional information on the storage of transuranic waste, which may contain plutonium. DOE addresses plutonium storage and storage of other weapons materials in other National Environmental Policy Act documentation including the *Stockpile Stewardship and Management Programs Programmatic EIS* (DOE/EIS-0236), the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS* (DOE/EIS-0203), the *F-Canyon Plutonium Solutions EIS* (DOE/EIS-0219), the *Interim Management of Nuclear Materials EIS* (DOE/EIS-0220), the *Long-Term Storage and Disposition of Weapons - Useable Fissile Materials Programmatic EIS* (DOE/EIS-0229), the *Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components EIS* (DOE/EIS-0225), and the *Environmental Assessment for Operation of the HB-Line Facility and Frame Waste Recovery Process for the Production of Pu-238 Oxide at the SRS* (DOE/EIS-0948).

Response to Comment S002-02

The Department of Energy Savannah River Operations Office is committed to the safe storage and disposal of all nuclear and other hazardous materials for which it is responsible. Standards for the storage and disposal of radioactive material are set forth in the Atomic Energy Act of 1954 (42 USC §201 *et seq.*) and implemented through DOE Orders. The DOE Orders establish an extensive system of standards and requirements that protect human health and minimize dangers to life or property from radioactive material management activities under DOE's jurisdiction. DOE Order 5820.2A, "Radioactive Waste Management," establishes performance criteria for the storage of high-level and transuranic wastes and for the storage and disposal of low-level wastes. The performance criteria for low-level waste disposal facilities require that a radiological performance assessment be developed that projects the migration of radionuclides from the disposed waste to the environment and estimates the resulting dose to people. The performance assessment is used to establish the combination of waste inventory and proposed disposal method that provides reasonable assurance that the performance objectives will be met. Engineered structures, such as the low-level waste disposal vaults, and enhanced waste forms, such as the stabilized waste forms to be achieved by the Consolidated Incineration Facility or the proposed vitrification facilities, evaluated in this EIS are designed to provide containment of the radioactive materials in accordance with applicable requirements.

Further, the Atomic Energy Act, as amended, and other related statutes give EPA responsibility and authority for developing generally applicable standards for protection of the environment from radioactive material. EPA has promulgated several regulations under this authority including the "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes" (40 CFR 191). DOE must manage its radioactive wastes in accordance with applicable EPA regulations. In addition, the management of radioactive waste that also contains hazardous waste components, known as mixed waste, is also subject to regulation under RCRA, which is coadministered by the state of South Carolina.

Response to Comment S002-03

DOE analyzes accident scenarios associated with existing and proposed waste processing, storage, and disposal facilities in Appendix F, "Accident Analysis," of this EIS. Accident analysis methodology included natural phenomena initiators such as floods, tornadoes, and earthquakes. DOE considers the potential for flood damage in the design of SRS facilities.

Both above-grade and below-grade storage and disposal facilities would be located in E-Area, which is centered over the drainage divide between Upper Three Runs and Fourmile Branch and is approximately 30 meters (100 feet) above their floodplains (as shown in Figure 3-7 of the EIS). Sites of new construction would be graded to direct stormwater away from the storage and disposal facilities. In addition, facility design would include sumps to remove water that entered underground disposal areas. Therefore, flooding would not damage above- or below-grade storage and disposal facilities.

As shown in Figure 3-4 of the EIS, no earthquake fault underlies E-Area, where SRS waste management activities are carried out. A design-basis earthquake, which has an estimated ground acceleration of 0.2 times the acceleration of gravity (0.*2g*), is (as stated in Section 3.2.3 of the EIS) estimated to have a 2.0×10^{-4} annual probability of occurrence (1 in 5,000 years) at SRS. Appendix F analyzed 24 potential accidents that would be initiated by earthquakes. The analysis shows that the risk of these accidents (probability × consequences), both individually and cumulatively, is not the highest risk event for any waste type. The highest risk accident to a storage or disposal facility initiated by an earthquake would increase the likelihood of a fatal cancer to the offsite maximally exposed individual by 4 chances in 1 million which would not be detectable, given the individual likelihood of fatal cancer from all causes of about 1 in 4. As stated in Section F.7, Secondary Impacts from Postulated Accidents, no adverse impacts on water quality from postulated accidents are considered likely. Contamination would migrate slowly to the groundwater, so clean-up efforts that would follow a release incident would capture the contaminants before they reach the groundwater, and it is unlikely that the postulated accidents would result in offsite contamination.

Accurate/Augusta Reporting, Inc.
Comment HH-001
Page 1

MR. MINOT: I have in my hand here something that -- from Oak Ridge about in situ vitrification that they've apparently been very successful in. Is that part of your plan?

MR. THOMAS: In situ -- this is the Waste Management EIS for solid waste streams. Now --

MR. MINOT: Well, that's exactly what they're talking about. They're talking about taking the contaminated dirt and putting electrodes in it and melting it down and forming a solid glass form.

HH001-01 **MR. THOMAS:** That isn't processing. That is in the environmental restoration we're in for in situ, and the environmental restoration folks are evaluating in situ vitrification as potential treatment for remediation sites. Does that make sense?

MR. MINOT: What the hell difference does it make? You want to contain it. Why dig it up and carry it off to a glass-making facility even though it's across the way?

MR. THOMAS: We didn't, in this EIS, want to make policies for particular environmental restoration sites. What we wanted to do was to try to determine how much waste would be coming out of those and then set up the facilities to treat it. Those individual environmental restoration sites are the subject of other NEPA actions which will be done as those sites come about.

PK56-40

Comment HH-001. (page 1 of 3)

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Comment HH-001
Page 2

MR. MINOT: I don't know a NEPA action from anything.

MR. THOMAS: National Environmental Policy Act, which an environmental impact statement is a NEPA action. So there's a separate process for evaluating and the cleanup and technologies for environmental restoration sites as dictated by --

MR. MINOT: That's bureaucratic gobbledegook. What I'm talking about, if I have a problem and it consists of contaminated soil, which you indicated that a large majority of this, at least the mixed waste, was a contaminated soil problem, some of the high-level waste is -- you know, has to be reduced out of a liquid form, and certainly we want it out of the groundwater and out of the aquifers. But contaminated soils, it seems that this seems to be a viable or at least something to be considered. We're not going to be selling that land -- DOE is not going to sell that land for residential property sites in the next 1,000 years.

HH001-01 (cont.)

MS. MARSALA: It may. It may.

MR. MINOT: Not -- no. No. No.

MS. MARSALA: They have a plan for it.

MR. MINOT: No, they don't. No they don't. That's the Mickey Mouse that they're talking about. Let's be realistic. The question was, have you considered this?

MR. THOMAS: The environmental restoration folks are considering that.

MR. MINOT: I'm talking about in your program to handle waste.

MR. THOMAS: No, we are not.

MR. MINOT: Why not?

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Comment HH-001. (page 2 of 3)

Accurate/Augusta Reporting, Inc.
Comment HH-001
Page 3

MR. THOMAS: Because we take that results from other facilities, all right, that we project to come to us and have a centralized treatment facility. Now, if I was remediating --

MR. MINOT: No, that's not -- that wasn't my understanding of it. The problem was to look at the waste as it exists and what might be coming in.

MR. THOMAS: Right.

MR. MINOT: And if the best answer is to freeze it in place and move on, you know.

MR NOLL: Not taking the soil out of the ground and doing something with it is -- one of the projections would be the minimum case.

HH001-01 (cont.)

MR. THOMAS: Right.

MR. NOLL: And if they leave the soil there, there's several things they can do. It is between negotiations between the State who gives us the permit.

MR. MINOT: You're asking for comment. My comment would be, why not consider this? And don't give me the -- you know, well, we have to take it from them, whoever them are. That a viable solution to solving the waste management problem at SRS might be, for its contaminated soil, the least expensive, the least exposure to people, and more equipment that has to be trashed later on because it was digging in this dirt. It may be a consideration. And why can't we propose that as a comment to this particular --

MR. POPE: You can. You can.

MR. MINOT: So moved.

PK56-40

Comment HH-001. (page 3 of 3)

Response to Comment HH001-01

Although specific alternatives for environmental restoration (i.e., cleaning up contaminants released into the environment in the past) would be subject to separate NEPA review, if appropriate, DOE has included in this EIS the waste volumes that could be generated from environmental restoration activities. As the discussions at the hearing indicated, DOE-Savannah River Operations Office is evaluating the feasibility of in-place vitrification of contaminated soil as well as other in-place treatments. In-place vitrification is addressed in Appendix D, Section D.7.15 of the EIS as an emerging treatment technology which may well be employed for the treatment of some or much of the contaminated soil at SRS. Sections 2.1.3, 2.1.4, and 2.1.5 of the EIS show that the expected, minimum, and maximum waste volumes resulting from environmental restoration activities depend on whether in-place treatment is viable (as assumed for most of the units in the minimum waste forecast) or the waste must be removed for treatment (as assumed for most of the units in the maximum waste forecast).

As indicated in Section 2.1, the environmental restoration program is regulated by the *Federal Facility Agreement for SRS*, an agreement between EPA, the South Carolina Department of Health and Environmental Control (SCDHEC), and DOE. Characterization of the environmental restoration units (identified in Appendix G) is in its early stages. Therefore, DOE believes it would be premature to consider site-specific environmental restoration alternatives in this EIS. DOE-Savannah River Operations Office has established a land use planning group to develop a comprehensive land use plan and land use options for the SRS.

Accurate/Augusta Reporting, Inc.
Comment HH-002
Page 1

MS. MARSALA: Number one, you don't have to be told by me that DOE has a credibility gap with the public. Okay? You have done, inadvertently, no intention, no intentional doing, created an economic hardship on the city of Savannah and will be created and imposed on Hilton Head if this continues and we go to the river as a water source -- drinking water source. I resent it very, very much.

I think since you created this tritium problem -- because of the unknowns of 50 years ago there's no finger of blame being pointed -- you should subsidize the scintillating monitors that's been being used in the city of Savannah ever since that 1991 spill. Since nobody trusts DOE in letting the public know as quickly as the public would like to know, even if we let our hair stand on end for a couple of days, I think you should underwrite that and let it continue to be an independent testing but funded by DOE.

HH002-01

I further think you should offer Beaufort-Jasper Water Sewer Association a new scintillating monitor which is very sensitive to tritium readings. The maximum cost of the monitor is $25,000. The ultimate goal that they use to monitor it is the only one out of three that doesn't produce more hazardous waste in the testing of it. And you should supply the manpower that is needed to test it, and place it at least an hour/an hour and a half riverwise up the Savannah River so that an alarm could be sent for the Beaufort-Jasper to close our canal if the readings are higher than what we anticipate or hope that they're going to be.

And this is the message that I have sent to Hazel O'Leary and I restate it here. I think you should at least subsidize that. That's not going to break the bank as far as I'm concerned.

PK56-40

Comment HH-002. (page 1 of 2)

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Comment HH-002
Page 2

Secondly, there was -- from the Lawrence Livermore National Laboratory in California a new technology was developed for desalinating not only brackish water but soiled seawater. I would hope that the Department of Energy, which funds that particular program, would consider using that at the Savannah River Plant so that you don't have to lay off a bunch of people, just convert the mass plowshare, so to speak, and use the facility for something productive.

And if you can get the cooperation of Secretary Baggett from the Department of the Interior, because his reclamation group has already sent me a letter in response to my sending him that information that they think it's a very viable method, that they would develop and are considering developing it for commercial use if they had enough funding. So possibly in this country Macy's could help Macy's, instead of being separate entities being cooperative and to develop that technology. That's about it.

HH002-02 (cont.)

MR. WILLIAMS: Okay. Any other comments, questions, observations?

PK56-40

Comment HH-002. (page 2 of 2)

Response to Comment HH002-01

Subsidizing or providing additional scintillation monitors for Savannah River water users is outside the scope of the Waste Management EIS. However, this suggestion was forwarded to the DOE Savannah River Environmental Compliance Division for review.

After detailed review of DOE's and the state's monitoring program, DOE believes that additional monitoring is not necessary because of the following reasons:

- DOE presently monitors the tritium concentrations at a number of locations upstream of Savannah, GA including Highway 301, and the Beaufort Jasper and the Port Wentworth water treatment plant intakes. DOE presents the results of its monitoring program for public review in the *SRS Annual Environmental Monitoring Reports.* The 1994 annual dose to an individual who drank two liters of water per day from either of the Savannah River water intakes (0.06 millirem) is well below a level that would cause concern. DOE encourages public participation in its environmental monitoring program through review of the *SRS Annual Environmental Monitoring Reports.*
- River water at Highway 301 is routinely sampled by SCDHEC to independently verify that there are no health concerns presented by the Savannah River due to contaminants released from SRS.

We also wish to note that the SRS reactors, which in the past presented the greatest risk of an unplanned release, are presently shutdown. Only the K-Reactor is being maintained for possible future missions. Before K-Reactor was shutdown, the component that caused the release in December 1991 was replaced and successfully tested. That component has been drained and deactivated for over 2 years.

Response to Comment HH002-02

Lawrence Livermore Laboratories is currently bench-scale testing a less energy-intensive water desalination technology. The technology works on the principle of deionization. Deionization is simply the stabilization of the electrical charge on an atom, group of atoms, or molecule by maintaining or restoring its electrical configuration. The deionization unit would contain charged ion plates (i.e., positive and negative) that would be used to attract the salt molecules from saltwater. To purge the system the charge on the plates would be reversed and a concentrated brine (i.e., salt) solution would be removed. The plates would then be reversed again and the system would be ready to treat more saltwater. There is no application of this technology for desalination purposes at SRS, however, in theory the technology could be applied to the treatment of wastewater with inorganic contaminants.

Since this technology is being developed by DOE through the Office of Technology Development (OTD), its applications to SRS would be evaluated and applied through the DOE complex-wide focus areas which include: plumes (i.e., groundwater plumes), landfills, stabilization (i.e., materials and waste), high level waste, and mixed waste. OTD communicates the potential application of emerging and developing technologies to SRS.

In response to the comment about layoffs, in this EIS DOE evaluated the manpower needed to construct and operate the treatment, storage and disposal facilities. This includes retraining personnel to perform waste management activities.

I.3 Correspondence Received from Government Agencies and the Public

A.B. Gould, Director
Environmental Compliance Division
NEPA Compliance Officer
U.S. Department of Energy
Savannah River Operations Office
P.O. Box 5031
Aiken, South Carolina 29804-5031
Attention WMEIS

RE: Comments regarding the "Savannah River Site (SRS) Waste Management Draft Environmental Impact Statement"

Mr. Gould:

The subject document is well written, user friendly, and thorough in every respect.

1. The draft environmental impact statement (EIS) addresses options for treatment of polychlorinated biphenyl substances (PCBs). Shipment of PCBs to offsite locations from the Site is an option SRS should consider <u>only</u> after doing the following:

Proposing a blending plan to SCDHEC (and receiving approval of same) which allows SRS to blend PCBs and PCB contaminated media to below TSCA or waste acceptance limits with the waste streams already approved for burning in the Consolidated Incineration Facility (CIF).

L001-01 It is recognized the CIF is not licensed to incinerate TSCA substances, however, the State of South Carolina (SCDHEC) could be doing a dis-service to its residents of the State by forbidding on-site treatment and thereby requiring SRS to transport incinerable PCBs across local highways for treatment and disposal, when SRS could treat (by incineration) blended-down (or diluted) concentrations of this waste volume. While the RCRA Permitted incinerator at SRS may not be designed to achieve the destruction efficiency of a TSCA Licensed incinerator, blending waste PCB oils and residues (particularly with high heat value wastes) may result in more than adequate destruction, and hence reduce the need for offsite shipments.

2. This document (WMEIS) describes different operating lifespans for the CIF (in years). Depending on the different alternatives considered, the CIF would operate until other facilities could be constructed (the Alpha and/or Non-Alpha Vitrification Facilities).

L001-02 Because of the substantial demand for process steam in the immediate area of the CIF construction site (the CIF itself requires steam in its operation) SRS would better spend its financial resources by developing steam (or even electrical power) generating capabilities at the CIF if enough high-heat value waste is available. If SRS is chosen to receive incinerable waste from the DOE Complex (i.e. outside of SRS) then special consideration for producing steam and power should be given to this. If the existing incinerator can (without drastic engineering and construction changes) be modified to support steam production (i.e. reheating of condensate or other) in some way, then this concept should be considered as well.

James E. Bolen
Aiken, South Carolina - Resident

PK56-34

Letter L001.

Response to Comment L001-01

EPA has established regulations under the Toxic Substances Control Act that specify standards for the incineration of polychlorinated biphenyl materials (PCBs). As noted in the comment, these standards are generally more restrictive than those imposed on the incineration of hazardous wastes under RCRA. For example, a destruction and removal efficiency of 99.9999 percent is specified for the incineration of PCBs as opposed to the efficiency of 99.99 percent generally required by RCRA regulations. Certification of an incinerator under the Toxic Substances Control Act requires extensive testing in addition to that required for RCRA permitting. Furthermore, the EPA regulations under the Toxic Substances Control Act prohibit generators of PCB materials from avoiding, by dilution, requirements applicable to materials contaminated in excess of specified PCB concentrations. It would not be cost-effective to obtain permits under the Toxic Substances Control Act for the small amount of PCB wastes that could be treated at the Consolidated Incineration Facility, and it would not be legal to circumvent the Toxic Substances Control Act regulations by diluting PCB wastes.

Response to Comment L001-02

Implementation of steam or electrical power generation by recovering waste energy from the Consolidated Incineration Facility was considered at the time the process was being designed. Energy recovery was not adopted because the economic benefits were marginal. The small thermal capacity of the Consolidated Incineration Facility design limits the amount of recoverable energy. Additionally, energy recovery would increase the complexity of operations and maintenance and require that the combustion offgas be held at a temperature range known to promote the formation of undesired combustion products such as dioxins and furans. The costs to enhance the air pollution control system to counter this increased pollutant generation and maintain emissions at safe levels would offset any cost benefits of energy recovery. Retrofitting an energy recovery system into the Consolidated Incineration Facility at this time would significantly impact design of the downstream air pollution control system. Substantial costs would also be incurred to modify various environmental permits and to repeat emissions tests such as the trial burn required by RCRA.

PAINE COLLEGE

Division of Natural Sciences and Mathematics 1235 Fifteenth Street Augusta, Georgia 30901-3182 (706) 821-8200

A.B. Gould, Director, ECD
U.S. Department of Energy
Savannah River Operations Office
P.O. Box 5031
Aiken, SC 29804-5031

Dear Director Gould: 2.10.95

Re: WMEIS

L002-01 Thank you for sending me a copy of the WMEIS (i.e., DOE/EIS-0217-D, January, 1995). Because our CAB meets formally only once every two months and its next scheduled meeting is not until after DOE has planned to close the comment period, as Co-Chair of the SRS CAB's ER & Waste Management Subcommittee, I request that you extend the public comment period for the WMEIS.

The reason for this request is that the working group for our Subcommittee has begun to draft for the CAB's approval three motions on the WMEIS: a motion on the treatment of transuranic wastes (primarily pu-238); another on incinerable low level wastes; and the third on contaminated soils. If approved by the CAB, these three motions will be forwarded to DOE SRS, EPA, and DHEC (note that in addition to members of the public, the working group includes representatives of DOE, EPA, and DHEC).

L002-02 Because work just began on the motions last night, at this time, little can be said of what issues they will eventually address. But whatever is included in them, they will at least recommend that, in keeping with DOE's implementation of the first motion of the CAB (letter M. Fiori, DOE SRS Manager, January 20, 1995), the WMEIS be submitted to independent scientific peer review.

Thank you for your attention to this request.

Sincerely,

W.F. Lawless

cc: M. Fiori; R.H. Slay (Co-Chair, CAB); M. McClain (Co-Chair, CAB)

A College of The United Methodist Church and the Christian Methodist Episcopal Church

PK56-36

Letter L002.

Response to Comment L002-01

On March 3, 1995, the Manager, DOE-SR, extended the public comment period through March 31, 1995, to allow the Citizens Advisory Board time to consider and present comments. On March 13, 1995, DOE issued a press release announcing the extension of the public comment period; the announcement was published in local newspapers.

Response to Comment L002-02

DOE retained nationally recognized experts in waste management to provide independent review before issuing the Draft EIS. Four individuals participated, three of whom also provided independent review of the *SRS Proposed Site Treatment Plan* prepared in response to the Federal Facility Compliance Act of 1992. The reviewers were required to sign a "no conflict of interest" statement stating that they have no financial, contractual, personal, or organizational interests in decisions reached through the EIS that could affect their ability to render impartial advice. Their reviews included reading the documents, extensive discussion meetings at SRS, and submittal of written review comments. Their recommendations were incorporated into the draft EIS.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, Florida 33702

February 14, 1995

Mr. Arthur B. Gould, Jr.
NEPA Compliance Officer
U.S. Department of Energy
Savannah River Operations Office
P.O. Box 5031
Aiken, South Carolina 29804-5031 Attn: WM EIS

Dear Mr. Gould:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) for Waste Management, Savannah River Site, Aiken, South Carolina. The document addresses the environmental effects of various alternatives for nuclear and related waste management at the Savannah River Site (SRS). The alternatives include an evaluation of storage and disposal of five types of waste including liquid high-level radioactive, low-level radioactive, hazardous, mixed (radioactive and hazardous combined), and transuranic wastes.

The DEIS advises that waste management could affect a land area of about 100 to 1,000 acres in size. The final amount of land needed will be determined by the final volume of the waste and the processing technique utilized. Impacts involving areas in the 1,000-acre range are associated with the "maximum waste forecast" and are not anticipated. Direct elimination or degradation to aquatic resources is not anticipated.

L003-01 Considering the location and size of the area to be affected, even under the "minimal waste forecast" it is possible that tributary waters of the Savannah River could be adversely affected. Since work in wetlands is not called for, likely impacts to wetlands and other aquatic resources are limited to those associated with the discharge of degraded surface water from converted forest or other vegetated uplands. Several agencies, including the NMFS, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the States of Georgia and South Carolina are jointly and individually examining aquatic resource protection and restoration needs in the Savannah River. These efforts have been initiated as a result of increasing concern over the river's environmental quality and growing recognition of its enormous fishery, natural aesthetic, recreational, power production, and other public interest features. Of particular interest to the NMFS and other agencies is the river's function as a spawning and nursery site for anadromous fishes including American shad (Alosa sapidissima),

PK56-36

Letter L003 (page 1 of 2).

blueback herring (Alosa aestivalis), striped bass (Morone saxatilis), Atlantic sturgeon (Acipenser oxyrhynchus) and shortnose sturgeon (Acipenser brevirostrum). Because of their migratory nature, these species utilize significant portions of the river including sections that would be impacted by discharges from the Savannah River Site.

Based on the preceding, the final environmental document should fully address changes in the physical, chemical, and biological character of surface waters entering the Savannah River and its tributaries. Additionally, the final document should identify all measures that will be implemented to ensure adverse impact avoidance and mitigation and those measures that will be employed if significant adverse effects are realized. L003-01

Finally, in accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of the appropriate federal regulatory agency to review its activities and programs and to identify any activity or programs that may affect endangered or threatened species or their habitat. If it is determined that these activities may adversely affect any species listed as endangered or threatened, formal consultation with our Protected Species Management Branch must be initiated. The appropriate contact person for matters pertaining to protected species is Mr. Charles Oravetz who may be contacted at the letterhead address. L003-02

We appreciate the opportunity to provide these comments.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

PK36-36

Letter L003 (page 2 of 2).

Response to Comment L003-01

As described in the respective sections on surface water impacts in Chapter 4, no substantive changes in the physical, chemical, or biological characteristics of the surface waters feeding the Savannah River are expected to result from implementing any of the alternatives evaluated in the EIS. This is due to the essential similarity of the very low concentrations in the projected discharges to those currently being released in accordance with the conditions of the current National Pollutant Discharge Elimination System Permit, and the very small volumetric addition of a few percent, relative to the natural stream flows, at the maximum.

Discharges from SRS treatment systems and outfalls are monitored for the constituents included on the National Pollutant Discharge Elimination System permit on a schedule prescribed by the permit. If a discharge is found to exceed the permit limits, DOE determines the cause of the exceedance and corrects the problem. Most of the treatment systems can be shut down and the wastewater stored until the problem is corrected. Both the M-Area Dilute Effluent Treatment Facility and the F/H-Area Effluent Treatment Facility can be operated in a batch treatment mode. The M-Area Air Stripper can be shut down (the wells supplying the groundwater would cease pumping) until any problem could be corrected. Also, SRS has an ongoing stream monitoring program (not part of the National Pollutant Discharge Elimination System program) for the collection and analysis of samples. Thus, any changes in constituent concentrations would be noted and steps taken to locate the source of the changes. It should be noted that tables in Section 1.0 of Appendix E indicate that the radionuclides in the aqueous discharges will be very low as was explained in Section 4.1.4 of the EIS.

As discussed in Section 4.1.4, measures would be taken to control the impact of stormwater runoff during both construction and operation activities. SRS must meet criteria of National Pollutant Discharge Elimination System permits issued by SCDHEC for both activities. Pollution prevention plans have been prepared which detail the steps to be taken to control suspended solids, debris, and oil/grease that may be in the runoff and impact the streams (WSRC 1994). Facilities or measures taken to control these impacts would be regularly inspected. Additionally, immediately following major rain events, the facilities would be inspected. If problems are found during these inspections, DOE would take corrective actions to mitigate the problems.

Response to Comment L003-02

A protected species survey of the uncleared part of E-Area has been completed and submitted to U.S. Fish and Wildlife Service and the National Marine Fisheries Service. This survey, dated February 3, 1995, initiated informal consultation as required by Section 7 of the Endangered Species Act of 1973. The survey concluded that activities proposed for E-Area north of F-Area and south of the M-Line Railroad will not affect any Federally protected animal or plant species. The revised survey of April 1995 is included in this EIS as Appendix J.

The survey does not address impacts to threatened and endangered species on additional land outside the boundary of E-Area that would be needed if SRS is required to manage the maximum waste forecast. If land outside E-Area is needed, additional surveys for threatened and endangered species would be required and another Section 7 consultation would be initiated with U.S. Fish and Wildlife Service. Until decisions are made on the facilities that are needed and the amount of waste that would be handled at SRS, the selection of additional land would be premature.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30341-3724

February 24, 1995

Arthur B. Gould, Jr.
Savannah River Operations Office
NEPA Compliance Officer
U.S. Department of Energy
P.O. Box 5031
Aiken, South Carolina 29804-5031

Dear Mr. Gould:

We have completed our review of the Draft Environmental Impact Statement (DEIS) for Waste Management, Savannah River Site, Aiken, South Carolina. Technical assistance for this review was provided by the Radiation Studies Branch , Division of Environmental Hazards and Health Effects, National Center for Environmental Health. We are responding on behalf of the U.S. Public Health Service.

This review focused on the public health consequences associated with several proposed waste management alternatives. The attached pages offer general and specific comments that should be considered when preparing the Final EIS. If you have questions regarding these comments, you may contact Mr. Robert Whitcomb at (404) 488-7634, or me at (404) 488-7074.

Thank you for the opportunity to review this draft document. Please ensure that we are included on your list to receive a copy of the Final EIS, and future EIS's which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

Kenneth W. Holt

Kenneth W. Holt, M.S.E.H.
Special Programs Group (F29)
National Center for Environmental Health

Attachment

PK56-37

Letter L004. (page 1 of 6)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Centers for Disease Control

Memorandum

Date February 16, 1995

From Robert C. Whitcomb, Jr., Physical Scientist, National Center for Environmental Health, Division of Environmental Hazards and Health Effects, Radiation Studies Branch (F35)

Subject Review of 'Savannah River Site Waste Management Draft Environmental Impact Statement'

To Ken Holt, Environmental Health Scientist, Special Programs Office, National Center for Environmental Health

This review focuses on the public health consequences associated with several proposed alternatives for the management of waste at the Savannah River Site. Comments have been separated into two categories; general and specific. This page considers the general comments and subsequent pages provide specific comments. There are some minor changes that would improve the document as discussed below.

General Comments

L004-01 Populations are listed by pathway of exposure; 620,100 for the atmospheric pathway and 65,000 for the aqueous pathway. It may be that the population exposed by the aqueous pathway extends beyond the 80 kilometer (50 mile) atmospheric pathway. If this is the case, then it is possible for some 'downstreamers' to receive their dose only from the river. The question therefore is as follows; is the population exposed to the aqueous pathway (65,000) a subset of the 620,100 included in the atmospheric pathway? This clarification would be helpful for interpreting the collective doses and risk.

L004-02 There are several tables or figures in the beginning sections presented without numbering (e.g., page 2-4, page 2-23, page 2-24, etc..). They are also not included in the List of Tables or the List of Figures. All tables and figures should be numbered and included in the list of tables and in the list of figures respectively.

L004-03 All terms used within the text and tables should be included in the glossary. For example; collective dose is used but not defined in the glossary.

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Letter L004. (page 2 of 6)

Specific Comments

1) Section 3.12.1.2 Radiation Levels in the Vicinity of SRS, page 3-65, paragraph 3,

'A dose of this magnitude would result in an annual probability of contracting a latent fatal cancer of 6.5×10^{-7}.'

The question here is why provide a risk for this activity and not the previous activity of a hunter who had a higher estimated dose. Also, the risk is given with no reference to the risk factor used. The risk factor used is 5×10^{-4} risk of fatal cancer per person rem referenced to ICRP 60. L004-04

2) Section 3.12.1.3, Radiation Levels in E-, F-, H-, S-, and Z-Areas, page 3-66,

Table 3.12-1 presents gamma radiation levels measured in these areas except N-Area. In the previous section, N-Area had the maximum measured gamma radiation level of 506 millirem per year. In Figure S-3, SRS areas and facilities, N-Area is described as 'Site services and waste storage'. Therefore N-Area should be included in the table and in the discussion. L004-05

3) Section 4.1.11.2 Transportation, page 4-37, first paragraph,

'...by the risk factors of 0.0004 (for occupational health) and 0.0005 (for the general public) excess latent cancer fatalities per person-rem (ICRP 1991).

later in section 4.1.12 Occupational and Public Health, page 4-43, second paragraph,

'Dose-to-risk conversion factors for nonfatal cancers and genetic effects (0.0001 per person-rem and 0.00013 per person-rem, respectively; NCRP 1993) are ...'

and finally in section 4.1.12.2.1 Radiological Impacts, page 4-47, first paragraph,

'...the conversion factor of 0.0005 latent cancer fatality per rem for the general population (DOE 1993c).'

It is unnecessary to provide multiple references for this L004-06

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Letter L004. (page 3 of 6)

Savannah River Site Waste Management
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L004-06 (cont.)

information. The original source of these values is ICRP 1991. The NCRP and DOE have concurred with and adopted limits and values set by the International Commission on Radiological Protection. The reference source should be the same in both cases ICRP 1991 and not NCRP 1993 or DOE 1993c.

4) Section 4.1.11.2.2 Radiological Transportation Accident Impacts, page 4-41, Table 4.1.11-4, second to last column on right,

> The value for the Offsite MEI, minimum dose, high probability accident, excess latent cancer fatality of 1.4×10^{-10}g

L004-07

This value should be 1.9×10^{-13} based on the calculation $3.7\times10^{-10} \times 5\times10^{-4}$ risk per person rem for the offsite population. The current (incorrect) value is based on the calculation of $2.8\times10^{-7} \times 5\times10^{-4}$.

5) Section 4.1.12.2.1 Radiological Impacts, page 4-50, last paragraph,

> 'In the population of 620,100 people living within 80 kilometers (50 miles) of SRS and exposed to its atmospheric releases, the number of people expected to die of cancer is 145,700. In the population of 65,000 people using the Savannah River and exposed to the aqueous releases, the number of people expected to die of cancer is 15,275.'

L004-08

The way this paragraph is written it sounds like 145,700 are getting cancer as a result of atmospheric releases and 15,275 from aqueous releases. These are actually the normal expected incidence of cancer in populations this size. Please reword this paragraph for clarity.

6) Figure 4.1.12-2. Dose to individuals in communities within 80 kilometers (50 miles) of SRS under the no-action alternative, page 4-55,

L004-09

There is a typographical error on the Dose axis 1.0×10^{7} should be 1.0×10^{-7}.

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Letter L004. (page 4 of 6)

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7) Section 4.2.11.2.3 Transportation Maximum Waste Forecast, page 4-109, Table 4.2.11-9, second to last column on right,

The value for the Remote MEI, excess latent cancer fatality of 4.1×10^{-10c}

This value should be 4.1×10^{-11} based on the calculation 8.2×10^{-8} x 5×10^{-4} risk per person rem for the offsite population. L004-10

8) Section 4.3.12.3.2 Public Health and Safety, Radiological Impacts, page 4-181, second paragraph, first sentence,

'The health effects associated with the maximum waste forecast are included in Table 4.3.12-3.'

This should read Table 4.3.12-2. L004-11

9) Section 4.3.12.3.2 Public Health and Safety, Radiological Impacts, page 4-181, second paragraph,

'..and the number of fatal cancers in the regional population could be 3.6 (effectively 4). This probability of a fatal cancer is much smaller than the one chance in four (23.5 percent) ...'

Then in Section 4.4.12.3.2 Public Health and Safety, Radiological Impacts, page 4-242,

'The number of additional fatal cancers in the regional population could be 0.20 (effectively zero).'

Change the sentence from Section 4.3.12.3.2 Public Health and Safety, Radiological Impacts, page 4-181, second paragraph, to read; '..and the number of additional fatal cancers in the regional population could be 3.6 (effectively 4). L004-12

10) Section 4.4.5.1.2 Operational Impacts, page 4-208,

'The two radioisotopes contributing most of the radiation dose would be cesium-137 and plutonium-239.'

How was this determined? Were screening or sensitivity analyses performed? How much of the dose do these represent? Please describe the process. L004-13

PK56-39

Letter L004. (page 5 of 6)

11) Section 4.4.11.2.2 Transportation Minimum Waste Forecast, Table 4.4.11-7, page 228

L004-14 **The value (2.2×10^{-4d}) at the bottom right hand column of Table 4.4.11-7 refers to footnote d. Footnote d uses the risk factor for occupational (0.0004) rather than population (0.0005). The value is correct but the reference should be 2.2×10^{-4c} and footnote c should read 'c. Additional probability of an excess latent fatal cancer. Value equals the total dose times the risk factor (0.0005 excess fatal cancers per person-rem).'**

12) Section 4.4.12.2.2, Radiological Impacts, page 239,

'Table 4.3.12-3 includes...'

L004-15 **This should read Table 4.3.12-2.**

PK56-39

Letter L004. (page 6 of 6)

Response to Comment L004-01

The downstream population which uses the Savannah River as the source of its drinking water is not considered part of the population within 80 kilometers (50 miles) of SRS. The text in Section 3.8.5 has been modified to clarify this point. In addition, a map locating all the communities within the 80-kilometer (50-mile) radius has been added to that section.

Response to Comment L004-02

All tables and figures in the document have been numbered.

Response to Comment L004-03

The term "collective dose" has been added to the glossary. Figures and tables were searched and other words have been included in the glossary.

Response to Comment L004-04

Because this probability of contracting a latent fatal cancer is not related to the waste management alternatives considered in the EIS, DOE believes that it is inappropriate to include a discussion of health impacts in Chapter 3, which only describes the affected environment. The sentence discussing the probability of contracting a fatal cancer has been deleted to make the discussion in question consistent with others in this chapter.

Response to Comment L004-05

N-Area data was inadvertently omitted from the discussion of gamma radiation levels. The data are now included in the table in Section 3.12.1.3. In addition, the level for N-Area given in the text of Section 3.12.1.2 was incorrect. The correct value is 460 millirem per year. The text has been corrected.

Response to Comment L004-06

DOE agrees with the comment. All citations dealing with risk conversion factors have been changed to reflect the original reference found in ICRP (1991).

Response to Comment L004-07

Table 4-8 (originally Table 4.1.11-4) has been revised and no longer presents low consequence accidents.

Response to Comment L004-08

DOE has revised the paragraph to clarify that the number of cancer deaths expected is not specific to the population in the vicinity of SRS but to any population of comparable size.

Response to Comment L004-09

The entry in the figure has been corrected.

Response to Comment L004-10

The entry in Table 4-31 (formerly Table 4.2.11-9) has been corrected to 4.1×10^{-11}.

Response to Comment L004-11

The table reference has been corrected.

Response to Comment L004-12

The word "additional" has been added to the sentence to make the statement correct.

Response to Comment L004-13

Contributions of various isotopes to the offsite maximally exposed individual and population doses were determined by developing isotope-specific emission factors for each facility. These factors, when coupled with facility throughput data based on the alternative and the waste forecast, yielded total quantities of each isotope released from each facility. The release values were then used with facility-specific unit-activity isotopic dose conversion factors to determine the isotope-specific doses. Calculated isotopic-specific doses are reported in Section E.4 (Appendix E). A detailed description of the calculations can be found in Chesney (1995). The text of the EIS has been revised to refer the reader to Appendix E and to Chesney (1995) for additional information.

In addition, the text in the no-action alternative section has been changed. In the no-action alternative (Section 4.1.5.2.2) the F-Area tank farm and the M-Area Vendor Treatment Facility have been added to the list of facilities that contribute to offsite doses.

Response to Comment L004-14

Reference to the footnote in the table has been corrected and the footnote has been modified to explain how the value is calculated.

Response to Comment L004-15

The table reference has been corrected.

SHIRLEY O. DENNIS
11 WING SHELL LANE • HILTON HEAD ISLAND, SOUTH CAROLINA 29926

7 March 1995

Arthur B. Gould, Jr., Dir.
NEPA Compliance Office
U.S. Dept. of Energy
Savannah River Operations Office
P.O. Box 5031, Code IS
Aiken, SC 29804-5031

I could not attend the recent local meeting for public comment on the waste management environmental impact statement. However, I want to let you know of my support. Also, I am very concerned that the project might suffer because of insufficient funding — this project should not be neglected nor abandoned. L005-01

Another important issue — there has been no permanent repository site designated in the U.S. — SRS should not become that permanent site. L005-02

Sincerely,
Shirley Dennis

PK56-40

Letter L005.

Response to Comment L005-01

DOE intends to pursue funding to support the initiatives developed on the basis of this EIS and the obligations imposed under the Federal Facilities Compliance Act. DOE-Savannah River prioritizes and requests funding for various projects through DOE-Headquarters (HQ). DOE-HQ requests funding from the U.S. Congress, which either approves or disapproves the request.

Response to Comment L005-02

DOE is investigating two sites for the permanent disposal of transuranic and high-level wastes. If approved, permanent repositories for transuranic waste in Carlsbad, New Mexico, and for high-level waste in Yucca Mountain, Nevada, would dispose of these wastes. However, as described in this EIS, SRS would contain permanent disposal sites for certain low-level and mixed/hazardous wastes.

INTER-OFFICE MEMORANDUM
Savannah River Site

09-Mar-1995 01:25pm EST

To: Arthur B. Gould, Jr.

From: Robert H. Wilcox
Dept: EF&RFSPD - Project Management

Draft EIS on SRS Waste Management

Thank you for sending me the two volume report DOE/EIS-0217D, "Savannah River Site Waste Management Draft Environmental Impact Statement". I appreciate the opportunity to review the report, and I do wish to offer the following comments which are intended to be constructive in the broad sense.

1. General. Once again, I must question the interpretation of the NEPA which calls for the creation of documents such as this and of this one in particular. Managing wastes at the SRS as elsewhere is an ongoing multi-faceted program with a myriad of necessary policy and business-type decisions needed by the U.S. Government. Such decisions have been needed since the early days of operating SRS through the enactment of NEPA, the end of the Cold War, and will be needed well beyond into the future. When, oh when, with whatever changes in federal policy and even laws are appropriate, will we stop devoting scarce resources to processes and volumes like this and get on with an orderly, cost-effective management of the business of necessary cleanup of such sites. L006-01

2. This Draft EIS. Nothing in 1 above is intended to question the accuracy of what has been put together by the authors of this report. To the limited extent that I have been able to review it, I have found no errors in what has been prepared.

3. Cleanup Philosophy. In the interest of minimizing future federal outlays, would it not make sense to take a fresh look at the many environmental requirements enacted during the last 25 years, especially as they pertain to large federally-owned sites like SRS. Such a look should focus on identified real and potential dangers and lay out a long-range approach capable of achieving bipartisan buy-in and support over the long haul. This draft EIS can be a most important reference in any such effort. My suggestion is not to imply that much planning has not already been done. It should be taken instead to suggest that what is needed now is less of an emphasis on compliance with present regulations and more of an open attitude toward reducing (or making exceptions to) them for sites such as SRS. L006-02

4. Environmental Consequences of SRS Waste Management. It is appropriate to emphasize what the report points out (e.g. in Section 5.7) that the differences among the various "management alternatives" would generally be minor for the same waste forecast. Impacts will be more dependent on the amount of waste managed, and that, in turn, depends largely on the government decisions on the extent of environmental restoration and decontamination/decommissioning. In any case, if I read the report right, environmental impacts are very small. (Once again this raises the question

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Letter L006. (page 1 of 2)

L006-03 of why such important decisions are more keyed to the NEPA process than to a businesslike cost-benefit approach of spending federal dollars.)

5. The Consolidated Incineration Facility (CIF). If I understand it right, this document is intended to analyze alternative approaches to operating the CIF and the environmental impacts of each. This would appear to be the most significant specific purpose of the report, along with some analyses of potential future facilities. The report appears to indicate that CIF's impact would vary depending on amount and type of waste and on the duration of its operation. L006-04 The conclusion seems to be, however, that none of the cases analyzed result in an impact which would affect decisions on how best to operate CIF.

6. Overall SRS Waste Picture. Treatment or not of the kind of wastes analyzed in this report is, of course, a trivial decision compared with the management of the site's high level wastes and spent nuclear fuel. As these appear to be outside the scope of this EIS, I offer no comments now, though I have done so on other opportunities.

7. Recommendation. DOE should conclude this EIS process as soon as possible, give the report a respected place on the bookshelf, and get on with the waste management job consistent with the real drivers of actual and potential risk to public health and the need to maximize the cleanup benefit for the cost to the federal taxpayer. L006-05

PK56-41

Letter L006. (page 2 of 2)

Response to Comment L006-01

NEPA requires agencies to prepare a detailed statement (i.e., an EIS) on proposals for major Federal actions significantly affecting the quality of the human environment. DOE determined that the actions proposed in this EIS are major and may significantly affect the environment. Simply stated, DOE supports NEPA and its goal to ensure that environmental amenities and values are considered in decisionmaking along with economic and technical considerations.

Response to Comment L006-02

DOE is required and fully intends to comply with current, applicable regulations. This EIS considers three reasonable alternatives (alternatives A, B, and C) that would comply with applicable waste management requirements. However, the suggested "fresh look" at environmental requirements is not only outside the scope of this EIS, but is also beyond the authority of DOE to implement.

Response to Comment L006-03

The NEPA process includes the formulation of reasonable alternatives that are feasible from a common sense, technical, and economic standpoint. As paraphrased from the Summary and Chapter 2, the factors used to identify the most desirable technologies include process efficiency and effectiveness, engineering feasibility, costs, and environmental attributes. Because the environmental impacts of the candidate technologies are very small, the values of the other criteria are expected to weigh heavily in the decisionmaking process.

Response to Comment L006-04

DOE agrees that the impacts resulting from any of the operating scenarios for the Consolidated Incineration Facility evaluated in this EIS are very small. DOE evaluated a wide range of alternative operating scenarios for this facility to aid in establishing the appropriate role of incineration in an integrated waste management system for SRS. Different waste types (including hazardous, mixed, and low-level wastes) and volumes were proposed for treatment at the Consolidated Incineration Facility. The operating scenarios considered ranged from modifying the facility to include solid waste feed and ash handling systems capable of accommodating large volumes of soils and sludges to operating the incinerator for only a limited time until a non-alpha vitrification facility could be designed and constructed. The emissions and exposures associated with the operation of the Consolidated Incineration Facility vary with the waste volumes proposed for treatment under each alternative; however, under all alternatives, the impacts would be very small. DOE will consider the environmental consequences evaluated in this environmental impact statement along with costs, schedule, and regulatory requirements in reaching a decision regarding the operation of the Consolidated Incineration Facility. DOE will document its decision in the Record of Decision for this EIS.

Response to Comment L006-05

DOE believes that the responses to comments L006-01 and -03 address this concern. Part of the process is to identify the real and potential issues and to implement the actions required to establish a safe and cost-effective mix of treatment, storage, and disposal facilities.

CITIZENS FOR ENVIRONMENTAL JUSTICE

Commentary on the Draft EIS Waste Management (Savannah River Site)

"Should SRS/DOE continue with waste management practices currently in place or continue practices with specifics modifications?"

Contrast the quantity (volume) of waste generated through the no-action plan with that generated through the other three options, alternatives a,b, and c.
L007-01 The limited treatment practice meets regulatory requirements. Are there specific regulatory requirements for the extensive, agressive treatments of sitewide strategy C?
Or will these regulatory requirements be made with public involvement?
L007-02 PEIS has Class C waste and DEIS doesn't have Class C waste. Explain here.
L007-03 Shallow land disposal of low-level waste will stop in March for unstablilized waste forms, where will the low level waste be disposed of then?
L007-04 Does there exist currently the technology for the characterization of TRU waste?

L007-05 Making sure that the decisions made around the management and interim storage of nuclear materials is in no way detrimental to the citizens living near the cleanup sites is of grave concern. The health effects of radioactive pollutants is still largely an unknown one. However, it has been scientifically recognized that high-energy radiation in low doses over long exposure periods is far more serious than was previously believed since the discovery of radiation. The production of nuclear weapons on the DOE sites around the nation imposed risks on human life and health without the knowledge of such nuclear weapons production, and subsequently, also without their consent. In addition to safeguarding the health of the citizens residing and working in and around these nuclear facilities, there must be a serious regard for these radioactive nuclides and their escape into the environment. Special care in handling even minute quantities of radioactive subtances must be required to protect the health and safety of the workers and the public health.

L007-06 In addition to the radioactive waste now stored at the SRS, the DOE also stores tons of this highly radioactive spent nuclear fuel at other sites around the country. The threat of "criticality" or the risk of a natural nuclear explosion from a chain reaction is a real one These spontaneous explosions will lead to major releases of radioactivity.

L007-07 In interim storage with inadequate protection from natural and human events, there is more than 500,000 55 gallon drums of radioactive transuranic waste.

L007-08 In light of these and many similar facts about the nature of radionuclides, we propose that hasty cleanup action just for the sake of saying that a site is cleanup is not recommended

PK56-42

Letter L007. (page 1 of 4)

Placing the by products of plutonium production in the most stable form possible will prove to be costly and time consuming, but it seems to be a more viable decision than transferring these by products to a final disposal site that has not yet been proven technically acceptable L007-09

The eventual genetic and immune system effects from chronic radiation exposure are not fully understood, nor are the biological interactions among radioactive and toxic pollutants. Given the clear health and environmental risks, steps taken now to minimize the spread of contamination will be a much better investment than assuming that spilled waste can be cleaned up later. L007-10

There must be a consensus between government and the public about which of the technologies used are the most reliable and feasible ones. L007-11 The technology must be developed to separate, characterize, and identify the kinds of nuclear waste that is now being stored at DOE sites. These wastes must be taken out of the environment by stabilizing and containing them as quickly as possible. It is strongly urged that these wastes be contained and stored at the sites at which they presently are stored to avoid the costs of transport; and, the threat of releases and theft; and, the possibility of having to clean up another area of contamination if such an accident did occur. L007-12

Submitted by

Debra Hasan
Citizens for Environmental Justice
Savannah, Georgia
March 13, 1995

PK56-42

Letter L007. (page 2 of 4)

Public Comments from February 25, CFEJ, "A Community Look at Look at Management," workshop on Savannah River Site Waste Management Draft Environmental Impact Statement.

L007-13 "The DOE needs to educate the communities of how dangerous these wastes are. The waste should be neutralized instead of storing it in containers which
L007-14 will only be temporarily safe."

Participant, WM EIS workshop

L007-15 "Include that all waste is harmful , specifically what types of waste. Also include that all waste is harmful to a certain degree, whether it be low-level, high-level, etc. Also, include both shortterm and longterm effects concerning waste management."

Participant, WM EIS workshop

L007-16 "We, the community need to be educated about what DOE is doing in managing waste."

Participant, WM FIS workshop

L007-17 "Based on our understanding, we believe that nuclear waste should be converted to glass and stored in uninhabited areas."

Participant, WM EIS workshop

L007-18 "Use more graphic pictures, utilizing serious comedy. Include agencies, organizations who participated."

Participant, WM EIS workshop

L007-19 "Change managomont now. Answer the following questions. How does the waste affect my community? What type of physical affects will the waste have
L007-20 on the human body?"

PK56-42

Letter L007. (page 3 of 4)

"More information on how it can effect a person's health and community. Also, maybe there could be more public announcements." L007-21

Participant, WM EIS workshop

"This was one of the most informative, workshops that I have attended since becoming involved with CFEJ. It was very explicit, and I understood and learned more about environmental pollution." L007-22

Participant, WM EIS workshop

PK56-42

Letter L007. (page 4 of 4)

Response to Comment L007-01

The three action alternatives (alternatives A, B, and C) examined in the Waste Management EIS represent treatment, storage, and disposal configurations that would provide the capability to manage all SRS wastes in accordance with applicable regulatory requirements. The alternatives represent different strategies (limited, moderate, and extensive treatment) for meeting regulatory objectives. The extensive treatment scenario of alternative C is not prescribed by regulation.

Some of the regulations applicable to SRS waste management prescribe the technology to be used to manage a particular type of waste, whereas other regulations establish a level of performance that the management technology must achieve. For wastes for which regulations prescribe a particular technology, the prescribed technology is included in all three action alternatives. For example, EPA regulations under RCRA specify that all mixed high-level radioactive wastes be treated by vitrification, and DOE would use vitrification to treat its mixed high-level waste under any of the three action alternatives. Where the regulations establish performance criteria but do not prescribe a method of treatment, DOE considered a range of management technologies in this EIS. This analysis allowed DOE to compare the benefits afforded by each technology (e.g., volume reduction, migration resistance of the final waste form) and the corresponding impacts of implementation (e.g., worker and public health, cost, safety) as part of the basis for selecting a waste management configuration.

Public involvement in the NEPA process does not establish or alter regulatory policy. Agencies responsible for establishing regulations provide the regulations for public review during their development. For example, EPA provides for public involvement in the development of new RCRA regulations. The text of the proposed regulation is published in the *Federal Register* and supporting information used by EPA to develop the proposal is available for public review in the RCRA docket. EPA considers any comments received on the proposed regulation in developing the final regulation.

Response to Comment L007-02

This comment refers to the category of low-level waste known as "class C" waste. This waste classification is defined in 10 CFR 61.55 (U.S. Nuclear Regulatory Commission) as waste that must meet rigorous requirements on its waste form to ensure stability; it also requires additional measures at the disposal facility to protect against inadvertent intrusion. This classification is generally reserved for waste containing high concentrations of long-lived radioisotopes such as carbon-14 and iodine-129 (half-lives of 5,730 and 17,000,000 years respectively). Waste containing concentrations of long-lived radionuclides in excess of the class C criterion is referred to as "greater-than-class C" waste and is generally not acceptable for near-surface disposal. These wastes would normally be disposed of in a geologic repository as defined in 10 CFR 60.

DOE classifies waste differently from the 10 CFR 61 waste classification system; however, DOE discusses the disposition of greater-than-class C waste in DOE Order 5820.2A, "Radioactive Waste Management." The Order requires that disposal systems for such waste be justified by specific performance assessments through the NEPA process.

Though not specifically discussed in the WMEIS, small quantities of waste meeting the greater-than-class C criteria of 10 CFR 61.55 have been identified at SRS. This waste, consisting primarily of spent-deionizer resins from reactor moderator purification systems, has been included in the long-lived low-level waste category. Section 2.2.3.3 of the WMEIS states that DOE plans to store this long-lived waste in the long-lived waste storage buildings in E-Area. The Waste Management

Programmatic EIS evaluates a regionalization alternative under which a very small amount (less than 1 cubic meter) of greater-than-class C waste would be transferred to SRS. Receipt of this very small amount of additional low-level waste would not affect the alternatives considered or the environmental consequences evaluated in the EIS; DOE would manage this waste as long-lived low-level waste.

Response to Comment L007-03

In the absence of a site-specific radiological performance assessment, the existing disposal units in the Low-Level Radioactive Waste Disposal Facility cannot demonstrate conformance with the performance objectives and assessment requirements of DOE Order 5820.2A. DOE determined that disposal of low-level wastes that have not been certified as conforming to the DOE Order 5820.2A requirements should cease as of March 31, 1995. Shallow land disposal of uncertified wastes at the Low-Level Radioactive Waste Disposal Facility concluded March 31, 1995 with limited exceptions (such as the continued use of suspect soils to backfill the existing disposal units). DOE will continue to dispose of wastes that have been certified to comply with waste acceptance criteria based on radiological performance assessments. Such disposal will occur at the E-Area vaults (for most low-level waste) and shallow land disposal (for suspect soils only) in the area adjacent to the Low-Level Radioactive Waste Disposal Facility for which a radiological performance assessment has been completed. DOE assumes that radiological performance assessments to be developed in the future will support shallow land disposal of additional low-level wastes such as the stabilized ash and blowdown wastes from the Consolidated Incineration Facility.

Response to Comment L007-04

Although the technology exists, SRS does not have a facility to completely characterize radiological properties of transuranic waste (waste contaminated with greater than 100 nanocuries per gram). SRS conservatively manages alpha waste (material in the activity range from 10 to 100 nanocuries per gram) as transuranic waste. SRS plans to ship its transuranic waste to the DOE Waste Isolation Pilot Plant when that facility becomes operational. Once the Waste Isolation Pilot Plant Waste Acceptance Criteria are finalized, SRS plans to develop the transuranic waste characterization/certification facility to characterize and repackage its transuranic waste for shipment to the Waste Isolation Pilot Plant. The alpha waste would be certified as mixed low-level waste or low-level waste for disposal at SRS. The characterization of hazardous constituents would continue to be based on the process knowledge of the generator and the waste would be packaged to meet the Waste Isolation Pilot Plant No-Migration Petition requirements once approved.

Response to Comment L007-05

As stated in Section 3.12.2.2 the current SRS radiological control program implements the Radiation Protection Guidance to the Federal Agencies for Occupational Exposure approved by President Reagan on January 20, 1987, and issued to all Federal agencies. This guidance has been subsequently codified (10 CFR 835) as a Federal Regulation governing all DOE activities (58 FR 238). Policies and program requirements formulated to ensure the protection of SRS workers and visitors are documented in the *SRS Radiological Control Procedure Manual, WSRC 5Q*.

The safety of the public and the well-being of the environment is ensured by conduct of the effluent monitoring and environmental surveillance programs at SRS; the programs are based on current scientific understanding of radiation effects, which is reflected in DOE orders. DOE Order 5400.1, "General Environmental Protection Program," requires the submission of an environmental report that documents the impact of facility operations on the environment and on public health. These annual reports demonstrate compliance with requirements of DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

DOE is firmly committed to operating a Radiological Control Program of the highest quality. This commitment applies to all DOE activities that manage radiation and radioactive materials and that may potentially result in radiation exposure to workers, the public, and the environment. Performance excellence has been demonstrated by maintaining radiation exposures to SRS workers and the public, at values which are well below regulatory limits.

Response to Comment L007-06

The disposition of spent nuclear fuel at SRS and other sites in the nuclear weapons complex is not within the scope of this EIS. DOE exercises strict control over all fissionable material for which it is responsible because of the potential risks associated with these materials. DOE is preparing other EISs which address these issues; please refer to Table 1-1 in this EIS.

Response to Comment L007-07

SRS performs storage of its transuranic waste in accordance with its RCRA Part A Permit and DOE orders. SRS utilizes containers and storage pads in accordance with detailed procedures to protect human health and the environment. Depending on the size of the waste material, transuranic waste is packaged in 55-gallon drums or carbon steel boxes. For drums with greater than 0.5 curies of alpha activity, up to 14 drums are placed inside a concrete culvert which is sealed to protect against potential radiological exposure.

As indicated in Section 2.2.6 and Section B.30 of Appendix B, the SRS procedures for transuranic waste address requirements for packaging and segregating waste, labeling and assaying containers, recordkeeping of container contents, onsite transportation, storage of containers and inspection of storage facilities. The storage facility consists of 19 reinforced concrete pads roughly 80 ft. by 150 ft. in size known as "TRU pads." The transuranic waste pads are all located in an area with controlled access in the central portion of SRS. TRU Pads 1-17 operate under RCRA interim status which requires a contingency plan for emergencies and maintenance of inspection records and facility personnel training records. TRU Pads 1-6 are full of containers and in accordance with past interim storage practices are covered with soil until their retrieval. This interim storage practice provides added radiological protection to humans and the environment from the transuranic waste and protection of the containers from the weather. TRU Pads 7-13 are uncovered pads that store primary carbon steel boxes and concrete culverts. TRU Pads 14-17, where 55-gallon drums are stored, are covered with plastic enclosures, and resemble greenhouses. TRU Pads 18-19 operate under DOE orders since they store only nonhazardous transuranic waste. These two uncovered pads contain only carbon steel boxes. Through years of study and management of transuranic waste, SRS has utilized the above mentioned interim storage practices to protect humans and the environment and provide safe retrievable storage of transuranic waste.

The SRS RCRA Part A Permit for TRU Pads 1-17 allows a maximum of 84,200 55-gallon drums, although this number will not be reached due to the other storage containers on the pads and packing of higher activity drums inside concrete culverts. Based on the current volume estimate for transuranic waste in storage of 10,053 cubic meters (2,656,000 gallons), it has been conservatively estimated that no more than 48,000 55-gallon drums are presently in storage at the transuranic waste facility.

Response to Comment L007-08

Remedial decisionmaking is regulated by the *Federal Facility Agreement for SRS*, an agreement between the U.S. Environmental Protection Agency, the South Carolina Department of Health and Environmental Control, and DOE. Characterization of the environmental restoration units (identified in Appendix G) is in its early stages. DOE believes it would be premature to consider site-specific environmental restoration alternatives in this EIS, and therefore does not include site cleanup in the scope of this EIS.

Response to Comment L007-09

The placement of all wastes in the most stable form possible is consistent with the extensive treatment configuration alternative (alternative C). The waste that would be transported to geologic repositories (high-level and transuranic waste) requires permanent isolation from the environment. DOE is investigating two sites for the permanent disposal of transuranic and high-level wastes. If approved, permanent repositories in Carlsbad, New Mexico, and Yucca Mountain, Nevada, would dispose of these wastes. The design and operation of these sites is not in the scope of this EIS. SRS high-level waste would be processed in the Defense Waste Processing Facility and the vitrified product would be enclosed in stainless steel canisters and transferred to the Yucca Mountain repository for permanent disposal. DOE recently issued a Supplemental EIS on this facility (DOE 1994) and a Record of Decision (DOE 1995).

Response to Comment L007-10

Pollution prevention, including minimizing the spread of waste, is an integral part of SRS's pollution prevention program under the *Department of Energy, Savannah River Site Waste Minimization and Pollution Prevention Awareness Plan, FY 1995*. The waste minimization program has identified source reduction, through administrative controls and good housekeeping practices, as an essential element to achieve waste volume reduction. The source reduction program includes administrative controls that reduce the likelihood of spills and minimize the spread of contamination. Section 2.2.1.3 presents the 1994 waste minimization goals. These goals are reviewed at least annually and progress reports, which are prepared quarterly, show substantial and continuing achievement of its goals.

Response to Comment L007-11

DOE agrees. DOE-SR has established a Citizens Advisory Board to help achieve this objective. Public and state government involvement is a significant component of the Federal Facility Compliance Act, which involves selection of the technology for the management of mixed waste.

Response to Comment L007-12

DOE agrees that certain waste in storage requires characterization and separation; this EIS analyzes a proposal to construct and operate the transuranic waste characterization/certification facility and a soil sort facility for these purposes. All of the action alternatives considered in the EIS have the objective of isolating wastes from the environment. Among these alternatives, alternative C would achieve the most stabilization, while alternative A could be implemented most quickly.

The comment regarding onsite management versus transport of waste is a DOE complex-wide issue. The final EIS includes an offsite low-level waste volume reduction initiative that has several advantages over the supercompactor described in the draft EIS (Section 2.6.3). The analysis indicates that *transportation impacts are very small.*

In general, strategies for the management of DOE nuclear weapons complex waste are beyond the scope of this EIS but are being addressed in the Waste Management Programmatic EIS. The minimization of waste transport by onsite treatment, storage, and disposal is consistent with the decentralization alternative that is under consideration in the programmatic EIS.

Response to Comment L007-13

DOE has attempted in this EIS, and in other documents over the years, to inform the public about the risks associated with the wastes which result from its operations. It is difficult to convey this important information in a manner which is accurate and understandable, and yet does not raise undue and unfounded fears among members of the public. DOE welcomes any suggestions for means to share this information with the public.

Response to Comment L007-14

DOE agrees that prolonged storage is not an acceptable substitute for proper treatment and disposal. The alternatives considered by DOE include waste storage only until the required treatment and disposal technologies can be developed and implemented. When prolonged storage may be required pending a disposal determination, DOE proposes that treatment be provided that will minimize hazards associated with such storage.

Response to Comment L007-15

The EIS has identified in Chapter 4, as well as in Appendices E and F, the magnitudes of the chemical and radioactive risks from both normal operations and accidents for each of the waste types to be managed at SRS.

Response to Comment L007-16

See the response to Comment L007-13. DOE continually informs the public and provides opportunities for their involvement. After announcing its intent to prepare this EIS, DOE held three workshops and three scoping meetings in combination with two other related EISs. After issuing the draft EIS, DOE conducted hearings at six locations to inform the public of its plans and receive comments.

Response to Comment L007-17

The encapsulation of waste in glass by vitrification is a technology that will be used extensively at SRS. Two facilities, the Defense Waste Processing Facility and the M-Area Vendor Treatment Facility, will vitrify high-level and certain mixed low-level wastes, respectively. Vitrified high-level waste would be sent to a geologic repository for permanent disposal when such a facility is available (see response to Comment L007-09). In addition, this EIS analyzes the impacts of constructing and operating two vitrification facilities, one for non-alpha waste (mixed low-level and possibly low-level and hazardous waste) and one for transuranic and other alpha-emitting waste. Alternative C relies heavily on vitrification to create a highly migration-resistant waste form.

Response to Comment L007-18

Agencies, organizations, and individuals who participated in the preparation of this EIS are identified in the List of Preparers. DOE has attempted to use graphics where it believes they are useful and appropriate, and has examined other possible applications for graphics in the Final EIS.

Response to Comment L007-19

Generally speaking, the EIS shows that offsite effects, if any, to individuals or communities due to the waste management actions discussed in the EIS would be very small. These effects would be the result of radiation exposure, which is calculated to result from the various alternatives analyzed in the EIS. The estimated dose received by the population in any specific region or community, as well as the dose to an average individual in that region or community can be determined for each of the alternatives discussed in the EIS. The harm to a community or individual would be the risk of contracting cancer. The following paragraphs describe the process for determining that risk or harm.

Figure 4-6 identifies annular sectors around the SRS within which communities of interest to the reader can be located. For each of these sectors, Table E.5-1 provides two sets of fractional values: the first is the fraction of the total population dose resulting from a particular alternative which is received by the population in that sector, and the second, is the fraction of the total population dose which is received by the average person in that annular sector. Offsite (i.e., public) population doses, expressed as "person-rem" over the 30-year period, are presented for each of the alternatives in their respective sections of Chapter 4, and are summarized in Table 2-38 of the EIS.

Thus, a community can be located within a specific annular sector on the map in Figure 4-6, and the dose fraction for that sector determined from Table E.5-1 for either population dose or for the average individual dose. If the community comprises most or all of that annular sector, multiplying the particular population dose in the appropriate section of Chapter 4 (or from Summary Table 2-38) by the population dose fraction will give an approximate value of the community population dose. If the community is a smaller part of the annular sector, multiplying the particular alternative's population dose by the average individual dose fraction will provide the dose to the average individual in that community, and multiplying again by the community's population will give an estimate of the population dose for that community.

Multiplying the population dose to the community of interest by the cancer risk factor of 0.0005 per person-rem provides an estimated number of fatal cancers that would be expected to occur in that community due to the radiation dose received over the thirty-year period analyzed in this EIS.

Response to Comment L007-20

The effects on members of the public from managing these wastes would result from very small amounts of radioactive materials and perhaps hazardous chemicals that might escape during the handling, treatment, and disposal of these wastes. The most likely effect of exposure to these radioactive materials and chemicals is an increase in the risk of contracting cancer, which is small but which increases as the exposure increases. Therefore, impacts to offsite populations have been evaluated and determined to be very small. Impacts to offsite populations have been presented as an incremental increase in the risk of developing a fatal cancer and the number of additional cancer deaths for individuals and populations, respectively. These impacts have been included in the Summary Section and Chapter 4 of the EIS.

Response to Comment L007-21

Please see the responses to comments L007-19 and L007-20. Also, DOE endeavors to keep the public informed of activities and provides opportunities for public involvement. See the response to Comment L007-16.

Response to Comment L007-22

DOE appreciates the efforts of the Citizens for Environmental Justice and their presentation of the workshop on February 25, 1995. It was a valuable precursor to the hearings that DOE presented in Savannah on February 28.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

MAR 31 1995

4FAB/EPS-mh

A. B. Gould, Director
Environmental Compliance Division
U.S. Department of Energy
Savannah River Operations Office
P.O. Box 5031
Aiken, SC 29804-5031
Attention: WMEIS

SUBJECT: Draft Environmental Impact Statement (DEIS), Savannah River Site (SRS) Waste Management, Aiken, South Carolina

Dear Mr. Gould:

We have reviewed the subject document in accordance with Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. The DEIS discusses minimizing, treating, storing, and disposing of liquid high-level radioactive, low-level radioactive, hazardous, mixed (radioactive and hazardous), and transuranic wastes at SRS. Alternatives considered include No Action, Limited Treatment (A), Moderate Treatment (B), and Extensive Treatment (C). For each of the action alternatives, the DEIS presents three forecasts of waste volume based on the expected, minimum and maximum amounts of wastes SRS might need to manage.

In general, the DEIS does a good job dealing with a very complex issue. While our review identified no major technical deficiencies, we offer the following comments and observations.

ENVIRONMENTAL JUSTICE

We wish to commend DOE on their assessment of environmental justice (Section 4.1.12.2.3). The DEIS concludes that "none of the alternative strategies would have disproportionate adverse effects on minority populations or low-income communities" (page 4-52).

WASTE MINIMIZATION

According to the DEIS, the determining factor of potential impacts is the amount of waste SRS would be called upon to manage (expected, minimum or maximum forecast) rather than the management strategy used (Alternative A, B, or C). The ultimate amount of waste managed is expected to depend in large part on the extent of environmental restoration (ER) and facility decontamination and decommissioning (D/D) undertaken at SRS in the future (page S-14).

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PK56-43

Letter L008. (page 1 of 3)

Page Two

This being the case, we expect that every effort will be made to minimize waste generated by ER and D/D activities. The DEIS states that D/D methods have not yet been identified for most SRS facilities and that the selection process would be subject to separate review under NEPA (page 3-92). We recognize that, in many cases at SRS, D/D activities present new challenges for DOE and that starting on small-scale projects will provide experience for larger ones (Section 3.14.1). What experience can be drawn from commercial applications of D/D activities?

L008-01

If Alternative C is chosen, additional treatment variances should be sought to minimize storage requirements. Section 2.5.3, Low Level Waste, for the expected waste forecast, indicates that 24 additional buildings will eventually be needed for storage of spent deionizers. DOE should look at technologies currently planned with the idea of stabilizing or destroying deionizers.

L008-02

Also, under Alternative C, DOE should minimize containerized storage. DOE should consider using technologies that will be available for destruction or stabilization of radioactive oil and mercury-contaminated tritiated oils rather than planning for 30 year storage capacity.

L008-03

It is notable that Pollution Prevention/Waste Minimization is discussed at the beginning of each alternative description in Chapter 2. We salute the efforts of the SRS waste minimization program and encourage continuous development and improvement of these efforts.

SENSITIVE RESOURCE IMPACTS

Under the maximum waste forecast, the DEIS states that it is probable that any site selected for expansion of the various waste management facilities could contain wetlands, steep slopes, threatened and endangered species habitat, and cultural resources (page 4-92, 4-154, and 4-214). As mentioned, additional biological and wetlands assessments would be required as part of the site(s) selection process. What criteria will be used in site selection? Avoidance of sensitive resources should be given top consideration.

L008-04

SUMMARY

Although we have no major objections to any of the action alternatives, we tend to favor the Extensive Treatment Configuration (Alternative C). While this alternative may increase short-term impacts, the long-term benefits (e.g., reducing volume and toxicity and creating stable, migration-resistant waste forms) are attractive. In addition, the cost-benefit analyses performed shows this alternative to be competitive with the others.

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Letter L008. (page 2 of 3)

Page Three

We agree that the No Action Alternative is not a preferable option as it could cause DOE to violate some regulatory requirements and agreements. For any alternative chosen, we wish to emphasize that pollution prevention and waste minimization should be considered processes of continuous improvement that are integrated into every waste management activity.

Based on our comments given above, we rate this DEIS "EC-2." That is, we have environmental concerns about the project and more information is needed to fully assess the impacts. If you have any questions concerning our comments, you may contact Marion Hopkins of my staff at 404/347-3776.

Sincerely,

Heinz J. Mueller, Chief
Environmental Policy Section

PK56-43

Letter L008. (page 3 of 3)

Response to Comment L008-01

Since DOE is experienced with decontamination and decommissioning is limited to date, DOE relies on commercial experience. This includes using private companies with previous decontamination and decommissioning experience and using the same methodologies for waste treatment and minimization developed by and for private industry. The lessons learned from previous DOE and commercial activities have been compiled into the *Decommissioning Handbook*, (DOE/EM-0142P, March 1994) which serves as a reference when determining the means for achieving the appropriate level of cleanup of SRS facilities.

Response to Comment L008-02

DOE agrees that long-term storage of spent deionizers is not desirable; however, treatments for these waste streams are not completely developed at this time. DOE is aggressively pursuing several emerging technologies described in Appendix D of this EIS that may prove suitable for treating these wastes. The primary technologies being considered are quantum catalytic extraction, polyethylene encapsulation, and vinyl ester styrene solidification, which stabilizes and encapsulates spent deionizers. These technologies are rapidly approaching commercial availability and, if they prove feasible, will be used to reduce or eliminate the storage of these wastes.

Response to Comment L008-03

DOE is utilizing available treatment for radioactive oils and mercury-contaminated tritiated oils where the radioactivity level is low and does not pose an environmental risk. The wastes in question, however, are small in volume but have very high concentrations of tritium. Treatment by conventional means would release this tritium into the environment. DOE is investigating emerging technologies which may be suitable for disposal of these wastes. One such technology is a packed bed reactor (described in Appendix D, Section D.7.10) which would have the ability to capture the tritium and mercury in the offgas system, preventing release to the environment.

Response to Comment L008-04

Should the maximum waste forecast become reality, DOE would employ a site selection process similar to the one employed for the area adjacent to F- and E-Areas to identify sites for additional waste management facilities. In response to consultation requirements under NEPA, DOE described this selection process in the Protected Species Survey, dated April 1995 and completed pursuant to Section 7 of the Endangered Species Act. The initial effort to site new facilities near existing waste management facilities resulted in the selection of land near F- and E-Areas. In order to minimize impacts to biodiversity, wetlands, threatened and endangered species, and cultural resources, every effort was made to site facilities in existing cleared areas. Under the alternatives and forecasts for this EIS, varying number of facilities could not be accommodated in these cleared areas and undeveloped land was required. Every effort was made to site potential facilities that could not be accommodated in existing cleared areas on level, upland pine forest that had been previously farmed. This avoided wetlands, threatened and endangered species habitat, areas of high diversity, and archaeological sites. Undeveloped wetlands and steep upland areas that had never been farmed were considered only when their use could not be avoided due to their proximity to preferred sites (e.g., some upland hardwood sites would be required for sediment ponds). The values of these areas to wildlife and the biodiversity of the region was a consideration in the final selection. It is anticipated that any construction needed to accommodate the amount of waste anticipated by the maximum waste forecast would employ a similar site selection process documented through correspondence and site visits, if necessary, with U.S. Fish and Wildlife Service and National Marine Fisheries Service, the U.S. Army Corps of Engineers, and the State Historic Preservation Officer.

Arthur B. Gould, Jr., Director
NEPA Compliance Officer
U.S. Dept. of Energy
SRS Operations Office
Aiken, SC 29804-5031

I appreciate the opportunity to have participated in the informational meeting held in Columbia and to have this further opportunity to comment in writing concerning the SRS Waste Management Draft EIS. On the understanding that the comment period has been extended until March 30, I am submitting these comments which are of a generalized character.

A serious concern, which you point out, and which makes much of the planning you are doing a gesture of hope over experience is the tremendous uncertainty about future waste burdens to be undertaken by SRS, whether through such possibles as the temporary(?) storage of spent fuel rods, the handling of foreign nuclear materials, the handling of decommissioning waste, civilian and governmental and the handling of new wastes to be generated by new initiatives being suggested by congressional leaders and others. We in South Carolina have a great concern about how much and what kinds of waste, imported or yet-to-be-generated, that will almost inevitably be treated/stored at SRS. As this and other documents so clearly point out there is already a heavy burden of on-site generated waste still awaiting treatment and various forms of processing for which true permanent storage seems to be always a plan and never a certainty. L009-(

We ask that in making decisions about further waste to be stored, treated, incinerated, etc. at SRS, which has not been generated on site, you take into account the fact that you have already heavilly impacted this state. This is a new era of considering environmental justice. Where is the justice in so heavily impacted this one small state?

We continue to be concerned over the long delays in solidifying the 36 million gallons of high level liquid waste and the uncertainties about the DWPF. L009-(

Thank you for the opportunity to comment,

Sincerely yours,

Mary T. Kelly

Mary T. Kelly, Ph.D., Natural Resources Specialist, League of Women Voters SC
4018 Sandwood Drive
Columbia, S.C. 29206
803-782-8410

PK56-43

Letter L009.

Response to Comment L009-01

The EIS presents, in Section 2.1 and Appendix A, DOE's range of forecasts of the waste it may manage at SRS, including the relatively small volumes from other sites. As indicated in that material, the major determinant of waste volume is the extent of onsite restoration activities, rather than the receipt of offsite waste.

DOE will issue a programmatic EIS on waste management that will provide the basis for decisions on alternative treatment and disposal options for the entire DOE complex. The programmatic EIS will detail the types and quantities of waste that might be managed at SRS and at other DOE facilities. The public will have a chance to comment on the proposals during the public comment period. There are a number of equity issues that will have to be worked out between states concerning how much and what types of waste each will allow to be managed within its borders to ensure no state is overburdened.

Response to Comment L009-02

DOE completed a detailed supplemental EIS for the Defense Waste Processing Facility in November 1994 to assist in determining how to proceed with the Defense Waste Processing Facility. On April 12, 1995, DOE published its Record of Decision for the Defense Waste Processing Facility in the *Federal Register* (60 FR 18589). The Record of Decision documents DOE's decision to continue construction and to operate the Defense Waste Processing Facility as currently designed using the In-Tank Precipitation process. DOE has also decided to implement additional safety modifications to the Defense Waste Processing Facility prior to operating the facility with radioactive waste. As noted in the Record of Decision, DOE currently proposes to vitrify only the high-level radioactive waste currently in tanks at SRS, plus any small increments produced as a result of ongoing SRS activities. DOE would undertake additional NEPA reviews if other wastes are proposed for treatment at the Defense Waste Processing Facility.

The Defense Waste Processing Facility is presently being tested with simulated waste. As of mid-April-1995, 24 canisters of vitrified simulated waste had been produced. DOE is presently on schedule for radioactive testing to begin in December 1995. Processing of SRS high-level radioactive waste is scheduled to begin in mid-February 1996. DOE believes that the existing and future inventories of high-level waste can be processed by 2018.

PAINE COLLEGE

Division of Natural Sciences and Mathematics 1235 Fifteenth Street Augusta, Georgia 30901-3182 (706) 821-8200

NEPA Compliance Officer
Department of Energy--Savannah River Operations Office
P.O. Box A
Aiken, SC 29802

Dear Dr. Fiori: March 31, 1995

Re: Waste Management Environmental Impact Statement (WM-EIS)

Please accept the attached material as my personal comments on the Waste Management Environmental Impact Statement (WM-EIS). This material regards three draft motions from this past Monday, March 27, 1995, that were presented to and approved by the Environmental Restoration and Waste Management Subcommittee of the Savannah River Citizens Advisory Board, of which I am the Subcommittee Co-Chair. All three motions had been reviewed by me with the members of the Subcommittee and later with Brian Costner, Energy Research Foundation and CAB member--the attached version of the Soil motion had even been revised at Costner's request in preparation for consideration by the full Board at its meeting held on Tuesday, March 28th.

The first motion, on Pu-238 and Transuranic Waste Treatment, was approved by the full Board and has already been forwarded to Dr. Mario P. Fiori, Manager, SRS. However, due to time constraints, the other two motions, Combustible Low Activity Waste Treatment and Hazardous and Mixed Soil Treatment, were not voted on by the CAB. I anticipate that these two motions will be brought before the full CAB at the next opportunity (presently, they are scheduled for the July meeting).

But in order to meet the March 31, 1995, cutoff for public input, the attached comments concerning the second and third motions, including the presentation materials (i.e., slides), supporting information on the motions, and the motions, are being submitted as my personal comments without the endorsement of the full CAB at this time. In addition, please include the minutes of the Subcommittee meeting (they are available from Dawn Haygood, 1-800-603-0970).

If you should have any questions concerning these comments, please contact me at your earliest convenience.

Sincerely,

W.F Lawless, Ph.D.
Associate Professor of Mathematics and Psychology

A College of The United Methodist Church and the Christian Methodist Episcopal Church

PK56-44

Letter L010. (page 1 of 18)

Attachment 1

Savannah River Site
Citizens Advisory Board
Environmental Remediation and Waste Management Subcommittee
Motion on Pu-238 Combustible Waste Management

In response to the Transuranic Waste Treatment Plan in the Waste Management Environmental Impact Statement, because of uncertainty associated with the start-up of the Waste Isolation Pilot Plant (WIPP), because of danger created by the serious consequences of a high activity Pu-238 or Pu-239 accident during storage or treatment at SRS, and because of he likelihood of the long term storage of transuranic waste at SRS after waste treatment, the CAB recommends that DOE:

L010-01 1. Categorize the SRS High Activity Transuranic waste as an urgent problem.

L010-02 2. Expedite the selection of an appropriate organic treatment (e.g. destruction/stabilization) for SRS transuranic waste by year's end to help make this selection. DOE should commission an independent "Blue Ribbon" panel of experts to review the treatment and waste-form options in a report to DOE and a presentation before the CAB at its November 1995 meeting; and,

L010-03 3. Assign the highest priority to obtain funding no later than the FY97 budget for a capital line-item project to treat transuranic wastes and convert them into a stabilized waste for (e.g., vitrified).

L010-04 4. Further, because of the increased probability of an accident during the scheduled repackaging of the Pu-238/239 wastes on 5 of the TRU pads (storing approximately 400,000 total curies), to eliminate the need to handle these wastes twice, he CAB recommends that DOE reconsider its repackaging plan carefully, possibly including a review by ISPR, to determine if SRS can wait until a treatment option is available without incurring undue risk.

PK56-44

Letter L010. (page 2 of 18)

Attachment 2

**Savannah River Site
Citizens Advisory Board
Environmental Remediation and Waste Management Subcommittee
Motion on the Consolidated Incineration Facility**

In response to the Combustible Low Level Waste Treatment Plan in the Waste Management Environmental Impact Statement, the Citizens Advisory Board recommends that:

1: Because of the insignificant differences in the air emissions from supercompaction and incineration, similar volume reduction ratios, and the additional advantage of a stabilized waste form resulting in lower disposal cost, DOE expeditiously process the SRS combustible low-level wastes in the CIF; and, L010

2. Because the stabilized waste form resulting from the Consolidated Incineration Facility can significantly affect long-term groundwater impacts, DOE determine, and evaluate in a cost-based analysis (CBA) by independent scientific peer review (ISPR), the best means to stabilize the ash waste concurrent with on-going schedule, activities and start-up. L010

PK56-44

Letter L010. (page 3 of 18)

Attachment 3

Savannah River Site
Citizens Advisory Board
Environmental Remediation and Waste Management Subcommittee
Motion on SRS Soils

In response to the Hazardous and Mixed Waste Soil Treatment Plan in the Waste Management Environmental Impact Statement, the CAB recommends that:

L010-07 1. Because of uncertainty of the waste volume and characterization of hazardous and mixed waste soils resulting from the lack of an SRS Future Use Plan, developed cleanup standards, sufficient site characterization data and cost effective treatment options, DOE defer the non-alpha vitrification facility for treating soils; and,

L010-08 2. In order to be able to treat the wide range of contaminated soils at SRS (D&D, seepage basin soils, etc.), and the uncertainty associated with the loss of institutional control of SRS in 100 years, DOE fund soils treatment research and development at a high level of priority.

L010-09 3. DOE and the regulators work with the public to develop an appropriate plan for determining how to safely categorize and manage contaminated and suspect soils.

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ER & WM Subcommittee Motions:

1. ISPR (status: passed & accepted)
2. Zoning (status: passed & pending)
3. F&H-GW pump & treat (Mar. 28th)
4. Combustible Pu-238 (Mar. 28th)
5. Incinerable LLW (Mar. 28th)
6. Contaminated Soils (Mar. 28th)
7. Feasibility Study (RI/FS) (July??)
8. Market Based Plan (July)
9. Tritium-DNA health RFP (July)
10. Path Forward: DWPF initiatives (i.e., automated procedures; new canister storage; benzene; emptied waste tanks); FFA implementation plan

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The Savannah River Site Waste Management Environmental Impact Statement was developed to evaluate the treatment, storage, and disposal options for five waste types:

High Level Waste (HLW)
Low Level Waste (LLW)
Transuranic Waste (TRU)
Hazardous Waste (HW)
Mixed Waste (MW)

The ER & WM Subcommittee of the Savannah River Citizens Advisory Board selected three focus areas to provide input for the final WMEIS:

- **Transuranic Waste Treatment**
- **Combustible Low Activity Waste Treatment**
- **Hazardous and Mixed Waste Soils Treatment**

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Waste Management Environmental Impact Statement

Notice of Intent	April 1, 1994
Public Comment Period	April 6 - May 31, 1994
Public Scoping Meetings	May 1994
Implementation Plan	June 23, 1994
Draft EIS	January 20, 1995
Public Comment Period	January 27 - March 31, 1995
Final EIS	June 16, 1995
Record of Decision	July 26, 1995

EIS Options

A: Limited treatment and storage, lowest costs and releases to workers, highest long-term impact on the public.

B: Intermediate between A and C.

C: Extensive treatment and least storage impacts, highest costs and most short-term releases to workers and the public, least long-term impact on the public.

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TRANSURANIC WASTE

- Description
- Hazards
- Inventory
- Treatment Options
- Motion

Transuranic Waste

Description

- Waste contaminated with alpha-emitting transuranic radionuclides having an atomic number greater than 92, half-lives greater than 20 years, and concentrations greater than 100 nanocuries per gram
- TRU waste generated and sorted at SRS is composed primarily of Pu238 and Pu239
- Examples: *job control waste, sludges, resins, and filters*

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Transuranic Waste

Hazards

- Transuranic isotopes are extremely toxic due to long retention time in the body. Although alpha particles cannot penetrate skin, they may be harmful if entered the body through a cut, through breathing air, or through food or water.
- Most of the hazards associated with transuranic waste are in the handling of the waste by the worker or potential releases to the environment through accidents or natural disasters. Accidental fire in a Transuranic storage facility has one of the highest consequences to offsite public of any SRS scenario.
- Some transuranic wastes also have hazardous constituents making them mixed wastes. However, they are managed primarily on the radiological hazard.

Transuranic Waste

Current Inventory and expected Generation

- 10,034 cubic meters in storage
  - High activity - 5920 cubic meters; 700,000 curies
  - Low activity - 4114 cubic meters; 2100 curies
- Expected thirty-year forecasted generation -- 12,564 cubic meters
- Significant increase could be generated by ER and D&D.

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Transuranic Waste Options

- Continued storage without treatment
  - Least expensive but does not mitigate risk or provide long term solution
  - Container degradation
  - Significant offsite consequences from an accident - fire
- High temperature organic destruction/Stabilization
  - High cost
  - Offers complete solution for low and high activity
  - Inhalation potential eliminated when combined with superior waste form
  - Organic destruction virtually eliminates offsite consequences and hydrogen gas generation which limits shipment to final repository
  - Hybrid thermal units such as plasma hearth have advantage of eliminating need for pre-characterization which is high cost

Transuranic Waste Options
(Continued)

- Acid Digestion
  - Moderate to high cost
  - Destroys organics but requires additional treatment to produce stable waste form
- Sorting, Characterization, and Repackaging
  - High cost
  - Could configure low activity waste for shipment to repository
  - Could not configure high activity waste for repository. High activity requires organic destruction

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Pu-238 Background

1. At SRS, Tru wastes: job control waste, sludges, resins, and filters.

2. DOE complex-wide, SRS has 8% volume, 69% curies (mostly in a combustible waste matrix).

3. At SRS, 1/2 of its volume is certifiable to WIPP-WAC (mostly low activity Pu-239, less than 1% of total curies).

4. Pu-238 vitrification => high exposure and high danger; plasma hearth => low exposure and low danger.

5. Repackaging @$2-3 M for 5-6 of 22 pads.

6. xxx% gas generators; xxx% liquid; XXX% number of Pu-238 drums.

Combustible Low Activity Waste

- **Definition**
- **Categories**
- **Low Level Radioactive Waste**
- **Combustible Low Activity Waste Options**
- **Motion**

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LOW LEVEL RADIOACTIVE WASTE

Definition - Radioactive waste that does not meet the definition of high level or transuranic waste and does not contain materials designated as hazardous by RCRA

- Five Main Categories
  - Low Activity
  - Intermediate Activity
  - Intermediate Activity Tritium
  - Long Lived Waste
  - Suspect Soils

LOW LEVEL RADIOACTIVE WASTE

Hazards	Increasing Hazard ↓	
Low Activity Waste		<200 MR Beta/Gamma
Intermediate Activity Waste		>200 MR Beta/Gamma
Intermediate Activity Tritium Waste		>200 MR Beta/Gamma > 10 Curies Tritium
Long Lived Waste		Normally <200 MR Beta/Gamma Long Half Life

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Combustible Low Activity Waste Options

- **Direct Disposal**
  - **High cost due to lack of volume reduction and require construction disposal vault**
- **Supercompaction**
  - **Treatment cost justified by 12 to 1 volume reduction**
  - **Waste form unstabilized requiring high cost vault disposal**
  - **Air Emissions - Extremely low**
- **Consolidated Incineration Facility**
  - **Treatment cost justified due to 10 to 1 volume reduction**
  - **Facility available and designed to treat mixed and low activity waste**
  - **Provides waste form which has superior radiation containment and is better suited for less expensive shallow land disposal**
  - **Air Emissions - Slightly higher than supercompaction yet still extremely low**

CIF Background

1. Supercompactor product storage @$50/cu m; CIF ashcrete @$7/cu m.

2. Georgia Tech ISPR concluded that the differences in air emissions from the supercompactor and the CIF were very low and about equivalent.

Treatment costs:

CIF	**$1500 per cubic meter**
Supercompactor	**$1600 per cubic meter**

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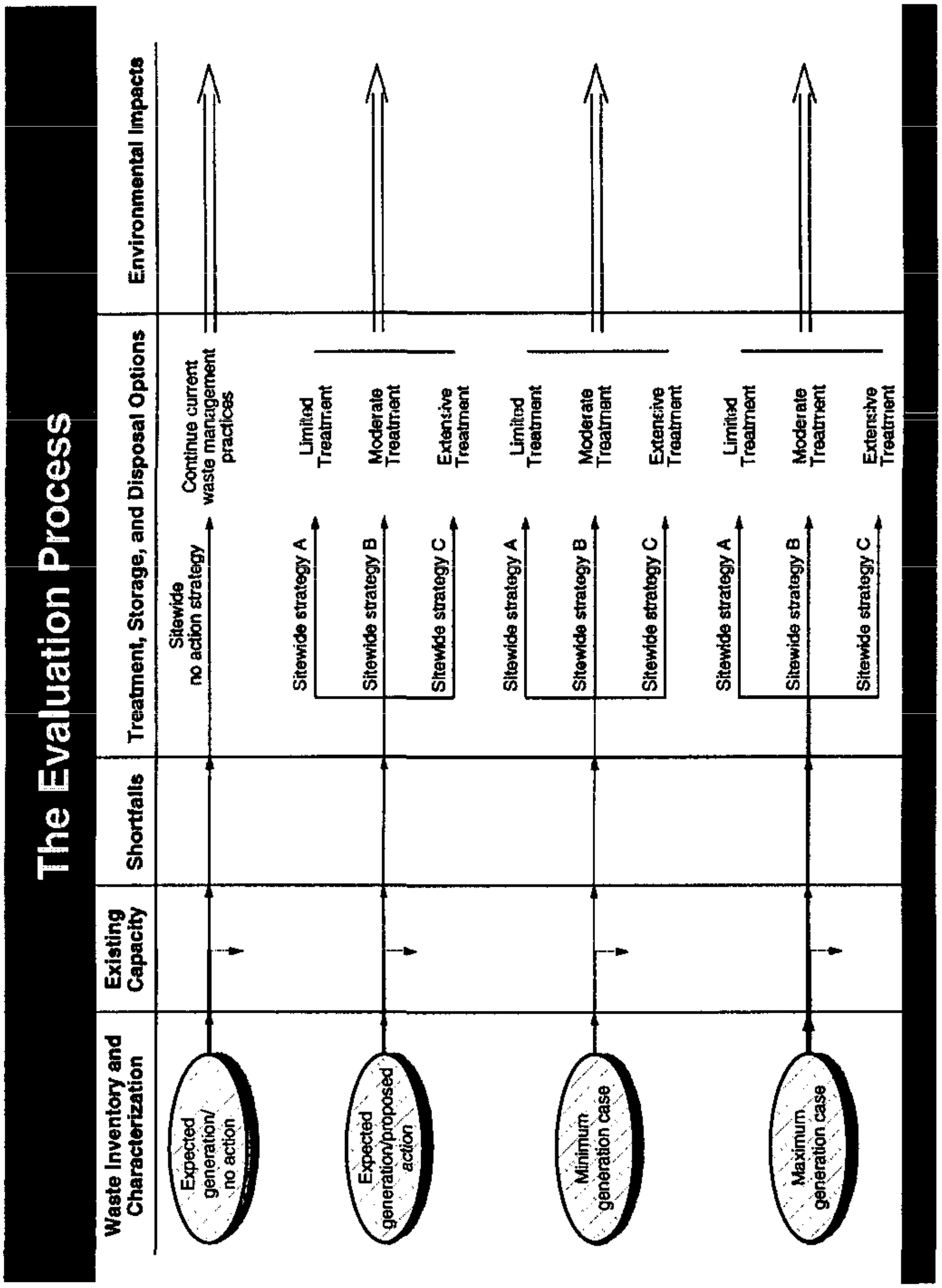

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Savannah River Site
Citizens Advisory Board
Environmental Remediation and Waste Management Subcommittee
Motion on the Consolidated Incineration Facility

In response to the Combustible Low Level Waste Treatment Plan in the Waste Management Environmental Impact Statement, the Citizens Advisory Board recommends that:

1. Because of the insignificant differences in the air emissions from supercompaction and incineration, similar volume reduction ratios, and the additional advantage of a stabilized waste form resulting in lower disposal cost, DOE expeditiously process the SRS combustible low-level wastes in the CIF; and,

2. Because the stabilized waste form resulting from the Consolidated Incineration Facility can significantly affect long-term groundwater impacts, DOE determine, and evaluate in a cost-based analysis (CBA) by independent scientific peer review (ISPR), the best means to stabilize the ash waste concurrent with on-going schedule, activities and start-up.

Hazardous & Mixed Waste Soils

- **Description**
- **Hazards**
- **Inventory**
- **Treatment Options**
- **Motion**

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Hazardous and Mixed Waste Soils

Description

- Regulated by Resource Conservation and Recovery Act
- Classified as either "characteristic" or "listed"
- Examples: freon, lead, paint solvents, pesticides
- Includes Seepage Basin soils

Hazards

- Mixed wastes contain hazardous and radioactive constituents
- Hazardous constituents are flammable, toxic, corrosive, or reactive
- Radioactive constituents range from low dose and concentrations to high

Current Inventory and Annual Generation

- Approximately 6000 cubic meters in storage
- 30 year forecast ranges from 250,000 cubic meters to 800,000 cubic meters

Hazardous and Mixed Soils Treatment

- Soil Washing
  - High cost due to waste water treatment capacity required
  - High volume capacity
  - Processes organic and metals contaminated soils
- Consolidated Incineration Facility
  - Moderate incremental cost
  - Limited capacity to process large volumes
  - Primarily for organic destruction but ash stabilization could treat metals content
- Non-alpha vitrification
  - High cost
  - Highly flexible-suitable for all soils types
  - Superior waste form to meet leaching requirements

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Hazardous and Mixed Soils Treatment
(Continued)

- **Low Temperature Thermal Treatment**
  - **Low cost**
  - **High volume treatment**
  - **Removes organic from soil but does not destroy organics**
  - **Suitable for organic contaminated soil only**
- **Bioremediation**
  - **Low cost**
  - **High volume treatment**
  - **Suitable for organic contaminated soil only**

Savannah River Site
Citizens Advisory Board
Environmental Remediation and Waste Management Subcommittee
Motion on SRS Soils

In response to the Hazardous and Mixed Waste Soil Treatment Plan in the Waste Management Environmental Impact Statement, the CAB recommends that:

1. Because of uncertainty of the waste volume and characterization of hazardous and mixed waste soils resulting from the lack of an SRS Future Use Plan, developed cleanup standards, sufficient site characterization data and cost effective treatment options, DOE defer the non-alpha vitrification facility for treating soils; and,

2. In order to be able to treat the wide range of contaminated soils at SRS (D&D, seepage basin soils, etc.), and the uncertainty associated with the loss of institutional control of SRS in 100 years, DOE fund soils treatment research and development at a high level of priority.

3. DOE and the regulators work with the public to develop an appropriate plan for determining how to safely categorize and manage contaminated and suspect soils.

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MOTION: SRS Soils

In response to the Hazardous and Mixed Waste Soil Treatment Plan in the Waste Management Environmental Impact Statement, the CAB recommends that:

1. Because of the uncertainty of the waste volume and characterization of hazardous and mixed waste soils resulting from the lack of an SRS Future Use Plan, developed cleanup standards, sufficient site characterization data, and cost effective treatment options, DOE defer the non-alpha vitrification facility for treating soils; and,

2. In order to be able to treat the wide range of contaminated soils at SRS (D&D, seepage-basin soils, etc.), and the uncertainty associated with the loss of institutional control of SRS in 100 years, DOE fund soils treatment research and development at a high level of priority.

Fact Sheet for backup discussions

- **2 million curies of Pu 238/239 in High Level Waste system**
  700,000 curies of Pu 238/239 on Transuranic Waste pads
- **Fiberglass containers subject**
  - **1 container leaked on Pad 3**
  - **There were 14 fiberglass containers total**
  - **After the leak, all were packaged in secondary containment (concrete culvert)**
  - **Fiberglass was discontinued after the leak**
- **Curie content on TRU pads 1-6 is 400,000 curies**

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Savannah River Site Citizens Advisory Board
Environmental Remediation &
Waste Management Program Subcommittee
Meeting Summary
March 27, 1995

The Environmental Remediation (ER) Program Subcommittee met on Monday, March 27, 1995 from 7:30 p.m. to 9:00 p.m. at the Hyatt Regency Hotel in Savannah. Bill Lawless presided over the meeting. Other subcommittee members present were Anne Brown, Ann Loadholt, Kathryn May, Joanne Nestor, and P.K. Smith. Camilla Warren of the Environmental Protection Agency Region IV office attended. Ann Ragan from the South Carolina Department of Health and Environmental Control, (SCDHEC), also attended. Hunter Weiler attended for the Department of Energy's Headquarters office. Gerri El and Brian Hennessey of the Department of Energy's Savannah River Operations Office also attended. Attendees from Westinghouse Savannah River Company (WSRC) were Clay Jones, Cliff Thomas, Leslie Huber, Mary Flora, Ken Crase, and Walt Loring.

The meeting covered draft presentations and four draft motions; with detailed discussions followed by a vote. The four motions were: 1) Independent Scientific Peer Review of current and proposed ground water remediation projects; 2) To categorize the SRS High Activity Transuranic waste as urgent and assign high priority to funding/treatment; 3) Recommend use of the Consolidated Incineration Facility for low level activity wastes; 4) Delay treatment of contaminated soils. After detailed discussions of the motions, all four motions were passed unanimously (by all subcommittee members present) to recommend the motions for consideration by the Citizen's Advisory Board, at the March 28 CAB meeting.

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Response to Comment L010-01

DOE agrees, in principal, that the treatment of high activity transuranic waste should be pursued with a sense of urgency. However, the categorization of any waste as an urgent problem would require, at the outset, evidence of an imminent threat to the health and safety of the public or the work force. The accident analysis for high activity transuranic wastes indicates that, in a fire, the offsite population dose can be high but that the expected frequency of such an event is low, making its occurrence unlikely and its risk very low. While this situation does not pose an imminent threat that warrants classification as an urgent problem, the likelihood of a serious accident increases the longer these wastes remain untreated in storage. For this reason, DOE agrees that long-term storage of untreated waste is not desirable and has assigned a high priority to addressing transuranic waste treatment.

Response to Comment L010-02

DOE agrees with the recommendation to expedite the treatment selection for high activity transuranic wastes. DOE has conducted and continues extensive research and development on organic destruction treatment options for transuranic wastes. The Office of Technology Development has identified waste focus areas for research including transuranic wastes, and is funding ongoing activities at various DOE sites. The goal of this research is to have a selected technology completely developed and available for site implementation by November 1997. As part of the Office of Technology Development technology selection process, the DOE National Environmental Science and Technology Council performs independent technical reviews and evaluations of priorities. The DOE National Environmental Science and Technology Council is comprised of scientists and engineers with national and international reputations in their fields of expertise. DOE will make every effort to select a technology for treatment of transuranic waste by year's end and will present a status report at the November 1995 Citizens Advisory Board meeting.

Response to Comment L010-03

As a result of SRS developing the proposed site treatment plan as required by the Federal Facility Compliance Act, preferred technologies have been identified to allow treatment of SRS mixed waste streams including transuranic waste. To support this effort, funding has been targeted in fiscal year 1997 specifically for the Federal Facilities Compliance Act related activities. In the case of transuranic waste treatment, funding has been targeted for two specific activities. The first activity is to begin development of a transuranic waste treatment facility. In fiscal year 1997 it is envisioned that pre-engineering activities would be performed to support development of a capital line-item to treat transuranic wastes. A second activity that would be performed in fiscal year 1997 would be to initiate a direct support contract for transuranic waste characterization and certification. At present, these funds are targeted to support transuranic waste treatment; however, actual funds are not guaranteed at this time. It should be noted that arc melter studies and hybrid plasma induction activities are currently being performed in the research and development arena to address transuranic waste treatment.

Response to Comment L010-04

The retrieval activities planned for transuranic waste stored on TRU Pads 2 to 5 include "overpacking" and not "repackaging." With overpacking, an existing 55-gallon drum will be placed inside an 83-gallon overpack drum for continued safe storage. It should be understood that waste will not be removed from the existing 55-gallon drum and repackaged into a new drum. The primary objective of the retrieval project is the safety of continued transuranic waste storage. These drums were first placed in storage in the mid 1970s; they have a minimum design life of 20 years. Since the drums are under earthen cover, monitoring their condition is not possible. The storage and retrieval hazards of the covered drums will increase with time from corrosion, and are enhanced because the drums cannot be routinely monitored. The covered drums to be retrieved are the lowest risk containers on these pads based on curie loading, but if these drums are left stored under earthen cover until significant deterioration occurs, the hazards associated with handling the drums during retrieval can increase by 300 percent. With regard to worker safety, an environmental assessment performed in 1988 (DOE 1988) showed that routine transuranic waste retrieval operations would result in insignificant amounts of radiation exposure to operating personnel. It also showed that retrieval and subsequent overpacking of these drums reduces the immediate environmental hazards.

The buried drums on TRU Pads 2 to 5 must be retrieved for disposal at the Waste Isolation Pilot Plant. The plan is to retrieve the drums without further delay, vent and purge them of any accumulated flammable gases, and overpack them with a new, vented 83-gallon drum. The overpacked and vented drums will then be re-stored on a weather-protected storage pad in a safe condition. The waste would not be repackaged until a suitable facility is constructed in the future.

Response to Comment L010-05

DOE proposes to incinerate combustible low-level waste and to use supercompaction to treat noncombustible low-level waste. As indicated in Appendix B, Section B.5 the Consolidated Incineration Facility was originally intended for the processing of solid and liquid hazardous and mixed wastes for which incineration is the preferred treatment. However, Appendix B.5 confirms that Consolidated Incineration Facility capacity is expected to be adequate for the incineration of combustible low-level wastes as well.

Response to Comment L010-06

DOE has completed the evaluation of stabilization alternatives for the Consolidated Incineration Facility residue and blowdown (Burns et al. 1993). Several studies on ash stabilization and blowdown have been completed. DOE is continuing to evaluate treatment technologies. The selected means of stabilization is cementation since it represents the most cost-effective alternative, is compatible with ash and blowdown chemistry, and will minimize groundwater impacts. DOE welcomes review of the data and will convene an independent scientific peer review team to evaluate the data. DOE will attempt to arrange this review promptly so that the results can be presented at the July 1995 Citizens Advisory Board meeting.

Response to Comment L010-07

DOE agrees that uncertainties exist in the nature of the final cleanup standards, as well as in the completed definition of areas to be decontaminated and restored. The range of waste forecasts presented in the EIS is intended to bound the effects of those uncertainties on the resulting waste volumes.

The non-alpha vitrification facility is an appropriate and flexible technology for treating soils. However, DOE will continue to evaluate alternative treatment activities based on further soil characterization and on new technologies. If waste volumes meet or exceed the expected (best estimate) waste forecasts, the non-alpha vitrification facility would be required to treat liquid, soil, and sludge wastes generally resulting from environmental restoration and/or decontamination and decommissioning activities.

Response to Comment L010-08

DOE agrees that research and development on the treatment of contaminated soils warrants (and is receiving) a high priority to ensure that areas containing such soils can be processed both effectively and economically. It should be noted, however, that there is no statutory or regulatory requirement that DOE relinquish control over all or parts of SRS in 100 years. It is possible that areas not economically or technically feasible to decontaminate or restore to acceptable levels may remain under the control of DOE or another government agency for an indefinite period.

Response to Comment L010-09

At the request of the Citizens Advisory Board, DOE will work with them to develop an appropriate plan for determining how to safely categorize and manage contaminated and suspect soils.

I.4 References

Burns, H. H., G. K. Geogeton, R. H. Hsu, H. L. Martin, M. R. Poirier, and D. G. Salem, 1993, *Final Study on Alternative Solutions for Treatment of the CIF Blowdown*, SWE-CIF-93-0043, Westinghouse Savannah River Company, Aiken, South Carolina.

Chesney, S. D., 1995, Halliburton NUS Corporation, Aiken, South Carolina, Interoffice Memorandum to B. H. Bradford, Halliburton NUS Corporation, Aiken, South Carolina, "Dose Analysis for Waste Management Environmental Impact Statement," RHSES-002, January 15.

DOE (U.S. Department of Energy), 1988, Environmental Assessment, Management Activities for Retrieved and Newly Generated Transuranic Waste, Savannah River Plant, DOE/EA-0315, August.

DOE (U.S. Department of Energy), 1994, Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility, DOE/EIS-0082-S, Savannah River Operations Office, Aiken, South Carolina, November.

DOE (U.S. Department of Energy), 1995, "Record of Decision for the Defense Waste Processing Facility Environmental Impact Statement," 60 FR 18589, April 12.

ICRP (International Commission on Radiological Protection), 1991, *1990 Recommendations of the International Commission on Radiological Protection*, ICRP Publication 60, Annals of the ICRP, Volume 21, Number 1-3, Pergamon Press, New York, New York.

WSRC (Westinghouse Savannah River Company), 1994, *Department of Energy, Savannah River Site Waste Minimization and Pollution Prevention Awareness Plan, FY 1995*, WSRC-RP-93-1494, Savannah River Site, Aiken, South Carolina, June 27.

APPENDIX J

PROTECTED SPECIES CONSULTATION

The information presented in this Protected Species Survey, published in April 1995, is based on the configuration of the alternatives presented in the draft EIS. This configuration has changed since the draft EIS with respect to the number of facilities and the land area required (Table 2-28 and Figures 4-13, 4-14, 4-22, 4-23, 4-31, 4-32). Changes in acreages range from a decrease of 33 acres between the draft and final in alternative B – maximum waste forecast, to an increase of 17 acres between the draft and final in alternative A – maximum waste forecast. These changes fall within the scope of the alternatives and within the areas surveyed and do not represent major modifications to land requirements. The survey concluded that DOE's plans to construct and operate additional waste management facilities within the uncleared portions of E-Area should not affect any Federally threatened or endangered species.

The amount of waste SRS would be required to treat has not been determined so the need for additional land beyond the uncleared parts of E-Area has not been identified. As stated in the survey, DOE will continue to consult informally with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service as waste management decisions are made.

Information presented in the Protected Species Survey was collected over a 3-year period. Rare plant surveys were conducted in 1992 and 1994 by a private consultant to the U.S. Forest Service. Surveys were done periodically from late March through August of each year along transects established through the area. In 1993, the U.S. Forest Service surveyed the area for red-cockaded woodpeckers, activity, or nest trees by walking through the area along compass lines 20 meters (66 feet) apart.

DOE/EIS-0217
July 1995

PROTECTED SPECIES SURVEY

PROPOSED WASTE MANAGEMENT EXPANSION IN THE UNCLEARED PORTION OF E-AREA

APRIL 1995

U.S. Department of Energy
Savannah River Site
Aiken, SC 29802

DOE/EIS-0217
July 1995

PROTECTED SPECIES SURVEY

PROPOSED WASTE MANAGEMENT EXPANSION IN THE UNCLEARED PORTION OF E-AREA

Publication Date: April 1995

U.S. Department of Energy
Savannah River Site
Aiken, SC 29802

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INTRODUCTION

This report documents the results of a protected species survey conducted in support of the proposed U.S. Department of Energy (DOE) plan to construct and operate additional waste management treatment, storage, and disposal facilities within the uncleared portion of E-Area at the Savannah River Site (SRS) located near Aiken, South Carolina (Figure 1).

Approximately 600 acres of undeveloped woodland adjacent to E-Area were investigated as potential sites for the proposed waste management treatment, storage, and disposal facilities. Approximately 61 acres of currently graded, fenced, and partially developed land and 115 acres of undeveloped land would be required to develop the additional facilities.

Plant and animal surveys conducted by the Savannah River Forest Station (SRFS) during 1992, 1993, and 1994 located no protected species within or adjacent to areas that would be affected (LeMaster 1994a, b, and c).

The term "protected species" as used in the context of this report encompasses both plant and animal species that have been designated by the Federal government as endangered or threatened as defined in the Endangered Species Act and identified in the U.S. Fish and Wildlife Service (USFWS) list of endangered and threatened wildlife and plants (50 CFR Parts 17.11 and 17.12).

DESCRIPTION OF PROPOSED PROJECT

This protected species survey evaluated approximately 600 acres of undeveloped woodland adjacent to approximately 100 acres of previously cleared, fenced, and partially developed land within E-Area (Figures 2 and 3). Dominant cover types are shown in Figure 2. The proposed project is to treat, store and dispose of radioactive, mixed, and hazardous wastes generated during 40 years of operations at the SRS. DOE proposes to construct the following treatment, storage, and disposal facilities:

- 24 long-lived waste storage buildings (size 50' x 50')
- 18 Resource Conservation and Recovery Act (RCRA)-permitted disposal vaults (size 200' x 50')
- 4 low-activity waste vaults (size 650' x 150')
- 4 intermediate-level waste vaults (size 250' x 50')
- 56 shallow land disposal trenches (size 100' x 20')
- 14 transuranic waste storage pads (size 150' x 50')
- 80 mixed waste storage buildings (size 160' x 60')
- 1 supercompactor
- 1 alpha vitrification facility
- 1 non-alpha vitrification facility
- 1 containment building
- 1 transuranic waste characterization/certification facility

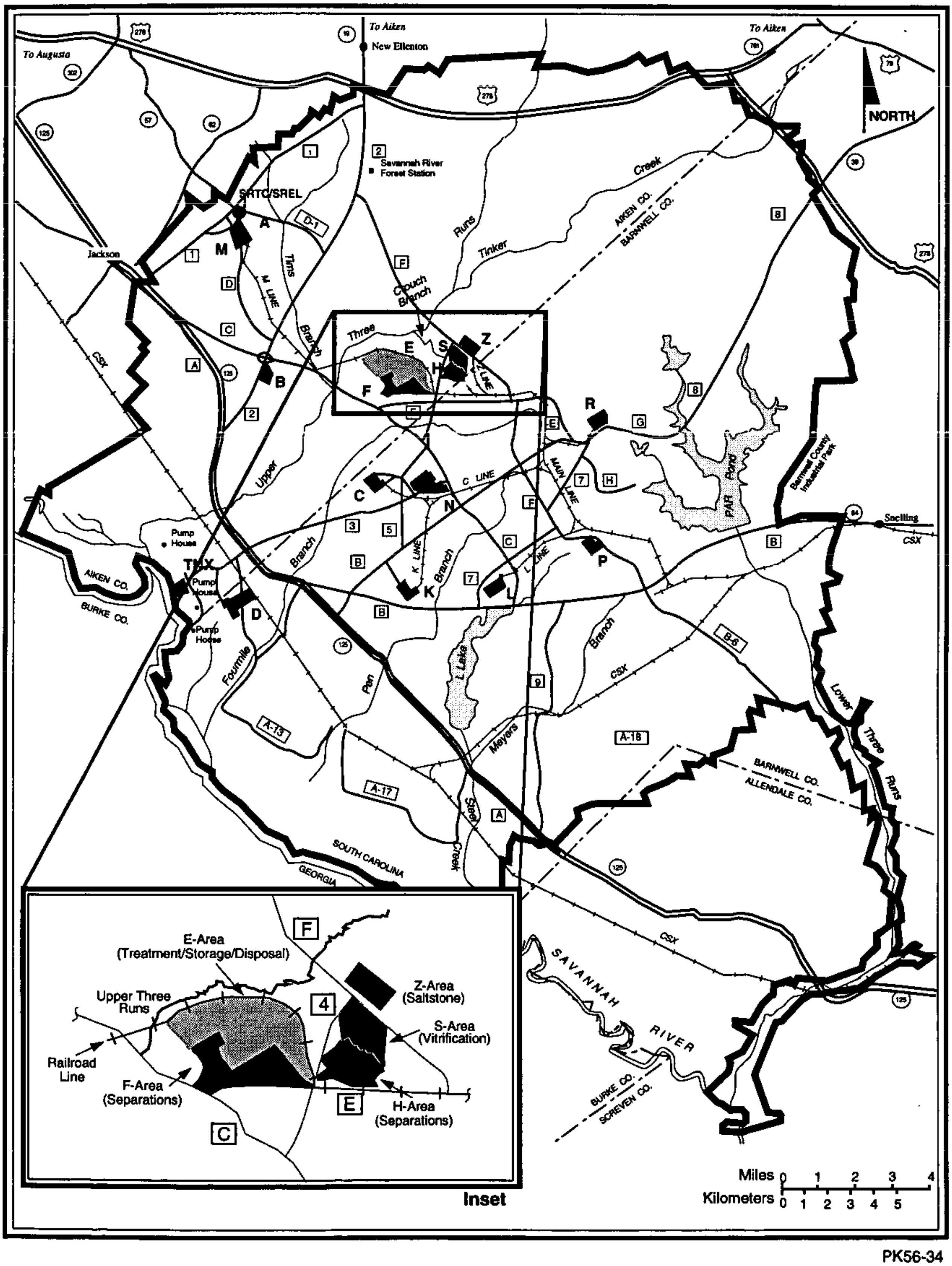

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Figure 1. General location of the proposed waste management expansion in E-Area at the Savannah River Site, South Carolina. Refer to Figure 2 for details on the proposed project area .

Construction of the treatment facilities that are proposed to be located northwest of F-Area will require approximately 10 years. Until the treatment facilities are available, all waste will be stored within the developed portion of E-Area, a loblolly pine (*Pinus taeda*) plantation planted in 1987 (3 acres), and a recently harvested mixed pine hardwood stand (4 acres) (Figure 2). When treatment of the waste begins in 2008, waste stored in the developed portion of E-Area will be treated, consolidated, and disposed in RCRA vaults to be constructed in a 9-acre loblolly pine plantation established in 1987 (Figure 3).

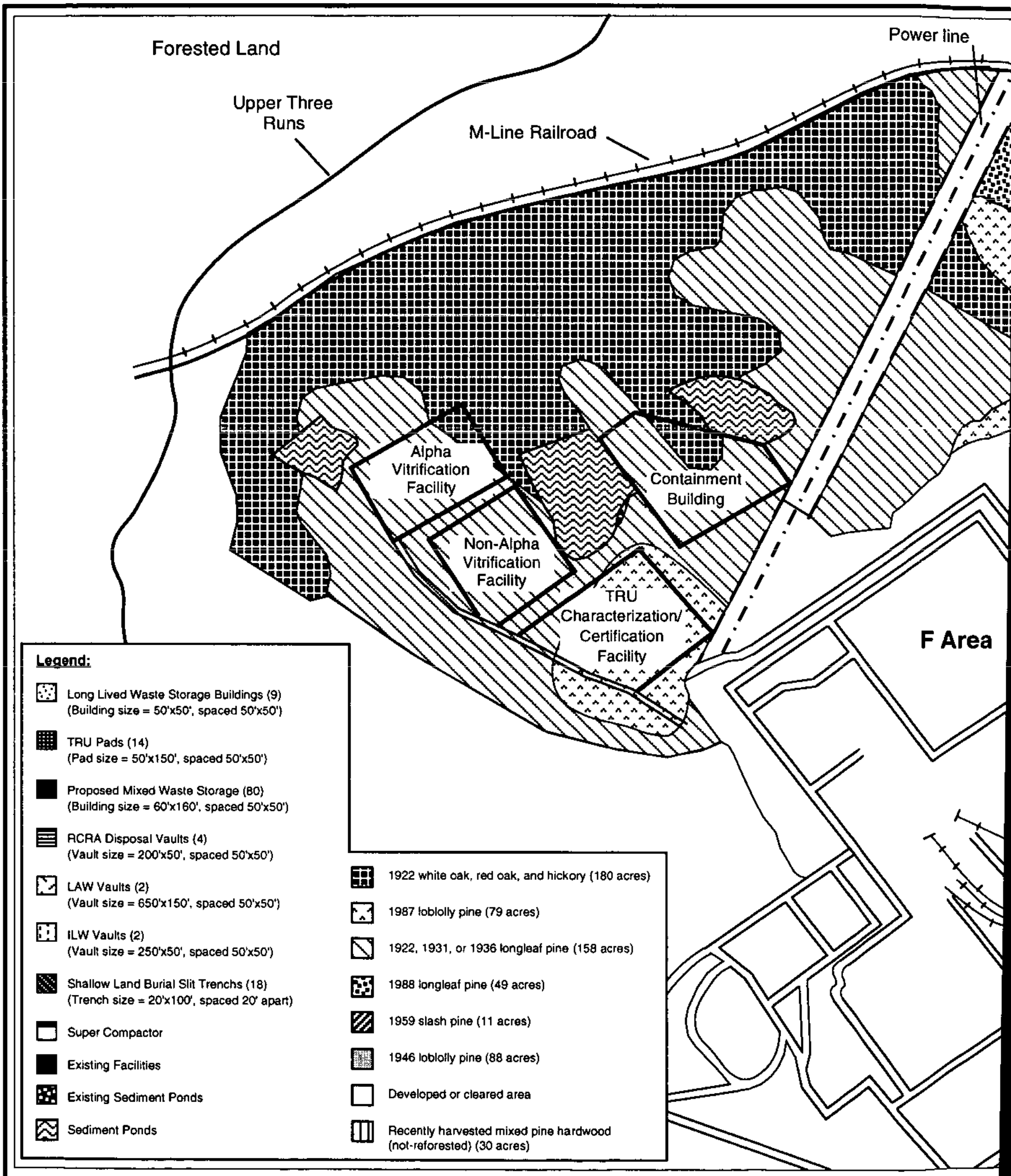
Efforts will be implemented to avoid problems before performing activities that would disturb surface soils and cause potential impacts. Erosion control will be established in accordance with the SRS Project Storm Water Management and Sedimentation Reduction Plan (WSRC 1993) as required by law. Management practices such as silt fences, hay bales, and rip-rap will be installed during construction to prevent erosion and avoid impacts to the wetlands located downgradient from the proposed project. Marketable timber would be harvested from the proposed project area.

To minimize impacts to the biodiversity, wetlands, and archaeological resources of SRS and to protect threatened and endangered species, the proposed facilities would be located adjacent to existing cleared and developed land in E-Area. All disposal facilities except the RCRA disposal vaults would be located in a 100-acre cleared, graded, and currently developed portion of E-Area. Additional land requirements for the treatment facilities would encompass approximately 34 acres of loblolly pine established in 1987; 57 acres of longleaf pine (*P. palustris*) established in 1922, 1931, and 1936; and 20 acres of white oak (*Quercus alba*), red oak (*Q. rubra*), and hickory (*Carya sp.*) established in 1922.

Three waste management alternatives have been analyzed in a draft environmental impact statement published in March 1995. If SRS were required to treat the maximum amount of waste it could handle, new facility construction could affect as much as 184 acres of undeveloped land north of E-Area. An additional 789 acres outside the surveyed area would also be required under the maximum waste forecast. Should SRS have to treat the maximum amount of waste, additional threatened and endangered species surveys, wetlands assessments, and archaeological resource surveys would be required. The amount of waste SRS would be required to treat has not been determined so no siting studies to identify any additional land have been initiated.

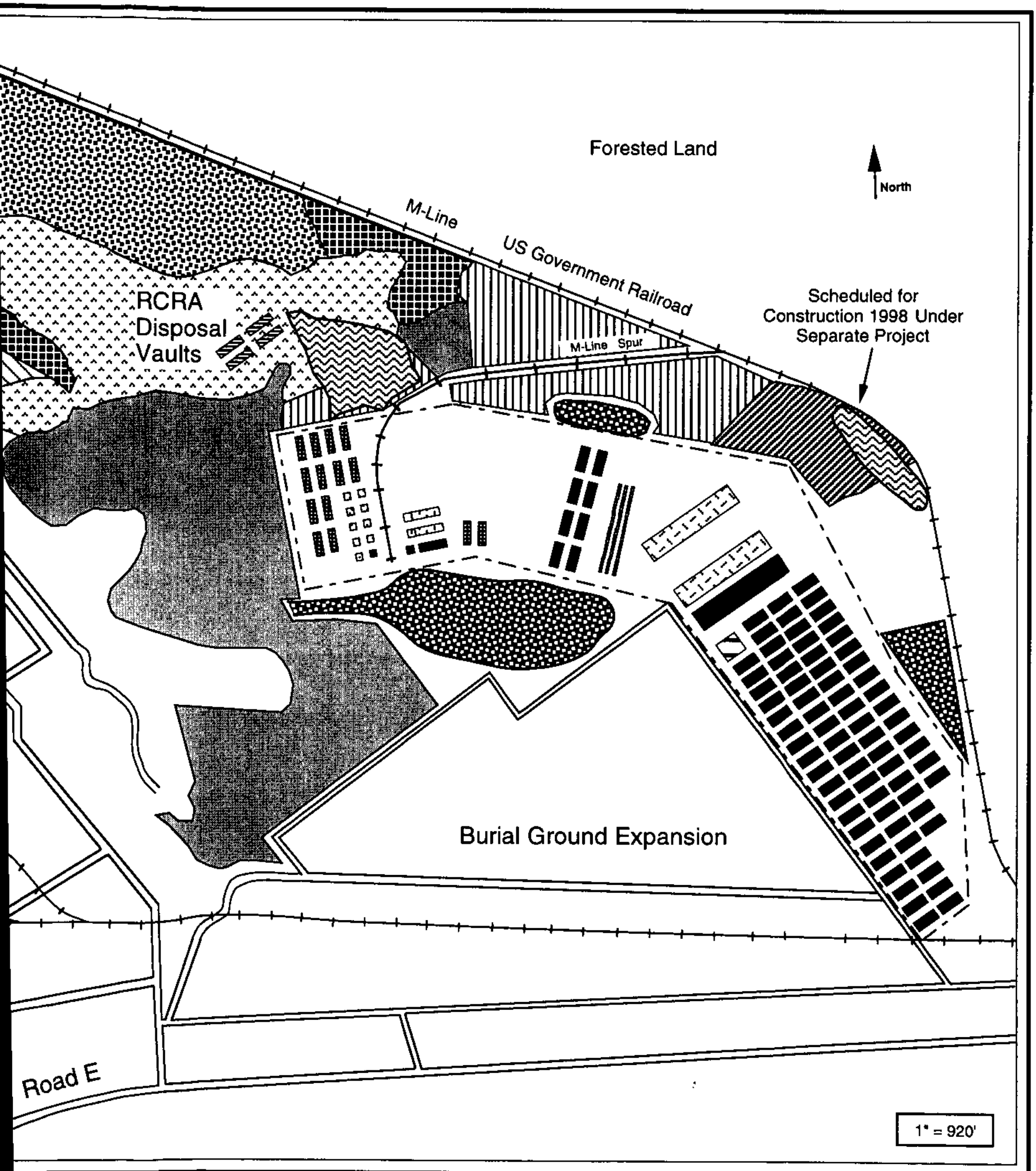
DESCRIPTION OF PROJECT AND SURROUNDING AREA

The proposed waste management area is located north of the developed portion of E-Area and south of Upper Three Runs and M-Line railroad. The majority of the site is a relatively level upland area dominated by Ailey sand (2-6 percent slopes), Lakeland sand (0-6 percent slopes), Troup sand (0-6 percent slopes), and Blanton sand (0-6 percent slopes). These level upland areas end abruptly along distinct bluffs overlooking the floodplain of Upper Three Runs and several small unnamed tributaries. These steep slopes are composed of Troup and Lucy sands

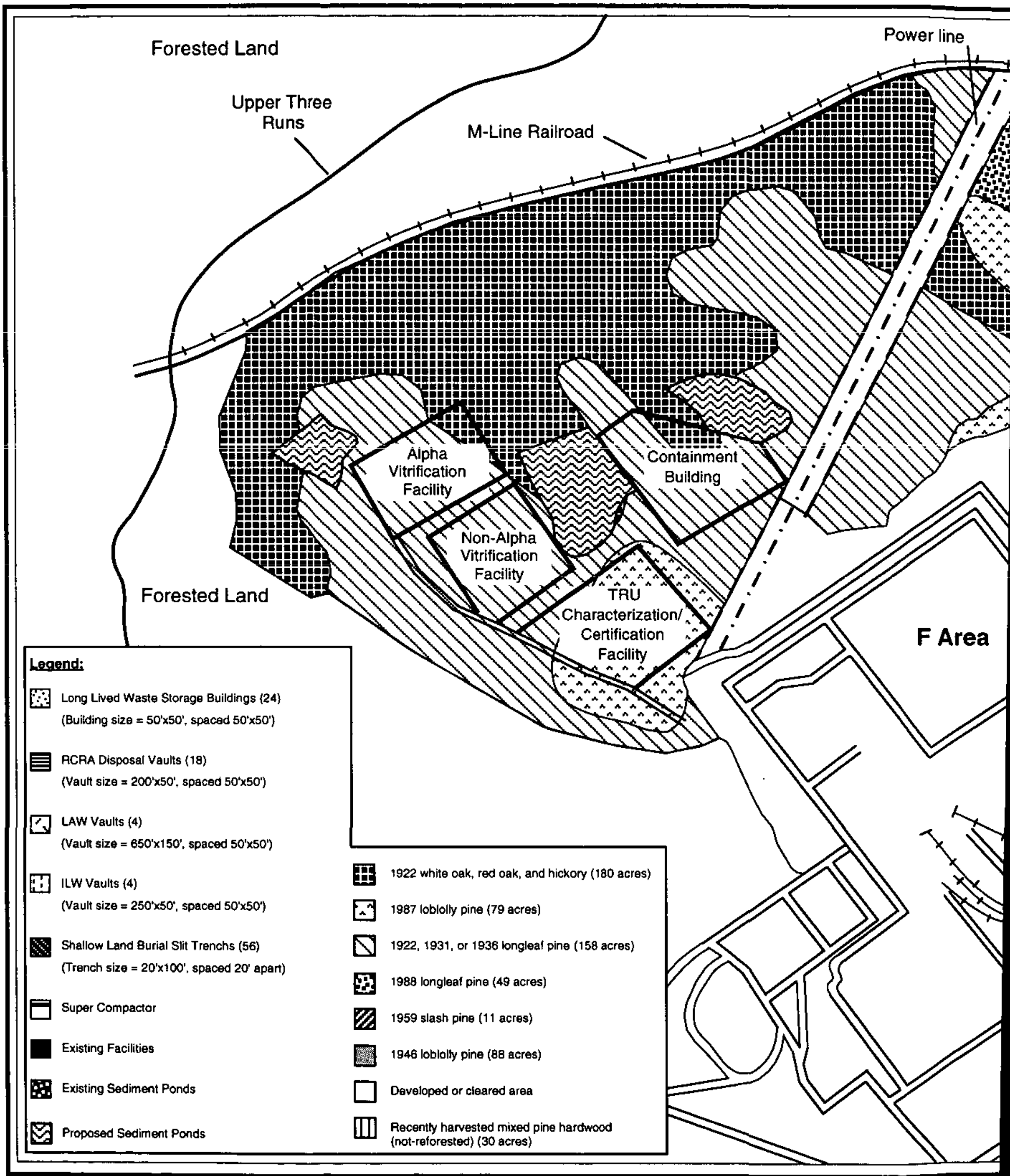


Source: SRFS (1994)

Figure 2. Map depicting the major plant communities/habitat types in and around the part of E-Area scheduled for expansion by 2008 and general footprints of the facilities that will be constructed.

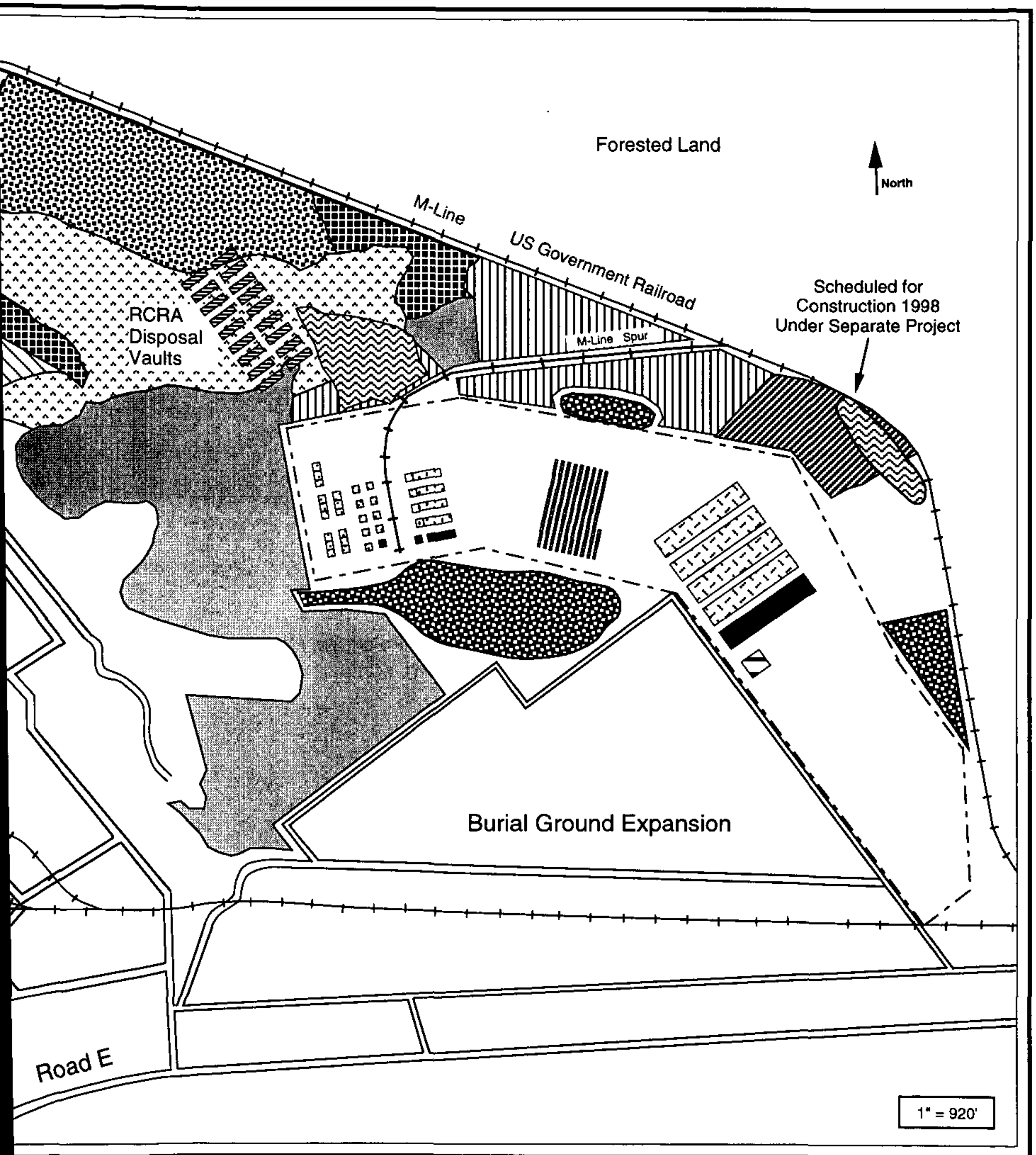

Forested Land
North
M-Line
US Government Railroad
Scheduled for Construction 1998 Under Separate Project
RCRA Disposal Vaults
M-Line Spur
Burial Ground Expansion
Road E
1" = 920'

PK56-34



Source: SRFS (1994)

Figure 3. Map depicting the major plant communities/habitat types in and around the part of E-Area scheduled for expansion by 2024 and general footprints of the facilities that will be constructed.



Forested Land
North
M-Line
US Government Railroad
Scheduled for
Construction 1998
Under Separate Project
RCRA
Disposal
Vaults
M-Line Spur
Burial Ground Expansion
Road E
1" = 920'

PK56-34

(25-40 percent slopes and 15-25 percent slopes). The wetland floodplain of Upper Three Runs is composed of Ogeechee sandy loam ponded, fluvaquents, frequently flooded, and Pickney sand, frequently flooded (Rogers 1990). Contour elevations range from 130 feet above sea level along Upper Three Runs to 300 feet on the hilltops.

The sandy upland portions of the survey area are composed of approximately 11 acres of slash pine (*P. elliottii*) planted in 1959; 79 acres of loblolly pine planted in 1987; 88 acres of loblolly pine planted in 1946; 49 acres of longleaf pine planted in 1988; 158 acres of longleaf pine established in 1922, 1931, or 1936; and 30 acres of recently harvested mixed pine hardwood. The slopes are dominated by 180 acres of an upland hardwood community established in 1922. These steep slopes contain a closed canopy of mature white oak, red oak, and hickory. The wetlands adjacent to Upper Three Runs are dominated by tulip poplar (*Liriodendron tulipifera*) and sweet gum (*Liquidambar styraciflua*) (SRFS 1994).

PROTECTED SPECIES REVIEWED

Based on the protected species accounts provided in 50 Code of Federal Regulations 17.11 and 17.12 and the lists provided in Hyatt (1994), a list of protected species potentially occurring in the proposed project area was compiled (Table 1). Table 1 also provides a brief description of the preferred habitat for each of these species.

SURVEY RESULTS

Surveys of the proposed project area were conducted during 1992, 1993, and 1994 by SRFS for evidence of any of the protected species listed in Table 1.

IMPACT IDENTIFICATION

Based on the results of the aforementioned surveys, potential impacts which were identified are listed below:

Bald Eagle (*Haliaeetus leucocephalus*) - Records of the presence of this species on the SRS date back to the late 1950s (Mayer et al. 1985, 1986). Two bald eagle nesting territories have been established on SRS (Mayer et al. 1988; Wike et al. 1994). The nearest of these nest sites to the proposed project area is located approximately 7 miles to the south. There have been no documented records of bald eagles using the proposed project area (Mayer et al. 1985, 1986). In addition, the proposed project area has no preferable forage or nesting habitat available. The project area provides only marginal roosting habitat. Based on SRS records, use of the project site by bald eagles would be incidental at best. No evidence indicating the presence of this species was encountered during the surveys. The proposed project should have little to no impact on this endangered species. However, there is the potential that suitable habitat could become inhabited during the 30-year life of the project. As new facilities are planned, additional surveys will be initiated as needed and consultation with the USFWS will continue.

Table 1. Plant and animal species that potentially occur on the SRS and are protected under the Endangered Species Act of 1973 (Hyatt 1994).

Common Name	Scientific Name	Federal Status[a]	Preferred Habitat
ANIMALS			
Bald Eagle	*Haliaeetus leucocephalus*	Endangered[b]	Suitable open wetland areas for hunting, and undisturbed lakeshore or coastal regions with large trees for roosting and nesting
Wood Stork	*Mycteria americana*	Endangered	Freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps, and feeding in freshwater marshes, flooded pastures and flooded ditches
Red-Cockaded Woodpecker	*Picoides borealis*	Endangered	Overmature pine trees; prefers understory vegetation less than 5 feet tall
American Alligator	*Alligator mississippiensis*	Threatened (due to similarity of appearance)	River swamps, lakes, bayous, and marshes in the southeastern states
Shortnose Sturgeon	*Acipenser brevirostrum*	Endangered	Atlantic seaboard rivers
PLANTS			
Smooth Purple Coneflower	*Echinacea laevigata*	Endangered	Meadows and woodlands on basic or circumneutral soils

a. Endangered - a species that is in danger of extinction throughout all or significant portion of its range and has protection under the Endangered Species Act.
Threatened (due to similarity of appearance) - species not listed pursuant to Section 4 of the Endangered Species Act, but given special consideration because it closely resembles a listed taxa; or special treatment of the unlisted species will further the policy and enforcement of the Endangered Species Act.

b. The Bald Eagle has been proposed to be downlisted to threatened (59 FR 35584).

Wood Stork (*Mycteria americana*) - The breeding colony of wood storks from Birdsville, Georgia, continues to sporadically use wetland areas of the SRS for foraging (Wike et al. 1994). Documented wood stork use of SRS dates back to the late 1950s (Norris 1963). However, the proposed project area provides neither forage nor nesting habitat for this endangered species. In addition, there are no documented records of any previous use of the project site by wood storks (Coulter 1993). No evidence of this species was found during the surveys. The proposed project should not have any impact on this endangered species. However, as new facilities are planned, surveys will be initiated as needed and consultation with the USFWS will continue.

Red-Cockaded Woodpecker (*Picoides borealis*) - Seventy-seven red-cockaded woodpeckers lived on SRS at the end of 1994 (LeMaster 1994b). Red-cockaded woodpeckers prefer to nest in pines more than 60 years old and forage in pine forests more than 40 years old. Although the proposed project site is within the interior portion of SRS that is not intensively managed for the birds, the age of several stands of pines on the site make them appropriate for nesting and foraging. Due to the suitability of the habitat and the proximity of active colonies (7 miles to the north) and managed recruitment stands (1.5 miles to the north), an intensive survey was conducted in 1993. One hundred and fifty eight acres of longleaf pine established in 1922, 1931, or 1936 were surveyed. No evidence of red-cockaded woodpeckers was found during the survey (LeMaster 1994c). While the proposed project should have no impact on this endangered species, there is the potential that suitable habitat could become inhabited during the 30-year life of the project. No land clearing or facility construction is currently planned until at least after the year 2000. As new facilities are planned, additional surveys will be initiated as needed and consultation with USFWS will continue.

American Alligator (*Alligator mississippiensis*) - The SRS supports a population of approximately 200 to 250 American alligators (Gibbons and Semlitsch, 1991). The proposed project area does not provide any suitable habitat for this protected species. In addition, there are no documented records of any previous use of the project site by alligators. The closest known areas used by alligators are the wetlands present in the Upper Three Runs drainage corridor, located adjacent to the project site. No evidence of this species was found during the surveys. The proposed project should not have any impact on the threatened species. However, as new facilities are planned, surveys will be initiated as needed and consultation with the USFWS will continue.

Shortnose Sturgeon (*Acipenser brevirostrum*) - The proposed project has been designed utilizing Best Management Practices to eliminate or minimize impacts from any discharges that could impact tributaries to the Savannah River. In addition, the proposed project site is an upland area, and the project boundary is over 1,000 feet from the nearest stream (Upper Three Runs), which at that point is 15 kilometers from the river. The shortnose sturgeon occurs in the river along the southwestern boundary of SRS (Wike et al. 1994). The proposed project area does not provide any suitable habitat for this species. Furthermore, no evidence of this species was found during the surveys.

Therefore, the proposed project should not have any impact on this endangered species. As new facilities are planned, additional surveys will be initiated and consultation with the National Marine Fisheries Service (NMFS) will continue.

Smooth Purple Coneflower (*Echinacea laevigata*) - Two populations of this species are known to occur on the SRS (Knox and Sharitz 1990; Hyatt 1994). The first, a small dwindling population located adjacent to Burma Road, includes approximately 200 individuals (SRFS 1992). This population is approximately 4.5 miles southwest of the proposed project area. The second population, composed of approximately 500 individuals, is located 7.2 miles southeast of the project area (LeMaster 1994b). The proposed project area could provide habitat for the smooth purple coneflower. However, no evidence of this species was found during the 1992 and 1994 botanical surveys. The proposed project should not have any impact on this endangered species. While the proposed project should have no impact on this endangered species, there is the potential that suitable habitat could become inhabited during the 30-year life of the project. As new facilities are planned, additional surveys will be initiated as needed and consultation with USFWS will continue.

MITIGATION PLANS

No mitigation plans are necessary to minimize or prevent potential impacts to any of the protected species listed in Table 1.

SUMMARY

The proposed project should not affect any Federally protected animal or plant species. DOE will continue to consult informally with the USFWS and the NMFS as new facilities are planned and National Environmental Policy Act reviews continue over the 30-year life of the project.

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50 CFR 17.11 and 17.12. August 23, 1993. Endangered and Threatened Wildlife and Plants. Code of Federal Regulations.

59 FR 35584. **Endangered and Threatened Wildlife and Plants; Reclassify the Bald Eagle from Endangered to Threatened in Most of the Lower 48 States.** 50 CFR Part 17. *Federal Register* Vol. 59. No. 132. Tuesday, July 12, 1994. Pages 35584-35594.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, FL 33702

May 22, 1995 F/SEO13:JEB

Stephen A. Danker
Environmental Scientist
Environmental Compliance Division
Savannah River Operations Office
U.S. Department of Energy
P.O. Box A
Aiken, SC 29802

Dear Mr. Danker:

This responds to your letter of April 13, 1995 which included a copy of the Protected Species Survey for the proposed waste management expansion in the uncleared portion of E-Area for the Savannah River Site (SRS), Aiken, South Carolina. The survey states that shortnose sturgeon would not be affected by the waste management expansion because shortnose sturgeon do not occur in the vicinity of the project area and because the nearest tributary to the Savannah River is over 1.5 kilometers from the project area.

We have reviewed the information provided and concur that the proposed project to more safely store and dispose of radioactive wastes at the SRS are not likely to adversely impact threatened or endangered species under our jurisdiction.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified, or critical habitat is determined that may be affected by the proposed activity.

If you have any questions please contact Jeffrey Brown, Fishery Biologist, at (813) 570-5312.

Sincerely,

Andrew J. Kemmerer
Regional Director

cc: F/PR8
F/SEO2

file name: SEC7\SRSEAREA.LET
file: 1514-22 m

United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
P.O. Box 12559
217 Fort Johnson Road
Charleston, South Carolina 29422-2559
May 24, 1995

JUN 01 REC'D

Mr. Stephen A. Danker
Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

Re: Additional Waste Management Facilities at SRS
Uncleared Portion of E-Area at SRS
FWS Log No. 4-6-95-242

Dear Mr. Danker:

We have reviewed the revised Protected Species Survey received April 18, 1995 concerning the above-referenced project in Aiken County, South Carolina. The proposed project includes construction and operation of additional waste management treatment, storage, and disposal facilities to support past and future operations and activities at SRS. The following comments are provided in accordance with the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), and Section 7 of the Endangered Species Act, as amended (16 U.S.C. 1531-1543).

Based on the information received, we will concur with a determination that this action is not likely to adversely affect federally listed or proposed endangered and threatened species. In view of this, we believe that the requirements of Section 7 of the Endangered Species Act have been satisfied. However, obligations under Section 7 of the Act must be reconsidered if (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner which was not considered in this assessment, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Your interest in ensuring the protection of endangered and threatened species is appreciated. If you have any questions please contact Ms. Lori Duncan of my staff at (803) 727-4707. In future correspondence concerning the project, please reference FWS Log No. 4-6-95-242.

Sincerely yours,

Catherine D. Duncan
Acting Field Supervisor

CDD/LWD/km

INDEX FOR VOLUME II