

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.9.1 Cultural Resources – Expected Waste Forecast**

Waste treatment, storage, and disposal facilities would be constructed within the currently developed portion of E-Area, to the north and northwest of this area, and to the northwest of F-Area (Figures 4-22 and 4-23).

Construction within the developed and fenced portion of E-Area would not affect cultural or archaeological resources because this area has been previously disturbed.

The two small areas of unsurveyed land (Figure 4-5) would be surveyed and any resources would be protected as described in Section 4.1.9. Archaeological sites in the proposed area of expansion could be impacted as described in Section 4.1.9. If this occurred, DOE would protect the cultural resources as described in Section 4.1.9.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.9.2 Cultural Resources – Minimum Waste Forecast**

Construction of new waste management facilities under this case would require approximately 0.11 fewer square kilometer (26 fewer acres) than for the expected waste forecast. Although the precise configuration of facilities is currently undetermined, construction would take place within the areas identified in Section 4.3.9.1. | TC

As discussed in Section 4.3.9.1, construction within the developed and fenced portion of E-Area or to the northwest of this area would not affect archaeological resources. Before construction could begin in the undeveloped area northwest of F-Area, the Savannah River Archaeology Research Program and DOE would complete the consultation process with the State Historic Preservation Officer and develop mitigation action plans to ensure that important archaeological resources would be protected and preserved (Sassaman 1994).

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.9.3 Cultural Resources – Maximum Waste Forecast**

TC | Construction of new waste management facilities for this forecast would require approximately 4.2 square kilometers (1,029 acres), 3.5 square kilometers (862 acres) more than for the expected waste forecast. Much of the proposed construction would take place within the areas identified in Section 4.3.9.1. However, these areas are not large enough to support all of the new facilities required TC | under this case. DOE would need an estimated 3.1 square kilometers (775 acres) outside the areas identified in Section 4.3.9.1.

Construction within the developed and fenced portion of E-Area or to the northwest of this area would not affect archaeological resources. Before construction could begin in the undeveloped area northwest of F-Area, the Savannah River Archaeology Research Program and DOE would complete the consultation process with the State Historic Preservation Officer and develop mitigation action plans, as described in Section 4.3.9.2.

TC | Until DOE determines the precise location of the additional 3.1 square kilometers (775 acres) that would be used outside of F- and E-Areas, effects on cultural resources cannot be predicted. The potential disturbance of important cultural resources would be proportional to the amount of land that would be disturbed. However, in compliance with the Programmatic Memorandum of Agreement, DOE would survey all areas proposed for construction activities prior to disturbance. If important resources are discovered, DOE would avoid or remove them.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.10 AESTHETICS AND SCENIC RESOURCES – EXPECTED, MINIMUM, AND MAXIMUM WASTE FORECASTS**

Activities associated with alternative C waste forecasts would not adversely affect scenic resources or aesthetics. E-Area is already dedicated to industrial use. In all cases, new construction would not be visible from off SRS or from public access roads on SRS. The new facilities would not produce emissions to the atmosphere that would be visible or that would indirectly reduce visibility.

### 4.3.11 TRAFFIC AND TRANSPORTATION

#### 4.3.11.1 Traffic

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.11.1.1 Traffic – Expected Waste Forecast**

The alternative C – expected waste forecast would require 108 more construction workers than the no-action alternative. As shown in Table 4-44, no roads would exceed carrying capacity.

TC

Traffic effects would be minimal. There would be one less waste shipment per day compared to the estimate for the no-action alternative (Table 4-45) due to fewer hazardous waste shipments to and from the RCRA-permitted storage facility. The effect on traffic would be very small.

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.11.1.2 Traffic – Minimum Waste Forecast**

For the minimum forecast, there would be 85 more construction workers than under the no-action alternative. Roads would remain within the design carrying capacity (Table 4-44). Effects on traffic would be minimal.

TC

There would be 14 fewer daily waste shipments compared to no-action estimates (Table 4-45). This decrease would be due to smaller volumes of all types of waste. The lower number of hazardous waste shipments would also be due to a lower number of shipments to and from the storage facility. The lower volume of truck traffic would result in a slightly positive effect on traffic.

TC

**Table 4-44.** Number of vehicles per hour during peak hours under alternative C.

Road	Design capacity, vehicles per hour	No-action alternative (percentage of design capacity)	Waste forecast		
			Minimum	Expected	Maximum
Offsite (percentage of design capacity)					
SC 19	3,000 <sup>a</sup>	2,821(94)	2,860(95)	2,870(96)	2,957(99)
SC 125	3,200 <sup>a</sup>	2,720(85)	2,757(86)	2,768(87)	2,853(89)
SC 57	2,100 <sup>a</sup>	706(34)	714(34)	717(34)	738(35)
Onsite					
Road E at E-Area	2,300 <sup>b</sup>	788 <sup>c</sup> (33)	873 <sup>d</sup> (38)	896 <sup>d</sup> (39)	1,089 <sup>d</sup> (47)

- a. Adapted from Smith (1989).
- b. Adapted from TRB (1985).
- c. Includes baseline plus the maximum number (42) of construction workers (Hess 1995a).
- d. Includes baseline plus the maximum number (132 for the minimum, 155 for expected, and 348 for the maximum waste forecast) of construction workers (Hess 1995a).

**Table 4-45.** SRS daily hazardous and radioactive waste shipments by truck under alternative C.<sup>a</sup>

Waste	1994 no-action traffic <sup>a</sup>	Change from no-action		
		Minimum	Expected	Maximum
Hazardous	14	-6	-1	4
Low-level	7	-3	<1 <sup>b</sup>	10
Mixed	8	-5	<1	14
Transuranic <sup>c</sup>	1	<1	<1	15
Total change	NA <sup>d</sup>	-14	-1	43
Total shipments per day	30	16	29	73

- a. Shipments per day: To arrive at shipments per day, the total number of waste shipments estimated for the 30 years considered in this EIS was divided by 30 to determine estimated shipments per year. These numbers were divided by 250, which represents working days in a calendar year, to determine shipments per day. Supplemental data are provided in the traffic and transportation section of Appendix E.
- b. Values less than 1 are treated as 0 for purposes of comparison.
- c. Includes mixed and nonmixed transuranic waste shipments.
- d. NA = not applicable.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.11.1.3 Traffic – Maximum Waste Forecast**

As discussed in Section 4.1.11.1, the 1992 South Carolina highway fatality rate of 2.3 per 100 million miles driven provides a baseline estimate of 5.5 traffic fatalities annually. Under alternative C, the largest increase in construction workers would occur for the maximum waste forecast (301 more workers than under the no-action alternative). These workers would be expected to drive 3.5 million miles annually (3.0 million miles more than under the no-action alternative), which is predicted to result in 1.5 additional traffic fatalities per year. Traffic on roads would remain within design carrying capacity (Table 4-44). Effects on traffic would be minimal.

TC

There would be 43 additional daily waste shipments compared to no-action estimates (Table 4-45), primarily due to larger volumes of waste and shipments of ashcrete to E-Area. These shipments would originate at various SRS locations (primarily F- and H-Areas) and terminate at the E-Area treatment and disposal facilities. Shipments from the transuranic waste characterization/certification facility, alpha vitrification and non-alpha vitrification facilities, and containment building are not considered because these shipments would occur on a dedicated road that would be designed to accommodate expected traffic flows. The addition of 43 trucks during normal work hours would have minimal adverse effects on traffic.

TC

**4.3.11.2 Transportation**

Consequences from incident-free onsite transportation under alternative C were based on those calculated under the no-action alternative adjusted for changes in number of shipments (as a result of changes in volumes of wastes shipped). Consequences and corresponding health effects from onsite transportation accidents for any given shipment are independent of the number of shipments and are, therefore, the same as the no-action alternative. These results are provided in Table 4-8. The probability of an accident occurring for each type of waste shipped is provided in Table 4-26.

TE

For alternative C, DOE analyzed the impacts that would result from offsite shipments of mixed waste (lead) and low-level waste. Methodology and receptors are defined in Section 4.2.11. Incident-free doses from offsite shipments were calculated as in Section 4.1.11.2.1.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.11.2.1 Transportation – Expected Waste Forecast**

**Incident-Free Radiological Impacts**

The dose and number of excess fatal cancers from incident-free transportation for alternative C – expected waste forecast would not change from the no-action alternative in any receptor group except involved workers (Table 4-46) because of the minimal increases in volumes of waste shipped under this alternative. Involved workers' exposures would increase slightly due to the increased volume of low-level equipment shipped.

**Table 4-46.** Annual dose (percent change from the no-action alternative) and associated excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative C – expected waste forecast.

TC	Waste <sup>a</sup>	Uninvolved worker <sup>b</sup>		Uninvolved workers		Involved workers	
		(rem)		(person-rem)		(person-rem)	
	Low-level	0.011	(0%)	2.0	(2%)	190	(31%)
	Mixed	$5.8 \times 10^{-5}$	(5%)	0.12	(4%)	4.4	(2%)
	Transuranic	$1.3 \times 10^{-4}$	(0%)	0.0095	(0%)	0.15	(0%)
	Total <sup>c</sup>	0.011 <sup>d</sup>		2.1 <sup>e</sup>		200 <sup>e</sup>	
	Excess latent cancer fatalities	$4.5 \times 10^{-6f}$		$8.6 \times 10^{-4g}$		0.079 <sup>g</sup>	

- a. See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.
- b. See Section 4.1.11.2 for descriptions of receptors
- c. Totals rounded to two significant figures.
- d. Assumes the same individual has maximal exposure to each waste (Appendix E) for a single year.
- e. Dose from 1 year of exposure to incident-free transportation of waste (see Appendix E).
- f. Additional probability of an excess latent fatal cancer
- g. Value equals the total dose  $\times$  the risk factor (0.0004 excess latent fatal cancer per person-rem).

The probability of an uninvolved worker developing an excess fatal cancer would be about 1 in 220,000 from incident-free onsite transportation of radioactive material (Table 4-44). The number of additional fatal cancers in the involved and uninvolved workers workforce due to incident-free onsite transportation would be about two, while the uninvolved workers would be less than one.

The annual probability of a member of the public developing an excess fatal cancer would be about 1 in 58 million from incident-free offsite transportation of radioactive material (Table 4-47). The additional

**Table 4-47.** Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative C – expected waste forecast.

Waste	Involved workers <sup>a</sup> (person-rem)	Remote MEI <sup>b</sup> (rem)	Remote population (person-rem)
Low-level	0.36	$3.3 \times 10^{-5}$	0.54
Mixed	0.012	$3.2 \times 10^{-8}$	0.0025
Totals <sup>c</sup>	0.37	$3.3 \times 10^{-5}$	0.54
Excess latent cancer fatalities	$1.5 \times 10^{-4}$	$1.7 \times 10^{-8d}$	$2.7 \times 10^{-4}$

TC

- a. See Section 4.1.11.2 for descriptions of receptors.
- b. MEI = maximally exposed individual.
- c. Dose for the remote MEI assumes exposure to each waste (see Appendix E) in a year; for the populations, dose is the result of exposure to 1 year of incident-free transportation of waste (see Appendix E).
- d. Additional probability of an excess latent fatal cancer.

TE

fatal cancers that could develop in members of the public and involved workers from exposure to offsite waste shipments would be less than one.

### Transportation Accident Impacts

The probability of an onsite accident would be similar to that under the no-action alternative because similar waste volumes would be shipped; the consequences due to an accident would be the same as described in Section 4.1.11.2.2. Effects from accidents involving offsite shipments were calculated as in Section 4.1.11.2.2. The results are summarized in Table 4-48. Probabilities of an accident involving each waste type are presented in Table 4-26.

**Table 4-48.** Probability of an accident during 30 years of offsite transport of radioactive material for each waste forecast under alternative C, dose, and excess latent cancer fatalities from an accident.

Waste	Probability of an accident			Dose (person-rem)	Number of excess latent fatal cancers
	Minimum forecast	Expected forecast	Maximum forecast		
Low-level	$7.2 \times 10^{-7}$	$1.3 \times 10^{-6}$	$3.4 \times 10^{-6}$	$5.2 \times 10^{-4}$	$2.6 \times 10^{-7}$
Mixed	$4.6 \times 10^{-4}$	$1.1 \times 10^{-3}$	$2.7 \times 10^{-3}$	0.0047	$2.4 \times 10^{-6}$

TC

The low consequences and associated excess latent cancer fatalities in the remote population from offsite shipments for alternative C – expected waste forecast (Table 4-48) would be comparable to consequences to the onsite population under the no-action alternative (Table 4-8) and alternative A (Table 4-25). An offsite accident would be less severe than one involving onsite shipments because of

the small volume of waste shipped offsite. There would be less than one additional cancer to members of the general public from accidents during 30 years of waste shipments.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.11.2.2 Transportation – Minimum Waste Forecast**

**Incident-Free Radiological Impacts**

For alternative C – minimum waste forecast, there would be decreases in dose to all receptors from radioactive waste shipments (Table 4-49) compared to the expected waste forecast (Table 4-46) as a result of the decrease in volumes of all wastes. The annual probability of an uninvolved worker developing a fatal cancer from incident-free onsite transport would be about 1 in 430,000 (Table 4-49).

**Table 4-49.** Annual dose (percent change from the expected waste forecast) and associated excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative C – minimum waste forecast.

	Waste <sup>a</sup>	Uninvolved worker <sup>b</sup>		Uninvolved workers		Involved workers	
		(rem)	(-%)	(person-rem)	(-%)	(person-rem)	(-%)
TC	Low-level	0.0057	(-49%)	0.98	(-51%)	100	(-47%)
	Mixed	2.3×10 <sup>-5</sup>	(-61%)	0.050	(-60%)	1.7	(-62%)
	Transuranic	9.0×10 <sup>-5</sup>	(-30%)	0.0066	(-30%)	0.10	(-30%)
	<b>Total<sup>c</sup></b>	<b>0.0058<sup>d</sup></b>		<b>1.0<sup>e</sup></b>		<b>100<sup>e</sup></b>	
	Excess latent cancer fatalities	2.3×10 <sup>-6f</sup>		4.1×10 <sup>-4g</sup>		0.041g	

- a. See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.
- b. See Section 4.1.11.2 for descriptions of receptors.
- c. Totals were rounded to two significant figures.
- d. Assumes the same individual has maximal exposure to each waste (Appendix E) for a single year.
- e. Dose from 1 year of exposure to incident-free transportation of waste (see Appendix E).
- f. Additional probability of an excess latent fatal cancer.
- g. Value equals the total dose × the risk factor (0.0004 excess latent fatal cancers per person-rem).

The involved worker population and the uninvolved workers could expect less than one additional fatal cancer per year from onsite transportation.

TC The probability per year that a member of the public would develop an excess fatal cancer from incident-free offsite transportation of radioactive material would be 1 in 110 million (Table 4-50). The number of

**Table 4-50.** Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative C – minimum waste forecast.

Waste	Involved workers (person-rem)	Remote MEI <sup>a</sup> (rem)	Remote population (person-rem)
Low-level	0.20	$1.8 \times 10^{-5}$	0.31
Mixed	0.0052	$1.4 \times 10^{-8}$	0.0011
Totals <sup>b</sup>	0.21	$1.8 \times 10^{-5}$	0.31
Excess latent cancer fatalities	$8.4 \times 10^{-5}$	$9.0 \times 10^{-9c}$	$1.6 \times 10^{-4}$

TC

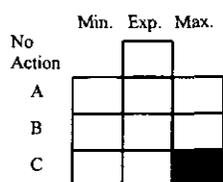
- a. MEI = maximally exposed individual.
- b. Dose for the remote MEI assumes exposure to each waste (see Appendix E) in a year; for the populations, dose is the result of 1 year of incident-free transportation of waste (see Appendix E).
- c. Additional probability of an excess latent fatal cancer.

TE

additional fatal cancers in both the remote population and the involved worker population would be less than one.

### Transportation Accident Impacts

The probability of an onsite accident involving radioactive wastes would decrease slightly (Table 4-26) for the minimum waste forecast because of the decreased volumes that would be shipped compared to the expected waste forecast; however, the consequences due to an accident would be the same as described in Section 4.1.11.3. Effects of offsite accidents would be the same for the expected case (Table 4-48); however, the probability of an offsite accident would decrease by about one-half compared to the expected waste forecast because of the decrease in volume of waste shipped.



### 4.3.11.2.3 Transportation – Maximum Waste Forecast

### Incident-Free Radiological Impacts

For the maximum waste forecast, there would be large increases in dose to all receptors (Table 4-51) due to the increases in volumes of wastes shipped. These increases would be similar to those that would occur for alternative A – maximum waste forecast. The annual probability of an uninvolved worker developing an excess fatal cancer would be about 1 in 150,000 (Table 4-51). The involved workers

**Table 4-51.** Annual dose (percent change from the expected waste forecast) and excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative C – maximum waste forecast.

TC TE	Waste <sup>a</sup>	Uninvolved worker <sup>b</sup>		Uninvolved workers		Involved workers	
		(rem)		(person-rem)		(person-rem)	
	Low-level	0.014	(27%)	2.6	(31%)	350	(83%)
	Mixed	2.0×10 <sup>-4</sup>	(247%)	0.45	(263%)	19	(321%)
	Transuranic	0.0021	(1,550%)	0.16	(1,550%)	2.4	(1,550%)
	Total <sup>c</sup>	0.016 <sup>d</sup>		3.2 <sup>e</sup>		370 <sup>e</sup>	
	Excess latent cancer fatalities	6.6×10 <sup>-6</sup> <sup>f</sup>		0.0013 <sup>g</sup>		0.15 <sup>g</sup>	

- a. See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.
- b. See Section 4.1.11.2 for descriptions of receptors.
- c. Totals rounded to two significant figures.
- d. Assumes the same individual has maximal exposure to each waste type (Appendix E) for a single year.
- e. Dose from 1 year of exposure to incident-free transportation of waste (see Appendix E).
- f. Additional probability of an excess latent fatal cancer.
- g. Value equals the total dose × the risk factor (0.0004 excess latent fatal cancers per person-rem).

population and the uninvolved workers could expect less than one additional fatal cancer per year from 30 years of incident-free transport.

Table 4-52 shows that the probability of a member of the public developing a fatal cancer is about 1 in 23 million per year from incident-free offsite transportation of radioactive material. The number of cancers that could develop in members of the public and involved workers would be less than one.

**Table 4-52.** Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative C – maximum waste forecast.

TC	Waste	Involved workers	Remote MEI <sup>a</sup>	Remote population
		(person-rem)	(rem)	(person-rem)
	Low-level	0.94	8.6×10 <sup>-5</sup>	1.4
	Mixed	0.031	8.2×10 <sup>-8</sup>	0.0064
	Totals <sup>b</sup>	0.97	8.6×10 <sup>-5</sup>	1.4
	Excess latent cancer fatalities	3.84×10 <sup>-4</sup>	4.3×10 <sup>-8</sup> <sup>c</sup>	7.0×10 <sup>-4</sup>

- a. MEI = maximally exposed individual.
- b. Dose for the remote MEI assumes exposure to each waste (see Appendix E) in a year; for the populations, dose is the result of exposure to 1 year of incident-free transportation of waste (see Appendix E).
- c. Additional probability of an excess latent fatal cancer.

## **Transportation Accident Impacts**

The probability of an onsite accident involving radioactive wastes would increase (Table 4-26) under the maximum waste forecast because more waste would be shipped compared to the expected waste forecast; however, the consequences due to a particular accident would be the same as described in Section 4.1.11.3. Effects of offsite shipments would be the same as for the expected case (Table 4-48); however, the probability of an offsite accident would be three times greater than that in the expected waste forecast because of the increase in volume of waste shipped.

TE

### **4.3.12 OCCUPATIONAL AND PUBLIC HEALTH**

Under alternative C, the non-alpha vitrification facility (including soil sorting), the transuranic waste characterization/certification facility, the Consolidated Incineration Facility, the alpha vitrification facility, compaction facilities, and the containment building would operate. Emissions from these facilities would increase adverse health effects over the no-action alternative for each of the three waste forecasts. However, effects would be small overall, except to involved workers under the maximum waste forecast.

For involved workers, the sources of most exposure would be the transuranic waste storage pads, the non-alpha vitrification facility, the Consolidated Incineration Facility, the H-Area high-level waste tank farm, and the transuranic waste characterization/certification facility; for the public and uninvolved workers the sources of most exposure would be the environmental releases from the alpha vitrification facility, the non-alpha vitrification facility, the Consolidated Incineration Facility, and the transuranic waste characterization/certification facility. (Consolidated Incineration Facility impacts are summarized in Appendix B.5.)

For radiological assessments, the same general methodology was used as under the no-action alternative (Section 4.1.12). The same risk estimators were used to convert doses to fatal cancers, and wastes were classified into treatability groups to facilitate the evaluations. However, the development of radiological source terms and worker exposures was much more involved. The expected performance of new facilities was based on actual design information, if available, augmented as necessary with operating experience with similar facilities.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 4.3.12.1 Occupational and Public Health – Expected Waste Forecast

For alternative C – expected waste forecast, the amounts of wastes would be the same as under the no-action alternative. Refer to Section 4.1.12 for a discussion of the no-action alternative.

#### 4.3.12.1.1 Occupational Health And Safety

##### Radiological Impacts

TE | Table 4-53 presents the worker doses and resulting health effects associated with alternative C – expected waste forecast. The doses (0.04 rem per year) would remain well within the SRS administrative guideline of 0.8 rem per year. The probabilities and projected numbers of fatal cancers from 30 years of alternative C waste management operations under this forecast would be much lower than those expected from all causes during the workers' lifetimes. It is expected that there would be 1.1 additional fatal cancers in the projected workforce of 2,184 involved workers.

##### Nonradiological Impacts

DOE considered potential nonradiological impacts to SRS workers from air emissions from the following facilities: the Defense Waste Processing Facility, including In-Tank Precipitation; the M-Area Vendor Treatment Facility; the Consolidated Incineration Facility; Building 645-2N, mixed waste storage; four new solvent tanks; the transuranic waste characterization/certification facility (including soil sorting); the containment building; the non-alpha vitrification facility (including soil sorting); and the alpha vitrification facility. Occupational health impacts to employees in the Defense Waste Processing Facility, including In-Tank Precipitation, were discussed in the *Final Supplemental Environmental Impact Statement, Defense Waste Processing Facility*. Occupational health impacts to employees associated with the Consolidated Incineration Facility were discussed in the *Environmental Assessment, Consolidated Incineration Facility*.

TE | Table E.2-3 in Appendix E presents a comparison between Occupational Safety and Health Administration permissible exposure limit values and potential exposures to uninvolved workers at both 100 meters (328 feet) and 640 meters (2,100 feet) from each facility for the expected, minimum, and maximum waste forecasts. Downwind concentrations were calculated using EPA's TSCREEN model

**Table 4-53. Worker radiological doses and resulting health effects associated with the implementation of alternative C.<sup>a</sup>**

Receptor(s)	No-action alternative	Waste forecast		
		Expected	Minimum	Maximum
<b>Individual involved worker<sup>b</sup></b>				
• Average annual dose (rem)	0.025	0.040	0.038	0.060
• Associated probability of a fatal cancer	1.0×10 <sup>-5</sup>	1.6×10 <sup>-5</sup>	1.5×10 <sup>-5</sup>	2.4×10 <sup>-5</sup>
• 30-year dose to average worker (rem)	0.75	1.2	1.2	1.8
• Associated probability of a fatal cancer	3.9×10 <sup>-4</sup>	4.8×10 <sup>-4</sup>	4.6×10 <sup>-4</sup>	7.2×10 <sup>-4</sup>
<b>All involved workers<sup>c,b</sup></b>				
• Annual dose (person-rem)	52	86	83	150
• Associated number of fatal cancers	0.021	0.035	0.033	0.060
• 30-year dose (person-rem)	1,600	2,600	2,500	4.5×10 <sup>4</sup>
• Associated number of a fatal cancer	0.62	1.0	1.0	1.8
<b>Individual uninvolved worker<sup>b,d</sup></b>				
• Annual dose at 100 meters (rem) <sup>a</sup> (associated probability of a fatal cancer)	1.0×10 <sup>-5</sup> (4.1×10 <sup>-9</sup> )	0.0094 3.8×10 <sup>-6</sup>	0.0045 1.8×10 <sup>-6</sup>	0.22 (8.8×10 <sup>-5</sup> )
• Annual dose at 640 meters (rem) (associated probability of a fatal cancer)	2.9×10 <sup>-7</sup> (1.1×10 <sup>-10</sup> )	0.0031 1.2×10 <sup>-6</sup>	0.0014 5.7×10 <sup>-7</sup>	0.073 2.9×10 <sup>-5</sup>
• 30-year dose at 100 meters (rem) (associated probability of a fatal cancer)	3.0×10 <sup>-4</sup> (1.2×10 <sup>-7</sup> )	0.28 1.1×10 <sup>-4</sup>	0.14 5.4×10 <sup>-5</sup>	6.6 (0.003)
• 30-year dose at 640 meters (rem) (associated probability of a fatal cancer)	8.6×10 <sup>-6</sup> (3.4×10 <sup>-9</sup> )	0.092 3.7×10 <sup>-5</sup>	0.043 1.7×10 <sup>-5</sup>	2.2 (0.0009)

a. Supplemental facility information is provided in Appendix E.

b. Annual individual worker doses can be compared with the regulatory dose limit of 5 rem (10 CFR 835) and with the SRS administrative exposure guideline of 0.8 rem. Operational procedures ensure that the dose to the maximally exposed worker will also remain within the regulatory dose limit as is reasonably achievable.

c. The number of involved workers is estimated to be 2,184 for the expected waste forecast, 2,169 for the minimum forecast, and 2,526 for the maximum forecast.

d. Dose is due to emissions from the alpha and non-alpha vitrification facilities. Doses conservatively assume 80 hours per week of exposure.

4-171

(EPA 1988). For each facility's emissions under the expected waste forecast, employee occupational exposure would be less than Occupational Safety and Health Administration permissible exposure limits. DOE expects minimal health impacts as a result of uninvolved worker exposure to emissions from these facilities.

#### 4.3.12.1.2 Public Health and Safety

##### Radiological Impacts

TC | Table 4-54 presents the radiological doses to the public and resulting health effects associated with the  
| alternative C – expected waste forecast. The annual doses to the offsite maximally exposed individual  
| (0.18 millirem) and to the SRS regional population (10 person-rem) would be about the same as those  
| that resulted from total SRS operations in 1993, which were more than 10 times lower than the  
| regulatory limits (Arnett, Karapatakis, and Mamatey 1994). For the offsite facility (assumed to be  
| located in Oak Ridge, Tennessee, for the purposes of this assessment) under this forecast, the annual  
| doses to the offsite maximally exposed individual ( $3.6 \times 10^{-4}$  millirem) and to regional population  
TC | ( $2.4 \times 10^{-3}$  person-rem) surrounding Oak Ridge, Tennessee, represent a very small fraction (less than  
| 0.3 percent) of the comparable doses to the SRS regional population. These doses remain less than  
| 0.3 percent of the comparable SRS doses for all waste forecast under this alternative (see Appendix E for  
| facility specific data). For this waste forecast, radiologically induced health effects to the public  
| (0.15 fatal cancers from 30 years of exposure) would be very small (Table 4-54).

##### Nonradiological Impacts

Potential nonradiological impacts to individuals residing offsite are considered for both criteria and carcinogenic pollutants. Maximum site boundary-line concentrations for criteria pollutants are discussed in Section 4.3.5.1.2.

For routine releases from SRS operating facilities for the expected waste forecast, criteria pollutant concentrations would be within state and federal ambient air quality standards, as discussed in Section 4.3.5.1.2. During periods of construction, the criteria pollutant concentrations at the SRS boundary would not exceed air quality standards under normal operating conditions. Neither the state nor the federal air quality standards would be exceeded by actual emissions from SRS. Emissions of criteria pollutants would have negligible health effects on offsite individuals.

**Table 4-54. Radiological doses associated with the implementation of alternative C and resulting health effects to the public.<sup>a</sup>**

Waste forecast/receptor(s)	No-action alternative				Alternative C			
	Dose <sup>b</sup>			Probability <sup>c</sup> or number of fatal cancer	Dose <sup>b</sup>			Probability <sup>c</sup> or number of fatal cancers
	Atmospheric releases	Aqueous releases	Total		Atmospheric releases <sup>f</sup>	Aqueous releases	Total	
<u>Expected waste generation</u>								
Offsite MEI <sup>d</sup>								
• Annual, millirem	1.2×10 <sup>-4</sup>	6.9×10 <sup>-4</sup>	8.1×10 <sup>-4</sup>	4.1×10 <sup>-7</sup>	0.18	6.9×10 <sup>-4</sup>	0.18	9.0×10 <sup>-8</sup>
• 30-year, millirem	0.0037	0.021	0.025	1.2×10 <sup>-8</sup>	5.4	0.021	5.4	2.7×10 <sup>-6</sup>
Population								
• Annual, person-rem	2.9×10 <sup>-4</sup>	0.0068	0.0071	3.5×10 <sup>-6</sup>	10	0.0068	10	0.0050
• 30-year, person-rem	0.0086	0.20	0.21	1.0×10 <sup>-4</sup>	302	0.20	302	0.15
<u>Minimum waste generation</u>								
Offsite MEI								
• Annual, millirem	NA <sup>e</sup>	NA	NA	NA	0.09	6.9×10 <sup>-4</sup>	0.09	4.6×10 <sup>-8</sup>
• 30-year, millirem	NA	NA	NA	NA	2.71	0.021	2.7	1.4×10 <sup>-6</sup>
Population								
• Annual, person-rem	NA	NA	NA	NA	4.9	0.0068	4.9	0.0025
• 30-year, person-rem	NA	NA	NA	NA	148	0.20	148	0.074
<u>Maximum waste generation</u>								
Offsite MEI								
• Annual, millirem	NA	NA	NA	NA	4.0	6.9×10 <sup>-4</sup>	4.0	2.0×10 <sup>-6</sup>
• 30-year, millirem	NA	NA	NA	NA	120	0.021	120	6.0×10 <sup>-5</sup>
Population								
• Annual, person-rem	NA	NA	NA	NA	229	0.0068	229	0.11
• 30-year, person-rem	NA	NA	NA	NA	6,880	0.20	6,880	3.4

a. Supplemental facility information is provided in Appendix E.

b. For atmospheric releases, the dose is 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.

c. For the offsite maximally exposed individual, probability of a fatal cancer; for population, number of fatal cancers.

d. MEI = maximally exposed individual.

e. NA = not applicable.

f. Atmospheric releases for MEI and population include contribution from offsite facilities, which contribute less than 0.3 percent to the atmospheric releases reported here.

Note: The doses to the public from total SRS operations in 1993 were 0.25 millirem to the offsite maximally exposed individual and 9.1 person-rem to the regional population. These doses, when added to the doses associated with the waste management alternative that are given in this table, are assumed to equal total SRS doses. For the maximum waste forecast (which gives the highest doses), the total annual dose to the offsite maximally exposed individual and the regional population would equal 4.42 millirem (0.25 + 4.17) and approximately 248 person-rem (9.1 + 239), respectively. The individual dose would fall below the proposed annual regulatory limits of 10 millirem from airborne releases, 4 millirem from drinking water, and 100 millirem from all pathways combined (proposed 10 CFR 834); the population dose would be lower than the proposed annual notification limit of 100 person-rem (proposed 10 CFR 834).

TC

4-173

TC

Offsite risks due to carcinogens are calculated using the Industrial Source Complex 2 model (Stewart 1994) for the facilities listed in Section 4.3.12.1.1. Emissions of carcinogenic compounds are based on the types and quantities of waste being processed at each facility. Table 4-55 shows the individual lifetime cancer risks calculated from unit risk factors (see Section 4.1.12.2.2) derived from EPA's Integrated Risk Information System data base (EPA 1994). The estimated increased probability of an individual developing cancer over a lifetime due to routine SRS emissions under the expected waste forecast is approximately 2 in 10 million (Table 4-55). DOE expects minimal health impacts from emissions of carcinogenic compounds.

**4.3.12.1.3 Environmental Justice Assessment**

Section 4.1.12.2.3 describes the methodology for analyzing radiological dose emissions to determine if there would be environmental justice concerns. Figure 4-24 illustrates the results of the analysis for alternative C expected waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. Supporting data for the analysis can be found in the environmental justice section of Appendix E.

TE | The predicted per capita dose differs very little between types of communities at a given distance from SRS, and the per capita dose is extremely small in each type of community. This analysis indicates that people of color or low income in the 80-kilometer (50-mile) region would be neither disproportionately nor adversely impacted. Therefore, environmental justice issues would not be a concern for the alternative C – expected waste forecast.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.12.2 Occupational and Public Health – Minimum Waste Forecast**

Because the waste amounts for alternative C – minimum waste forecast would be smaller than for the expected forecast and the treatment operations the same, the impacts to workers and the public would be smaller than described in Section 4.3.12.1.

**Table 4-55.** Estimated probability of excess latent cancers in the offsite population from nonradiological carcinogens emitted under alternative C.

Pollutant	Unit risk factor <sup>a</sup> (latent cancers/ $\mu\text{g}/\text{m}^3$ ) <sup>e</sup>	Concentration <sup>b,c</sup>			Latent cancers <sup>d</sup>		
		Expected waste forecast ( $\mu\text{g}/\text{m}^3$ )	Minimum waste forecast ( $\mu\text{g}/\text{m}^3$ )	Maximum waste forecast ( $\mu\text{g}/\text{m}^3$ )	Expected waste forecast	Minimum waste forecast	Maximum waste forecast
Acetaldehyde	$2.2 \times 10^{-6}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$4.4 \times 10^{-13}$	$2.3 \times 10^{-13}$	$9.6 \times 10^{-13}$
Acrylamide	0.0013	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$2.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	$5.6 \times 10^{-10}$
Acrylonitrile	$6.8 \times 10^{-5}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$1.3 \times 10^{-11}$	$7.0 \times 10^{-12}$	$3.0 \times 10^{-11}$
Arsenic Pentoxide	0.0043	$1.0 \times 10^{-6}$	$4.1 \times 10^{-7}$	$2.0 \times 10^{-6}$	$1.8 \times 10^{-9}$	$7.6 \times 10^{-10}$	$3.7 \times 10^{-9}$
Asbestos	0.23	$5.9 \times 10^{-8}$	$4.6 \times 10^{-8}$	$2.3 \times 10^{-7}$	$5.8 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.3 \times 10^{-8}$
Benzene	$8.3 \times 10^{-6}$	0.044	0.044	0.044	$1.6 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.6 \times 10^{-7}$
Benzidine	0.067	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$1.3 \times 10^{-8}$	$6.9 \times 10^{-9}$	$2.9 \times 10^{-8}$
Bis(chloromethyl) ether	0.062	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$1.2 \times 10^{-8}$	$6.4 \times 10^{-9}$	$2.7 \times 10^{-8}$
Bromoform	$1.1 \times 10^{-6}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$2.2 \times 10^{-13}$	$1.1 \times 10^{-13}$	$4.8 \times 10^{-13}$
Carbon Tetrachloride	$1.5 \times 10^{-5}$	$1.1 \times 10^{-5}$	$1.1 \times 10^{-5}$	$1.4 \times 10^{-5}$	$7.1 \times 10^{-11}$	$6.8 \times 10^{-11}$	$9.0 \times 10^{-11}$
Chlordane	$3.7 \times 10^{-4}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$7.3 \times 10^{-11}$	$3.8 \times 10^{-11}$	$1.6 \times 10^{-10}$
Chloroform	$2.3 \times 10^{-5}$	0.003	0.003	0.003	$3.0 \times 10^{-8}$	$3.0 \times 10^{-8}$	$3.0 \times 10^{-8}$
Cr(+6) Compounds	0.012	$1.4 \times 10^{-8}$	$7.4 \times 10^{-9}$	$3.2 \times 10^{-8}$	$7.2 \times 10^{-11}$	$3.8 \times 10^{-11}$	$1.6 \times 10^{-10}$
Formaldehyde	$1.3 \times 10^{-5}$	$9.4 \times 10^{-7}$	$7.2 \times 10^{-7}$	$1.5 \times 10^{-6}$	$5.3 \times 10^{-12}$	$4.0 \times 10^{-12}$	$8.3 \times 10^{-12}$
Heptachlor	0.0013	$1.1 \times 10^{-6}$	$5.9 \times 10^{-7}$	$2.5 \times 10^{-6}$	$6.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.4 \times 10^{-9}$
Hexachlorobenzene	$4.6 \times 10^{-4}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$9.1 \times 10^{-11}$	$4.7 \times 10^{-11}$	$2.0 \times 10^{-10}$
Hexachlorobutadiene	$2.2 \times 10^{-5}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$4.4 \times 10^{-12}$	$2.3 \times 10^{-12}$	$9.6 \times 10^{-12}$
Hydrazine	0.0049	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$9.7 \times 10^{-10}$	$5.0 \times 10^{-10}$	$2.1 \times 10^{-9}$
1,1,2,2-Tetrachloroethane	$5.8 \times 10^{-5}$	$9.2 \times 10^{-6}$	$4.7 \times 10^{-6}$	$2.0 \times 10^{-5}$	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$5.0 \times 10^{-10}$
1,1,2-Trichloroethane	$1.6 \times 10^{-5}$	$4.6 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.0 \times 10^{-6}$	$3.2 \times 10^{-12}$	$1.6 \times 10^{-12}$	$7.0 \times 10^{-12}$
Toxaphene	$3.2 \times 10^{-4}$	$1.1 \times 10^{-6}$	$5.9 \times 10^{-7}$	$2.5 \times 10^{-6}$	$1.4 \times 10^{-10}$	$8.1 \times 10^{-11}$	$3.5 \times 10^{-10}$
1,1 Dichloroethene	$5.0 \times 10^{-5}$	$2.2 \times 10^{-5}$	$2.2 \times 10^{-5}$	$2.8 \times 10^{-5}$	$4.8 \times 10^{-10}$	$4.6 \times 10^{-10}$	$6.0 \times 10^{-10}$
Methylene Chloride	$4.7 \times 10^{-7}$	$9.4 \times 10^{-7}$	$7.2 \times 10^{-7}$	$1.5 \times 10^{-6}$	$1.9 \times 10^{-13}$	$1.5 \times 10^{-13}$	$3.0 \times 10^{-13}$
				TOTAL	$2.2 \times 10^{-7}$	$2.1 \times 10^{-7}$	$2.7 \times 10^{-7}$

a. Source: EPA (1994).

b. Maximum annual boundary line concentration.

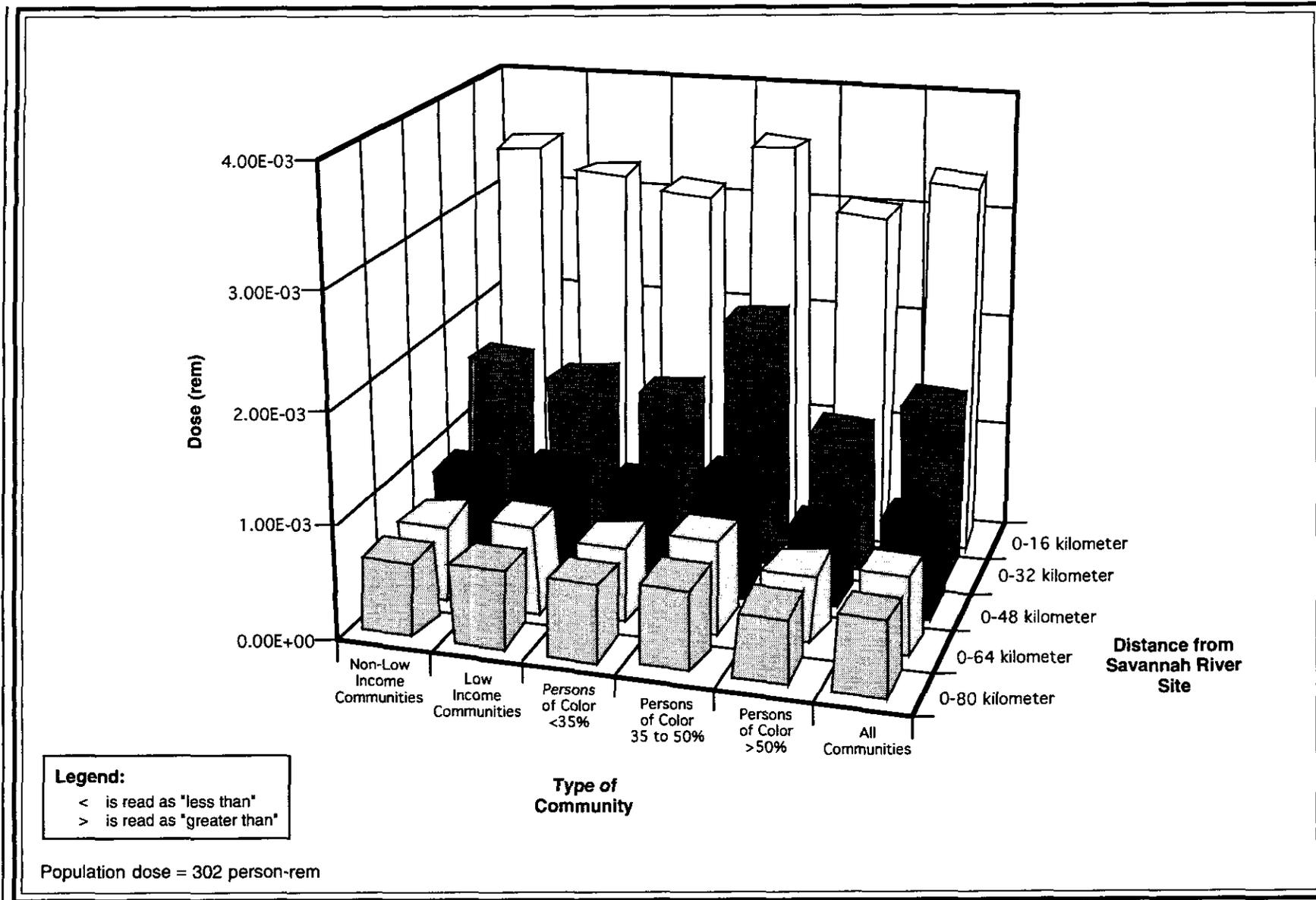
c. Source: Stewart (1994).

d. Latent cancer probability equals unit risk factor times concentration times 30 years divided by 70 years.

e. Micrograms per cubic meter of air.

TC  
4-175

TC  
4-176



PK56-4

TE Figure 4-24. Dose to individuals in communities within 80 kilometers (50 miles) of SRS for alternative C – expected forecast.

#### **4.3.12.2.1 Occupational Health and Safety**

##### **Radiological Impacts**

Table 4-53 includes the worker doses and resulting health effects associated with the minimum waste forecast. Doses (0.039 rem per year) and health effects associated with this case would be smaller than those associated with the expected waste forecast. From 30 years of exposure, there would be one additional fatal cancer in the workforce of 2,169.

##### **Nonradiological Impacts**

Table E.2-3 in Appendix E presents a comparison of the nonradiological air concentrations to SRS workers exposed under the minimum waste forecast based on Occupational Safety and Health Administration permissible exposure limits values. Exposures to SRS workers are either equal to or less than those occurring in the expected waste forecast. For all facilities, employee occupational exposure would be less than Occupational Safety and Health Administration permissible exposure limits. Negligible impacts to worker's health would occur due to emissions under the minimum waste forecast. | TE

#### **4.3.12.2.2 Public Health and Safety**

##### **Radiological Impacts**

Table 4-54 includes the doses to the public and the resulting health effects associated with the minimum waste forecast. Doses and health effects associated with this case would be smaller than those associated with the expected waste forecast.

##### **Nonradiological Impacts**

Potential nonradiological impacts to individuals residing offsite are considered for both criteria and carcinogenic pollutants under the minimum waste forecast. For routine releases from operating facilities, criteria pollutant concentrations would be within state and Federal ambient air quality standards, as discussed in Section 4.3.5.2. During periods of construction, the criteria pollutant concentrations at the SRS boundary would not exceed air quality standards under normal operating conditions. DOE expects very small health impacts to the public from emissions of criteria pollutants.

TC | Table 4-55 presents offsite risks from emissions of carcinogens. The overall incremental lifetime cancer risk is approximately 2 in 10 million. DOE expects very small health impacts to the public from emissions of carcinogenic compounds.

**4.3.12.2.3 Environmental Justice Assessment**

Figure 4-25 illustrates the results of the analysis for alternative C – minimum waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. No communities would be disproportionately affected by emissions resulting from this case.

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.3.12.3 Occupational and Public Health – Maximum Waste Forecast**

The amounts of wastes to be treated for alternative C – maximum waste forecast would be larger than for the minimum and expected waste forecasts, but the treatment operations would be the same. The maximum waste forecast would result in the greatest effects on worker and public health.

**4.3.12.3.1 Occupational Health and Safety**

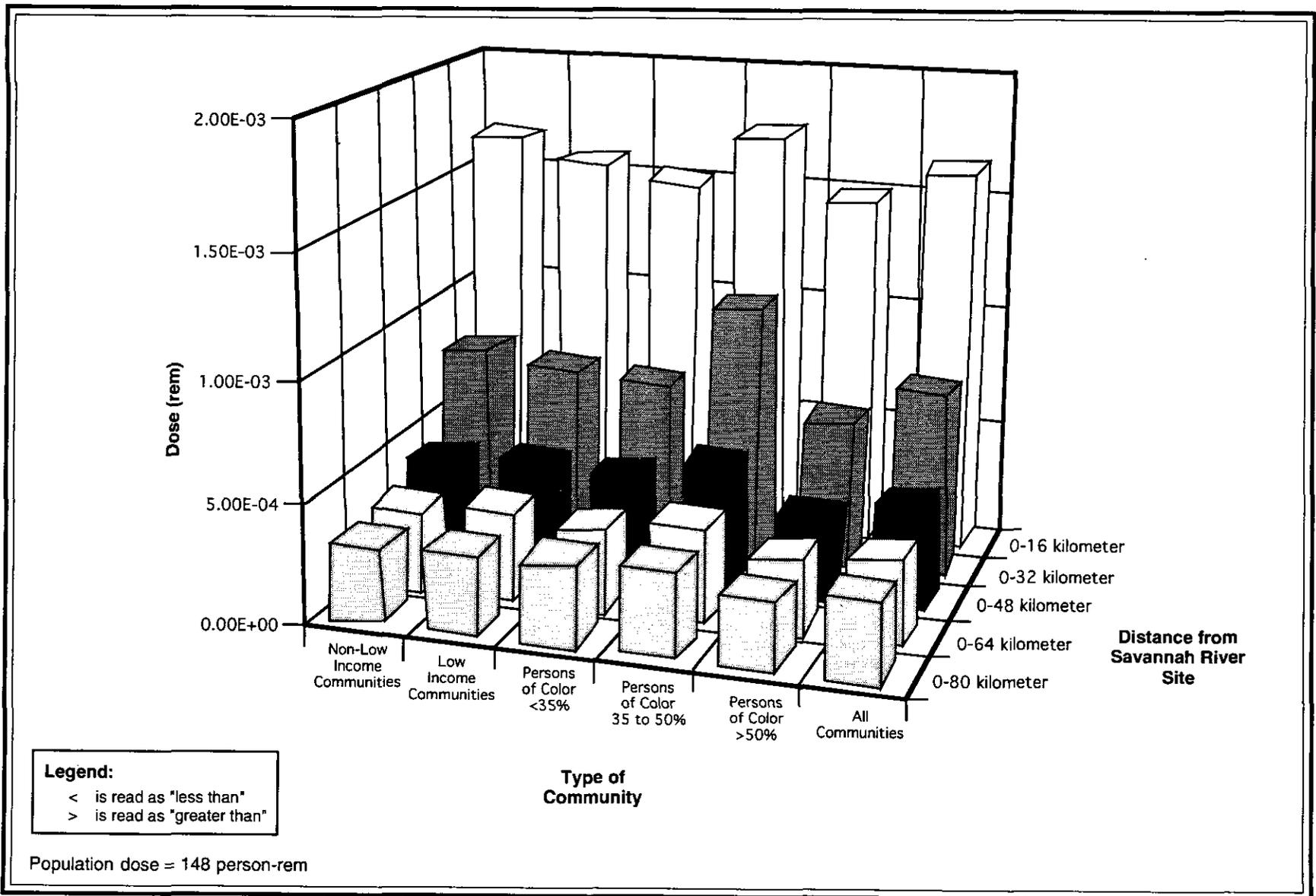
**Radiological Impacts**

Table 4-53 includes the worker doses and resulting health effects associated with the maximum waste forecast. The doses would remain below the SRS administrative guideline of 0.8 rem per year.

TE | However, it is projected that two people in the involved workforce of 2,526 could develop a fatal cancer sometime during their lifetimes as the result of 30 years of exposure.

**Nonradiological Impacts**

Table E.2-3 in Appendix E presents a comparison of the nonradiological air concentrations to SRS workers exposed under the maximum waste forecast based on Occupational Safety and Health Administration permissible exposure limits values. Exposures to SRS workers are either equal to or greater than those occurring in the expected waste forecast. However, for all facilities, employee occupational exposure would be less than Occupational Safety and Health Administration permissible



TC

**Figure 4-25.** Dose to individuals in communities within 80 kilometers (50 miles) of SRS for alternative C – minimum forecast.

TE

exposure limits. DOE expects minimal health impacts from emissions from facilities under the maximum waste forecast.

#### 4.3.12.3.2 Public Health and Safety

##### Radiological Impacts

TC | Table 4-54 includes the doses to the public and resulting health effects associated with the maximum waste forecast. The annual doses to the offsite maximally exposed individual (4.0 millirem) and to the regional population (229 person-rem) would exceed the corresponding doses of 0.25 millirem and 9.1 person-rem, respectively, from total SRS operations in 1993 (Arnett, Karapatakis, and Mamatey 1994). However, regulatory dose limits would not be exceeded (refer to note on Table 4-54).

TE | The health effects associated with the maximum waste forecast are included in Table 4-54. Based on a risk estimator of 0.0005 latent cancer fatality per rem (Section 4.1.12.2), the probability of the offsite maximally exposed individual developing a fatal cancer from 30 years of exposure to radiation

TC | associated with this waste forecast would be 6 in 100,000, and the number of additional fatal cancers in the regional population could be 3.4. This probability of a fatal cancer is much smaller than the one chance in four (23.5 percent) that a member of the public will develop a fatal cancer from all causes, and the number of fatal cancers is much less than the 145,700 fatal cancers that the regional population of 620,100 can expect to develop from all causes during their lifetimes.

TE | Each alternative C waste forecast would result in larger radiological doses to the public and consequent health effects than would alternative A (see Tables 4-33 and 4-54).

##### Nonradiological Impacts

Potential nonradiological impacts to individuals residing offsite are considered for both criteria and carcinogenic pollutants for alternative C – maximum waste forecast.

For routine releases from operating facilities, criteria pollutant concentrations would be within state and Federal ambient air quality standards, as discussed in Section 4.3.5.3. During periods of construction, the criteria pollutant concentrations at the SRS boundary would not exceed air quality standards under normal operating conditions.

Table 4-55 presents offsite risks from carcinogens. The overall change in lifetime cancer risk is approximately 3 in 10 million, which is greater than the risk associated with expected waste forecast. Nonetheless, very small health effects to the public are expected from facilities in the maximum waste forecast.

#### 4.3.12.3.3 Environmental Justice Assessment

Figure 4-26 illustrates the results of the analysis for alternative C – maximum waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. No communities would be disproportionately affected by emissions resulting from this case.

### 4.3.13 FACILITY ACCIDENTS

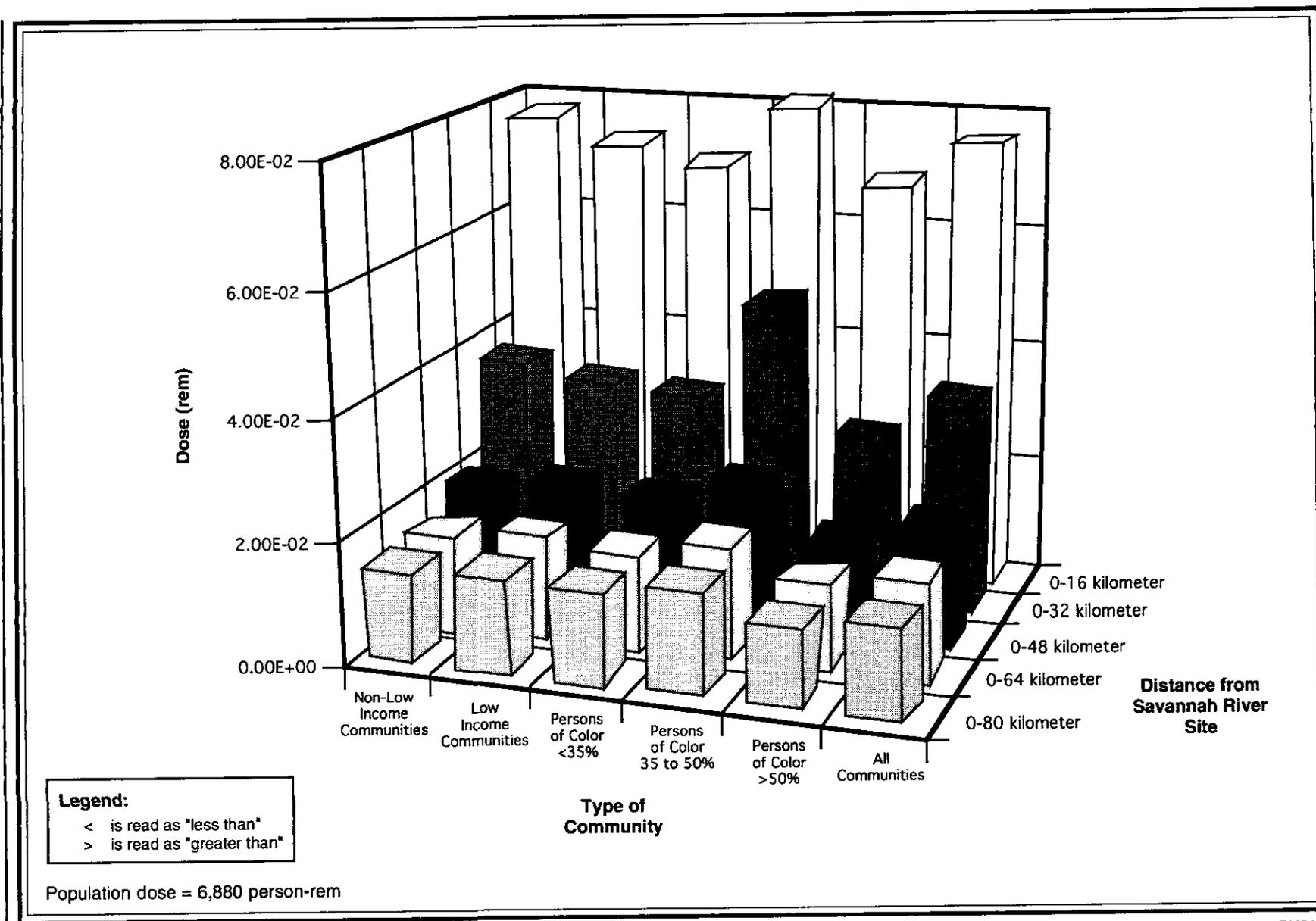
This section summarizes the risks to workers and members of the public from potential facility accidents associated with the various wastes under alternative C. The methodologies used to develop the radiological and hazardous material accident scenarios are the same as those discussed in Section 4.1.13.1 for the no-action alternative.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.13.1 Facility Accidents – Expected Waste Forecast**

Figures 4-27 through 4-30 summarize the projected impacts of radiological accidents on the population, the offsite maximally exposed individual, and uninvolved workers at 640 meters (2,100 feet) and 100 meters (328 feet) for alternative C – expected waste forecast. An anticipated accident (i.e., one occurring between once every 10 years and once every 100 years) involving mixed waste presents the greatest risk under alternative C to the population within 80 kilometers (50 miles) of SRS (see Figure 4-27). This accident scenario would increase the risk to the population within 80 kilometers (50 miles) by  $1.7 \times 10^{-2}$  latent fatal cancer per year. The postulated accident scenarios associated with the various waste types are described in Appendix F.

TC  
 4-182



PK56-4

TE | **Figure 4-26.** Dose to individuals in communities within 80 kilometers (50 miles) of SRS for alternative C – maximum waste forecast.

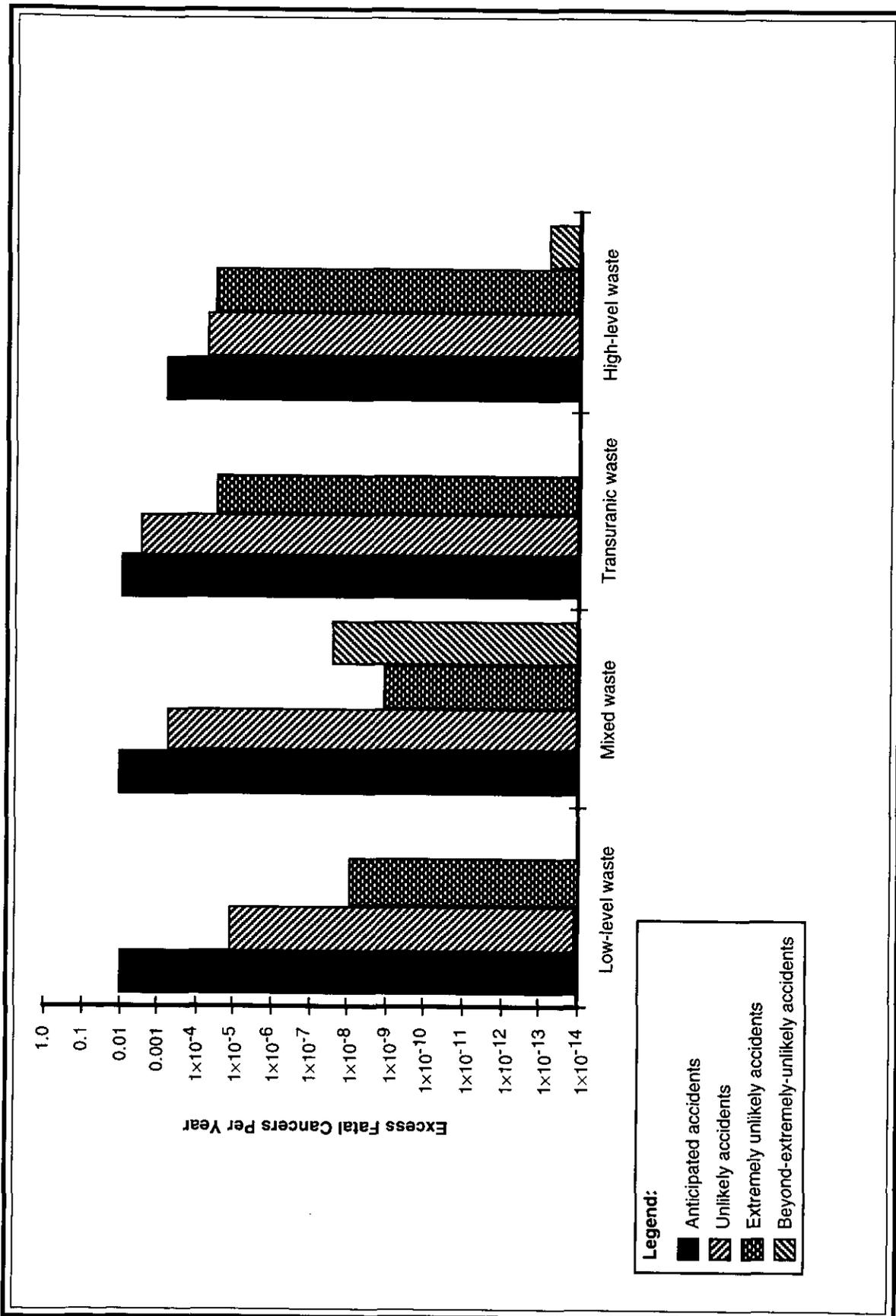
TC

TE

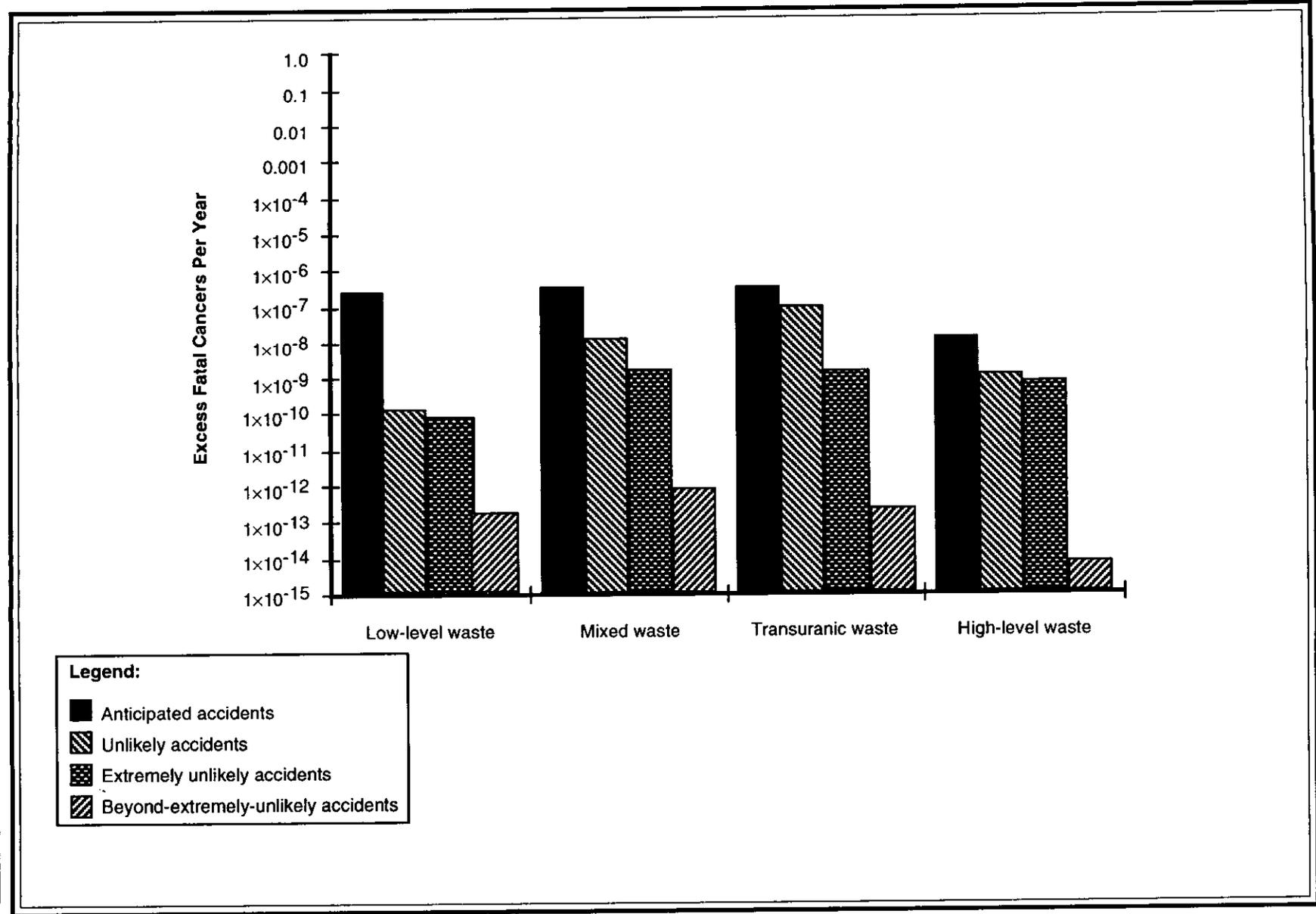
TE

PK56-31

Figure 4-27. Summary of radiological accident impacts to the population within 80 kilometers (50 miles) for alternative C – expected waste forecast



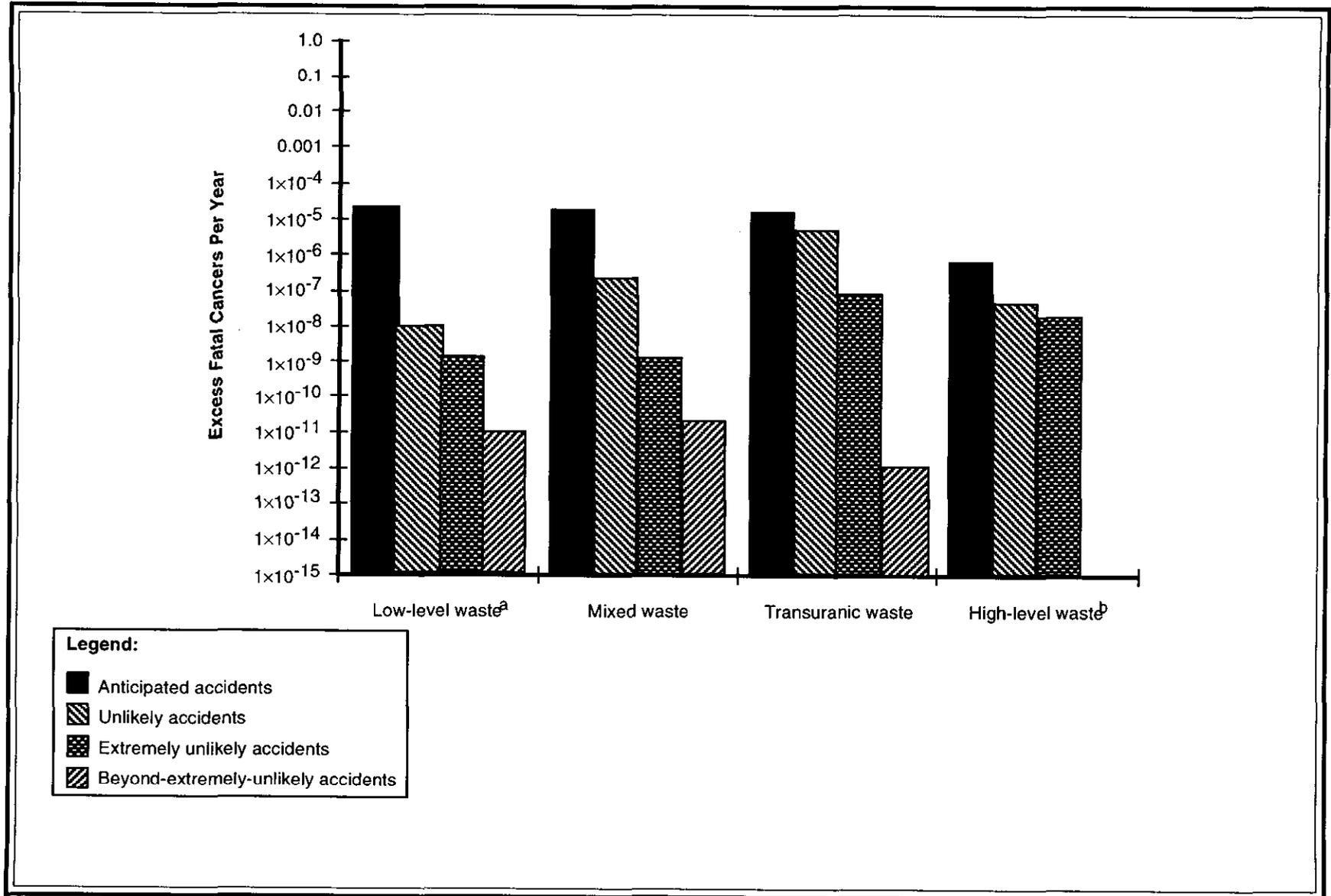
TC  
4-184



TE

PK56-31

TE | **Figure 4-28.** Summary of radiological accident impacts to the offsite maximally exposed individual for alternative C – expected waste forecast.



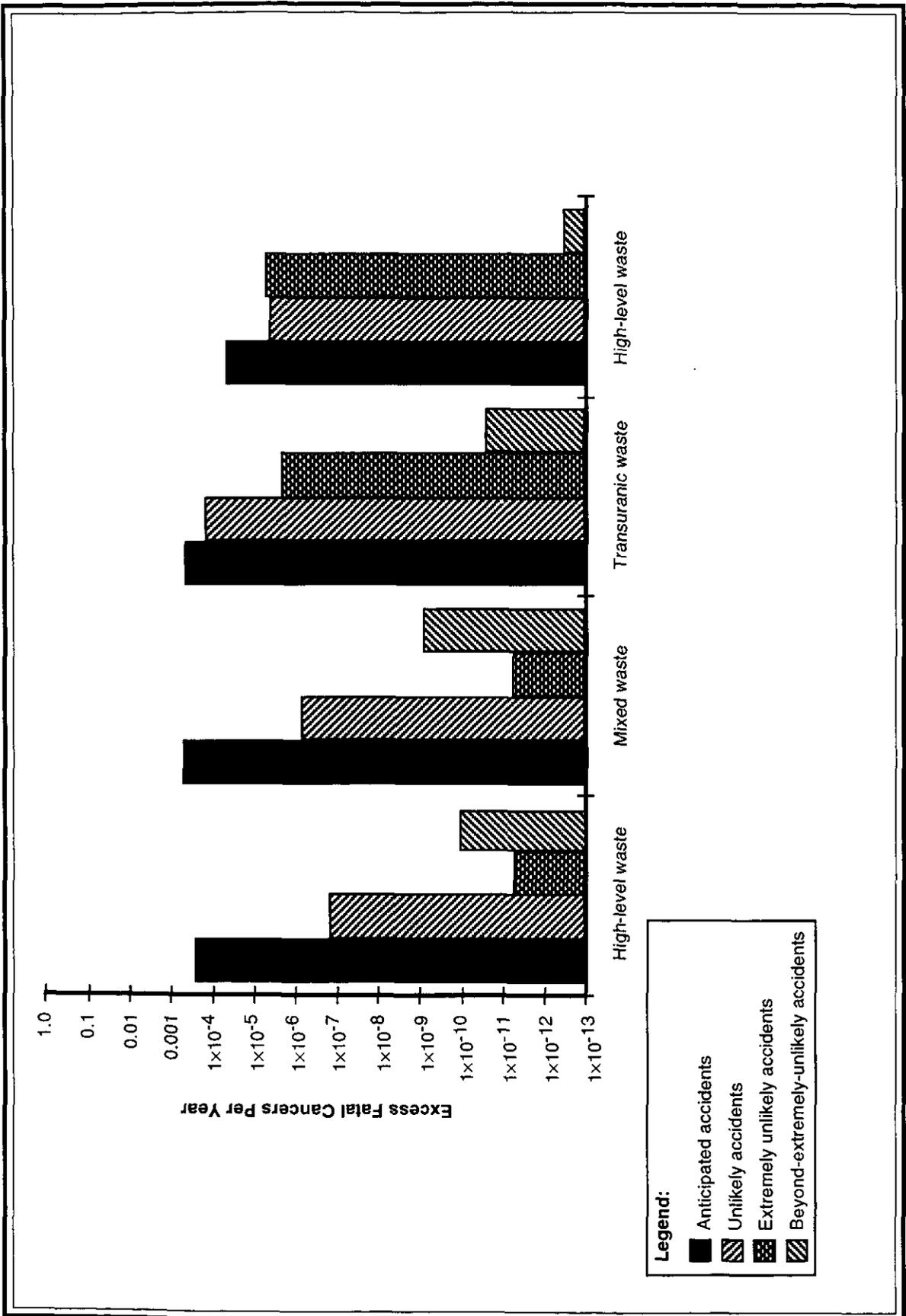
TC

TE

TE

PK56-31

**Figure 4-29.** Summary of radiological accident impacts to the uninvolved worker within 640 meters (2,100 feet) for alternative C – expected waste forecast.



PK56-31

Figure 4-30. Summary of radiological accident impacts to the uninvolved worker within 100 meters (328 feet) for alternative C – expected waste forecast.

An anticipated accident involving mixed waste would pose the greatest risk to the offsite maximally exposed individual (Figure 4-28) and the uninvolved worker at 640 meters (2,100 feet) (Figure 4-29). The anticipated accident scenario would increase the risk to the offsite maximally exposed individual by  $3.3 \times 10^{-7}$  latent fatal cancer per year and to the uninvolved worker at 640 meters (2,100 feet) by  $1.8 \times 10^{-5}$  latent fatal cancer per year.

An anticipated accident involving mixed waste would pose the greatest risk to the uninvolved worker at 100 meters (328 feet) (Figure 4-30). The anticipated accident scenario would increase the risk to the uninvolved worker at 100 meters (328 feet) by  $1.0 \times 10^{-3}$  latent fatal cancer per year.

TE

Regardless of waste type for each receptor group, the greatest estimated risks associated with alternative C are identical to those for the no-action alternative. However, there could be differences in the overall risk to each receptor group for specific waste types. For example, the overall risks for low-level, mixed, and transuranic wastes are different to greater or lesser degrees between the two alternatives.

Table 4-56 provides a comparison of overall risk for specific waste types between the no-action alternative and alternative C. A multiplicative change factor is used to illustrate differences between no-action and alternative C risks. If the risks presented are identical, the multiplication factor is one. However, if the risks presented are different, the multiplication factor is the ratio of the two values. Arrows indicate whether the alternative C risks are larger or smaller than the no-action alternative risks.

A complete summary of all representative bounding accidents considered for alternative C is presented in Table 4-57. This table provides accident descriptions, annual frequency of occurrence, increased risk of latent fatal cancers for all receptor groups, and the waste type with which the accident scenario was associated. Details regarding the individual postulated accident scenarios associated with the various waste types are provided in Appendix F.

The impacts resulting from chemical hazards associated with the alternative C – expected waste forecast are the same as those discussed for alternative A in Section 4.2.13.1. Only one chemical release scenario would expose an offsite maximally exposed individual to airborne concentrations greater than ERPG-2 values. Appendix F provides further detail and discussion regarding chemical hazards associated with each waste type.

**Table 4-56.** Comparison of risks from accidents under the no-action alternative and alternative C.

Receptor	Waste <sup>b</sup>	Estimated risk <sup>a</sup>		Change factor <sup>c</sup>
		No-action alternative	Alternative C	
Population within 80 kilometers	Low-level	0.017	0.0081	↓2.1
	Mixed	0.017	0.017	1.0
	Transuranic	0.005	1.4×10 <sup>-5</sup>	↑3.0
	High-level	6.3×10 <sup>-4</sup>	6.3×10 <sup>-4</sup>	1.0
Offsite maximally exposed individual	Low-level	3.3×10 <sup>-7</sup>	1.6×10 <sup>-7</sup>	↓2.1
	Mixed	3.3×10 <sup>-7</sup>	3.3×10 <sup>-7</sup>	1.0
	Transuranic	9.8×10 <sup>-8</sup>	2.9×10 <sup>-7</sup>	↑3.0
	High-level	1.3×10 <sup>-8</sup>	1.3×10 <sup>-8</sup>	1.0
Uninvolved worker to 640 meters	Low-level	1.8×10 <sup>-5</sup>	8.9×10 <sup>-6</sup>	↓2.1
	Mixed	1.8×10 <sup>-5</sup>	1.8×10 <sup>-5</sup>	1.0
	Transuranic	5.5×10 <sup>-6</sup>	1.6×10 <sup>-5</sup>	↑2.9
	High-level	6.4×10 <sup>-7</sup>	6.4×10 <sup>-7</sup>	1.0
Uninvolved worker to 100 meters	Low-level	0.001	2.5×10 <sup>-4</sup>	↓4.0
	Mixed	0.001	0.001	1.0
	Transuranic	3.1×10 <sup>-4</sup>	9.0×10 <sup>-4</sup>	↑2.9
	High-level	1.8×10 <sup>-5</sup>	1.8×10 <sup>-5</sup>	1.0

TE

- a. Increased risk of latent fatal cancers per year.
- b. Wastes are described in Section 2.1 and Appendix F.
- c. Change factors represent the multiplication factor required to equate no-action alternative risks to alternative C risks (e.g., no-action risk times change factor equals alternative C risk). The up arrow (↑) indicates that alternative C presents the greater risk and the down arrow (↓) indicates that alternative C presents the lesser risk.

In addition to the risk to human health from accidents, secondary impacts from postulated accidents on plant and animal resources, water resources, the economy, national defense, environmental contamination, threatened and endangered species, land use, and Native American treaty rights are considered. This qualitative assessment (see Appendix F) determined that there would be no substantial impacts from accidents for alternative C – expected waste forecast.

**Table 4-57. Summary of representative bounding accidents under alternative C.<sup>a</sup>**

Accident Description	Affected waste types <sup>c</sup>	Frequency (per year)	Increased risk of latent fatal cancers per year <sup>b</sup>			
			Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Maximally exposed offsite individual	Population within 80 kilometers
RHLWE <sup>d</sup> release due to a feed line break	High-level	0.007 <sup>e</sup>	1.79×10 <sup>-5</sup>	6.38×10 <sup>-7</sup>	1.32×10 <sup>-7</sup>	6.34×10 <sup>-4</sup>
RHLWE release due to a design basis earthquake	High-level	2.00×10 <sup>-4f</sup>	1.54×10 <sup>-6</sup>	5.46×10 <sup>-8</sup>	1.12×10 <sup>-9</sup>	5.43×10 <sup>-5</sup>
RHLWE release due to evaporator pressurization and breach	High-level	5.09×10 <sup>-5g</sup>	1.95×10 <sup>-6</sup>	3.46×10 <sup>-8</sup>	7.13×10 <sup>-10</sup>	3.44×10 <sup>-5</sup>
Design basis ETF <sup>h</sup> airborne release due to tornado	High-level	3.69×10 <sup>-7i</sup>	3.20×10 <sup>-13</sup>	1.02×10 <sup>-14</sup>	7.20×10 <sup>-15</sup>	6.35×10 <sup>-14</sup>
Fire at the LLWSB <sup>j</sup>	Low-level	0.0830 <sup>e</sup>	2.51×10 <sup>-4</sup>	8.93×10 <sup>-6</sup>	1.61×10 <sup>-7</sup>	0.00813
Container breach at the ILNTV <sup>k</sup>	Mixed	0.02 <sup>e</sup>	0.00104	1.84×10 <sup>-5</sup>	3.31×10 <sup>-7</sup>	0.0168
Release due to multiple open containers at the Containment Building	Mixed	3.00×10 <sup>-4f</sup>	4.69×10 <sup>-7</sup>	6.91×10 <sup>-7</sup>	1.22×10 <sup>-8</sup>	5.70×10 <sup>-4</sup>
F3 tornado <sup>l</sup> at Building 316-M	Mixed	2.80×10 <sup>-5g</sup>	5.35×10 <sup>-12</sup>	1.29×10 <sup>-9</sup>	1.65×10 <sup>-9</sup>	1.12×10 <sup>-9</sup>
Aircraft crash at the Containment Building	Mixed	1.60×10 <sup>-7i</sup>	9.73×10 <sup>-10</sup>	3.46×10 <sup>-11</sup>	6.66×10 <sup>-13</sup>	3.19×10 <sup>-8</sup>
Deflagration in culvert during TRU <sup>m</sup> drum retrieval activities	Transuranic	0.01 <sup>e</sup>	8.96×10 <sup>-4</sup>	1.59×10 <sup>-5</sup>	2.86×10 <sup>-7</sup>	0.0145
Fire in culvert at the TRU waste storage pads (one drum in culvert)	Transuranic	8.10×10 <sup>-4f</sup>	3.07×10 <sup>-4</sup>	5.48×10 <sup>-6</sup>	9.84×10 <sup>-8</sup>	0.00498
Vehicle crash with resulting fire at the TRU waste storage pads	Transuranic	6.50×10 <sup>-5g</sup>	4.47×10 <sup>-6</sup>	7.96×10 <sup>-8</sup>	1.43×10 <sup>-9</sup>	7.25×10 <sup>-5</sup>

- a. A complete description and analysis of the representative bounding accidents are presented in Appendix F.
- b. Increased risk of fatal cancers per year is calculated by multiplying the [consequence (dose) × latent cancer conversion factor] × annual frequency. For dose consequences and latent cancer fatalities per dose, see tables in Appendix F.
- c. The waste type for which the accident scenario is identified as a representative bounding accident. A representative bounding accident may be identified for more than one waste type. These waste types are listed as high-level, low-level, mixed, and transuranic waste types.
- d. Replacement High-Level Waste Evaporator.
- e. The frequency of this accident scenario is within the anticipated accident range.
- f. The frequency of this accident scenario is within the unlikely accident range.
- g. The frequency of this accident scenario is within the extremely unlikely accident range.
- h. F/H-Area Effluent Treatment Facility.
- i. The frequency of this accident scenario is within beyond-extremely-unlikely accident range.
- j. Long-lived waste storage building.
- k. Intermediate-level nontritium vault.
- l. F3 tornadoes have rotational wind speeds of 254 to 331 kilometers (158 to 206 miles) per hour.
- m. Transuranic.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.13.2 Facility Accidents – Minimum Waste Forecast**

Alternative C – minimum waste forecast is not expected to change the duration of risk for the facilities associated with the representative bounding accidents (see Appendix F).

DOE does expect that a slight decrease in risk would occur for the alternative C minimum waste forecast. A comparison of the number and types of facilities needed for the minimum and expected waste forecasts is provided in Table 2-31.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.3.13.3 Facility Accidents – Maximum Waste Forecast**

The maximum waste forecast would not be expected to increase or decrease the duration of risk for the facilities associated with the representative bounding accidents identified under alternative C (see Appendix F).

DOE does expect that an increase in risk over the expected waste forecast would occur for the maximum waste forecast under alternative C. A comparison of the number and types of facilities needed for the maximum and expected waste forecasts is provided in Section 2.5.7.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

## 4.4 Alternative B – Moderate Treatment Configuration and DOE's Preferred Treatment Alternative

This section discusses the impacts of moderate management practices (described in Section 2.6) on the existing environment (described in Chapter 3).

### 4.4.1 INTRODUCTION

Moderate treatment practices (alternative B) for waste at SRS include the ongoing activities listed under the no-action alternative (Section 4.1.1). In addition, DOE would:

- Construct and operate a containment building to treat mixed waste. | TE
- Construct and operate a non-alpha vitrification facility for mixed waste soils and sludges.
- Sort mixed waste soils at the non-alpha vitrification facility to separate uncontaminated soils for reuse.
- Operate a mobile low-level soil sort facility to separate uncontaminated soils for reuse and low-activity and suspect soils for disposal. | TE
- Decontaminate and recycle low-activity equipment waste (metals) offsite. Treatment residues would be returned to SRS for shallow land disposal. | TC
- Treat small quantities of mixed and PCB wastes offsite.
- Operate the Consolidated Incineration Facility for mixed, hazardous, and low-level wastes. | TC
- Construct and operate a transuranic waste characterization/certification facility.
- Construct and operate an alpha vitrification facility.
- Dispose of transuranic wastes at the Waste Isolation Pilot Plant.

- Treat small quantities of mixed and PCB wastes offsite. Treatment residuals would be returned to SRS for disposal.
- Operate the Consolidated Incineration Facility for mixed (benzene generated by the Defense Waste Processing Facility, organic and aqueous liquid wastes, decontamination solutions from the containment building, PUREX solvent, radioactive oil, sludges, and debris), hazardous, and low-level wastes.
- Treat low-activity job-control and equipment wastes offsite; residuals would be returned to SRS for treatment at the Consolidated Incineration Facility or for disposal.
- Store tritiated oil to allow time for radioactive decay.
- Send elemental mercury and mercury-contaminated materials to the Idaho National Engineering Laboratory for treatment; residuals would be returned to SRS for RCRA-permitted disposal or shallow land disposal.
- Send calcium metal waste to the Los Alamos National Laboratory for treatment; residuals would be returned to SRS for shallow land disposal.
- Send lead offsite for decontamination and recycling; treatment residuals would be returned for RCRA-permitted disposal at SRS.
- Construct disposal vaults for stabilized ash and blowdown from the incineration process (Hess 1995a).

Mixed waste storage facilities would be constructed on previously cleared land in E-Area. Four of the six new waste treatment facilities (for characterization/certification of transuranic and alpha waste; for vitrification of transuranic and alpha wastes; for vitrification of mixed wastes; and for decontamination/macroencapsulation of mixed and hazardous waste) would be built on undeveloped land northwest of F-Area. (See Figures 4-31 and 4-32.)

Construction under alternative B would require 0.40 square kilometer (99 acres) of undeveloped land northwest of F-Area and 0.032 square kilometer (8 acres) of undeveloped land northeast of F-Area by 2006. An additional 0.040 square kilometer (10 acres) of undeveloped land would be required by 2024

for construction of disposal vaults northeast of F-Area. All other construction would be on previously cleared and developed land in the eastern portion of E-Area.

#### 4.4.2 GEOLOGIC RESOURCES

	Min.	Exp.	Max.
No Action			
A			
B			
C			

##### 4.4.2.1 Geologic Resources – Expected Waste Forecast

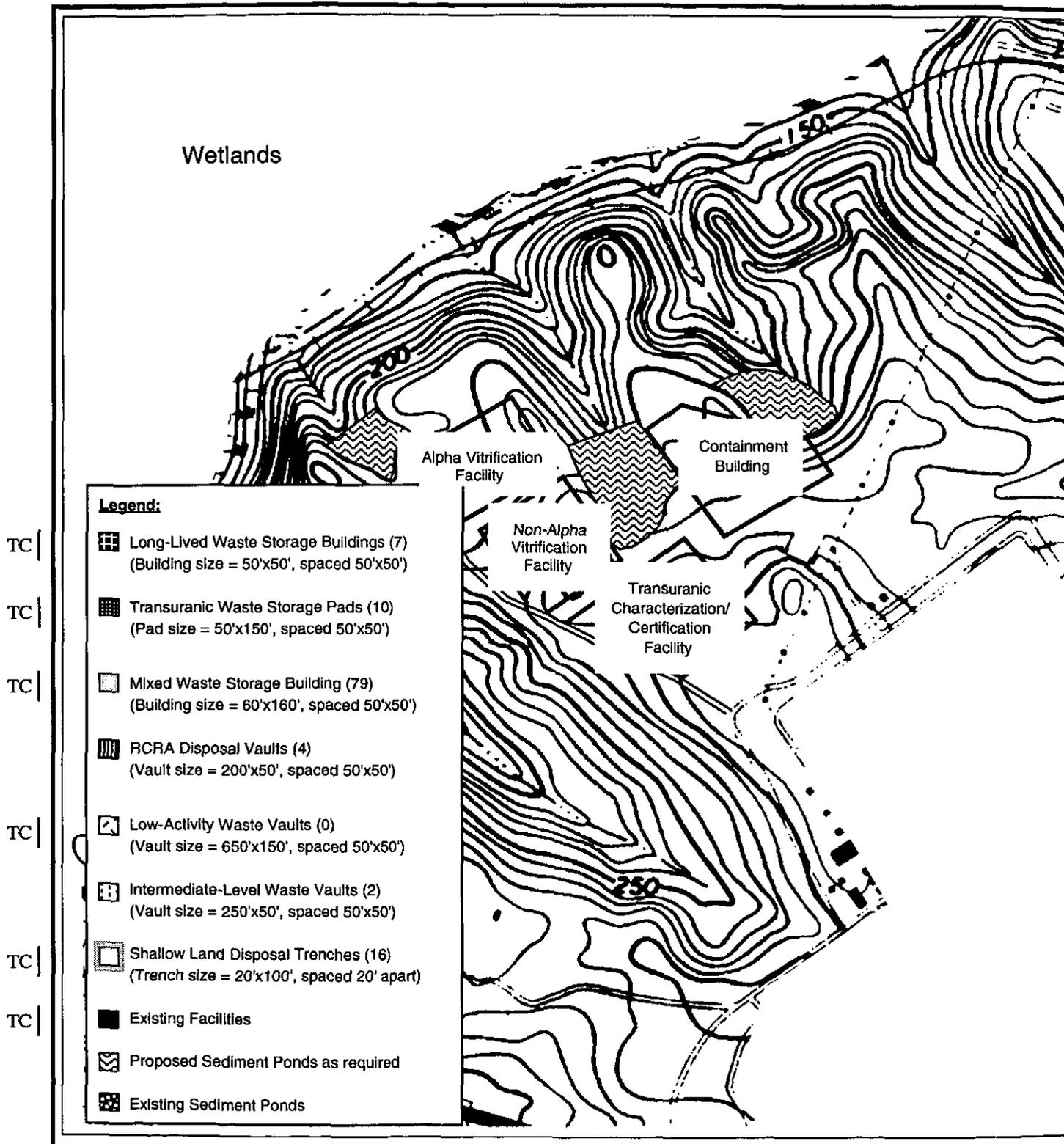
Effects from alternative B – expected waste forecast would be mainly from the construction of new facilities. The effects discussed under the no-action alternative (Section 4.1.2) form the basis for comparison and are referenced in this section.

Waste management activities associated with alternative B – expected waste forecast would affect soils in E-Area. The number of new facilities would be substantially fewer than under the no-action alternative. Approximately 0.433 square kilometer (107 acres) of undeveloped land in E-Area would be cleared and graded for the construction of new facilities through approximately 2006. Later, an additional 0.040 square kilometer (10 acres) would be cleared for construction of additional RCRA-permitted disposal vaults. This total of 0.47 square kilometer (117 acres) is approximately 73 percent of the 0.65 square kilometer (160 acres) of undisturbed land that would be required under the no-action alternative. Approximately 0.21 square kilometer (51 acres) of developed land (by 2006) would be required for new facilities. The reduction in number of facilities and corresponding decrease in the amount of land needed would reduce the area of soils that would be affected by approximately 25 percent.

TC

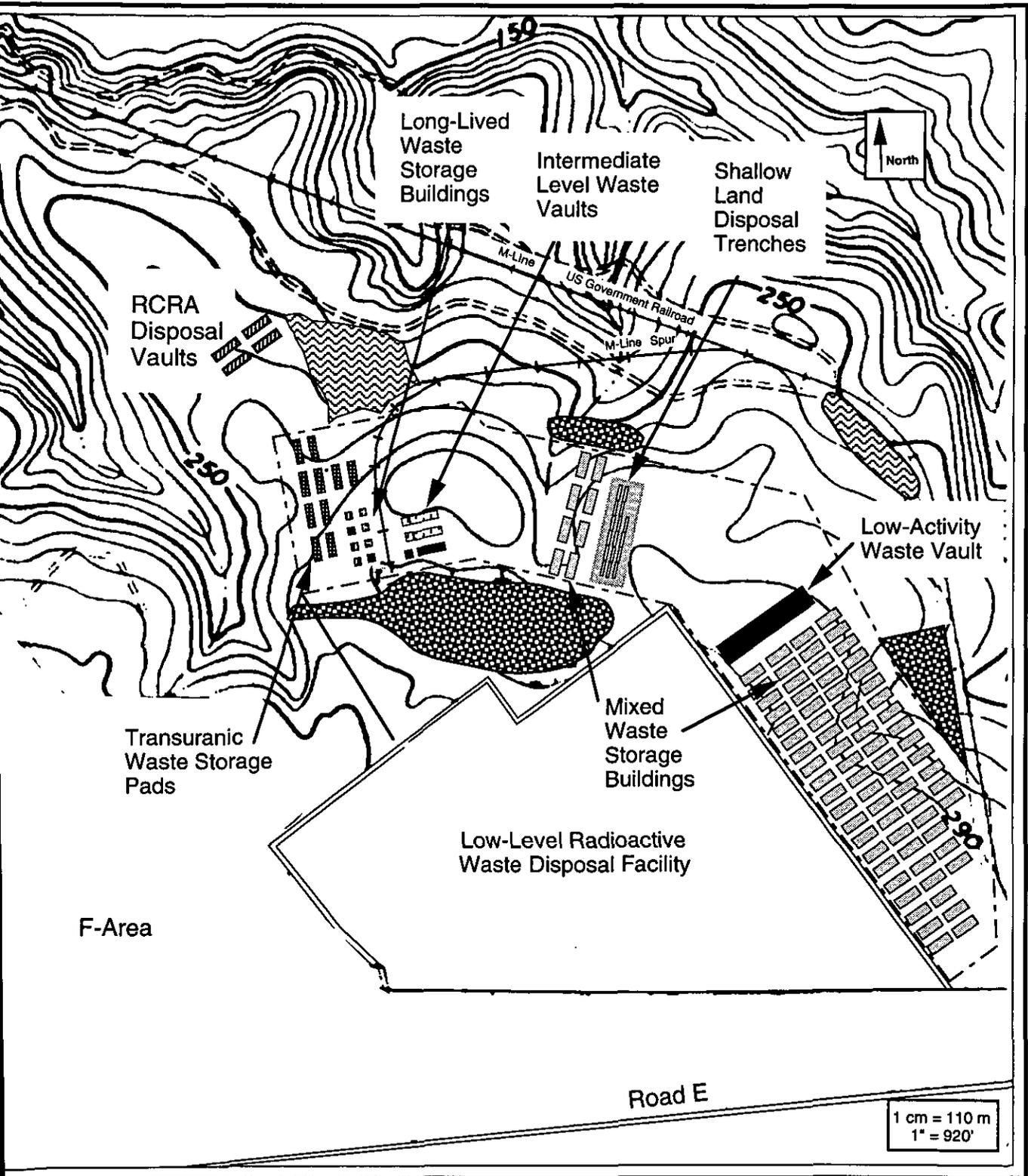
The potential for accidental oil, fuel, and chemical spills would be less under this scenario than under the no-action alternative because of reduced construction and operation activities. Spill prevention, control, and countermeasures for this scenario would be the same as for the no-action alternative discussed in Section 4.1.2; therefore, impacts to soils would be very small.

TE

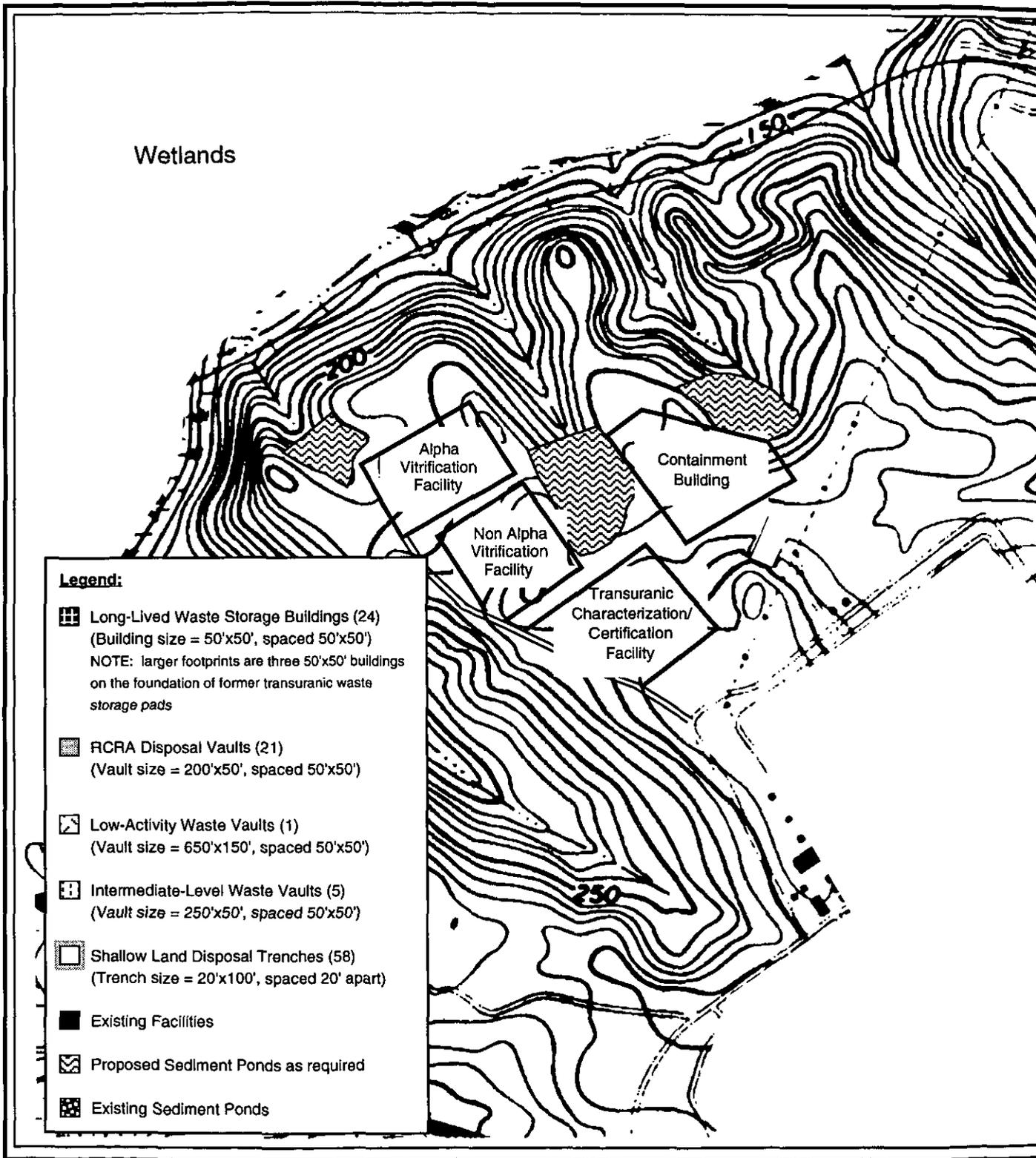


PK56-22

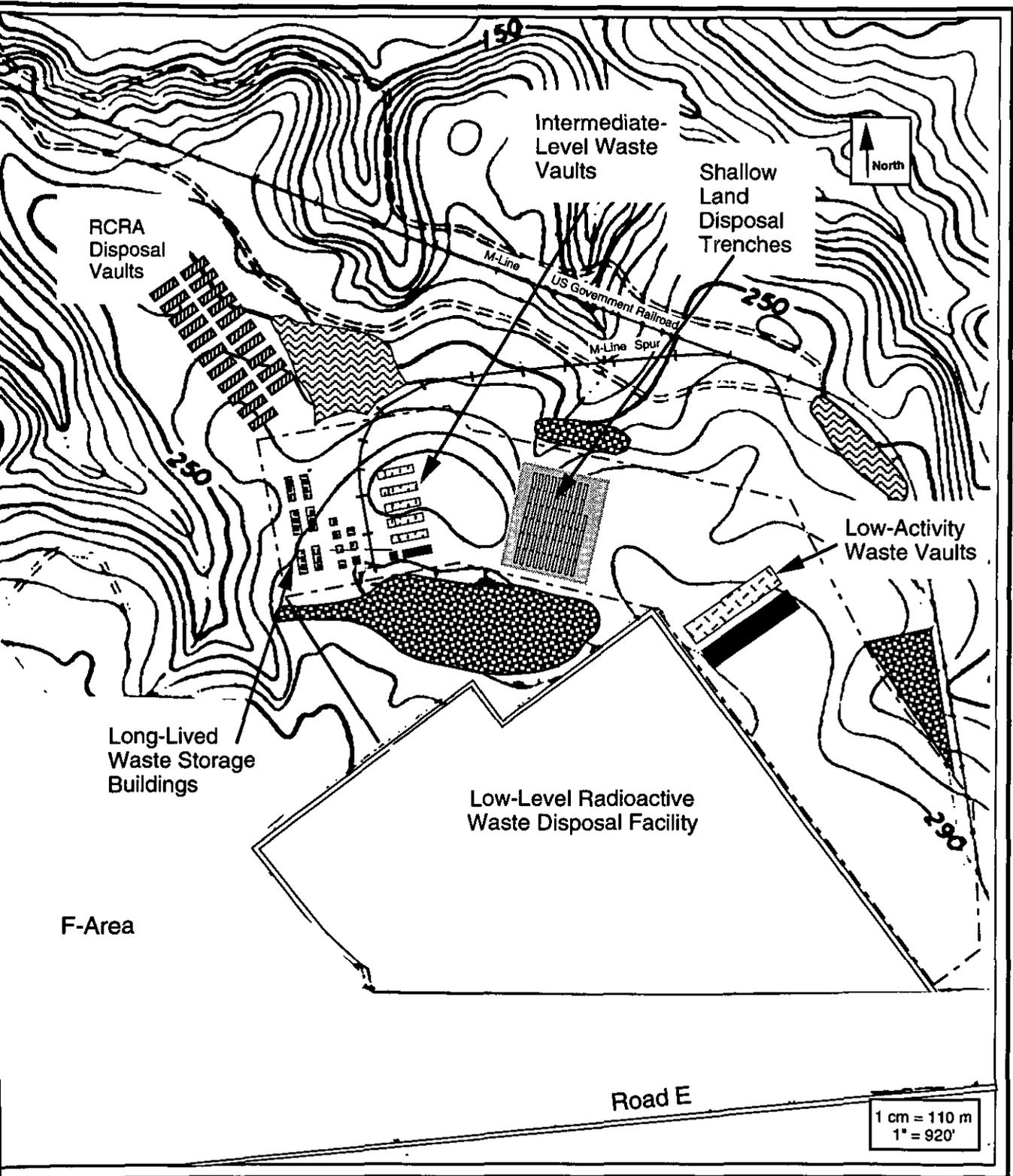
TC | **Figure 4-31.** Configuration of treatment, storage, and disposal facilities in E-Area for alternative B – expected waste forecast by 2006.



PK56-22



TC | **Figure 4-32.** Configuration of treatment, storage, and disposal facilities in E-Area for alternative B – expected waste forecast by 2024.



PK56-22

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.2.2 Geologic Resources – Minimum Waste Forecast**

TC

Effects on geologic resources from alternative B – minimum waste forecast would be less than those from the expected waste forecast, because less land would be disturbed by construction activities. Approximately 0.10 square kilometer (25 acres) of cleared land (by 2008) and 0.36 square kilometer (90 acres) of uncleared land (by 2024) would be used for new facilities.

For operations activities, spill prevention, control and countermeasures plans would be the same as for the no-action alternative.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.2.3 Geologic Resources – Maximum Waste Forecast**

TC

Effects on geologic resources from alternative B – maximum waste forecast would be substantially greater than from the expected waste forecast, because of the large number of new facilities. Approximately 0.283 square kilometer (70 acres) of cleared land and 0.745 square kilometer (184 acres) of uncleared land in E-Area, and 3.06 square kilometers (756 acres) of cleared or uncleared land outside E-Area would be used for construction.

For operations activities, spill prevention, control and countermeasures would be the same as for the no-action alternative.

**4.4.3 GROUNDWATER RESOURCES**

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.3.1 Groundwater Resources – Expected Waste Forecast**

TC

This section discusses the effects of alternative B – expected waste forecast on groundwater resources at SRS. Effects can be evaluated by comparing the concentrations of contaminants predicted to enter the

groundwater from options under alternative B. Effects to groundwater resources under the no-action alternative (Section 4.1.3) form the basis for comparing the alternatives and are referenced in this section.

Operation and effects of the M-Area Air Stripper and the F- and H-Area tank farms would be the same as for the no-action alternative.

For this alternative and forecast and as noted in Section 4.1.3, releases to the groundwater from the disposal vaults are improbable during active maintenance; however, releases could eventually occur after loss of institutional control and degradation of the vaults. Impacts from the RCRA-permitted disposal vaults would be similar to the effects under the no-action alternative (Section 4.1.3).

TE

For alternative B – expected waste forecast, the number of additional low-activity and intermediate-level radioactive waste disposal vaults would be less than half (6) the number required for the no-action alternative (15). Modeling has shown that releases from these vaults would not cause current groundwater standards to be exceeded during the 30-year planning period, the 100-year institutional control period, or at any time after disposal (Toblin 1995). As in the no-action alternative, the predicted concentrations of tritium would be a very small fraction of the drinking water standard. See the discussion in Section 4.1.3 on the basis for the 4 millirem standard for evaluating the effects of disposal in the E-Area vaults on shallow groundwater at SRS.

TC

TE

TC

For this forecast, 58 additional slit trenches would be constructed. Fifteen (15) of these slit trenches would be used for disposal of suspect soil and have been evaluated using results from the previous Radiological Performance Assessment (Martin Marietta, EG&G, and WSRC 1994). Under this waste forecast, modeling results indicate that none of the radionuclides analyzed would at any time exceed DOE's performance objective of 4 millirem per year for drinking water (Toblin 1995). The remaining trenches would be filled with stabilized waste forms (ashcrete, glass, smelter ingots) subject to completion of performance assessments and demonstration of compliance with the performance objectives required by DOE Order 5820.2A. Therefore, DOE has conservatively assumed that groundwater concentrations as a result of radioactive releases from the RCRA-permitted vaults and all other low-level waste disposal facilities (vaults and slit trenches) would remain within the DOE performance objective of 4 millirem per year adopted by DOE in Order 5400.5.

TC

In summary, effects to groundwater resources for alternative B – expected waste forecast are expected to be similar to the effects under the no-action alternative (Section 4.1.3).

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.3.2 Groundwater Resources – Minimum Waste Forecast**

TE For this forecast and as noted in Section 4.1.3, releases to the groundwater from disposal vaults would be improbable during active maintenance; however, releases could eventually occur after loss of institutional control and degradation of the vaults. Impacts from the RCRA-permitted disposal vaults would be similar to the effects under the no-action alternative (Section 4.1.3).

TC There would be fewer additional low-activity and intermediate-level radioactive waste disposal vaults (3) than under the no-action alternative (15). Modeling has shown that releases from these vaults would not cause groundwater standards to be exceeded during the 30-year planning period, the 100-year period of institutional control period, or at any time after disposal (Toblin 1995). Impacts to groundwater resources from disposal vaults would be similar to the impacts under the no-action alternative (Section 4.1.3). The predicted concentrations of tritium would be a very small fraction of the drinking water standard.

TC For alternative B – minimum waste forecast, 37 additional slit trenches would be constructed. Six (6) of these slit trenches would be used for disposal of suspect soil and have been evaluated using results from the previous Radiological Performance Assessment (Martin Marietta, EG&G, and WSRC 1994). Under this waste forecast, modeling results indicate that none of the radionuclides analyzed would at any time exceed DOE's performance objective of 4 millirem per year for drinking water (Toblin 1995). The remaining trenches will be filled with stabilized waste forms (ashcrete, glass, smelter ingots) subject to completion of performance assessments and demonstration of compliance with the performance objectives required by DOE Order 5820.2A. Therefore, DOE has conservatively assumed that groundwater concentrations as a result of radioactive releases from the RCRA-permitted vaults and all other low-level waste disposal facilities (vaults and slit trenches) would remain within the DOE performance objective of 4 millirem per year adopted by DOE in Order 5400.5.

TC In summary, impacts to groundwater for alternative B – minimum waste forecast would be similar to the impacts under the no-action alternative (Section 4.1.3) and expected waste forecast (Section 4.4.3.1).

	Min.	Exp.	Max.
No Action			
A			
B			
C			

#### 4.4.3.3 Groundwater Resources – Maximum Waste Forecast

For this forecast and as noted in Section 4.1.3, releases to the groundwater from disposal vaults would be improbable during active maintenance; however, releases could eventually occur after loss of institutional control and degradation of the vaults. Impacts from the RCRA-permitted disposal vaults would be similar to the effects under the no-action alternative (Section 4.1.3).

TC

There would be more additional low-activity and intermediate-level radioactive disposal vaults (17) than under the no-action alternative (15). Modeling has shown that releases from these vaults would not cause groundwater standards to be exceeded during the 30-year planning period, the 100-year period of institutional control period, or at any time after disposal (Toblin 1995). Impacts to groundwater resources from disposal vaults under this case would be similar to those impacts discussed under the expected waste forecast and the no-action alternative (Section 4.1.3). The predicted concentrations of tritium would be a very small fraction of the drinking water standard.

TC

For alternative B – maximum waste forecast, 371 additional slit trenches would be constructed. Two hundred thirty eight (238) of these slit trenches would be used for disposal of suspect soil and have been evaluated using results from the previous Radiological Performance Assessment (Martin Marietta, EG&G, and WSRC 1994). Under this waste forecast, modeling results indicate that none of the radionuclides analyzed would at any time exceed DOE's performance objective of 4 millirem per year for drinking water (Toblin 1995). The remaining trenches would be filled with stabilized waste forms (ashcrete, glass, smelter ingots) subject to completion of performance assessments and demonstration of compliance with the performance objectives required by DOE Order 5820.2A. Therefore, DOE has conservatively assumed that groundwater concentrations as a result of radioactive releases from the RCRA-permitted vaults and all other low-level waste disposal facilities (vaults and slit trenches) would remain within the DOE performance objective of 4 millirem per year adopted by DOE in Order 5400.5.

TC

In summary, impacts to groundwater for alternative B – maximum waste forecast would be similar to the impacts under both the no-action alternative (Section 4.1.3) and alternative B – expected waste forecast (Section 4.4.3.1).

TC

#### 4.4.4 SURFACE WATER RESOURCES

	Min.	Exp.	Max.
No Action			
A			
B			
C			

##### 4.4.4.1 Surface Water – Expected Waste Forecast

Impacts to surface water were compared by evaluating the concentrations of pollutants that would be introduced.

For alternative B – expected waste forecast, the F/H-Area Effluent Treatment Facility, the M-Area Vendor Treatment Facility, and the M-Area Dilute Effluent Treatment Facility (which is the final stage of the M-Area Liquid Effluent Treatment Facility) would operate in the same manner discussed in Section 4.1.4. The wastewater would be similar in composition to wastewater already treated in these facilities and would be discharged to surface streams via existing permitted outfalls.

The Consolidated Incineration Facility would not directly discharge wastewater to the environment. Instead, the wastewater would be used in the ashcrete process and the stabilized ash and blowdown would be disposed of in disposal vaults or sent to shallow land disposal.

TE | The Replacement High-Level Waste Evaporator would evaporate the liquid waste from the high-level waste tanks in the F- and H-Area tank farms (as in the no-action alternative). It would be used in the same manner as the present F- and H-Area evaporators, with the distillate being sent to the F/H-Area Effluent Treatment Facility for treatment prior to being discharged to Upper Three Runs. The concentrate from the evaporator would be sent to the Defense Waste Processing Facility for vitrification. Since the Replacement High Level Waste Evaporator would be used in the same manner as the existing evaporators and would produce a distillate similar in composition to the present distillate, the effect of the effluent on Upper Three Runs would be the same as it is now.

Alternative B would require the construction and operation of two vitrification facilities, a containment building, additional storage buildings, storage pads, the transuranic waste characterization/certification facility, low-level waste disposal trenches, and vaults. As discussed in Section 4.1.4, before facilities would be constructed, DOE would prepare erosion and sedimentation control plans to comply with state regulations on stormwater discharges; after facilities began operating, they would be included in the *SRS Stormwater Pollution Prevention Plan*.

Other than through stormwater discharges, the containment building, the storage buildings, the storage pads, and the vaults would not affect SRS surface waters. Liquid waste discharged from processes in the containment building would be sent to the Consolidated Incineration Facility and not discharged to surface waters. The alpha vitrification facility and the non-alpha vitrification facility would have wastewater discharges that would be treated and recycled for reuse in the vitrification processes. Leakage or spills at the storage pads, storage buildings, or vaults would be collected in sumps or secondary containment and checked for contamination before being discharged. If the accumulated liquid were found to be contaminated, it would be treated prior to discharge. Stormwater infiltrating the vaults and trenches would eventually discharge to surface waters. Appendix E contains a detailed list of drinking water doses from these discharges. The doses would be 100,000 times less than the regulatory standards (40 CFR 141) (Toblin 1995).

TC

TC

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.4.2 Surface Water – Minimum Waste Forecast**

For the minimum waste forecast, fewer new facilities would be built than for the expected waste forecast. The amount of wastewater needing treatment would be less than that for the expected waste forecast discussed in Section 4.4.4.1. Wastewater would be treated in existing SRS treatment facilities. The receiving streams would not be additionally impacted. As in the expected waste forecast, surface water would not be impacted by groundwater discharges.

TE

Erosion and sedimentation would be controlled during construction activities, as discussed in Section 4.1.4. After the facilities are operating, they would be included in the *SRS Stormwater Pollution Prevention Plan*.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.4.3 Surface Water – Maximum Waste Forecast**

The wastewater from the vitrification facilities would be treated with ion exchange systems in dedicated wastewater treatment systems and recycled to the vitrification process for reuse, not discharged to a surface stream.

Wastewater from the containment building would be treated in a new wastewater treatment plant. The treated water would be discharged to surface water through a permitted outfall. SRS would comply with the permit limits established by SCDHEC. The predicted dose to the offsite maximally exposed individual would be  $1.39 \times 10^{-5}$  millirem per year (Appendix E). Wastewater would not be discharged from the mobile soil sort facility.

Erosion and sedimentation control plans and pollution prevention measures would be the same as for other cases.

#### 4.4.5 AIR RESOURCES

	Min.	Exp.	Max.
No Action			
A			
B			
C			

##### 4.4.5.1 Air Resources – Expected Waste Forecast

TE | This section presents the impacts to air quality as a result of alternative B – expected waste forecast. The increases of pollutant concentrations at and beyond the SRS boundary from waste management under this alternative are small when compared to existing concentrations. Operations under alternative B would not exceed state or Federal air quality standards.

##### 4.4.5.1.1 Construction

Potential impacts to air quality from construction activities could include fugitive dust and exhaust from earth-moving equipment. Approximately  $2.90 \times 10^5$  cubic meters ( $2.22 \times 10^5$  cubic yards) of soil would be disturbed in E-Area for the construction of new facilities in this case.

Maximum concentrations at SRS's boundary resulting from a year of average construction are shown in Table 4-58. These concentrations are generally lower than those shown for the no-action alternative. The sum of the increase over baseline of pollutant concentrations due to construction activities plus the existing baseline concentrations would be within both state and federal air quality standards.

##### 4.4.5.1.2 Operations

In addition to existing SRS emissions there would be nonradiological and radiological emissions due to the operation of facilities such as the Defense Waste Processing Facility, including In-Tank

**Table 4-58.** Maximum SRS boundary-line concentrations resulting from a year of average construction activities under alternative B (in micrograms per cubic meter of air).

Pollutant	Averaging time	Baseline ( $\mu\text{g}/\text{m}^3$ ) <sup>a</sup>	Average increase ( $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>			SCDHEC standard ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	Baseline + increase as percent of standard		
			Expected	Minimum	Maximum		Expected	Minimum	Maximum
Nitrogen oxides	1 year	14	<0.01 <sup>d</sup>	<0.01	0.03	100	14	14	14
Sulfur dioxide	3 hours	857	28.53	14.89	334	1,300	68	67	92
	24 hours	213	0.54	0.28	6.33	365	59	58	60
	1 year	19	<0.01	<0.01	<0.01	80	21	21	21
Carbon monoxide	1 hour	171	673	323	6,645	40,000	2	1	17
	8 hours	22	106	51	1,010	10,000	1	1	10
Total suspended particulates	1 year	43	<0.01	<0.01	0.03	75	57	57	57
Particulate matter less than 10 microns in diameter	24 hours	85	1.99	1.03	22.54	150	58	57	72
	1 year	25	0.01	0.01	0.04	50	50	50	50

a. Source: Stewart (1994).  
 b. Source: Hess (1994a).  
 c. Source: SCDHEC (1976).  
 d. < is read as "less than."

TC | Precipitation; the Consolidated Incineration Facility; the M-Area Vendor Treatment Facility; the mobile soil sort facility; the mixed and hazardous waste containment building; the non-alpha waste vitrification facility (including soil sorting); the transuranic waste characterization/certification facility; and the alpha waste vitrification facility.

*Emissions from new or proposed facilities are estimated based on processes occurring in the facilities or similar facilities, annual average waste flow volumes, and air permit applications. Air emissions from such facilities as storage vaults and mixed waste storage buildings would be minimal.*

TE | Increases to maximum boundary-line concentrations of pollutants would not occur as a result of the continued operation of existing facilities. Additional emissions from the M-Area Air Stripper and the F/H-Area Effluent Treatment Facility from the expected waste forecast would be small, as discussed in Section 4.1.5.2.

TE | **Nonradiological Air Emissions Impacts**

Maximum ground-level concentrations for nonradiological air pollutants were estimated from the Industrial Source Complex Version 2 Dispersion Model using calculated emissions from all facilities included in alternative B (Stewart 1994). Modeled air toxic concentrations for carcinogens are based on an annual averaging period and are presented in Section 4.4.12.1.2. Air dispersion modeling was performed with calculated emission rates for the above-listed facilities (Stewart 1994).

TC | The following facilities were incorporated into the modeling analysis for alternative B air dispersion: the Consolidated Incineration Facility, including the ashcrete storage silo, the ashcrete hopper duct, and the ashcrete mixer; four new solvent tanks to support the Consolidated Incineration Facility; the Defense Waste Processing Facility, including In-Tank Precipitation; the M-Area Vendor Treatment Facility; the mixed and hazardous waste containment building; the transuranic waste characterization/certification facility; hazardous waste storage facilities; mixed waste storage facilities; the mobile soil sort facility; the non-alpha waste vitrification facility (including soil sorting); and the alpha waste vitrification facility.

TE | The emissions of air toxics would be minimal. Maximum boundary-line concentrations for air toxics emanating from existing SRS sources, including the Consolidated Incineration Facility and the Defense Waste Processing Facility, would be well below SCDHEC regulatory standards and are presented in the *SCDHEC Regulation No. 62.5 Standard No. 2 and Standard No. 8 Compliance Modeling Input/Output Data*.

The Savannah River Technology Center laboratory's liquid waste and E-Area vaults would have minimal air emissions, as described in Section 4.1.5.2.

Table 4-59 shows the increase in maximum ground-level concentrations at the SRS boundary for nonradiological air pollutants due to routine releases from facilities for alternative B – expected, minimum, and maximum waste forecasts. For the expected waste forecast, maximum ground-level concentrations would be similar to those under the no-action alternative. Refer to Section 4.2.5.1.2 for a discussion of the emissions from offsite lead decontamination.

TC

### **Radiological Air Emissions Impacts**

TE

Offsite maximally exposed individual and population doses were determined for atmospheric releases resulting from routine operations under alternative B. The major sources of radionuclides would be the alpha and non-alpha vitrification facilities, the transuranic waste characterization/certification facility, and the Consolidated Incineration Facility. Other facilities with radiological releases would include the M-Area Vendor Treatment Facility, the mobile soil sort facility, and the containment building.

L004-13

TC

SRS-specific computer codes MAXIGASP and POPGASP were used to determine the maximum individual dose and the 80-kilometer (50-mile) population dose, respectively, resulting from routine atmospheric releases. See Appendix E for detailed facility-specific isotopic and dose data.

L004-13

Table 4-60 shows the dose to the offsite maximally exposed individual and the population. The calculated maximum committed effective annual dose equivalent to a hypothetical individual is 0.032 millirem (Chesney 1995), which is well within the annual dose limit of 10 millirem from SRS atmospheric releases. In comparison, an individual living near the SRS receives a dose of 0.25 millirem from all current SRS releases of radioactivity (Arnett 1994). The 0.032 millirem annual dose is greater than the  $1.3 \times 10^{-4}$  millirem annual dose shown for the no-action alternative.

TC

TC

The annual dose to the population within 80 kilometers (50 miles) of SRS would be 1.5 person-rem. In comparison, the collective dose received from natural sources of radiation is approximately 195,000 person-rem (Arnett, Karapatakis, and Mamatey 1994). Section 4.4.12.1.2 describes the potential health effects of these releases on individuals residing offsite. The 1.5 person-rem annual dose is greater than the  $2.9 \times 10^{-4}$  annual dose shown for the no-action alternative.

TE **Table 4-59.** Changes in maximum ground-level concentrations of air pollutants at SRS boundary for alternative B – expected, minimum, and maximum waste forecasts.

Pollutant	Averaging time	Existing sources ( $\mu\text{g}/\text{m}^3$ ) <sup>a,b</sup>	Regulatory standards ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	Background concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>d</sup>	Increases in concentration ( $\mu\text{g}/\text{m}^3$ )			Percent of standard <sup>e</sup>		
					Expected	Minimum	Maximum	Expected	Minimum	Maximum
Nitrogen oxides	1 year	6	100	8	0.79	0.79	0.83	15	15	15
	3 hours	823	1,300	34	3.82	3.81	3.85	66	66	66
	24 hours	196	365	17	0.81	0.81	0.81	59	59	59
Sulfur oxides	1 year	14	80	3	0.05	0.05	0.05	21	21	21
	1 hour	171	40,000	NA <sup>f</sup>	31.45	31.46	31.46	0.5	0.5	0.5
	8 hours	22	10,000	NA	7.68	7.68	7.68	0.3	0.3	0.3
Carbon monoxide	1 year	13	75	30	2.01	2.01	2.01	60	60	60
Total suspended particulates	24 hours	51	150	34	4.61	4.61	4.61	60	60	60
Particulate matter less than 10 microns in diameter	1 year	3	50	22	0.10	0.10	0.10	50	50	50
	3 months	$4.0 \times 10^{-4}$	1.5	0.011	$3.00\text{E-}05$	$3.00\text{E-}05$	$5.00\text{E-}05$	0.8	0.8	0.8
Lead	12 hours	2	3.7	NA	0.00187	0.00187	0.00187	54	54	54
	24 hours	1	2.9	NA	$9.30 \times 10^{-4}$	$9.30 \times 10^{-4}$	$9.30 \times 10^{-4}$	35	35	35
	1 week	0.4	1.60		$7.00 \times 10^{-5}$	$7.00 \times 10^{-5}$	$7.00 \times 10^{-5}$	25	25	25
	1 month	0.1	0.80	NA	$9.00 \times 10^{-5}$	$9.00 \times 10^{-5}$	$9.00 \times 10^{-5}$	13	13	13
Gaseous fluorides (as hydrogen fluoride)	12 hours	2	3.7	NA	0.00187	0.00187	0.00187	54	54	54
	24 hours	1	2.9	NA	$9.30 \times 10^{-4}$	$9.30 \times 10^{-4}$	$9.30 \times 10^{-4}$	35	35	35
	1 week	0.4	1.60		$7.00 \times 10^{-5}$	$7.00 \times 10^{-5}$	$7.00 \times 10^{-5}$	25	25	25
	1 month	0.1	0.80	NA	$9.00 \times 10^{-5}$	$9.00 \times 10^{-5}$	$9.00 \times 10^{-5}$	13	13	13

a. Micrograms per cubic meter of air.

b. Source: Stewart (1994).

c. Source: SCDHEC (1976).

d. Source: SCDHEC (1992).

e. Percent of standard =  $100 \times (\text{actual} + \text{background} + \text{increment})$  divided by regulatory standard.

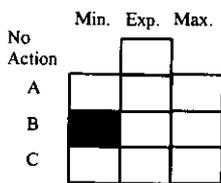
f. NA = not applicable.

**Table 4-60.** Annual radiological doses to individuals and the population within 80 kilometers (50 miles) of SRS from atmospheric pathways under alternative B.<sup>a</sup>

Waste Forecast	Offsite maximally exposed individual	Population
	Dose (millirem)	Dose (person-rem)
Expected	0.032	1.5
Minimum	0.02	0.98
Maximum	0.33	14

TC

a. Source: Chesney (1995).



**4.4.5.2 Air Resources – Minimum Waste Forecast**

The minimum waste forecast would have fewer adverse effects than the expected waste forecast.

**4.4.5.2.1 Construction**

Impacts were evaluated for the construction of facilities listed in Section 2.6.7. Maximum concentrations at the SRS boundary resulting from a year of average construction are presented in Table 4-58. These concentrations are less than those for the expected waste forecast. The construction-related emissions would meet both state and federal air quality standards.

**4.4.5.2.2 Operations**

Increases in radiological and nonradiological impacts were determined for the same facilities listed in Section 4.4.5.1.2.

**Nonradiological Air Emissions Impacts**

TE

Nonradiological air emissions would be less than those estimated for the expected waste forecast. Maximum boundary-line concentrations are presented in Table 4-59. Modeled concentrations would be less than those shown for the expected waste forecast. Total concentrations would be less than applicable state and federal ambient air quality standards.

TE | **Radiological Air Emissions Impacts**

TC | Table 4-60 shows the dose to the offsite maximally exposed individual and the population due to atmospheric releases. The calculated maximum committed annual dose equivalent to a hypothetical individual is 0.02 millirem (Chesney 1995), which is less than the dose for the expected waste forecast and below the annual dose limit of 10 millirem from SRS atmospheric releases.

TC | The annual dose to the population within 80 kilometers (50 miles) of SRS would be 0.98 person-rem, which would be less than the population dose calculated for the expected waste forecast.

Air quality would change as a result of construction and operation activities. The minimum waste forecast would have less impact than the expected waste forecast.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.5.3 Air Resources – Maximum Waste Forecast**

**4.4.5.3.1 Construction**

TE | Impacts were evaluated for the construction of facilities discussed in Section 2.6.7. Maximum concentrations at the SRS boundary resulting from a year of average construction are presented in Table 4-58. These concentrations are greater than those in the expected waste forecast. Construction management procedures would require wetting of roads to reduce particulate emissions.

During a year of average construction, the sum of the additional concentrations of air pollutants resulting from construction activities plus the existing baseline concentrations would be less than both state and federal air quality standards.

**4.4.5.3.2 Operations**

Both radiological and nonradiological impacts were determined for the facilities listed in Section 4.4.5.1.2. Air emissions would be greater than in the expected waste forecast, and effects on air quality would also be greater.

## Nonradiological Air Emissions Impacts

TE

Nonradiological air emissions would be greater than those estimated for the expected waste forecast. Maximum boundary-line concentrations are presented in Table 4-59. Modeled concentrations are greater than those in the expected waste forecast. Cumulative concentrations would be less than applicable state and federal ambient air quality standards.

## Radiological Air Emissions Impacts

TE

Offsite maximally exposed individual and population doses were determined for atmospheric releases resulting from routine operations at the facilities presented in Section 4.3.5.2.2.

Table 4-60 shows the dose to the offsite maximally exposed individual and the population due to atmospheric releases. The calculated maximum committed annual dose equivalent to a hypothetical individual is 0.33 millirem (Chesney 1995), which would be greater than the dose for the expected waste forecast, but within the annual dose limit of 10 millirem from SRS atmospheric releases.

TC

The annual dose to the population within 80 kilometers (50 miles) of SRS would be 14 person-rem, which is greater than the population dose calculated for the expected waste forecast. In comparison, the collective dose to the same population from natural sources of radiation is approximately 195,000 person-rem (Arnett, Karapatakis, and Mamatey 1994). Section 4.4.12.1.2 describes the potential health effects of these releases on individuals.

## 4.4.6 ECOLOGICAL RESOURCES

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 4.4.6.1 Ecological Resources – Expected Waste Forecast

For alternative B – expected waste forecast, undisturbed land would be cleared and graded to build new facilities. (The land areas are given in acres; to convert to square kilometers, multiply by 0.004047.)

TC | Clearing and grading would affect 107 acres of woodland by 2006 and an additional 10 acres by 2024, as follows:

- 26 acres of loblolly pine planted in 1987
- 20 acres of white oak, red oak, and hickory regenerated in 1922
- 57 acres of longleaf pine regenerated in 1922, 1931, or 1936
- 4 acres from which mixed pine/hardwood have recently been harvested

TC | • 10 acres of loblolly pine planted in 1987, which would be cleared between 2006 and 2024

TC | Effects of clearing and grading the land are described in Section 4.1.6. The land required for this alternative is less than that required under the no-action alternative or alternative C, but 21 acres more than under alternative A.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.6.2 Ecological Resources – Minimum Waste Forecast**

TC | Approximately 90 acres of undeveloped land located between the M-Line railroad and the E-Area expansion and extending northwest of F-Area would be required for alternative B – minimum waste  
 TC | forecast by 2024. Impacts to the ecological resources of the area would be slightly less than those described in Section 4.4.6.1.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.6.3 Ecological Resources – Maximum Waste Forecast**

TC | Approximately 184 acres of undeveloped land located between the M-Line railroad and the E-Area expansion and extending northwest of F-Area would be required for the maximum waste forecast. By  
 TC | 2008, an additional 756 acres of land in an undetermined location would also be required. Impacts to the ecological resources of the area would be considerably greater than described in Section 4.4.6.1 due to the greater area (see Section 4.2.6.3 for some possible adverse effects). Additional threatened and endangered species surveys and wetlands assessments would be required as part of the site-selection process should this case be implemented.

**4.4.7 LAND USE**

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.7.1 Land Use – Expected Waste Forecast**

DOE would use approximately 158 acres (107 acres of undeveloped land; 51 acres of developed land) in E-Area through 2006 for activities associated with alternative B – expected waste forecast. By 2024, the total would have been reduced to about 136 acres because as wastes are treated and disposed of, the storage buildings would be taken out of service and decontaminated and decommissioned; some would be demolished. SRS has about 181,000 acres of undeveloped land, which includes wetlands and other areas that cannot be developed, and 17,000 acres of developed land.

TC

TC

Activities associated with alternative B would not affect current SRS land-use plans; E-Area was designated as an area for nuclear facilities in the draft *1994 Land-Use Baseline Report*. Furthermore, no part of E-Area has been identified as a potential site for future new missions. And according to the *FY 1994 Draft Site Development Plan*, proposed future land management plans specify that E-Area be characterized and remediated for environmental contamination in its entirety, if necessary. DOE will make decisions on future SRS land uses through the site development, land-use, and future-use planning processes, including public input through avenues such as the Citizens Advisory Board.

TE

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.7.2 Land Use – Minimum Waste Forecast**

Activities associated with alternative B – minimum waste forecast would not impact current SRS land uses. DOE would use approximately 107 acres (51 fewer than for the expected waste forecast) in E-Area through 2008 for the facilities described in Section 4.4.1.

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.7.3 Land Use – Maximum Waste Forecast**

TC | Activities associated with alternative B – maximum waste forecast would not affect current SRS land  
 TC | uses. By 2006, DOE would use a total of 1,010 acres (254 acres in E-Area and 756 acres elsewhere) for  
 the facilities described in Section 4.2.1. This acreage is nearly 10 times the land that would be required  
 for the expected or minimum waste forecasts, but is less than 1 percent of the total undeveloped land on  
 SRS (DOE 1993d). However, considerably more acreage than this may be affected (see Section 4.2.6.3).  
 TC | Current land uses in E-Area would not be impacted. The location of the 756 acres outside of E-Area has  
 not been identified and would be the subject of further impact analyses (see Appendix J). However,  
 DOE would minimize the impact of clearing 756 acres by using the central industrialized portion of the  
 site, as described in Section 2.1.2 and Figure 2-1.

**4.4.8 SOCIOECONOMICS**

This section describes the potential effects of alternative B on the socioeconomic resources in the region  
 of influence discussed in Section 3.8.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.8.1 Socioeconomics – Expected Waste Forecast**

**4.4.8.1.1 Construction**

TC | DOE anticipates that construction employment would peak during 2004 through 2005 with  
 approximately 170 jobs (Table 4-61), 120 more than during peak employment under the no-action  
 alternative. This employment demand represents much less than 1 percent of the forecast employment in  
 2005. Given the normal fluctuation of employment in the construction industry, DOE does not expect a  
 net change in regional construction employment from implementation of alternative B. Given no net  
 change in employment, neither population nor personal income in the region would change. As a result,  
 socioeconomic resources would not be affected.

**Table 4-61.** Estimated construction and operations employment for alternative B – minimum, expected, and maximum waste forecasts.<sup>a</sup>

Year	Waste Forecast				
	Minimum		Expected		Maximum <sup>b</sup>
	Construction	Operations	Construction	Operations	Construction
1995	20	920	50	1,640	200
1996	20	1,110	30	1,940	70
1997	20	1,110	30	1,940	70
1998	20	1,110	30	1,940	170
1999	20	1,110	30	2,050	170
2000	20	1,120	40	2,270	180
2001	20	1,120	40	2,270	180
2002	40	1,170	70	2,330	250
2003	70	1,170	120	2,330	330
2004	120	1,250	170	2,330	330
2005	120	1,320	170	2,330	330
2006	90	1,420	100	2,360	240
2007	60	1,360	80	2,250	60
2008	20	1,600	40	2,550	100
2009	20	1,530	40	2,550	100
2010	20	1,530	40	2,550	100
2011	20	1,530	40	2,550	100
2012	20	1,530	40	2,550	100
2013	20	1,530	40	2,550	100
2014	20	1,530	40	2,550	100
2015	20	1,530	40	2,550	100
2016	20	1,530	40	2,550	100
2017	20	1,570	40	2,550	100
2018	20	1,570	40	2,550	100
2019	20	1,430	30	2,390	60
2020	20	1,430	30	2,390	60
2021	20	1,430	30	2,390	60
2022	20	1,430	30	2,390	60
2023	20	1,430	30	2,390	60
2024	20	1,430	30	2,390	60

a. Source: Hess (1995a).

b. Operations employment for the maximum waste forecast is provided in Table 4-62.

TC

#### 4.4.8.1.2 Operations

TC | Operations employment associated with implementation of the alternative B – expected waste forecast is expected to peak in 2008 through 2018 with an estimated 2,550 jobs (Table 4-61), 100 more than during peak employment under the no-action alternative. This employment demand represents less than 1 percent of forecast employment in 2015 (see Chapter 3) and approximately 12 percent of 1995 SRS employment. DOE believes these jobs would be filled from the existing SRS workforce. Thus, DOE does not anticipate an impact on socioeconomic resources from changes in operations employment.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

#### 4.4.8.2 Socioeconomics – Minimum Waste Forecast

##### 4.4.8.2.1 Construction

TC | Construction employment associated with alternative B – minimum waste forecast would be slightly less than that for the expected waste forecast and would peak during 2004 through 2005 with approximately 120 jobs (Table 4-61), which represents much less than 1 percent of the forecast employment in 2005. DOE does not expect a net change in regional construction employment from implementation of this alternative. As a result, socioeconomic resources in the region would not be affected.

##### 4.4.8.2.2 Operations

TC | Operations employment associated with implementation of the minimum waste forecast is expected to peak during 2017 and 2018 with an estimated 1,570 jobs (Table 4-60), 980 fewer than the expected waste forecast. This employment demand represents less than 1 percent of the forecast employment in 2018 and approximately 8 percent of 1995 SRS employment. DOE believes these jobs would be filled from the existing SRS workforce and, therefore, anticipates that socioeconomic resources would not be affected by changes in operations employment.

No Action	Min.	Exp.	Max.
A			
B			
C			

### 4.4.8.3 Socioeconomics – Maximum Waste Forecast

#### 4.4.8.3.1 Construction

Construction employment associated with alternative B – maximum waste forecast would be greater than that for the expected waste forecast and would peak during 2003 through 2005 with approximately 330 jobs (Table 4-61), which represents much less than 1 percent of the forecast employment in 2005. DOE does not expect a net change in regional construction employment from implementation of this alternative. As a result, DOE does not expect socioeconomic resources in the region to be affected.

TC

#### 4.4.8.3.2 Operations

Operations employment associated with the implementation of alternative B – maximum waste forecast is expected to peak between 2002 through 2005 with an estimated 10,010 jobs (Table 4-62), which represents 3.7 percent of the forecast regional employment in 2005 and approximately 50 percent of SRS's employment in 1995. DOE assumes that approximately 50 percent of the total SRS workforce would be available to support implementation of this case. If DOE transfers 50 percent of the SRS workforce, an additional 2,110 new employees would be required in the peak years. Based on the number of new jobs predicted, DOE calculated changes in regional employment, population, and personal income using the Economic-Demographic Forecasting and Simulation Model developed for the six-county region of influence (Treyz, Rickman, and Shao 1992).

TC

Results of the modeling indicate that the peak regional employment change would occur in 2002 with a total of approximately 4,800 new jobs (Table 4-63) (HNUS 1995b). This would represent a 1.8 percent increase in baseline regional employment and would have a substantial positive impact on the regional economy.

Potential changes in regional population would lag behind the peak change in employment because of migration lags and because new residents may have children after they move into the area. As a result, the maximum change in population would occur in 2005 with an estimated 8,340 additional people in the six-county region (Table 4-63) (HNUS 1995b). This increase is approximately 1.7 percent above the baseline population forecast and could affect the demand for community resources and services such as housing, schools, police, health care, and fire protection.

**Table 4-62.** Estimated new operations jobs required to support alternative B, -- maximum waste forecast.<sup>a</sup>

Year	Projected total site employment	Site employment available for WM activities <sup>b</sup>	Total operations employment for alternative B maximum case	New hires <sup>c</sup>
1995	20,000	10,000	2,620	0
1996	15,800	7,900	4,000	0
1997	15,800	7,900	4,000	0
1998	15,800	7,900	9,470	1,570
1999	15,800	7,900	9,470	1,570
2000	15,800	7,900	9,680	1,780
2001	15,800	7,900	9,680	1,780
2002	15,800	7,900	10,010	2,110
2003	15,800	7,900	10,010	2,110
2004	15,800	7,900	10,010	2,110
2005	15,800	7,900	10,010	2,110
2006	15,800	7,900	9,310	1,410
2007	15,800	7,900	4,040	0
2008	15,800	7,900	6,020	0
2009	15,800	7,900	6,020	0
2010	15,800	7,900	6,020	0
2011	15,800	7,900	6,020	0
2012	15,800	7,900	6,020	0
2013	15,800	7,900	6,020	0
2014	15,800	7,900	6,020	0
2015	15,800	7,900	6,020	0
2016	15,800	7,900	6,020	0
2017	15,800	7,900	6,020	0
2018	15,800	7,900	6,020	0
2019	15,800	7,900	4,040	0
2020	15,800	7,900	4,040	0
2021	15,800	7,900	4,040	0
2022	15,800	7,900	4,040	0
2023	15,800	7,900	4,040	0
2024	15,800	7,900	4,040	0

TC

- a. Source: Hess (1995a).  
 b. DOE assumed that approximately 50 percent of the total site workforce would be available to work on waste management activities.  
 c. New hires are calculated by comparing the required employment (column 4) to available employment (column 3); new hires would result only in those years when required employment exceeds available employment.

**Table 4-63. Changes in employment, population, and personal income for alternative B – maximum waste forecast.<sup>a</sup>**

Year	New hires <sup>b</sup>	Change in indirect regional employment <sup>c</sup>	Net change in total regional employment	Percent change in regional employment	Change in regional population	Percent change in regional population	Change in regional personal income (millions)	Percent change in regional personal income
1998	1,570	2,260	3,830	1.55	1,350	0.29	180	1.73
1999	1,570	2,190	3,760	1.50	2,990	0.63	210	1.91
2000	1,780	2,390	4,170	1.65	4,170	0.88	250	2.15
2001	1,780	2,290	4,070	1.59	5,200	1.09	270	2.19
2002	2,110	2,690	4,800	1.86	6,250	1.31	330	2.52
2003	2,110	2,610	4,720	1.81	7,190	1.50	350	2.52
2004	2,110	2,550	4,660	1.76	7,840	1.64	370	2.51
2005	2,110	2,510	4,620	1.73	8,340	1.74	390	2.50
2006	1,410	1,430	2,840	1.05	8,080	1.68	280	1.69

- a. Source: Hess (1995a); HNUS (1995b).
- b. From Table 4-62.
- c. Change in employment related to changes in population.

TC

TC | Potential changes in total personal income would peak in 2005 with a \$390 million increase over forecast regional income levels for that year (Table 4-63) (HNUS 1995b). This would be a 2.5 percent increase over baseline income levels and would have a substantial, positive effect on the regional economy.

**4.4.9 CULTURAL RESOURCES**

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.9.1 Cultural Resources – Expected Waste Forecast**

This section discusses the effects of alternative B – expected waste forecast on cultural resources. As illustrated in Figure 4-31, waste management facilities under alternative B would be constructed primarily within the currently developed, fenced portion of E-Area. Construction within this area would not affect archaeological resources because this area has been disturbed.

Construction of disposal vaults to the northwest of the currently developed portion of E-Area (Figure 4-31) would not affect archaeological resources because when this area was surveyed, no important sites were discovered. No additional archaeological work is planned.

Archaeological sites in the area of proposed expansion could be impacted as described in Section 4.1.9. If this occurred, DOE would protect the cultural resources as described in Section 4.1.9.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.9.2 Cultural Resources – Minimum Waste Forecast**

TC | Construction of new waste management facilities for this forecast would require approximately 0.21 square kilometer (51 acres) less than for the expected waste forecast. Although the precise configuration of facilities is currently undetermined, construction would take place within the areas discussed in Section 4.4.9.1.

As discussed in Section 4.4.9.1, construction within the developed and fenced portion of E-Area or to the northwest of this area would have no effect on cultural or archaeological resources. Before construction could be initiated in the undeveloped area northwest of F-Area, the Savannah River Archaeology

Research Program and DOE would complete the consultation process with the State Historic Preservation Officer and develop mitigation action plans to ensure that important archaeological resources would be protected and preserved (Sassaman 1994).

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.9.3 Cultural Resources – Maximum Waste Forecast**

Construction of new waste management facilities for this forecast would require approximately 4.1 square kilometers (1,010 acres), 3.4 square kilometers (852 acres) more than for the expected waste forecast. Much of the proposed construction would take place within E-Area. However, this area is not large enough to support all of the new facilities. DOE would need an additional estimated 3.1 square kilometers (756 acres) outside of the areas addressed in Section 4.4.9.1.

TC

TC

Construction within the developed and fenced portion of E-Area or to the northwest of this area would not affect archaeological resources. Before construction could begin in the undeveloped area northwest of F-Area, the Savannah River Archaeology Research Program and DOE would complete the consultation process with the State Historic Preservation Officer and develop mitigation action plans, as described in Section 4.3.9.2.

Until DOE has determined the precise location of the additional 3.1 square kilometers (756 acres) that would be used outside of E-Area, effects on cultural resources cannot be predicted. The potential disturbance of important cultural resources would be proportional to the amount of land disturbed. However, in compliance with the Programmatic Memorandum of Agreement, DOE would survey all areas proposed for construction activities prior to disturbance. If important resources were discovered, DOE would avoid or remove them.

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

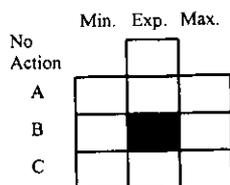
**4.4.10 AESTHETICS AND SCENIC RESOURCES – EXPECTED, MINIMUM, AND MAXIMUM WASTE FORECASTS**

TE

Activities associated with alternative B and the three waste forecasts would not adversely affect scenic resources or aesthetics. E-Area is already dedicated to industrial use. New construction would not be

visible from off SRS or from public access roads on SRS. The new facilities would not produce emissions to the atmosphere that would be visible or that would indirectly reduce visibility.

#### 4.4.11 TRAFFIC AND TRANSPORTATION



##### 4.4.11.1 Traffic

##### 4.4.11.1.1 Traffic – Expected Waste Forecast

This section discusses the effects of alternative B – expected waste forecast on traffic and transportation.

TC  
 TE This case would require 119 more construction workers than the no-action alternative. Traffic on all roads would remain within carrying capacity (Table 4-64), and effects on traffic would be minimal.

**Table 4-64.** Number of vehicles per hour during peak hours under alternative B.

Road	Design capacity, vehicles per hour	No-action alternative (percentage of capacity) <sup>a</sup>	Waste forecast		
			Minimum	Expected	Maximum
Offsite			Percentage of design capacity		
SC 19	3,000 <sup>b</sup>	2,821 (94)	2,852 (95)	2,875 (96)	2,948 (98)
SC 125	3,200 <sup>b</sup>	2,720 (85)	2,750 (86)	2,772 (87)	2,842 (89)
SC 57	2,100 <sup>b</sup>	706 (34)	713 (34)	719 (34)	737 (35)
Onsite					
Road E at E-Area	2,300 <sup>c</sup>	788 <sup>d</sup> (34)	856 <sup>e</sup> (37)	907 <sup>e</sup> (39)	1,068 <sup>e</sup> (46)

- a. Number in parentheses represents percentage of design capacity.  
 b. Adapted from Smith (1989).  
 c. Adapted from TRB (1985).  
 d. Includes baseline plus the maximum number (47) of construction workers (Hess 1995a).  
 e. Includes baseline plus the maximum number (115 for the minimum, 166 for the expected, and 327 for the maximum waste forecast) of construction workers (Hess 1995a).

There would be four additional daily waste shipments over the no-action estimate (Table 4-65). These additional shipments are due primarily to the shipment of low-level waste to offsite processing facilities. Offsite trucks with shipments of low-level waste would travel approximately 340,000 miles per year and would be expected to result in 0.04 prompt fatality annually. DOE does not expect effects on traffic.

TC

**Table 4-65.** SRS daily hazardous and radioactive waste shipments by truck under alternative B.<sup>a</sup>

Waste type	1994 no-action alternative traffica	Change from no-action		
		Minimum	Expected	Maximum
Hazardous	14	-6	<1 <sup>c</sup>	6
Low-level	7	<1	4	22
Mixed	8	-4	<1	14
Transuranic <sup>b</sup>	1	<1	<1	15
Total change	NA	-10	4	57
Total shipments per day	30	19	34	87

TC

- a. Shipments per day: To arrive at shipments per day, the total number of waste shipments estimated for the 30 years considered in this EIS was divided by 30 to determine estimated shipments per year. These numbers were divided by 250, which represents working days in a calendar year, to determine shipments per day. Supplemental information is provided in the traffic and transportation section of Appendix E.
- b. Includes mixed and nonmixed transuranic waste shipments.
- c. Values less than 1 are treated as zero for purposes of comparison.

As discussed in Section 4.1.11.1, the 1992 South Carolina highway fatality rate of 2.3 per 100 million miles driven leads to a baseline estimate of 5.5 traffic fatalities annually. Under alternative B, the largest increase in construction workers would occur for the maximum waste forecast (280 more workers than under the no-action alternative). These workers would be expected to drive 3.3 million miles annually (2.8 million miles more than under the no-action alternative), which is predicted to result in 1.4 additional prompt fatalities per year.

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.11.1.2 Traffic – Minimum Waste Forecast**

Alternative B – minimum waste forecast would require 68 more construction workers (Table 4-64) than the no-action alternative. Traffic on all roads would remain within design capacity, and the effects of increased traffic would be minimal.

TC

TC | There would be 11 fewer waste shipments per day compared to estimates for the no-action alternative (Table 4-65). This would be due to smaller volumes of all types of waste. The effects of decreased truck traffic would be minimal.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.11.1.3 Traffic – Maximum Waste Forecast**

TC | Alternative B – maximum waste forecast would require 280 more construction workers than the no-action alternative (Table 4-64). However, traffic on all roads would remain within carrying capacity, and effects to traffic would be minimal.

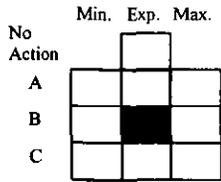
TC | There would be 57 additional daily waste shipments over the no-action estimate (Table 4-65), primarily due to the larger volumes of wastes [offsite shipments of low-level waste would be approximately equal to the expected case (2 per day)]. Except for offsite shipments, these shipments would originate at various SRS locations (primarily F- and H-Areas) and terminate at the E-Area treatment and disposal facilities. Shipments from the transuranic waste characterization/certification facility, alpha vitrification and non-alpha vitrification facilities, and containment building are not considered because these shipments would occur on a dedicated road that would be designed to accommodate expected traffic flows. The addition of 57 trucks during normal work hours would be expected to have a very small adverse effect on traffic.

TC  
TE

**4.4.11.2 Transportation**

Consequences of incident-free onsite transportation over 30 years under alternative B were based on those calculated for the no-action alternative adjusted for changes in number of shipments (as a result of changes in volume of waste shipped). Consequences and health effects of onsite transportation accidents for any given shipment are independent of the number of shipments and are, therefore, the same as for the no-action alternative (Table 4-8). The probability of an accident occurring for each type of waste shipped is shown in Table 4-26.

For alternative B, DOE analyzed the impacts from offsite shipments of mixed waste (lead) and low-level waste. Other offsite shipments were excluded from the analyses because the volumes over the 30-year period are very small or the shipments occur only once. The methodology and receptors are defined in Section 4.2.11.



**4.4.11.2.1 Transportation – Expected Waste Forecast**

**Incident-Free Radiological Impacts**

For the expected waste forecast, there would be a small increase in dose and in the number of excess fatal cancers compared to the no-action alternative because of the addition of stabilized ash and blowdown from the Consolidated Incineration Facility that would be shipped onsite (Table 4-66) for this alternative.

TC

The probability per year of an individual uninvolved worker developing an additional fatal cancer from incident-free onsite shipments is about 1 in 200,000 (Table 4-66). Members of the involved and uninvolved worker populations could expect less than one fatal cancer from transportation exposure.

TE

**Table 4-66.** Annual dose (percent change from the no-action alternative) and excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative B – expected waste forecast.

Waste <sup>a</sup>	Uninvolved worker <sup>b</sup> (rem)		Uninvolved workers (person-rem)		Involved workers (person-rem)	
Low-level	0.011	(0%)	2.1	(5%)	240	(64%)
Mixed	6.7×10 <sup>-5</sup>	(21%)	0.14	(19%)	4.8	(10%)
Transuranic	1.3×10 <sup>-4</sup>	(0%)	0.0095	(0%)	0.15	(0%)
Totals <sup>c</sup>	0.011 <sup>d</sup>		2.2 <sup>e</sup>		240 <sup>e</sup>	
Excess latent cancer fatalities	4.6×10 <sup>-6</sup> <sup>f</sup>		8.9×10 <sup>-4</sup> <sup>g</sup>		0.098 <sup>g</sup>	

TC

- a. See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.
- b. See Section 4.1.11.2 for descriptions of receptors.
- c. Totals rounded to two significant figures.
- d. Assumes the same individual has maximal exposure to each waste (Appendix E) for a single year.
- e. Dose from 1 year of exposure to incident-free transportation of waste (Appendix E).
- f. Additional probability of an excess latent cancer fatality.
- g. Values equal the total dose × the risk factor (0.0004 excess latent fatal cancers per person-rem).

TE

Radiological effects of offsite shipments would be similar to those under alternative A and are summarized in Table 4-67. The probability of an individual member of the public developing an additional fatal cancer would be about 1 in 15 million per year from incident-free offsite transportation of radioactive material (Table 4-67). The number of additional fatal cancers that could be expected among

TC

**Table 4-67.** Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative B – expected waste forecast.

	Waste	Involved workers <sup>a</sup> (person-rem)	Remote MEI <sup>b</sup> (rem)	Remote population <sup>c</sup> (person-rem)
TC	Low-level	0.57	$5.2 \times 10^{-5}$	0.87
	Mixed	0.012	$3.2 \times 10^{-8}$	0.0025
	Low-level volume reduction <sup>d</sup>	16	$8.1 \times 10^{-5}$	6.4
	Totals <sup>e</sup>	17	$1.3 \times 10^{-4}$	7.3
	Excess latent cancer fatalities	$6.6 \times 10^{-3}$	$6.5 \times 10^{-8f}$	$3.6 \times 10^{-3}$

a. See Section 4.1.11.2 for descriptions of receptors.

b. MEI = maximally exposed individual.

c. Offsite population along the transportation route.

d. Includes only low-level waste sent offsite for size reduction, supercompaction, or incineration. This represents a change from the draft EIS.

TC e. Dose for the remote MEI assumes exposure to each waste (see Appendix E) in a year; for the populations, dose is the result of exposure to 1 year of incident-free transportation of waste (see Appendix E).

f. Additional probability of an excess latent cancer fatality.

members of the public and involved workers would be less than one per year from incident-free onsite transportation. This analysis assumes that offsite shipments occur between SRS and a facility located in Oak Ridge, Tennessee. This route was selected as representative of possible offsite vendor locations.

### Transportation Accident Impacts

The probability of an onsite accident would be similar to that under the no-action alternative because similar waste volumes would be shipped; the consequences due to a particular accident would be the same as described in Section 4.1.11.3. Probabilities of an accident involving each waste type are given in Table 4-26.

The consequences and associated excess latent cancer fatalities in the offsite population along the transportation route ("remote population") from offsite shipments under this alternative are similar to those for the uninvolved workers from onsite shipments as summarized in Table 4-67 and Table 4-27. An offsite accident would be less severe than one involving onsite shipments due to the smaller volume of waste in an individual shipment (Table 4-68). The number of fatal cancers that could be expected among members of the public would be less than one from incident-free offsite transport.

**Table 4-68.** Probability of an accident during 30 years of offsite transport of radioactive material for each waste forecast under alternative B, dose, and excess latent cancer fatalities from an accident.

Waste	Probability of an accident			Dose (person rem)	Number of excess latent fatal cancers
	Minimum forecast	Expected forecast	Maximum forecast		
Low-level	$1.1 \times 10^{-6}$	$2.1 \times 10^{-6}$	$6.5 \times 10^{-6}$	$4.8 \times 10^{-4}$	$2.4 \times 10^{-7}$
Mixed	$4.6 \times 10^{-4}$	$1.1 \times 10^{-3}$	$2.7 \times 10^{-3}$	0.0047	$2.4 \times 10^{-6}$
Low-level volume reduction <sup>a</sup>	$1.2 \times 10^{-6}$	$1.6 \times 10^{-6}$	$1.6 \times 10^{-6}$	370	0.19

a. Includes only low-level waste sent offsite for size reduction, supercompaction, or incineration. This represents a change from the draft EIS.

TC

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.11.2.2 Transportation -- Minimum Waste Forecast**

**Incident-Free Radiological Impacts**

For the minimum waste forecast, there would be decreases in dose to all onsite receptors from all radioactive shipments compared to doses from the expected waste forecast (Table 4-69) due to the decrease in volumes of waste.

The annual probability of an uninvolved worker developing an additional fatal cancer from incident-free onsite transport would be about 1 in 430,000 (Table 4-69). Involved workers and uninvolved workers could expect less than one additional excess fatal cancer per year.

For the minimum waste forecast, the annual probability of a member of the public developing an additional fatal cancer would be about 1 in 21 million from incident-free offsite transport of radioactive material (Table 4-70). The number of additional fatal cancers that could be expected among members of the public and involved workers would be less than one.

TC

**Table 4-69.** Annual dose (percent change from the expected waste forecast) and excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative B – minimum waste forecast.

	Waste <sup>a</sup>	Uninvolved worker <sup>b</sup>		Uninvolved workers		Involved workers	
		(rem)	(-49%)	(person-rem)	(-51%)	(person-rem)	(-49%)
TC	Low-level	5.7×10 <sup>-3</sup>		1.0		120	
	Mixed	4.4×10 <sup>-5</sup>	(-34%)	0.091	(-53%)	2.5	(-47%)
	Transuranic	9.0×10 <sup>-5</sup>	(-30%)	0.0066	(-30%)	0.1	(-30%)
	Totals <sup>c</sup>	5.9×10 <sup>-3d</sup>		1.1 <sup>e</sup>		120 <sup>e</sup>	
	Excess latent cancer fatalities	2.3×10 <sup>-6f</sup>		4.4×10 <sup>-4g</sup>		0.050g	

TE a. See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.  
 b. See Section 4.1.11.2 for descriptions of receptors.  
 c. Totals rounded to two significant figures.  
 d. Assumes the same individual has maximal exposure to each waste type (Appendix E) for a single year.  
 e. Dose from 1 year of exposure to incident-free transportation of waste (see Appendix E).  
 TC f. Probability of an additional excess latent fatal cancer.  
 g. Value equals the total dose × the risk factor (0.0004 excess latent fatal cancers per person-rem).

**Table 4-70.** Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative B – minimum waste forecast.

	Waste	Involved workers <sup>a</sup>	Remote MEI <sup>b</sup>	Remote population
		(person-rem)	(rem)	(person-rem)
TC	Low-level	0.29	2.7×10 <sup>-5</sup>	0.45
	Mixed	0.0052	1.4×10 <sup>-8</sup>	0.0011
	Low-level volume reduction	20	6.6×10 <sup>-5</sup>	5.2
	Totals <sup>c</sup>	20	9.3×10 <sup>-5</sup>	5.7
TE	Excess latent cancer fatalities	8.0×10 <sup>-3d</sup>	4.7×10 <sup>-8e</sup>	2.8×10 <sup>-3d</sup>

TE a. See Section 4.1.11.2 for descriptions of receptors.  
 b. MEI = maximally exposed individual.  
 TE c. Dose for the remote MEI assumes exposure to each waste (see Appendix E) by the same individual in a year; for the populations, dose is the result of exposure to 1 year of incident-free transport of waste (see Appendix C).  
 TE Totals are rounded to two significant figures.  
 L004-14 d. Value equals the total dose times the risk factor (0.0004 excess fatal cancers per person-rem for involved workers; 0.0005 excess fatal cancers per person rem for the remote population).  
 e. Additional probability of an excess latent fatal cancer.

## Transportation Accident Impacts

The probability of an onsite accident involving radioactive wastes would decrease slightly for the minimum waste forecast (Table 4-26) because of the decreased volumes that would be shipped compared to those for the expected waste forecast; however, the consequences due to a particular accident would be the same as described in Section 4.1.11.2.2. Effects of offsite shipments would be the same as in Table 4-8; however, the probability of an offsite accident would decrease by about one half compared to the expected waste forecast due to the decrease in volume of waste shipped (Table 4-68).

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 4.4.11.2.3 Transportation – Maximum Waste Forecast

## Incident-Free Radiological Impacts

For the maximum waste forecast, there would be large increases in dose to all receptors compared to the expected waste forecast (Table 4-71), due to the increases in volumes of all wastes that would be shipped. These increases would be similar to those described under alternative A – maximum waste forecast.

**Table 4-71.** Annual dose (percent change from the expected waste forecast) and excess latent cancer fatalities from incident-free onsite transport of radioactive material for alternative B – maximum waste forecast.

Waste <sup>a</sup>	Uninvolved worker <sup>b</sup> (rem)		Uninvolved workers (person-rem)		Involved workers (person-rem)	
Low-level	0.014	(27%)	2.7	(31%)	540	(126%)
Mixed	$2.1 \times 10^{-4}$	(211%)	0.47	(228%)	19	(296%)
Transuranic	0.0021	(1,550%)	0.16	(1,550%)	2.4	(1,550%)
Totals <sup>c</sup>	0.017 <sup>d</sup>		3.3 <sup>e</sup>		560 <sup>e</sup>	
Excess latent cancer fatalities	$6.6 \times 10^{-6}$ <sup>f</sup>		0.0013 <sup>g</sup>		0.22 <sup>g</sup>	

- See Appendix E for a list of waste streams which make up each waste type. Dose is based on exposure to all waste streams of a particular waste type.
- See Section 4.1.11.2 for descriptions of receptors.
- Totals are rounded to two significant figures.
- Assumes the same individual has maximal exposure to each waste type (Appendix E) for a single year.
- Dose from 1 year of exposure to incident-free transportation.
- Additional probability of an excess latent fatal cancer.
- Values equal the total dose  $\times$  the risk factor (0.0004 excess latent fatal cancers per person-rem for involved workers; 0.0005 excess latent fatal cancers per person-rem for the uninvolved population).

TC

TE

The annual probability of an uninvolved worker developing an additional fatal cancer would be about 1 in 150,000 (Table 4-71). The involved workers population and the uninvolved workers could expect less than one additional excess fatal cancer from 30 years of incident-free onsite transportation under the maximum waste forecast.

TC | The annual probability of a member of the public developing an additional fatal cancer is about 1 in 7,700,000 from incident-free offsite transport of radioactive material (Table 4-72). The number of additional fatal cancers that could be expected among members of the public and involved workers would be less than one.

**Table 4-72. Annual dose and excess latent cancer fatalities from incident-free offsite transport of radioactive material for alternative B – maximum waste forecast.**

	Waste	Involved workers (person-rem)	Remote MEI <sup>a</sup> (rem)	Remote population (person-rem)
TC	Low level	1.8	$1.6 \times 10^{-4}$	2.7
	Mixed	0.031	$8.2 \times 10^{-8}$	$6.4 \times 10^{-3}$
	Low-level volume reduction	80	$9.6 \times 10^{-5}$	7.5
	Totals <sup>b</sup>	82	$2.6 \times 10^{-4}$	10
	Excess latent cancer fatalities	0.033 <sup>c</sup>	$1.3 \times 10^{-7d}$	0.051 <sup>c</sup>

TE |

a. MEI = maximally exposed individual.  
 b. Dose for the remote MEI assumes exposure to each waste in a year; for the population, dose is the result of exposure to 1 year of incident-free transportation of waste. Totals are rounded to two significant figures.  
 c. Values equal the total dose times the risk factor (0.0004 excess latent fatal cancers per person-rem for involved workers; 0.0005 excess latent fatal cancers per person-rem for the uninvolved population).  
 d. Additional probability of an excess latent fatal cancer.

**Transportation Accident Impacts**

The probability of an onsite accident involving radioactive wastes would increase (Table 4-26) because more waste would be shipped compared to the expected waste forecast; however, the consequences due to a particular accident would be the same as described in Section 4.1.11.3. Effects of offsite shipments would be the same as for the expected case (Table 4-68); however, the probability of an offsite accident would be three times greater than the expected waste forecast because of the increase in volume of waste shipped.

#### 4.4.12 OCCUPATIONAL AND PUBLIC HEALTH

Radiological and nonradiological impacts to workers and the public are presented in this section for alternative B. As expected, the impacts are smallest for the minimum waste forecast and largest for the maximum waste forecast.

Under alternative B, the Consolidated Incineration Facility, the alpha and non-alpha vitrification facilities, the mixed and hazardous waste containment building, the mobile soil sort facility, compaction facilities, and the transuranic waste characterization/certification facility would operate. Emissions from these facilities (see Appendix E for detailed facility dose information) would increase adverse health effects over the no-action alternative for the three waste forecasts. However, effects would remain small relative to those normally expected in the worker and regional population groups from all causes. In addition, significant quantities of low-level radioactive waste would be shipped offsite for processing (supercompacting, sorting, incinerating, or smelting).

TC

Under this alternative the major sources of potential exposure the involved workers would be the transuranic waste storage pads, the F- and H-Area tank farms, and the transuranic characterization/certification facility; for the public and uninvolved workers, the major sources of potential exposure would be environmental releases from the alpha and non-alpha vitrification facilities, the transuranic characterization/certification facility, and the Consolidated Incineration Facility (Consolidated Incineration Facility impacts are summarized in Appendix B.5). The report *Dose Comparison for Air Emissions From Incineration and Compaction of SRS Low-level Radioactive Job Control Waste* (Mulholland and Robinson 1994) compared radionuclide releases from treating solid low-level waste by incineration and compaction. The report evaluated release mechanisms and control equipment efficiencies to estimate quantities of radionuclides released by each process. These emissions were used to estimate doses to the nearest uninvolved worker and the maximally exposed offsite individual based on treatment of similar volumes of job-control waste by each technology. The report estimated that the annual dose to the uninvolved worker (baseline emissions estimate) at a distance of 350 meters (1,148 feet) from the Consolidated Incineration Facility and to the maximally exposed offsite individual would be  $7.7 \times 10^{-4}$  millirem and  $8.6 \times 10^{-4}$  millirem, respectively. As a perspective, these dose rates are 400,000 times lower than the background radiation dose (357 millirem, see Section 3.12.1.1) that the average member of the population within 80 kilometers (50 miles) of SRS receives.

L004-13

TE

The Mulholland and Robinson (1994a) report estimated the annual dose to the maximally exposed offsite individual from compaction of low-level job control waste to range from  $1.3 \times 10^{-6}$  millirem to  $4.1 \times 10^{-5}$  millirem, depending on the percentage of tritium assumed to be released in the process.

TE

TC | storage; the mobile soil sort facility; four new solvent tanks; the transuranic waste characterization/  
certification facility; the containment building, the non-alpha vitrification facility (including soil  
TE | sorting); and the alpha vitrification facility. Occupational health impacts to employees in the Defense  
Waste Processing Facility, including In-Tank Precipitation were discussed in the *Final Supplemental  
Environmental Impact Statement Defense Waste Processing Facility*. Occupational health impacts to  
employees associated with the Consolidated Incineration Facility were discussed in the *Environmental  
Assessment for the Consolidated Incineration Facility*.

TE | Table E.2-3 in Appendix E presents a comparison between Occupational Safety and Health  
Administration permissible exposure limit values and potential exposures to uninvolved workers at both  
100 meters (328 feet) and 640 meters (2,100 feet) from each facility for the expected, minimum, and  
maximum waste forecasts. Downwind concentrations were calculated using EPA's TSCREEN model  
(EPA 1988). For each facility's emissions, under the expected waste forecast, employee occupational  
exposure would be less than Occupational Safety and Health Administration permissible exposure limits.  
Worker exposure is approximately the same as would occur in the no-action alternative due to the  
M-Area Vendor Treatment Facility and Building 645-2N mixed waste storage operations. In most  
instances, downwind concentrations would be less than 1 percent of the applicable Occupational Safety  
and Health Administration permissible exposure guidelines. DOE expects minimal health impacts to  
uninvolved workers due to air emissions from these facilities.

#### 4.4.12.1.2 Public Health and Safety

##### Radiological Impacts

TC | Table 4-74 presents the doses to the public and resulting health effects that are associated with the  
expected waste forecast. The annual doses to the maximally exposed individual (0.032 millirem) and to  
the SRS regional population (1.5 person-rem) would be lower than those that resulted from total SRS  
operations in 1993, which were much lower than the regulatory limits (Arnett, Karapatakis, and  
Mamatey 1994). For the offsite facility (assumed to be located in Oak Ridge, Tennessee, for the  
purposes of this assessment) under this forecast, the annual doses to the offsite maximally exposed  
individual ( $1.7 \times 10^{-3}$  millirem) and to regional population ( $1.2 \times 10^{-2}$  person-rem) surrounding Oak Ridge,  
TC | Tennessee, represent a small fraction (less than 6 percent) of the comparable doses to the SRS regional  
population. These doses remain less than 6 percent of the comparable SRS doses for all waste forecast  
under this alternative (see Appendix E for facility specific data). For this waste forecasts, radiologically  
induced health effects to the public (0.023 fatal cancers from 30 years of exposure) would be very small  
(Table 4-74).

TE | **Table 4-74. Radiological doses associated with implementation of alternative B and resulting health effects to the public.<sup>a</sup>**

Waste forecast/receptor(s) <sup>c</sup>	No-action alternative			Probability <sup>d</sup> or number of fatal cancers	Alternative B			Probability <sup>d</sup> or number of fatal cancers
	Dose <sup>b</sup>				Dose <sup>b</sup>			
	Atmospheric releases	Aqueous releases	Total		Atmospheric releases <sup>g</sup>	Aqueous releases	Total	
<u>Expected waste forecast</u>								
Offsite MEI <sup>e</sup>								
• Annual millirem	1.2×10 <sup>-4</sup>	6.9×10 <sup>-4</sup>	8.1×10 <sup>-4</sup>	4.1×10 <sup>-10</sup>	0.035	6.9×10 <sup>-4</sup>	0.036	1.8×10 <sup>-8</sup>
• 30-year, millirem	0.0037	0.021	0.025	1.2×10 <sup>-8</sup>	1.046	0.021	1.067	5.3×10 <sup>-7</sup>
Population								
• Annual, person-rem	2.9×10 <sup>-4</sup>	0.0068	0.0071	3.5×10 <sup>-6</sup>	1.6	0.0068	1.6	8.0×10 <sup>-4</sup>
• 30-year, person-rem	0.0086	0.20	0.21	1.1×10 <sup>-4</sup>	48	0.20	48	0.024
<u>Minimum waste forecast</u>								
Offsite MEI								
• Annual, millirem	NA <sup>f</sup>	NA	NA	NA	0.023	6.9×10 <sup>-4</sup>	0.024	1.2×10 <sup>-8</sup>
• 30-year, millirem	NA	NA	NA	NA	0.69	0.021	0.71	3.6×10 <sup>-7</sup>
Population								
• Annual, person-rem	NA	NA	NA	NA	1.025	0.0068	1.032	5.2×10 <sup>-4</sup>
• 30-year, person-rem	NA	NA	NA	NA	31	0.20	31	0.015
<u>Maximum waste forecast</u>								
Offsite MEI								
• Annual, millirem	NA	NA	NA	NA	0.36	6.9×10 <sup>-4</sup>	0.36	1.8×10 <sup>-7</sup>
• 30-year, millirem	NA	NA	NA	NA	10.7	0.021	10.7	5.4×10 <sup>-6</sup>
Population								
• Annual, person-rem	NA	NA	NA	NA	15	0.0068	15	0.008
• 30-year, person-rem	NA	NA	NA	NA	437	0.20	437	0.22

- a. Supplemental facility information provided in Appendix E.
- b. For atmospheric releases, the dose is 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.
- c. The doses to the public from total SRS operations in 1993 were 0.25 millirem to the offsite maximally exposed individual and 9.1 person-rem to the regional population. These doses, when added to the incremental doses associated with the proposed action that are given in this table, are assumed to equal total SRS doses. For the maximum waste forecast (which gives the highest doses), the total annual doses to the offsite maximally exposed individual and the regional population would equal 0.58 millirem (0.25 + 0.33) and approximately 23.1 person-rem (9.1 + 14), respectively. The individual dose would fall below the proposed annual regulatory limits of 10 millirem from airborne releases, 4 millirem from drinking water, and 100 millirem from all pathways combined (proposed 10 CFR 834); the population dose would be lower than the proposed annual notification limit of 100 person-rem (proposed 10 CFR 834).
- d. For the offsite maximally exposed individual, probability of a fatal cancer; for population, number of fatal cancers.
- e. MEI = maximally exposed individual.
- f. NA = Not applicable.
- g. Atmospheric releases for MEI and population include contributions from offsite facilities, which contribute less than 6 percent to the atmospheric releases reported here.

TC

4-235

TC

## Nonradiological Impacts

Potential nonradiological impacts to individuals residing offsite are considered for both criteria and carcinogenic pollutants. Maximum site boundary-line concentrations for criteria pollutants are discussed in Section 4.4.5.1.2.

For routine releases from SRS operating facilities under the expected waste forecast, criteria pollutant concentrations would be within state and federal ambient air quality standards, as discussed in Section 4.4.5.1.2. During periods of construction, the criteria pollutant concentrations at the SRS boundary would not exceed air quality standards under normal operating conditions.

TC | Risks due to carcinogens for the SRS offsite population were calculated using the Industrial Source Complex 2 model for the same facilities discussed in Section 4.4.12.1.1. Emissions of carcinogenic compounds are based on the types and quantities of waste being processed at each facility. Table 4-75 shows the individual lifetime cancer risks calculated from unit risk factors (see Section 4.1.12.2.2) derived from EPA's Integrated Risk Information System data base (EPA 1994). As shown in Table 4-75, the estimated increased probability of an individual developing cancer over a lifetime due to routine SRS emissions under the expected waste forecast is approximately 2 in 10 million. This risk is equal to the calculated excess latent cancer risk for the no-action alternative. DOE expects minimal health impacts from offsite exposures.

### 4.4.12.1.3 Environmental Justice Assessment

TE | Section 4.1.12.2.3 describes the methodology for analyzing radiological dose emissions to determine if there would be disproportionate and adverse impacts on people of color or low income. Figure 4-33 illustrates the results of the analysis for alternative B – expected waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. Supporting data for the analysis can be found in Appendix E.

TE | The predicted per capita dose differs very little between types of communities at a given distance from SRS, and the per capita dose is extremely small in each type of community. This analysis indicates that people of color or low income in the 80-kilometer (50-mile) region would be neither disproportionately nor adversely impacted. Therefore, environmental justice issues would not be a concern in this alternative.

**Table 4-75. Estimated number of excess latent cancers in the offsite population from nonradiological carcinogens emitted under alternative B.<sup>a</sup>**

Pollutant	Unit risk factor <sup>a</sup> (latent cancers/ $\mu\text{g}/\text{m}^3$ ) <sup>e</sup>	Concentration <sup>b,c</sup>			Latent Cancers <sup>d</sup>		
		Expected waste forecast ( $\mu\text{g}/\text{m}^3$ )	Minimum waste forecast ( $\mu\text{g}/\text{m}^3$ )	Maximum waste forecast ( $\mu\text{g}/\text{m}^3$ )	Expected waste forecast <sup>d</sup>	Minimum waste forecast	Maximum waste forecast
Acetaldehyde	$2.2 \times 10^{-6}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$1.3 \times 10^{-13}$	$6.5 \times 10^{-14}$	$1.2 \times 10^{-13}$
Acrylamide	0.0013	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$7.8 \times 10^{-11}$	$3.8 \times 10^{-11}$	$6.9 \times 10^{-11}$
Acrylonitrile	$6.8 \times 10^{-5}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$4.1 \times 10^{-12}$	$2.0 \times 10^{-12}$	$3.6 \times 10^{-12}$
Arsenic Pentoxide	0.0043	$7.1 \times 10^{-7}$	$4.6 \times 10^{-7}$	$6.9 \times 10^{-7}$	$1.3 \times 10^{-9}$	$8.5 \times 10^{-10}$	$1.3 \times 10^{-9}$
Asbestos	0.23	$2.7 \times 10^{-8}$	$1.5 \times 10^{-8}$	$7.5 \times 10^{-8}$	$2.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$7.4 \times 10^{-9}$
Benzene	$8.3 \times 10^{-6}$	0.044	0.044	0.044	$1.6 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.6 \times 10^{-7}$
Benzidine	0.067	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$4.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	$3.5 \times 10^{-9}$
Bis(chloromethyl)ether	0.062	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$3.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$3.3 \times 10^{-9}$
Bromoform	$1.1 \times 10^{-6}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$6.6 \times 10^{-14}$	$3.3 \times 10^{-14}$	$5.8 \times 10^{-14}$
Carbon Tetrachloride	$1.5 \times 10^{-5}$	$1.2 \times 10^{-5}$	$9.9 \times 10^{-6}$	$1.4 \times 10^{-5}$	$7.4 \times 10^{-11}$	$6.4 \times 10^{-11}$	$9.3 \times 10^{-11}$
Chlordane	$3.7 \times 10^{-4}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$2.2 \times 10^{-11}$	$1.1 \times 10^{-11}$	$2.0 \times 10^{-11}$
Chloroform	$2.3 \times 10^{-5}$	0.003	0.003	0.003	$3.0 \times 10^{-8}$	$2.9 \times 10^{-8}$	$3.0 \times 10^{-8}$
Cr(+6) Compounds	0.012	$4.7 \times 10^{-9}$	$2.3 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.4 \times 10^{-11}$	$1.2 \times 10^{-11}$	$2.1 \times 10^{-11}$
Formaldehyde	$1.3 \times 10^{-5}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$7.8 \times 10^{-13}$	$3.8 \times 10^{-13}$	$6.9 \times 10^{-13}$
Heptachlor	0.0013	$3.5 \times 10^{-7}$	$1.7 \times 10^{-7}$	$3.1 \times 10^{-7}$	$1.9 \times 10^{-10}$	$9.6 \times 10^{-11}$	$1.7 \times 10^{-10}$
Hexachlorobenzene	$4.6 \times 10^{-4}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$2.8 \times 10^{-11}$	$1.4 \times 10^{-11}$	$2.4 \times 10^{-11}$
Hexachlorobutadiene	$2.2 \times 10^{-5}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$1.3 \times 10^{-12}$	$6.5 \times 10^{-13}$	$1.2 \times 10^{-12}$
Hydrazine	0.0049	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$2.9 \times 10^{-10}$	$1.4 \times 10^{-10}$	$2.6 \times 10^{-10}$
1,1,2,2-Tetrachloroethane	$5.8 \times 10^{-5}$	$2.8 \times 10^{-6}$	$1.4 \times 10^{-6}$	$2.4 \times 10^{-6}$	$6.9 \times 10^{-11}$	$3.4 \times 10^{-11}$	$6.0 \times 10^{-11}$
1,1,2-Trichloroethane	$1.6 \times 10^{-5}$	$1.4 \times 10^{-7}$	$6.9 \times 10^{-8}$	$1.2 \times 10^{-7}$	$9.6 \times 10^{-13}$	$4.7 \times 10^{-13}$	$8.4 \times 10^{-13}$
Toxaphene	$3.2 \times 10^{-4}$	$3.5 \times 10^{-7}$	$1.7 \times 10^{-7}$	$2.5 \times 10^{-7}$	$4.8 \times 10^{-11}$	$2.4 \times 10^{-11}$	$3.5 \times 10^{-11}$
1,1 Dichloroethene	$5.0 \times 10^{-5}$	$2.7 \times 10^{-5}$	$2.3 \times 10^{-5}$	$3.4 \times 10^{-5}$	$5.7 \times 10^{-10}$	$5.0 \times 10^{-10}$	$7.3 \times 10^{-10}$
Methylene chloride	$4.7 \times 10^{-7}$	$1.4 \times 10^{-7}$	$9.3 \times 10^{-8}$	$1.4 \times 10^{-7}$	$2.9 \times 10^{-14}$	$1.9 \times 10^{-14}$	$2.8 \times 10^{-14}$
				TOTAL	$2.0 \times 10^{-7}$	$1.9 \times 10^{-7}$	$2.0 \times 10^{-7}$

a. Source: EPA (1994).

b. Maximum annual boundary-line concentration.

c. Source: Stewart (1994).

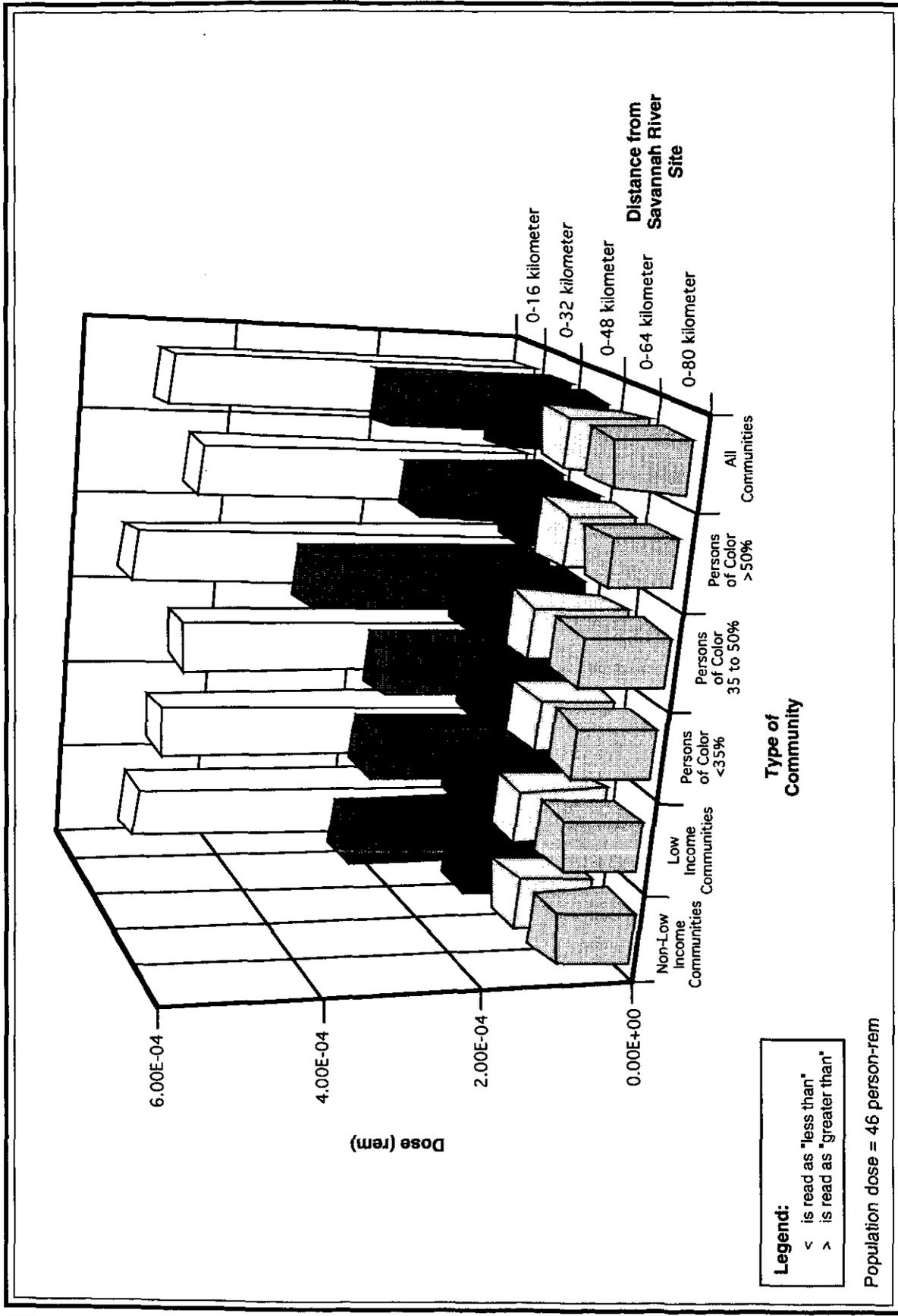
d. Latent cancer probability equals unit risk factor times concentration times 30 years divided by 70 years.

e. Micrograms per cubic meter of air.

f. Under the maximum waste forecast, wastewater would be treated in the containment building, which would lower the amount of wastewater going to the Consolidated Incineration Facility. Therefore, slightly higher impacts would occur in the expected waste forecast than in the maximum waste forecast.

TC  
4-237

TE



PK56-4

TE **Figure 4-33.** Dose to individuals in communities within 80 kilometers (50 miles) of SRS for the alternative B – expected waste forecast.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

#### 4.4.12.2 Occupational and Public Health – Minimum Waste Forecast

Because the waste amounts for alternative B – minimum waste forecast would be smaller than for the expected waste forecast and the treatment operations would be basically the same, the impacts to workers and the public would be smaller than described in Section 4.4.12.1.

##### 4.4.12.2.1 Occupational Health and Safety

###### Radiological Impacts

Table 4-73 includes the worker doses and resulting health effects associated with the minimum waste forecast. Doses (0.036 rem per year) and health effects associated with this case would be smaller than those associated with the expected waste forecast. The dose from 30 years of waste management could result in one additional fatal cancer in the involved workforce.

###### Nonradiological Impacts

Table E.2-4 in Appendix E presents a comparison of the nonradiological air concentrations to permissible exposure limits under the Occupational Safety and Health Administration. Exposures to SRS workers are either equal to or less than those occurring in the expected waste forecast. However, for all facilities, employee occupational exposure would be less than Occupational Safety and Health Administration permissible exposure limits. Worker exposure is less than that which would occur under the no-action alternative due to the M-Area Vendor Treatment Facility and Building 645-2N mixed waste storage operations.

##### 4.4.12.2.2 Public Health and Safety

###### Radiological Impacts

Table 4-74 includes the doses and resulting health effects to the public that are associated with the minimum waste forecast. Doses and health effects associated with this case would be smaller than those associated with the expected waste forecast. An 0.015 additional fatal cancer in the exposed public could occur from 30 years of minimum waste generation under alternative B.

TE

TC

**Nonradiological Impacts**

Potential nonradiological impacts to individuals residing offsite are considered for both criteria and carcinogenic pollutants for the minimum waste forecast. For routine releases from operating facilities, criteria pollutant concentrations would be within state and federal ambient air quality standards, as discussed in Section 4.4.5.2. During periods of construction, the criteria pollutant concentrations at the site boundary would not exceed air quality standards under normal operating conditions.

Table 4-75 presents offsite risks due to emissions of carcinogens. The overall increased lifetime cancer risk is approximately 3 in 10 million, which is less than for the expected waste forecast. DOE expects minimal health impacts from the minimum waste forecast.

**4.4.12.2.3 Environmental Justice Assessment**

TE | Figure 4-34 illustrates the results of the analysis for alternative B – minimum waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. No communities would be disproportionately affected by emissions resulting from this scenario.

No Action	Min.	Exp.	Max.
A			
B			
C			

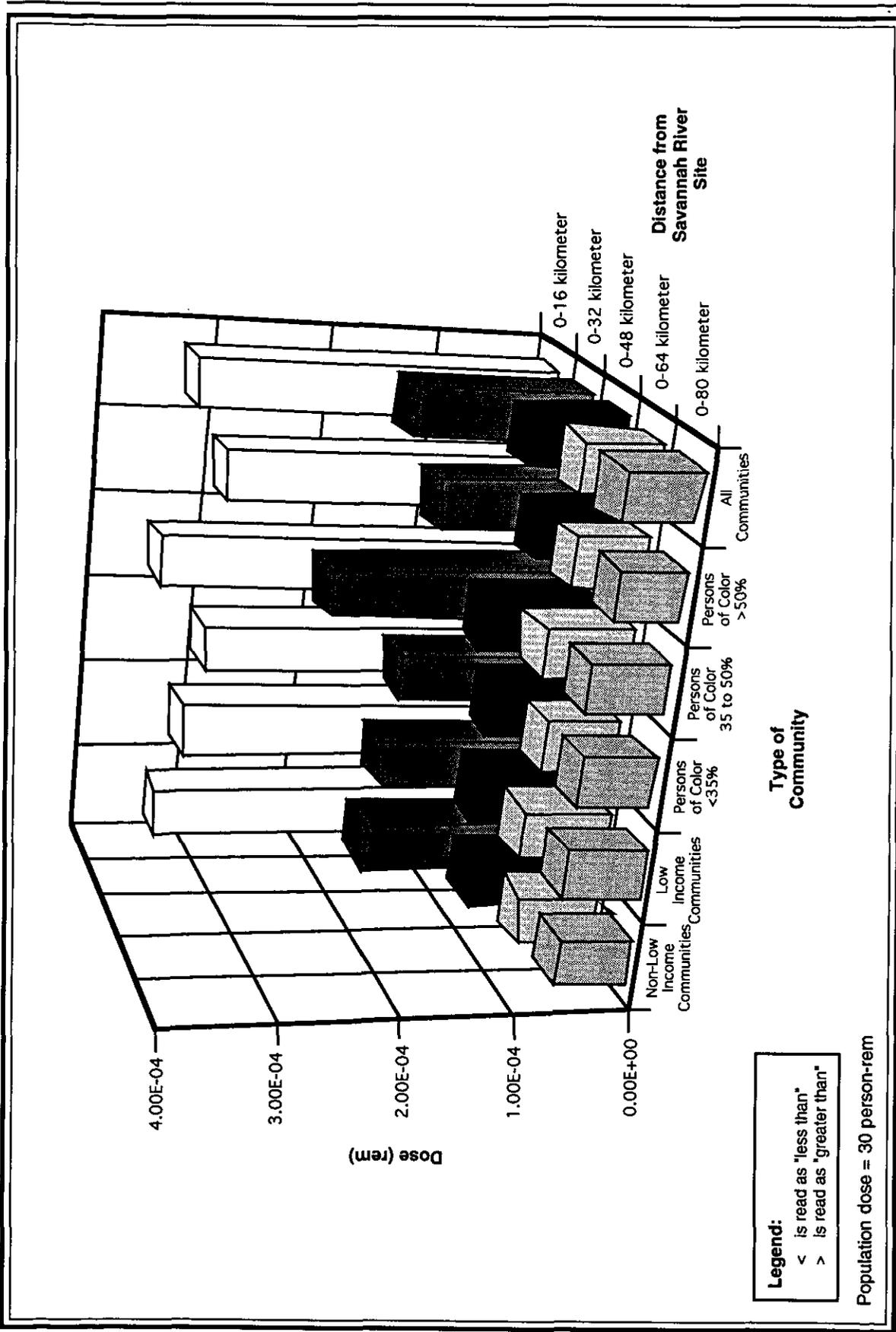
**4.4.12.3 Occupational and Public Health – Maximum Waste Forecast**

The amounts of wastes to be treated for alternative B – maximum waste forecast would be greater than for the minimum and expected waste forecasts, but the treatment operations would be the same. The maximum waste forecast would result in the largest health impacts to workers and the public for this alternative.

**4.4.12.3.1 Occupational Health and Safety**

**Radiological Impacts**

TE | Table 4-73 includes the worker doses and resulting health effects associated with the maximum waste forecast. The doses would remain below the SRS administrative guideline of 0.8 rem per year. Based on a risk estimator of 0.0004 latent cancer fatality per rem (Section 4.1.12.1), the probability of a worker contracting a fatal cancer as the result of a 30-year occupational exposure to radiation would be about



**Figure 4-34.** Dose to individuals in communities within 80 kilometers (50 miles) of SRS for the alternative B – minimum waste forecast.

TC | 7 chances in 10,000. It is also projected that 2 people in the workforce of 2,501 could develop a fatal cancer sometime during their lifetimes as the result of a 30-year exposure. Based on a lifetime fatal cancer risk from all causes of 23.5 percent (refer to Section 4.1.12.1), 588 people in this workforce would be expected to develop a fatal cancer independent of their occupational exposure.

### **Nonradiological Impacts**

TE | Nonradiological air concentrations were assessed for exposure by SRS workers under the maximum waste forecast. Table E.2-4 in Appendix E presents a comparison of these concentrations to permissible exposure limits under the Occupational Safety and Health Administration. Exposures to SRS workers would be either equal to or greater than those that would occur under the expected waste forecast. However, for all facilities, employee occupational exposure would be less than Occupational Safety and Health Administration permissible exposure limits.

#### **4.4.12.3.2 Public Health and Safety**

### **Radiological Impacts**

Table 4-74 includes the doses associated with the maximum waste forecast and resulting health effects to the public. The annual doses to the maximally exposed individual (0.33 millirem) and to the regional population (14 person-rem) would exceed the corresponding doses (0.25 millirem and 9.1 person-rem) from total SRS operations in 1993 (Arnett, Karapatakis, and Mamatey 1994). However, regulatory dose limits would not be exceeded (refer to Note on Table 4-54).

The health effects associated with the maximum waste forecast are included in Table 4-74. Based on a risk estimator of 0.0005 latent cancer fatality per rem (see Section 4.1.12.2), the probability of the maximally exposed member of the public developing a fatal cancer from 30 years of exposure to radiation associated with this waste forecast would be about 5 in 1 million. The number of additional fatal cancers in the regional population could be 0.20 (effectively zero). This probability of a fatal cancer is much smaller than the 1 chance in 4 that a member of the public would contract a fatal cancer from all causes, and the total fatal cancers would be much fewer than the 145,700 cancers that would be expected in the regional population of 620,100 from all causes sometime during their lifetimes.

Alternative B would result in radiological doses and health effects to the public that are intermediate between those associated with the alternatives A and C (Tables 4-33, 4-54, and 4-74). This would be true regardless of the amount of waste generated.

## Nonradiological Impacts

Potential nonradiological impacts to individuals residing offsite were considered for both criteria and carcinogenic pollutants under the maximum waste forecast.

For routine releases from operating facilities, criteria pollutant concentrations would be within state and Federal ambient air quality standards, as discussed in Section 4.4.5.3. During periods of construction, the criteria pollutant concentrations at the SRS boundary would not exceed air quality standards under normal operating conditions. With good construction management procedures, such as wetting dirt roads twice a day, particulate emissions would be approximately 50 percent of the levels shown in Section 4.4.5.3. DOE does not expect adverse health impacts due to routine air releases from operating facilities and construction activities.

Table 4-75 presents offsite risks due to carcinogens. The overall increased lifetime cancer risk is approximately 3 in 10 million, which is approximately equal to the expected waste forecast risk. DOE expects minimal health impacts from emissions of carcinogenic compounds.

TE

### 4.4.12.3.3 Environmental Justice Assessment

Figure 4-35 illustrates the results of the analysis for alternative B – maximum waste forecast for the 80-kilometer (50-mile) region of interest in this EIS. Emissions resulting from this case would not disproportionately affect any communities.

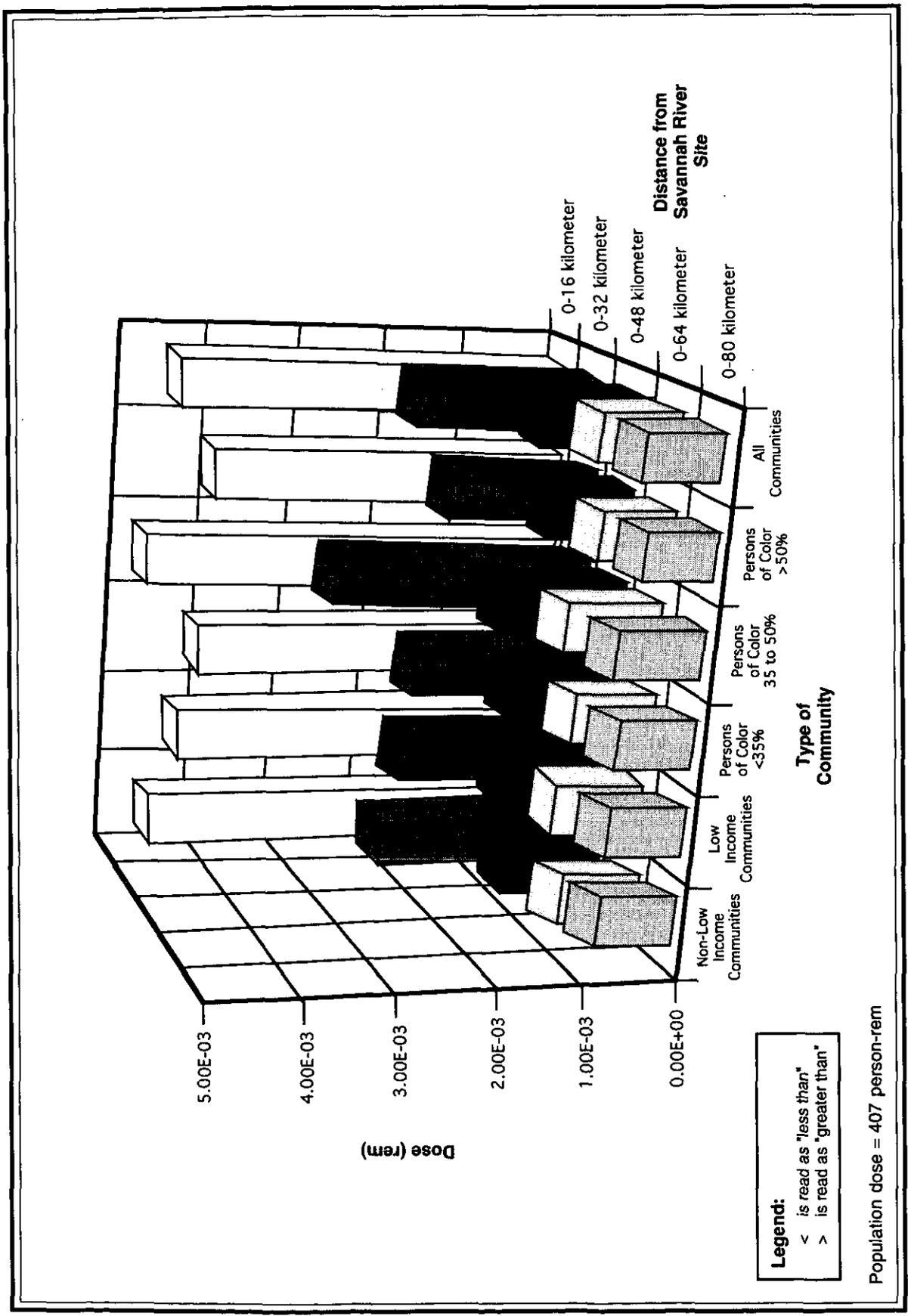
## 4.4.13 FACILITY ACCIDENTS

This section summarizes the risks to workers and members of the public from potential facility accidents associated with the various wastes under alternative B. The methodologies used to develop the radiological and hazardous material accident scenarios are the same as those discussed in Section 4.1.13.1 for the no-action alternative.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 4.4.13.1 Facility Accidents – Expected Waste Forecast

Figures 4-36 through 4-39 summarize the projected impacts of radiological accidents on the population, offsite maximally exposed individual, and uninvolved workers at 640 meters (2,100 feet) and 100 meters



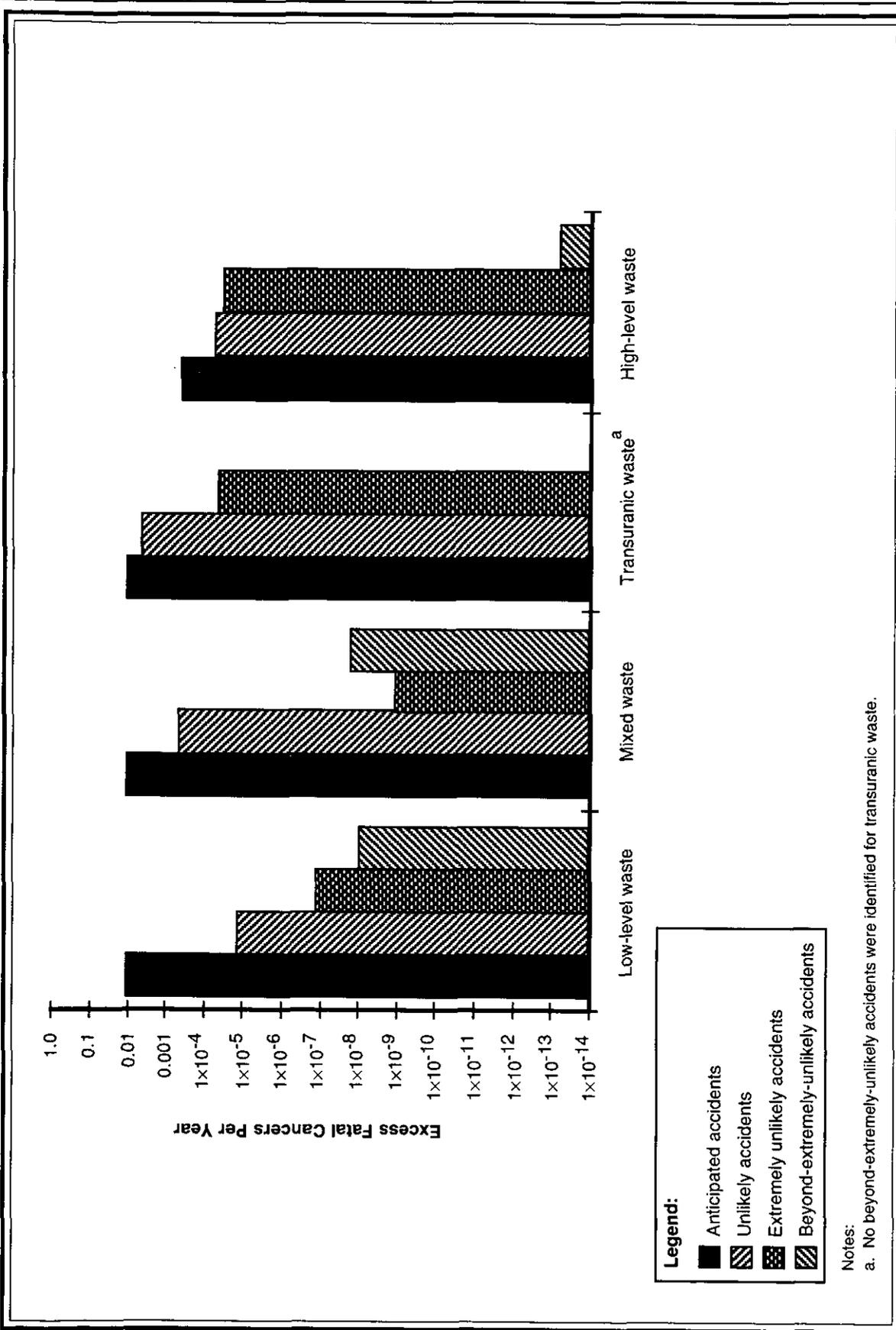
PK56-4

TE **Figure 4-35.** Dose to individuals in communities within 80 kilometers (50 miles) of SRS for the alternative B – maximum waste forecast.

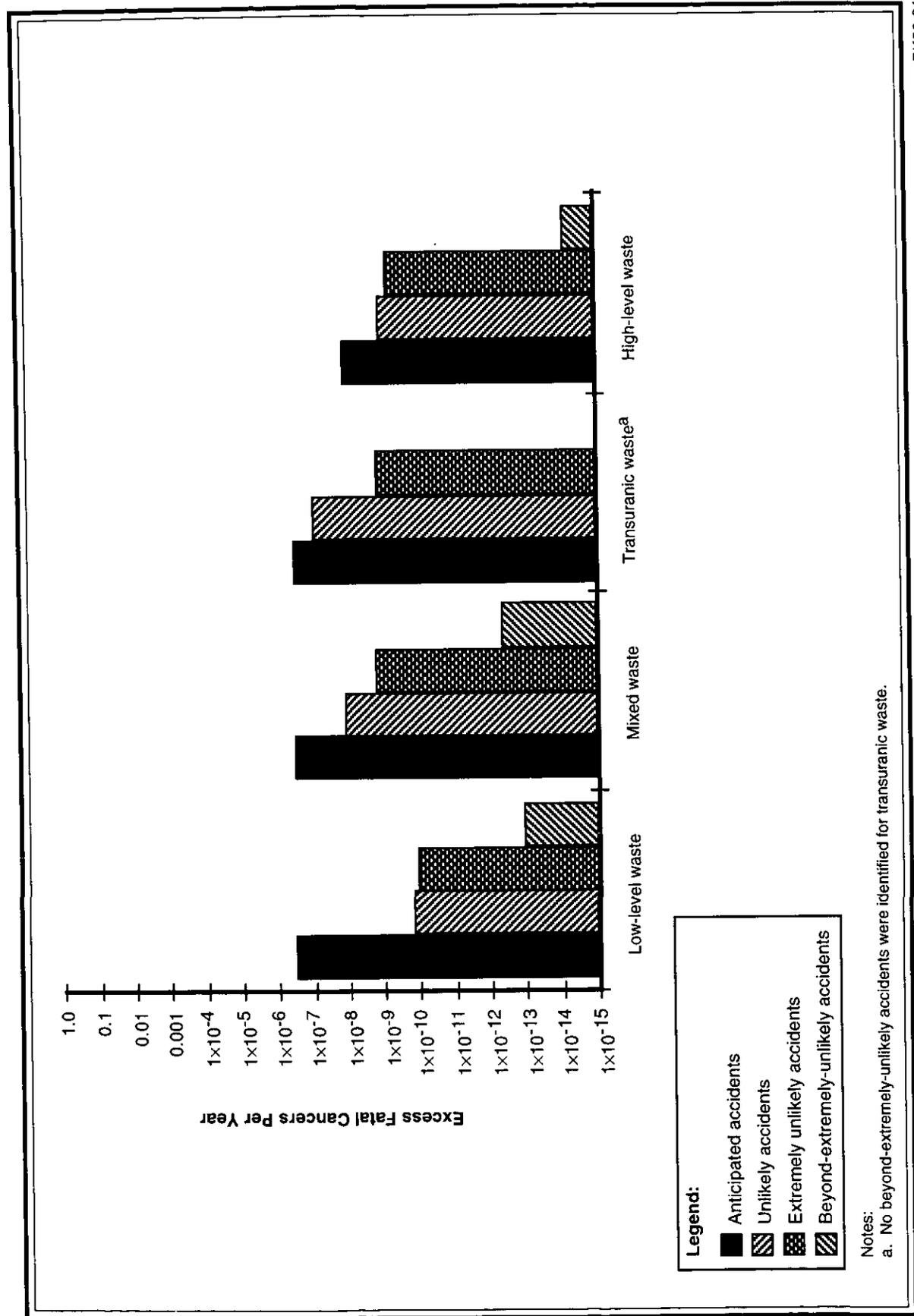
TC

TE

PK56-31



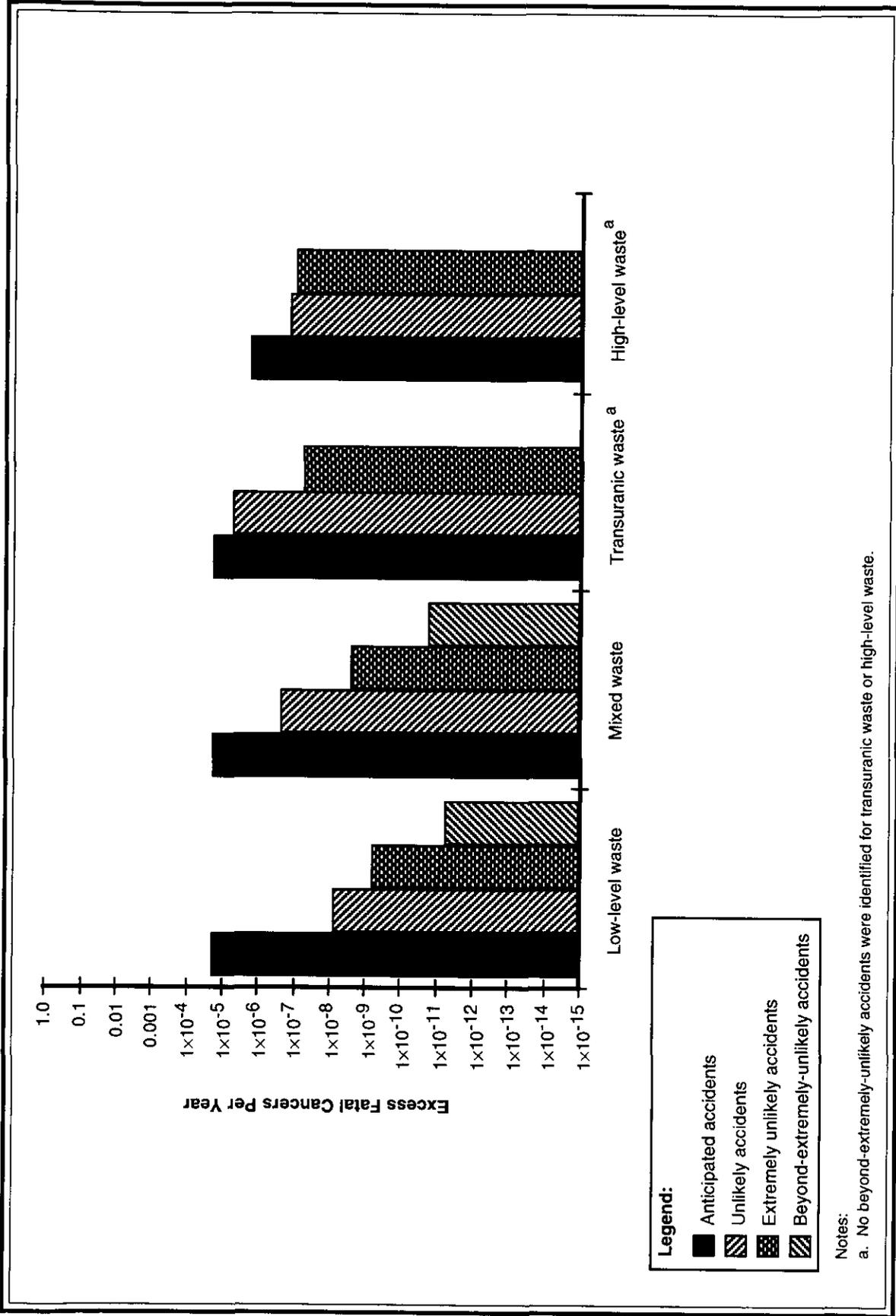
**Figure 4-36.** Summary of radiological accident impacts to the population within 80 kilometers (50 miles) for alternative B - expected waste forecast.



PK56-31

Figure 4-37. Summary of radiological accident impacts to the maximally exposed offsite individual for alternative B – expected waste forecast.

PK56-31



TC

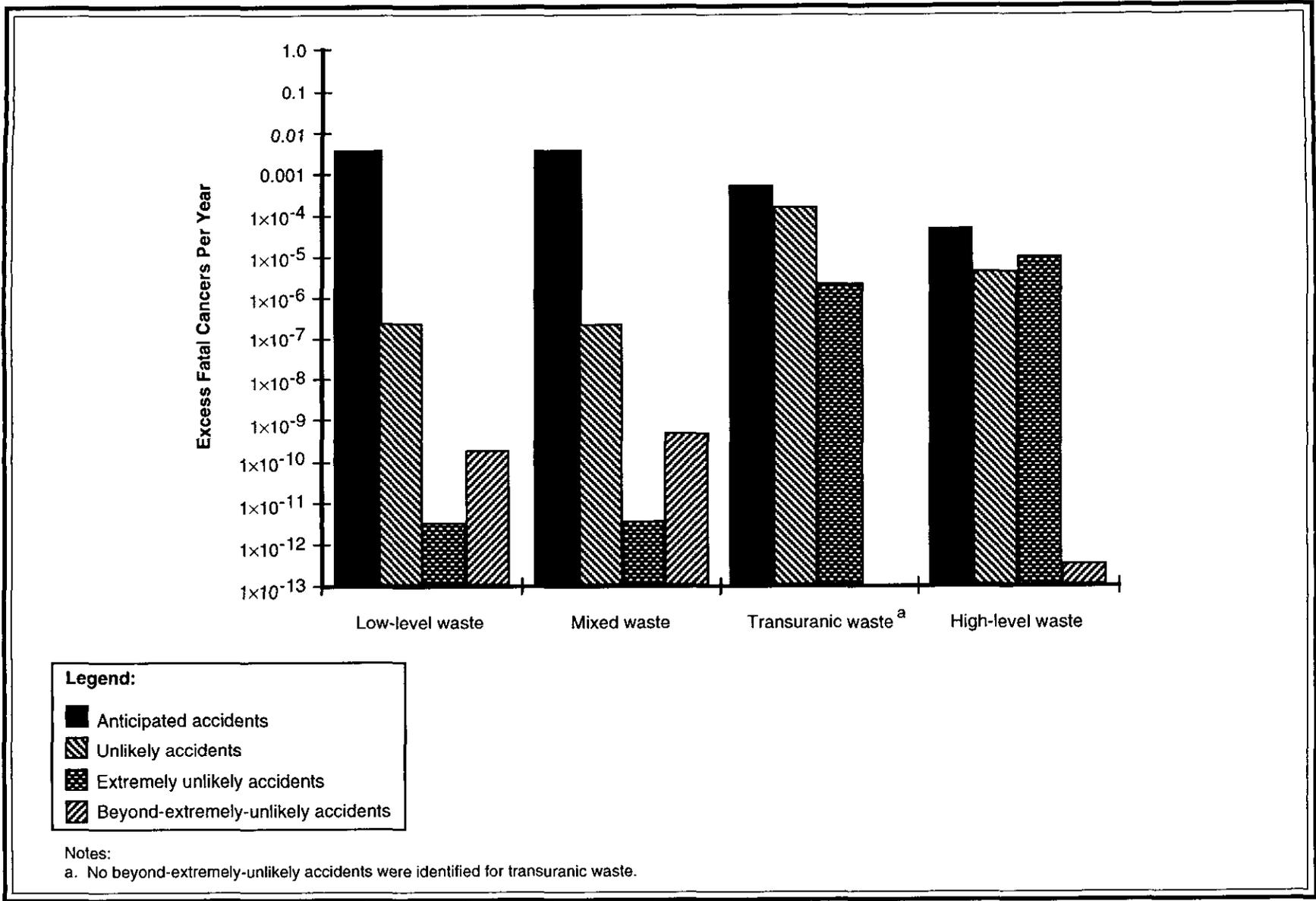
**Legend:**

- Anticipated accidents
- ▨ Unlikely accidents
- ▩ Extremely unlikely accidents
- ▧ Beyond-extremely-unlikely accidents

**Notes:**  
 a. No beyond-extremely-unlikely accidents were identified for transuranic waste or high-level waste.

**Figure 4-38.** Summary of radiological accident impacts to the uninvolved worker within 640 meters (2,100 feet) for alternative B – expected waste forecast.

TC  
 4-248



PK56-31

TE

**Figure 4-39.** Summary of radiological accident impacts to the uninvolved worker within 100 meters (328 feet) for alternative B – expected waste forecast.

(328 feet) for alternative B expected waste forecast. An anticipated accident (i.e., one occurring between once every 10 years and once every 100 years) involving either low-level waste or mixed waste is the accident scenario under alternative B that presents the greatest risk to the population within 80 kilometers (50 miles) of SRS (see Figure 4-27). This accident scenario would increase the risk to the population within 80 kilometers (50 miles) by  $1.7 \times 10^{-2}$  latent fatal cancer per year. The postulated accident scenarios associated with the various waste types are described in Appendix F.

An anticipated accident involving either low-level waste or mixed waste would pose the greatest risk to the offsite maximally exposed individual (Figure 4-37) and the uninvolved worker at 640 meters (2,100 feet) (Figure 4-38). The anticipated accident scenario would increase the risk to the offsite maximally exposed individual by  $3.3 \times 10^{-7}$  latent fatal cancer per year and to the uninvolved worker at 640 meters (2,100 feet) by  $1.8 \times 10^{-5}$  latent fatal cancer per year.

An anticipated accident involving either low-level waste or mixed waste would also pose the greatest risk to the uninvolved worker at 100 meters (328 feet) (Figure 4-39). The anticipated accident scenario would increase the risk to the uninvolved worker at 100 meters (328 feet) by  $1.0 \times 10^{-3}$  latent fatal cancer per year.

For each receptor group, regardless of waste type, the greatest estimated risks associated with the no-action alternative and alternative B are identical. However, there could be differences in the overall risk to each receptor group for specific waste types. Table 4-76 provides a comparison of overall risk for specific waste types between the no-action alternative and alternative B. A multiplicative change factor is used to illustrate differences between no-action and alternative B risks. If the risks presented are identical, a multiplication factor of one is used. However, if the risks presented are different, a multiplication factor that would equate the two values is used. Arrows indicate whether the alternative B risks were larger or smaller than the no-action risks.

A complete summary of all representative bounding accidents considered for alternative B is presented in Table 4-77. This table provides accident descriptions, annual frequency of occurrence, increased risk of latent fatal cancers for all receptor groups, and the waste type with which the accident scenario was associated. Details regarding the individual postulated accident scenarios associated with the various waste types are provided in Appendix F.

TE

The impacts resulting from chemical hazards associated with alternative B are the same as those discussed for alternative A in Section 4.2.13.1. Only one chemical release scenario would expose an

TE | **Table 4-76.** Comparison of risks from accidents under the no-action alternative and alternative B.

Receptor	Waste <sup>b</sup>	Estimated risk <sup>a</sup>		Change factor <sup>c</sup>
		No action	Alternative B	
Population within 80 kilometers	Low-level	0.017	0.017	1.0
	Mixed	0.017	0.017	↑1.0
	Transuranic	0.005	0.015	↑3.0
	High-level	6.3×10 <sup>-4</sup>	6.3×10 <sup>-4</sup>	1.0
Offsite maximally exposed individual	Low-level	3.3×10 <sup>-7</sup>	3.3×10 <sup>-7</sup>	1.0
	Mixed	3.3×10 <sup>-7</sup>	3.3×10 <sup>-7</sup>	1.0
	Transuranic	9.8×10 <sup>-8</sup>	2.9×10 <sup>-7</sup>	↑3.0
	High-level	1.3×10 <sup>-8</sup>	1.3×10 <sup>-8</sup>	1.0
Uninvolved worker to 640 meters	Low-level	1.8×10 <sup>-5</sup>	1.8×10 <sup>-5</sup>	1.0
	Mixed	1.8×10 <sup>-5</sup>	1.8×10 <sup>-5</sup>	1.0
	Transuranic	5.5×10 <sup>-6</sup>	1.6×10 <sup>-5</sup>	↑2.9
	High-level	3.4×10 <sup>-7</sup>	3.4×10 <sup>-7</sup>	1.0
Uninvolved worker to 100 meters	Low-level	0.001	0.001	1.0
	Mixed	0.001	0.001	1.0
	Transuranic	3.1×10 <sup>-4</sup>	9.0×10 <sup>-4</sup>	↑2.9
	High-level	1.8×10 <sup>-5</sup>	1.8×10 <sup>-5</sup>	1.0

- a. Increased risk of latent fatal cancers per year.  
 b. Wastes are described in Section 2.1 and Appendix F.  
 c. Change factors represent the multiplication factor required to equate the no-action alternative risks to the alternative B risks (e.g., no-action alternative risk times change factor equals alternative B risk). The up arrow (↑) indicates that the alternative B risk is the greater risk.

offsite maximally exposed individual to airborne concentrations greater than ERPG-2 values.

Appendix F provides further detail and discussion regarding chemical hazards associated with each waste type.

In addition to the risk to human health from accidents, secondary impacts from postulated accidents on plant and animal resources, water resources, the economy, national defense, environmental contamination, threatened and endangered species, land use, and Native American treaty rights are considered. This qualitative assessment (see Appendix F) determined that there would be no substantial impacts from accidents under alternative B expected waste forecast.

**Table 4-77. Summary of representative bounding accidents under alternative B.<sup>a</sup>**

Accident Description	Affected waste types <sup>c</sup>	Frequency (per year)	Increased risk of latent fatal cancers per year <sup>b</sup>			
			Uninvolved worker at 100 meters	Uninvolved worker at 640 meters	Maximally exposed offsite individual	Population within 80 kilometers
RHLWE <sup>d</sup> release due to a feed line break	High-level	0.07 <sup>e</sup>	1.79×10 <sup>-5</sup>	6.38×10 <sup>-7</sup>	1.32×10 <sup>-7</sup>	6.34×10 <sup>-4</sup>
RHLWE release due to a design basis earthquake	High-level	2.00×10 <sup>-4f</sup>	1.54×10 <sup>-6</sup>	5.46×10 <sup>-8</sup>	1.12×10 <sup>-9</sup>	5.43×10 <sup>-5</sup>
RHLWE release due to evaporator pressurization and breach	High-level	5.09×10 <sup>-5g</sup>	1.95×10 <sup>-6</sup>	3.46×10 <sup>-8</sup>	7.13×10 <sup>-10</sup>	3.44×10 <sup>-5</sup>
Design basis ETF <sup>h</sup> airborne release due to tornado	High-level	3.69×10 <sup>-7i</sup>	3.20×10 <sup>-13</sup>	1.02×10 <sup>-14</sup>	7.20×10 <sup>-15</sup>	6.35×10 <sup>-14</sup>
Container breach at the ILNTV <sup>j</sup>	Low-level Mixed	0.02 <sup>e</sup>	0.00104	1.84×10 <sup>-5</sup>	3.31×10 <sup>-7</sup>	0.0168
Large fire at the CIF <sup>k</sup>	Low-level	2.34×10 <sup>-4f</sup>	2.39×10 <sup>-7</sup>	7.63×10 <sup>-9</sup>	1.64×10 <sup>-10</sup>	1.12×10 <sup>-5</sup>
Tornado at the ILNTV	Low-level	2.00×10 <sup>-5g</sup>	3.26×10 <sup>-12</sup>	6.18×10 <sup>-10</sup>	1.18×10 <sup>-10</sup>	1.18×10 <sup>-7</sup>
Explosion at CIF	Low-level	3.40×10 <sup>-7i</sup>	1.74×10 <sup>-10</sup>	5.54×10 <sup>-12</sup>	1.19×10 <sup>-13</sup>	8.14×10 <sup>-9</sup>
Release due to multiple open containers at the Containment Building	Mixed	0.003 <sup>f</sup>	4.69×10 <sup>-7</sup>	6.91×10 <sup>-7</sup>	1.22×10 <sup>-8</sup>	5.70×10 <sup>-4</sup>
F3 tornado <sup>l</sup> at Building 316-M	Mixed	2.80×10 <sup>-5g</sup>	5.35×10 <sup>-12</sup>	1.29×10 <sup>-9</sup>	1.65×10 <sup>-9</sup>	1.12×10 <sup>-9</sup>
Aircraft crash at the Containment Building	Mixed	1.60×10 <sup>-7i</sup>	9.73×10 <sup>-10</sup>	3.46×10 <sup>-11</sup>	6.66×10 <sup>-13</sup>	3.19×10 <sup>-8</sup>
Deflagration in culvert during TRU <sup>m</sup> drum retrieval activities	Transuranic	0.01 <sup>e</sup>	8.96×10 <sup>-4</sup>	1.59×10 <sup>-5</sup>	2.86×10 <sup>-7</sup>	0.0145
Fire in culvert at the TRU waste storage pads (one drum in culvert)	Transuranic	8.10×10 <sup>-4f</sup>	3.07×10 <sup>-4</sup>	5.48×10 <sup>-6</sup>	9.84×10 <sup>-8</sup>	0.0498
Vehicle crash with resulting fire at the TRU waste storage pads	Transuranic	6.50×10 <sup>-5g</sup>	4.47×10 <sup>-6</sup>	7.96×10 <sup>-8</sup>	1.43×10 <sup>-9</sup>	7.25×10 <sup>-5</sup>

- a. A complete description and analysis of the representative bounding accidents are presented in Appendix F.
- b. Increased risk of fatal cancers per year is calculated by multiplying the [consequence (dose) × latent cancer conversion factor] × annual frequency. For dose consequences and latent cancer fatalities per dose, see tables in Appendix F.
- c. The waste type for which the accident scenario is identified as a representative bounding accident. A representative bounding accident may be identified for more than one waste type. These waste types are high-level, low-level, mixed, and transuranic.
- d. Replacement High-Level Waste Evaporator.
- e. The frequency of this accident scenario is within the anticipated accident range.
- f. The frequency of this accident scenario is within the unlikely accident range.
- g. The frequency of this accident scenario is within the extremely unlikely accident range.
- h. F/H-Area Effluent Treatment Facility.
- i. The frequency of this accident scenario is within the beyond-extremely-unlikely-accident range.
- j. Intermediate-Level Non-Tritium Vault.
- k. Consolidated Incineration Facility.
- l. F3 tornadoes have rotational wind speeds of 254 to 331 kilometers (158 to 206 miles) per hour.
- m. Transuranic.

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.13.2 Facility Accidents – Minimum Waste Forecast**

The minimum waste forecast is not expected to change the duration of risk for the facilities associated with the representative bounding accidents identified under alternative B (see Appendix F).

DOE expects that a slight decrease in risk would occur for alternative B – minimum waste forecast. A comparison of the number and types of facilities needed for the minimum and expected waste forecasts is provided in Section 2.6.7.

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.13.3 Facility Accidents – Maximum Waste Forecast**

The maximum waste forecast is not expected to change the duration of risk for the facilities associated with the representative bounding accidents identified under alternative B (see Appendix F).

DOE expects that an increase in risk would occur for the alternative B maximum waste forecast over the expected waste forecast. A comparison of the number and type of facilities needed for the maximum and expected waste forecasts is provided in Section 2.6.7.

**4.4.14 UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES UNDER ALTERNATIVE B**

TE | This section describes adverse impacts that would result from alternative B that cannot be avoided. It also describes the irreversible and irretrievable commitment of resources that would be associated with alternative B. As indicated in the preceding sections, the major variations in impacts are much more strongly influenced by the amount of wastes to be managed than by variations in the degree of treatment applied. Accordingly, the unavoidable adverse impacts and the irretrievable commitments of resources for the various waste forecasts for alternative B are also representative of the same forecasts under alternatives A and C.

**4.4.14.1 Unavoidable Adverse Impacts**

Several unavoidable adverse impacts would be expected as a result of implementing alternative B. The following sections identify impacts for the expected, minimum, and maximum waste forecasts.

No. Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.14.1.1 Expected Waste Forecast**

Construction activities would generate transient and minor air quality impacts as a result of fugitive dust and vehicle emissions.

Unavoidable radiation exposures to workers and the public from normal operation for alternative B – expected waste forecast would be well below established DOE limits. The hypothetical offsite maximally exposed individual would receive an annual average effective dose equivalent of 0.032 millirem from facility operations, compared to about 300 millirem from natural radiation sources. The two radioisotopes contributing the most to the potential exposure would be cesium-137 and plutonium-239.

New facilities would require the conversion of approximately 0.64 square kilometer (158 acres; both developed and undeveloped) to waste management use by 2006. Long-term impacts are expected to be limited to the loss of 0.47 square kilometer (117 acres) of undeveloped terrestrial habitat and associated natural resources. Small mammals, reptiles, and birds occupying this habitat would be displaced, disturbed, or killed by land clearing and associated construction activities, but local and regional populations of these wildlife species would not be severely affected.

TC

Construction of waste management facilities would prohibit use of associated land areas for other purposes (e.g., agriculture or timber production) for the foreseeable future. However, E-Area was designated as an area for nuclear facilities in the *1994 Draft Land-Use Baseline Report*, and is being used as intended.

Releases of radioactive constituents from low-level and mixed waste disposal facilities (vaults and slit trenches) would introduce radioactive contaminants to groundwater. Resulting concentrations would remain within the performance of objective of 4 millirem per year adopted by DOE in Order 5400.5. Hazardous constituents would also be released from the disposal facilities. Groundwater would

TE

TE | eventually carry contaminants to the onsite streams. In addition, onsite streams would receive wastewater discharges containing hazardous and radioactive constituents, such as the discharge from the F/H-Area Effluent Treatment Facility to Upper Three Runs. These streams would eventually carry the hazardous and radioactive constituents to the Savannah River. Impacts on groundwater resources, surface water resources, and aquatic organisms would be small.

TE | Traffic increases under alternative B are expected to be small and the impacts on onsite and offsite roads small.

DOE anticipates that only minor unavoidable adverse impacts on public or worker health would result from the expected waste forecast. The calculated discharges and exposures of pollutants (including radioactivity) to the public and facility workers would be many times below normal risk levels. This case would result in an additional  $7.5 \times 10^{-4}$  latent cancer fatality per year to the offsite population from airborne releases of radioactivity.

Archaeological sites eligible for the National Register of Historic Places could be affected during construction of waste management facilities on undeveloped land within E-Area. Mitigation action plans developed by the Savannah River Archaeological Research Program and approved by the South Carolina State Historic Preservation Office would protect, recover, or preserve these resources.

An unavoidable adverse impact resulting from operation of the proposed waste management facilities would be the generation of new waste, including low-level radioactive, hazardous, mixed, and nonhazardous solid waste. Disposal of these wastes has been accounted for in planning the proposed waste management facilities, with the exception of nonhazardous solid waste, which would be accommodated in existing onsite sanitary and industrial landfills and their successors.

No Action	Min.	Exp.	Max.
A			
B			
C			

**4.4.14.1.2 Minimum Waste Forecast**

TC | The adverse impacts associated with the minimum waste forecast that cannot be avoided would be slightly less than those associated with the expected waste forecast. For example, only 0.36 square kilometer (90 acres) of undeveloped woodland would be cleared and graded. A maximum of 107 acres (both developed and undeveloped) would be converted to waste management use by 2008.

No Action	Min.	Exp.	Max.
A			
B			
C			

#### 4.4.14.1.3 Maximum Waste Forecast

The adverse impacts associated with the maximum waste forecast that cannot be avoided would be greater than those associated with the expected waste forecast. For example, 3.8 square kilometers (940 acres) of undeveloped woodland would be cleared and graded. A maximum of 1,010 acres (both developed and undeveloped) would be converted to waste management use by 2006. The loss of this much natural habitat could adversely affect protected natural resources such as wetlands and threatened and endangered species. Impacts would require mitigation measures.

There would be 57 additional daily waste shipments over the 1994 baseline, primarily due to the larger volume of waste and the shipment of stabilized ash and blowdown from the Consolidated Incineration Facility to E-Area. This would almost triple the 1994 baseline traffic, but would be expected to slightly increase the total volume of onsite traffic and would not be expected to impact the SRS road system.

TE

#### 4.4.14.2 Irreversible or Irretrievable Commitment of Resources

Several irreversible or irretrievable commitments of resources would be expected to result from implementing alternative B. The sections which follow identify these commitments for the expected, minimum, and maximum waste forecasts.

No Action	Min.	Exp.	Max.
A			
B			
C			

#### 4.4.14.2.1 Expected Waste Forecast

The implementation of alternative B – expected waste forecast would commit approximately 0.47 square kilometer (117 acres) of undeveloped land and associated natural resources and a total of 158 acres (both developed and undeveloped) to waste management use for an indefinite period of time.

TE

Construction and operation of the facilities needed for alternative B – expected waste forecast would involve the commitment of land resources. At present, most of this land is dedicated to industrial, nuclear, and waste management uses. With the exception of the land supporting existing facilities, all other land could be recommitted to other purposes, if required.

Construction of the various facilities would require the consumption of materials such as concrete and steel. Operation of the non-alpha vitrification facility and the Consolidated Incineration Facility would consume chemicals such as nitrogen, sodium hydroxide, nitric acid, glass frit, sodium nitrite, and others. Operation of the waste management facilities would generate small volumes of nonhazardous solid, hazardous mixed, and low-level radioactive wastes and would require additional land area for disposal of these wastes.

TE Construction and operation of the waste management facilities associated with alternative B – expected waste forecast would include consumption of fossil fuels. Gasoline and diesel fuel would be consumed by heavy equipment used to clear and grade land and construct facilities. Fuel oil would be used as auxiliary fuel in each of the thermal treatment facilities. Auxiliary fuel consumption by the Consolidated Incineration Facility under alternative B has been evaluated in this EIS and is presented in Table B.5-2 of Appendix B. Comparable amounts of auxiliary fuel would be consumed by the thermal pretreatment units of the non-alpha and alpha vitrification facilities. Fuels would also be consumed to provide electrical power, including diesel fuel for emergency generators.

Releases from low-level and mixed waste disposal facilities (vaults and slit trenches) would introduce radioactive and hazardous contaminants to groundwater and streams. Concentrations of radioactive constituents in groundwater would remain within the performance objective of 4 millirem per year adopted by DOE in Order 5400.5.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

**4.4.14.2.2 Minimum Waste Forecast**

The irreversible and irretrievable commitment of resources for alternative B – minimum waste forecast would be slightly less than for the expected waste forecast. For example, approximately 0.43 square kilometer (107 acres) of land (both developed and undeveloped) would be committed to waste management.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

#### 4.4.14.2.3 Maximum Waste Forecast

The irreversible and irretrievable commitment of resources for alternative B – maximum waste forecast would be substantially greater than for the expected waste forecast. For example, approximately 0.74 square kilometer (184 acres) of undeveloped woodland in E-Area and 3.1 square kilometers (756 acres) of undeveloped woodland in an undetermined location would be required for the maximum waste forecast. A maximum of 1,010 acres (both developed and undeveloped) would be used for waste management by 2006.

#### 4.4.15 CUMULATIVE IMPACTS RESULTING FROM ALTERNATIVE B

This section presents potential cumulative impacts from alternative B when it is added to impacts from past, present, and reasonably foreseeable onsite activities and impacts of offsite industrial facilities.

TE

Cumulative impacts were assessed only for the moderate treatment alternative with the expected waste forecast because the impacts for this case generally fall between the other cases, and impacts do not vary greatly between alternatives. Despite some variation in impacts, using this approach allows for an assessment of the cumulative impacts that are representative of the magnitude of the cumulative impacts of the other alternatives. Assessing the cumulative impacts of one case also simplifies the presentation of the analysis.

TE

##### 4.4.15.1 Existing Facilities

The existing facilities and activities that are included in the analysis of baseline impacts are summarized in the following sections. Projected releases from normal operations of these facilities are reflected in the descriptions of baseline environmental conditions in Chapter 3 and are included in the analysis of impacts in Sections 4.1 through 4.3 and 4.4.1 through 4.4.13.

TC

##### 4.4.15.1.1 Savannah River Technology Center

The Savannah River Technology Center is the major research and development laboratory at SRS. It conducts research on fuels and targets, waste management, and process modifications and provides support for SRS improvements (WSRC 1994i).

TE | **4.4.15.1.2 F- and H-Area Separations Facilities**

At the F- and H-Area separations facilities, irradiated fuel and target elements are dissolved in nitric acid. A solvent-extraction process yields (1) a solution of plutonium, uranium, and neptunium and (2) a highly radioactive liquid waste containing nonvolatile fission products. After the product solutions are separated from the fission products, further processing converts plutonium, uranium, and other products in solution to solid forms for shipment, recycling, or further processing. Chemical processing in F-Area was suspended in March 1992 pending resolution of a potential safety concern and resumed after resolution of the safety concerns (DOE 1994c) and issuance of the Record of Decision on the F-Canyon Plutonium Solutions at SRS EIS (DOE 1995a). H-Area chemical processing has continued in support of a National Aeronautics and Space Administration space exploration program (DOE 1994b).

**4.4.15.1.3 Reactors**

Of the five production reactors, four are permanently shut down, and the remaining reactor is defueled and mothballed but capable of being restarted (WSRC 1994i).

**4.4.15.1.4 Replacement Tritium Facility**

TE | The Replacement Tritium Facility, a 1-acre underground facility in H-Area, is designed to minimize tritium losses to the environment and reduce waste generation. The Replacement Tritium Facility separates, mixes, and loads tritium in one facility (WSRC 1994i).

TE | **4.4.15.1.5 F/H-Area Effluent Treatment Facility**

The F/H-Area Effluent Treatment Facility, located in H-Area, stores and treats wastewater from the chemical separations facilities in F- and H-Areas. The F/H-Area Effluent Treatment Facility will treat wastewater from the Defense Waste Processing Facility when it begins operating, and would treat wastewater from some facilities proposed in this EIS. Spills and inadvertently contaminated water from any of the waste management facilities would be treated at the F/H-Area Effluent Treatment Facility (DOE 1992, 1994d).

#### 4.4.15.1.6 Offsite Facilities

Radiological impacts from the operation of the Vogtle Electric Generating Plant (Plant Vogtle), a two-unit commercial nuclear electric facility operated by Georgia Power directly across the Savannah River from SRS, are very small (for example, annual latent cancer fatalities are estimated to be  $2.9 \times 10^{-5}$ ) and have been included in the analysis.

Radiological impacts from the operation of the Chem-Nuclear Services facility, a commercial low-level waste disposal facility just east of SRS in the Barnwell County Industrial Park (see Figure 3-2), are very small and are not included in this analysis.

TC

South Carolina Electric and Gas Company's Urquhart Station, a three-unit, 250-megaWatt, coal- and natural-gas-fired steam electric plant in Beech Island, South Carolina, is about 32 river kilometers (20 river miles) north of SRS. Because of the distance between SRS and the Urquhart Station and the regional wind direction frequencies, there is little opportunity for any interaction of plant emissions, and no significant cumulative impact on air quality (DOE 1990).

TE

#### 4.4.15.2 New and Proposed Facilities or Programs

TE

In addition to the ongoing SRS and offsite operations, there are a number of planned actions and facilities at SRS included in the cumulative impacts analysis.

##### 4.4.15.2.1 Defense Waste Processing Facility

The Defense Waste Processing Facility is almost complete, and the high-level waste pre-treatment processes and the vitrification process are nearly ready to begin operating. The decision to operate the Defense Waste Processing Facility is the subject of a separate NEPA document (DOE 1994d). The EIS on the Defense Waste Processing Facility has been completed, and a Record of Decision was issued in April 1995 (DOE 1995a). The decision stated that DOE will complete facility construction and begin operating the Defense Waste Processing Facility to pretreat, immobilize, and store high-level radioactive waste. The environmental impacts from the operation of the Defense Waste Processing Facility are included in all alternatives and are therefore included in this cumulative analysis.

TE

TE | **4.4.15.2.2 F-Canyon Plutonium Solutions**

TC | In March 1992, DOE suspended chemical processing in F-Area until potential safety concerns could be adequately addressed. Those concerns were addressed; however, before processing resumed, the Secretary of Energy directed SRS to phase out defense-related chemical separations. There have been no operations since March 1992. Approximately  $3.03 \times 10^5$  liters (80,000 gallons) of solutions containing plutonium have been held in tanks in the processing facility since the suspension of operations. DOE proposed to process these solutions into forms that can be stored with less risk to the public, worker health and safety, and the environment and prepared a separate NEPA review for that proposal (DOE 1994c). Processing resumed in F-Canyon following issuance of a Record of Decision on this EIS (DOE 1995b). The environmental impacts associated with the processing of these solutions to plutonium metal are included in this cumulative impact analysis.

**4.4.15.2.3 Interim Management of Nuclear Materials**

TE | The cessation of nuclear reprocessing operations at SRS resulted in significant amounts of materials in various stages of the production and recovery cycle. These materials include irradiated and unirradiated fuel, targets, and control rods; acidic solutions containing dissolved targets or fuels and recovered isotopes; product forms of isotopes (oxide powders and metals) packaged in storage containers; and irradiated fuel and targets stored in the Receiving Basin for Offsite Fuels in H-Area. The *Draft Interim Management of Nuclear Materials EIS* (DOE 1995c) evaluates how to manage these existing SRS nuclear materials in a safe and environmentally sound manner until disposition decisions can be made, while maintaining the required inventory of usable forms of special isotopes. The environmental impacts TE | identified from the processes evaluated in the *Draft Interim Management of Nuclear Materials EIS* are included in this cumulative analysis.

**4.4.15.2.4 Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs**

TC | DOE prepared a separate EIS to inform two related decisionmaking processes concerning: (1) the transport, receipt, processing, and storage of spent nuclear fuel at the DOE Idaho National Engineering Laboratory over the next 10 years; and (2) programmatic decisions on spent nuclear fuel management over the next 40 years. SRS is a candidate for spent nuclear fuel management operations under several alternatives that DOE considered in the EIS (DOE 1995d). In that EIS, alternative 5 for spent nuclear TC | fuel [Centralization, Processing option; see DOE (1995d)] would have had the greatest onsite impacts to SRS; SRS would have had to manage approximately 2,700 metric tons of spent nuclear fuel, most of

which would have been transported to SRS from other DOE sites. The environmental effects at SRS of spent nuclear fuel actions under alternative 5 are included in this cumulative impact analysis. In the Record of Decision (DOE 1995e), however, DOE selected the regionalization alternative. Under the regionalization alternative, SRS will manage approximately 213 metric tons of spent nuclear fuel.

TE

#### **4.4.15.3 Moderate Treatment Configuration Alternative**

For the alternative B, the following new or additional facilities are proposed to manage the wastes projected under the expected waste forecast and were the basis for predicting impacts in Sections 4.4.1 through 4.4.13 as summarized in Table 2-38:

TE

- 24 long-lived low-level waste storage buildings
- 79 mixed waste storage buildings
- 10 transuranic and alpha waste storage pads
- a mixed waste containment building
- a non-alpha vitrification facility
- an alpha vitrification facility
- a mobile soil sort facility
- the Consolidated Incineration Facility
- a transuranic waste characterization/certification facility
- 58 shallow land disposal slit trenches
- 1 low-activity waste vault
- 5 intermediate-level waste vaults
- 21 RCRA-permitted disposal vaults
- the M-Area Vendor Treatment Facility

TC

TC

Refer to Appendix B for complete descriptions of the facilities and actions.

#### **4.4.15.4 Cumulative Impacts**

This section presents data on potential impacts from alternative B – expected waste forecast which, when added to impacts from past, present, and reasonably foreseeable SRS operations and offsite facilities, constitute the cumulative impacts on the affected environment.

TE

TE | Discussions of cumulative impacts for the following subjects are omitted because the impacts of the proposed waste management activities would be so small that their potential contribution to cumulative impacts would be negligible:

- geologic resources
- ecological resources
- aesthetics and scenic resources
- environmental justice
- cultural resources
- traffic

#### **4.4.15.4.1 Groundwater Resources**

TE | Cumulative impacts to groundwater resources would be very small from stabilizing the plutonium solutions, the interim management of nuclear materials, the Defense Waste Processing Facility, or waste management activities.

TC | Under alternative B – expected waste forecast, only small impacts to groundwater resources are anticipated. Any releases from shallow land disposal, disposal of low-level waste in vaults, or disposal in RCRA permitted vaults would not cause current groundwater standards to be exceeded during the 30-year planning period, the 100-year period of institutional control, or any time after disposal (see Section 4.1.3). Releases from RCRA storage facilities are unlikely.

TC | Groundwater contamination resulting from the waste disposal under this EIS would be in addition to existing contamination from past waste disposal. By the time that concentrations resulting from waste disposal activities evaluated in this EIS reached their peak (at least 97 to 130 years in the future), the concentrations of contaminants introduced by past disposal will have been substantially reduced below present concentrations as a result of natural decay processes and any environmental restoration programs.

TE | Radioactive releases from the Defense Waste Processing Facility that result in future doses to the offsite maximally exposed individual of 0.03 millirem per year (via groundwater infiltration to surface water) are projected from saltstone disposal in the vaults (DOE 1994d). In comparison, total SRS aqueous releases in 1993 resulted in doses to the offsite maximally exposed individual of 0.14 millirem (WSRC 1994i). For spent nuclear fuel activities, additional groundwater withdrawals would total about 67.7 million liters (17.9 million gallons) per year compared to current site withdrawals of 34.1 to 45.4 million liters (9 to 12 million gallons) per day.

#### 4.4.15.4.2 Surface Water Resources

Cumulative impacts to surface water resources would be very small. Few or no impacts are expected from spent fuel management, plutonium stabilization, interim management of nuclear materials, the Defense Waste Processing Facility, or waste management.

For alternative B – expected waste forecast, very small impacts to surface water resources are anticipated. Stormwater infiltrating the vaults and trenches and migrating into surface waters would contain radionuclides; however, doses in the Savannah River would be 10,000 times less than the municipal system drinking water limits of 4 millirem per year. Additional wastewater directed to the F/H-Area Effluent Treatment Facility would meet applicable effluent permit limits, and calculated radionuclide doses would be very small.

#### 4.4.15.4.3 Air Resources

Cumulative maximum boundary-line ground-level concentrations due to nonradiological air emissions from existing facilities (using actual emissions) and proposed facilities (using calculated emissions) are shown in Table 4-78. The cumulative concentration for each criteria pollutant would be less than either state or federal ambient air quality standards. Non-SRS facilities (such as Plant Vogtle and Chem-Nuclear Services) make very small contributions by comparison to air emissions over the area surrounding SRS.

As discussed in previous sections of this chapter, toxic air emissions from existing facilities and new facilities such as the Defense Waste Processing Facility and the Consolidated Incineration Facility would be very small, and compliance with SCDHEC standards has been demonstrated in the *SCDHEC Regulation No. 62.5 Standard No. 2 and Standard No. 8 Compliance Modeling Input/Output Data*. Collective emissions of air toxics from the proposed facilities, such as the transuranic waste certification/characterization facility, the non-alpha vitrification facility, or the mixed waste containment building, would be very small.

#### 4.4.15.4.4 Land Use

As indicated in Section 4.4.7.1, implementation of alternative B – expected waste forecast would require 0.64 square kilometer (158 acres) in E-Area; implementation of the centralization option for spent nuclear fuel management at SRS would require an additional 0.53 square kilometer (130 acres)

**Table 4-78. Cumulative maximum SRS boundary-line ground-level concentrations for criteria pollutants (in micrograms per cubic meter of air).<sup>a</sup>**

Criteria pollutant	Averaging time	Concentrations due to existing sitewide emissions <sup>b</sup>	Background concentrations <sup>c</sup>	Increased concentrations, alternative B <sup>b,d</sup>	Increased concentrations, plutonium solutions <sup>e</sup>	Increased concentrations, spent nuclear fuel <sup>f</sup>	Increased concentrations, interim management nuclear materials <sup>g</sup>	Regulatory standards <sup>h</sup>	Percent of standard <sup>i</sup>	
		( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	( $\mu\text{g}/\text{m}^3$ )	(%)	
TC	Nitrogen oxides	Annual	6	8	0.79	0.32	11.1	1.3	100	27.5
	Sulfur dioxide	3 hours	823	34	3.82	2.7	3.5	0.040	1,300	66.7
		24 hours	196	17	0.81	0.33	0.49	0.0089	365	58.8
		Annual	14	3	0.05	0.006	0.02	0.00056	80	21.3
	Carbon monoxide	1 hour	171	NA <sup>j</sup>	31.45	22	37	68	40,000	0.8
		8 hours	22	NA	27.07	2.7	5.1	16	10,000	0.7
Total suspended particulates	Annual	13	30	2.01	0.005	<0.01	(k)	75	60.0	
4-264 Particulate matter less than 10 microns in diameter	24 hours	51	34	4.61	0.16	0.4	(k)	150	60.5	
	Annual	3	22	0.10	0.005	0.01	(k)	50	50.2	
Lead	Quarterly	$4.0 \times 10^{-4}$	0.011	$2.8 \times 10^{-5}$	(k)	(k)	(k)	1.5	0.8	
Gaseous fluorides (as hydrogen fluoride)	12 hours	2.0	NA	0.0019	0.045	0.4	0.18	3.7	71.0	
	24 hours	1.0	NA	$9.3 \times 10^{-4}$	0.024	0.1	0.095	2.9	42.1	
	1 week	0.4	NA	$7.0 \times 10^{-5}$	0.0094	0.1	0.037	1.60	34.2	
	Monthly	0.1	NA	$9.0 \times 10^{-5}$	0.0026	0.02	0.010	0.80	16.6	

a. The scope of cumulative impacts as displayed in this table is based on the best information available in 1994. DOE recognizes that other actions may be underway.

b. Source: Stewart (1994).

c. SCDHEC (1992)

d. Alternative B includes Defense Waste Processing Facility and Consolidated Incineration Facility operation.

e. Preferred alternative from *F-Canyon Plutonium Solutions EIS* (DOE 1994c).

f. Alternative 5 from the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS* (DOE 1995d).

g. Preferred alternative from the *Draft Interim Management of Nuclear Materials EIS* (DOE 1995c).

h. SCDHEC (1976).

i. Percent of standard =  $100 \times (\text{actual} + \text{background} + \text{increment})$  divided by regulatory standard.

j. NA = not available.

k. Not reported.

TE

(locations undetermined) (DOE 1995c). Additional land commitments are not anticipated for the Defense Waste Processing Facility or the plutonium solutions operations. The cumulative land commitment of 1.2 square kilometers (288 acres) associated with these potential activities constitutes about 0.1 percent of the SRS land area.

#### 4.4.15.4.5 Socioeconomics

The maximum potential change in employment associated with alternative B – expected waste forecast, spent nuclear fuel management, interim management of nuclear materials, stabilization of plutonium solutions, and other SRS activities would occur around 2002, when approximately 3,000 (mostly construction) jobs would be created. This compares to a predicted regional labor force of 258,300 in 2002. This small increase, roughly 1 percent, in direct employment would have correspondingly small and temporary impacts on socioeconomics in the six-county region of influence.

#### 4.4.15.4.6 Transportation

The cumulative radiological doses and resulting health effects from incident-free transportation are presented in Table 4-79. Data for the Defense Waste Processing Facility and the stabilization of plutonium solutions are not included because transportation was not a factor in these EISs.

**Table 4-79.** Estimated annual average radiological doses and potential health effects from transportation activities.

	Normal (incident-free) transportation			Total
	Waste management <sup>a</sup>	Interim management of nuclear material <sup>b</sup>	Spent nuclear fuel <sup>c</sup>	
Remote population dose (person-rem)	7.3	(d)	0.23	7.53
Remote population excess LCFs <sup>e</sup>	$3.6 \times 10^{-3}$	(d)	$1.2 \times 10^{-4}$	$3.7 \times 10^{-3}$
Uninvolved workers dose (person-rem)	2.2	105	(f)	107
Onsite population excess LCFs	$8.9 \times 10^{-4}$	$4.20 \times 10^{-2}$	(f)	$4.3 \times 10^{-2}$
Involved workers dose (person-rem)	240	6.09	2.5	249
Involved workers excess LCFs	0.098	$2.44 \times 10^{-3}$	$1.0 \times 10^{-3}$	0.101

a. Alternative B – expected waste forecast.

b. Preferred alternative from the *Draft Interim Management of Nuclear Materials EIS* (DOE 1995c).

c. Highest consequence option; from DOE (1995d).

d. Not calculated - no offsite transport.

e. Latent cancer fatalities.

f. Not calculated - little onsite transport.

TE  
TC

TE

#### 4.4.15.4.7 Occupational and Public Health

##### Radiological

TE | Table 4-80 summarizes the cumulative radiological doses and resulting health effects to the offsite  
population from airborne and liquid releases from current activities (1993 SRS baseline conditions),  
operation of the proposed waste management facilities, actions planned for spent nuclear fuel  
management, stabilization of plutonium solutions, operation of the Defense Waste Processing Facility,  
actions associated with interim management of nuclear materials, and operation of Georgia Power  
Company's Plant Vogtle. Doses and resulting health effects are also presented for involved workers from  
direct radiation exposure for the same activities (except Plant Vogtle). Health effects from alternative B  
represent a small fraction of the minimal health effects due to current SRS practices. Doses and health  
effects due to alternative B represent less than 10 percent of the cumulative values listed in Table 4-80.

TE | For all activities listed in Table 4-80, the annual cumulative dose to the offsite maximally exposed  
TC | individual would increase approximately tenfold over the dose received from current SRS practices (to  
0.0020 rem from 0.00025 rem). Alternative B would contribute less than 2 percent of the total  
increment. The resulting cumulative health effects for all activities would increase the excess annual risk  
to the offsite maximally exposed individual of developing a fatal cancer from approximately 1 in  
 $1.0 \times 10^7$  to 1 in  $1.0 \times 10^6$ . Alternative B would contribute only about 2 percent of this increase.

TC | Offsite cumulative population doses from all activities presented in Table 4-80 would increase by less  
than tenfold compared to current levels (to 70 person-rem from 9.1 person-rem). Alternative B would  
contribute slightly more than 2 percent of the total. The resulting cumulative dose from all activities  
would increase the annual expected excess latent cancer fatalities from 0.0046 to 0.035. Alternative B  
would contribute slightly more than 2 percent of the increase.

TE | For all activities listed in Table 4-80, the annual cumulative collective dose to involved workers would  
TC | increase by a factor of 3 compared to the dose from current practices (to 799 person-rem from  
263 person-rem). Alternative B would contribute approximately 10 percent of the total. The resulting  
cumulative dose to the involved workers would increase from 0.11 latent cancer fatality per year for  
current practices to 0.32 latent cancer fatality per year from all activities presented in Table 4-80.  
Alternative B would contribute approximately 10 percent of the total increase.

**Table 4-80.** Estimated maximum annual cumulative radiological doses and resulting health effects to offsite population and facility workers.

Activity	Offsite maximally exposed individual (rem)				Total collective <sup>a</sup> (to 80-kilometer population) (person-rem)				All Workers (person-rem)	
	Dose from airborne releases <sup>b</sup>	Dose from aqueous releases <sup>b</sup>	Total dose <sup>b</sup>	Fatal cancer risk <sup>c</sup>	Dose from airborne releases <sup>d</sup>	Dose from aqueous releases <sup>d</sup>	Total dose <sup>d</sup>	Latent cancers fatalities <sup>e</sup>	Dose <sup>d</sup>	Latent cancer fatalities <sup>e</sup>
Waste Management-Alternative B	3.2×10 <sup>-5</sup>	6.9×10 <sup>-7</sup>	3.3×10 <sup>-5</sup>	1.7×10 <sup>-8</sup>	1.5	0.0068	1.5	7.5×10 <sup>-4</sup>	81	0.032
Current SRS practices	1.1×10 <sup>-4</sup>	1.4×10 <sup>-4</sup>	2.5×10 <sup>-4</sup>	1.3×10 <sup>-7</sup>	7.6	1.5	9.1	0.0046	263	0.11
Interim management of nuclear materials <sup>f</sup>	0.00097	2.4×10 <sup>-5</sup>	0.00099	5.0×10 <sup>-7</sup>	40	0.09	40	0.02	127	0.051
Stabilization of plutonium solutions <sup>g</sup>	8.61×10 <sup>-6</sup>	2.9×10 <sup>-7</sup>	8.9×10 <sup>-6</sup>	4.5×10 <sup>-9</sup>	0.38	3.7E-4	0.38	1.9×10 <sup>-4</sup>	131	0.052
Defense Waste Processing Facility <sup>h</sup>	1.0×10 <sup>-6</sup>	NA <sup>i</sup>	1.0×10 <sup>-6</sup>	5.0×10 <sup>-10</sup>	0.07	NA <sup>j</sup>	0.07	3.5×10 <sup>-5</sup>	118	0.047
Plant Vogtle <sup>k</sup>	3.7×10 <sup>-7</sup>	1.7×10 <sup>-4</sup>	1.7×10 <sup>-4</sup>	8.5×10 <sup>-8</sup>	0.047	0.0097	0.057	2.9×10 <sup>-5</sup>	NA	NA
SRS spent nuclear fuel <sup>l</sup>	4.0×10 <sup>-4</sup>	1.0×10 <sup>-4</sup>	5.0×10 <sup>-4</sup>	2.5×10 <sup>-7</sup>	16.0	2.4	18.4	0.0092	79	0.032
<b>Total</b>	<b>0.0015</b>	<b>4.4E-04</b>	<b>0.0020</b>	<b>9.9E-07</b>	<b>66</b>	<b>4.0</b>	<b>70</b>	<b>0.035</b>	<b>799</b>	<b>0.32</b>

a. Collective dose: for the 80-kilometer (50-mile) population after atmospheric releases; for downstream users of Savannah River water after liquid releases.

b. Dose in rem.

c. Probability of an excess fatal cancer.

d. Dose in person-rem.

e. Incidence of excess latent fatal cancers.

f. Preferred alternative from the *Draft Interim Management of Nuclear Materials EIS* (DOE 1995c).

g. Source: DOE (1994c).

h. Source: DOE (1994d)

i. NA = not applicable. There are no direct radioactive releases to surface water from the Defense Waste Processing Facility operations.

j. NA = not applicable.

k. NRC (1994).

l. Highest values from Appendix C of DOE (1995d).

4-267

## **Nonradiological**

TE | The cumulative occupational health impacts resulting from the operation of the proposed waste management facilities and the Defense Waste Processing Facility, in addition to facilities associated with spent nuclear fuel management, stabilization of plutonium solutions, are analyzed qualitatively because most of the facilities associated with these programs are not yet operating. Each EIS for the above facilities concludes that nonradiological air emissions from routine operations for the facilities involved with these programs would be well below applicable Occupational Safety and Health Administration guidelines. In addition, concentrations of air contaminants near facilities operating under alternative B would be less than 1 percent of the applicable permissible exposure guidelines under the Occupational Safety and Health Administration.

Cumulative maximum boundary-line ground-level concentrations from the routine operation of facilities associated with alternative B, spent nuclear fuel management, and the stabilization of plutonium solutions were calculated for criteria pollutants, as shown in Table 4-78. For each criteria pollutant, maximum boundary-line concentrations would be less than either state or federal ambient air quality standards. EPA considers ambient air not to be harmful to the public when concentrations of air contaminants are less than federal standards.

Cumulative public health impacts due to carcinogenic emissions from facilities associated with the proposed programs are presented in Table 4-81. Unit risk factors for latent nonfatal cancers were obtained from EPA's Integrated Risk Information System. Total estimated latent nonfatal cancers due to the routine operation of the proposed facilities would be approximately 5 in 100 million.

**Table 4-81. Maximum SRS boundary-line concentrations (in micrograms per cubic meter of air) and cumulative public health impacts from carcinogenic emissions.**

Pollutant <sup>a</sup>	Unit risk factor (latent cancers probability/ $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>	SRS baseline ( $\mu\text{g}/\text{m}^3$ ) <sup>c</sup>	Alternative B ( $\mu\text{g}/\text{m}^3$ ) <sup>d</sup>	Spent nuclear fuel ( $\mu\text{g}/\text{m}^3$ ) <sup>e</sup>	F-Canyon plutonium solutions ( $\mu\text{g}/\text{m}^3$ )	Interim management nuclear materials ( $\mu\text{g}/\text{m}^3$ )	Latent cancer probability <sup>f</sup>
Acetaldehyde	$2.2 \times 10^{-6}$	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Acrylamide	0.0013	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Acrylonitrile	$6.8 \times 10^{-5}$	0.002	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.9 \times 10^{-9}$
Arsenic pentoxide	0.0043	N/A	$7.1 \times 10^{-7}$	N/A	N/A	N/A	$6.7 \times 10^{-13}$
Asbestos	0.23	N/A	$2.7 \times 10^{-8}$	N/A	N/A	N/A	$2.5 \times 10^{-14}$
Benzene	$8.3 \times 10^{-6}$	0.17	0.044	0.005	0.001	N/A	$2.1 \times 10^{-7}$
Benzidine	0.067	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Bis (chloromethyl) ether	0.062	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Bromoform	$1.1 \times 10^{-6}$	0.002	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.6 \times 10^{-9}$
Carbon tetrachloride	$1.5 \times 10^{-5}$	$2.6 \times 10^{-4}$	$1.2 \times 10^{-5}$	N/A	N/A	N/A	$2.6 \times 10^{-10}$
Chlordane	$3.7 \times 10^{-4}$	$2.3 \times 10^{-4}$	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$2.1 \times 10^{-10}$
Chloroform	$2.3 \times 10^{-5}$	0.62	0.003	N/A	N/A	N/A	$5.9 \times 10^{-7}$
Cr (+6) compounds	0.012	N/A	$4.9 \times 10^{-9}$	N/A	N/A	N/A	$4.4 \times 10^{-15}$
Formaldehyde	$1.3 \times 10^{-5}$	$1.6 \times 10^{-4}$	$1.4 \times 10^{-7}$	0.0013	N/A	N/A	$1.3 \times 10^{-9}$
Heptachlor	0.0013	N/A	$3.5 \times 10^{-7}$	N/A	N/A	N/A	$3.3 \times 10^{-13}$
Hexachlorobenzene	$4.6 \times 10^{-4}$	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Hexachlorobutadlene	$2.2 \times 10^{-5}$	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
Hydrazine	0.0049	N/A	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.3 \times 10^{-13}$
1,1,2,2-Tetrachloroethane	$5.8 \times 10^{-5}$	$9.9 \times 10^{-5}$	$2.8 \times 10^{-6}$	N/A	N/A	N/A	$9.6 \times 10^{-11}$
1,1,2-Trichloroethane	$1.6 \times 10^{-5}$	0.002	$1.4 \times 10^{-7}$	N/A	N/A	N/A	$1.9 \times 10^{-9}$
Toxaphene	$3.2 \times 10^{-4}$	N/A	$3.5 \times 10^{-7}$	N/A	N/A	N/A	$3.3 \times 10^{-13}$
1,1 Dichloroethene	$5.0 \times 10^{-5}$	$6.3 \times 10^{-6}$	$2.7 \times 10^{-5}$	N/A	N/A	N/A	$3.1 \times 10^{-11}$
Methylene chloride	$4.7 \times 10^{-7}$	1.31	$1.4 \times 10^{-7}$	0.0025	N/A	N/A	$1.2 \times 10^{-6}$
Total							$2.0 \times 10^{-6}$

TC

TC

4-269

- a. Background values are not available because there is no ambient air monitoring existing for air toxics.
- b. Source: EPA (1994).
- c. Calculated maximum potential annual concentration from WSRC (1993b).
- d. Alternative B includes Defense Waste Processing Facility and Consolidated Incineration Facility operations.
- e. Spent nuclear fuel values are adjusted from 24-hour concentrations to annual concentrations.
- f. Latent cancer probability adjusted for 30 years of waste management activities. Total probability for each pollutant equals unit risk factor  $\times$  concentration  $\times$  30 years/70 years.
- g. NA = not applicable.

## 4.5 Environmental Restoration and Decontamination and Decommissioning

TE  
TC

There are 407 waste storage facilities that would be constructed under the no-action alternative. These facilities consist of storage buildings, pads, and tanks. About 100 new waste handling and storage facilities would be required by the action alternatives – expected forecast. Decisions on decontaminating and decommissioning these facilities would not be made until the facilities' missions have been completed, which in most cases will be 30 or more years in the future.

DOE requires that new waste storage and handling facilities use pollution control systems that meet applicable regulatory requirements and ensure that the environmental restoration of these facilities will be minimized or unnecessary (DOE Order 6430.1A "General Design Criteria"). In addition, DOE requires that these facilities be designed to simplify periodic decontamination and ultimate facility decommissioning or reuse. Measures that simplify future decontamination include minimizing and limiting the use of items such as service piping, conduits, and ductwork to areas designed to facilitate decontamination. Walls, ceilings, and floors are to be finished with washable or strippable coverings. Cracks, crevices, and joints are to be caulked or sealed and finished smooth to prevent the accumulation of contaminated material in inaccessible areas. DOE also requires special design principles that preclude contamination of fixed portions of the structure, avoid buried pipelines, provide visual inspection points, use materials that are easily decontaminated, and other measures that anticipate the need for eventual decommissioning of the facilities.

More than 6,000 buildings on SRS will eventually be declared surplus and will need to be decommissioned, as described in Section 3.14. The decommissioning of new waste storage and handling facilities proposed in the alternatives will result in minimal additional decontamination and decommissioning at SRS; however, some of these facilities could contain radioactive or hazardous material. Regardless of the alternative selected, environmental restoration and decontamination and decommissioning of these facilities would be subject to environmental and public review as the facilities' missions are completed.

## 4.6 Mitigation Measures

As required by the Council on Environmental Quality, this section considers mitigation measures that could reduce or offset the potential environmental consequences of waste management activities and that are not part of the proposed action or its alternatives. DOE has not identified specific measures, other than management controls and standard engineering practices, that would reduce impacts beyond measures that are part of each alternative. If future activities lead to impacts beyond those described herein, mitigation action planning would begin concurrent with consideration of the appropriate NEPA documentation. Based on the potential environmental effects described in this chapter for each alternative, DOE will consider establishing additional programs to reduce environmental impacts.

TE

Many mitigation measures have been implemented as a result of current waste management. Current mitigation measures include administrative or management controls and engineered systems (e.g., backup systems, failsafe designs) that are required by environmental regulations or DOE Orders, and implemented through operating procedures. These activities would continue under each alternative described in this EIS.

Management controls include erosion and sedimentation control plans instituted through stormwater pollution prevention plans and their permits; spill prevention control and countermeasures plans; and best management plans. These plans and others are referenced throughout Chapter 4.

As described in Section 4.1.9, DOE has surveyed the undeveloped portions of E-Area for cultural resources and identified 12 archaeological sites that might be eligible for listing on the National Register of Historic Places. Mitigation of potential impacts on these sites will be by avoidance, if possible. If avoidance is not possible, effects of facility construction and operation will be mitigated by data recovery (i.e., an archaeological excavation of the site). Mitigation will be conducted in consultation with the South Carolina State Historic Preservation Office in accordance with the Programmatic Memorandum of Agreement between the South Carolina State Historic Preservation Office, DOE, and the Advisory Council on Historic Preservation.

TE

## 4.7 References

Arnett, M. W., 1994, *Savannah River Site Environmental Data for 1993*, WSRC-TR-94-077, Westinghouse Savannah River Company, Aiken, South Carolina.

Arnett, M. W., L. K. Karapatakis, and A. R. Mamatey, 1994, *Savannah River Site Environmental Report for 1993*, WSRC-TR-94-075, Westinghouse Savannah River Company, Aiken, South Carolina.

TE | Bauer, L. R., 1991, *Modeling Chronic Atmospheric Releases at the SRS: Evaluation and Verification of XOQDOQ*, WSRC-RP-91-320, Savannah River Laboratory, Aiken, South Carolina.

Brooks, M. J., G. T. Hanson, and R. D. Brooks, 1986, *An Intensive Archaeological Survey and Testing of Alternative, New Low-Level Radioactive and Hazardous/Mixed Waste Storage/Disposal Facilities, Savannah River Plant, Aiken and Barnwell Counties, South Carolina*, Manuscript on file with the Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia, South Carolina.

CDC (Centers for Disease Control and Prevention), 1993, "Advance Report of Final Mortality Statistics, 1990," *Monthly Vital Statistics Report 41*, No. 7 Supplement, U.S. Public Health Service, Department of Health and Human Services, Washington, D.C., January 7.

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, Revision 1, June 30.

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

DOE (U.S. Department of Energy), 1990, *Final Environmental Impact Statement, Continued Operation of K-, L-, and P-Reactors, Savannah River Site, Aiken, South Carolina*, DOE/EIS-0147, Savannah River Operations Office, Aiken, South, Carolina.

DOE (U.S. Department of Energy), 1991, *Draft Environmental Impact Statement for the Siting, Construction, and Operation of New Production Reactor Capacity*, DOE/EIS-0144D, Office of New Production Reactors, Washington, D.C.

- DOE (U.S. Department of Energy), 1992, *Environmental Assessment, Consolidated Incineration Facility, Savannah River Site*, DOE/EA-0400, Office of Environmental Restoration and Waste Management, Savannah River Plant, Aiken, South Carolina.
- DOE (U.S. Department of Energy), 1993a, *Environmental Assessment, Treatment of M-Area Mixed Wastes at the Savannah River Site*, DOE/EA-0918, Savannah River Operations Office, Aiken, South Carolina, August.
- DOE (U.S. Department of Energy), 1993b, *Occupational Injury and Property Damage Summary, January - December 1992*, DOE/EH/10570-H1, SPMS Maintenance and Operations, EG&G Idaho, Inc., Idaho Falls, Idaho.
- DOE (U.S. Department of Energy), 1993c, *Introduction to Natural Resources Management at the Savannah River Site*, Savannah River Operations Office, Aiken, South Carolina.
- DOE (U.S. Department of Energy), 1993d, *Environmental Assessment for Natural Resource Management Activities at the Savannah River Site*, DOE-EA-0826, Savannah River Operations Office, Aiken, South Carolina, July.
- DOE (U.S. Department of Energy), 1994a, *FY 1994 Draft Site Development Plan*, Savannah River Operations Office, Aiken, South Carolina, June.
- DOE (U.S. Department of Energy), 1994b, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, DOE-STF-3009-94, Washington, D.C.
- DOE (U.S. Department of Energy), 1994c, *Final F-Canyon Plutonium Solutions Environmental Impact Statement*, DOE/EIS-0219, Savannah River Operations Office, Aiken, South Carolina.
- DOE (U.S. Department of Energy), 1994d, *Final Supplemental Environmental Impact Statement Defense Waste Processing Facility*, DOE/EIS-0082S, Savannah River Operations Office, Aiken, South Carolina.
- DOE (U.S. Department of Energy), 1995a, Record of Decision, *Defense Waste Processing Facility at the Savannah River Site*, Savannah River Operations Office, Aiken, South Carolina, 60 *Federal Register* 18589, April 12.

DOE (U.S. Department of Energy), 1995b, Record of Decision, *Final F-Canyon Plutonium Solutions Environmental Impact Statement*, Savannah River Operations Office, Aiken, South Carolina, 60 *Federal Register* 9824, February 22.

TC | DOE (U.S. Department of Energy), 1995c, *Draft Interim Management of Nuclear Materials Environmental Impact Statement*, DOE/EIS-0220D, Savannah River Operations Office, Aiken, South Carolina, March.

DOE (U.S. Department of Energy), 1995d, *Final Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, Volume 1, Appendix C, Savannah River Spent Nuclear Fuel Management Program*, DOE/EIS-0203-F, Idaho Operations Office, Idaho Falls, Idaho.

DOE (U.S. Department of Energy), 1995e, "Record of Decision for Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs," 60 FR 28680, June 1.

DOT (U.S. Department of Transportation), 1982, *Large Truck Accident Causation*, DOT-HS-806300, National Highway Traffic Safety Administration, Washington, D.C.

Ebasco, 1992, *Master Plan for Solid Waste Treatment Complex Document*, WSRC-TR-92-362, Westinghouse Savannah River Company, Aiken, South Carolina.

Eckerman, K. F., F. J. Congel, A. K. Roecklein, and W. J. Pasciak, 1980, *Users Guide to GASPAR Code*, NUREG-0597, U.S. Nuclear Regulatory Commission, Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1984, *Assessing the Releases and Costs Associated with Truck Transport of Hazardous Waste*, PB84-224468, Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1985, *Office of Air Quality Planning and Standards - Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*, Section 11.2.3.1, Fourth Edition, Research Triangle Park, North Carolina, September.

EPA (U.S. Environmental Protection Agency), 1988, *A Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*, EPA-450/4-88-009, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, September.

- EPA (U.S. Environmental Protection Agency), 1990, *Toxic Air Pollution Emission Factors – A Compilation for Selected Air Toxic Compounds and Sources*, EPA-450/2-90-011, October.
- 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.
- EPA (U.S. Environmental Protection Agency), 1994, *Integrated Risk Information System*, "Toxicology Information Program," National Library of Medicine, October 2, 1994. | TC
- Hamby, D. M., 1991, *LADTAP XL: An Improved Electronic Spreadsheet Version of LADTAP II*, WSRC-RP-91-975, Westinghouse Savannah River Company, Aiken, South Carolina. | TE
- Hamby, D. M., 1992, *Verification of the GASPARE Dose Assessment Module Used in MAXIGASP and POPGASP*, WSRC-RP-92-418, Savannah River Laboratory, Aiken, South Carolina.
- Henry, V. G., 1986, U.S. Department of the Interior, Fish and Wildlife Service, Asheville, North Carolina, personal communication with C. G. Halsted, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, February 21.
- Hess, M. L., 1994a, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, "Air Emissions from Construction Activities," ESH-NEP-94-0196, October 14.
- Hess, M. L., 1994b, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, "Facilities with Negligible Emissions," ESH-NEP-94-0190, October 13.
- Hess, M. L., 1994c, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, "WMEIS Transportation Data," ESH-NEP-94-0134, September 22.
- Hess, M. L., 1994d, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, "Truck Traffic Associated with Construction," ESH-NEP-94-0162, August 30.

- TC Hess, M. L., 1995a, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, "WSRC Data Transmittal - Complete Copy of Cost Model for WMEIS," ESH-NEP-95-0078, May 5.
- TC Hess, M. L., 1995b, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, "WSRC Data Transmittal - Revised Facility Costs for the No-Action Alternative and Revised Employees for Alternative A Minimum Forecast (U)," ESH-NEP-95-0085, May 16.
- TE Hess, M. L., 1995c, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to H. L. Pope, U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina, "WSRC Data Transmittal – Hamby's Computer Calculations," ESH-EP-95-0011, June 5.
- TC HNUS (Halliburton NUS Corporation), 1995a, *Transportation Radiological Analysis for the Waste Management Environmental Impact Statement*, Savannah River Center, Aiken, South Carolina.
- HNUS (Halliburton NUS Corporation), 1995b, *Computer printouts generated from the Regional Economic Models, Inc. (REM), Economic-Demographic Forecasting and Simulation Model for the SRS Region of Influence*, Savannah River Center, Aiken, South Carolina.
- ICRP (International Commission on Radiological Protection), 1991, *1990 Recommendations of the International Commission of Radiological Protection*, ICRP Publication 60, Annals of the ICRP, Volume 21, Number 1-3, Pergammon Press, New York, New York.
- LeMaster, E. T., 1994a, Savannah River Forest Station, Aiken, South Carolina, Personal communication to R. K. Abernethy, Halliburton NUS Corporation, Aiken, South Carolina, "Red-cockaded woodpecker survey of compartment 49 stands 6 and 8," November 3.
- LeMaster, E. T., 1994b, Savannah River Forest Station, Aiken, South Carolina, Personal communication to R. K. Abernethy, Halliburton NUS Corporation, Aiken, South Carolina, "Locations of rare plants located during 1992 and 1994 surveys of E-Area," September 27.

- Martin Marietta (Martin Marietta Energy Systems), EG&G (EG&G-Idaho), and WSRC (Westinghouse Savannah River Company), 1994, *Radiological Performance Assessment for the E-Area Vaults Disposal Facility*, WSRC-RP-94-218, Westinghouse Savannah River Company, Aiken, South Carolina.
- Mulholland, J. A., and M. G. Robinson, 1994, *Dose Comparison for Air Emissions from the Incineration and Compaction of SRS Low-Level Radioactive Job Control Wastes*, GT/ERDA-94041-001, Revision 3.
- Neuhauser, K. S. and F. L. Kanipe, 1992, *RADTRAN: Volume 3 User Guide*, SAND89-2370; TTC-0943; UC-722, Sandia National Laboratories, Albuquerque, New Mexico.
- NIOSH (National Institute of Safety and Health), 1990, *Pocket Guide to Chemical Hazards*, National Institute for Occupational Safety and Health, Cincinnati, Ohio.
- NRC (U.S. Nuclear Regulatory Commission), 1977, *Final Environmental Impact Statement on the Transportation of Radioactive Material by Air and Other Modes*, NUREG-0170, Washington, D.C.
- NRC (U.S. Nuclear Regulatory Commission), 1994, *Dose Commitments Due to Radioactive Releases from Nuclear Power Plant Sites in 1991*, NUREG/CR-2850, Washington, D.C.
- NUS (NUS Corporation), 1991, *Update to the Air Quality Cooling Tower, and Noise Impact Analyses in Support of the New Production Reactor Environmental Impact Statement*, Aiken, South Carolina.
- Rollins, E. M., 1995, Halliburton NUS Corporation, Aiken, South Carolina, Interoffice Memorandum to B. H. Bradford, Halliburton NUS Corporation, Aiken, South Carolina, "Traffic Analysis for Waste Management Environmental Impact Statement," RHSES-001, Revision 1, June 30.
- Sagendorf, J. F., J. T. Croll, and W. F. Sandusky, 1982, *XOQDOQ: Computer Program for the Meteorological Evaluations of Routine Effluent Releases at Nuclear Power Stations, Final Report*, NUREG/CR-2919, U.S. Nuclear Regulatory Commission, Washington, D.C.
- Sassaman, K. E., 1994, Savannah River Archaeological Research Program, The University of South Carolina, Columbia, South Carolina, Interoffice Memorandum to L. S. Moore, Halliburton NUS Corporation, Aiken, South Carolina, "E-Area Archaeological Survey," September 19.

- SCDHEC (South Carolina Department of Health and Environmental Control), 1976, South Carolina Code of Laws, SCDHEC Regulation 61-62, "Air Pollution Control Regulations and Standards," Columbia, South Carolina.
- SCDHEC (South Carolina Department of Health and Environmental Control), 1992, *1992 Air Pollution Measurements of the South Carolina Air Quality Surveillance Network*, Columbia, South Carolina.
- SCDOT (South Carolina Department of Transportation), 1992, *1992 South Carolina Traffic Accident Fact Book*, Columbia, South Carolina.
- Simpkins, A. A., 1994a, Westinghouse Savannah River Company, Aiken, South Carolina, Internal Memorandum to J. J. Mayer, "Waste Management EIS - Environmental Dosimetry Calculations," SRT-ETS-940121, August 26.
- Simpkins, A. A., 1994b, Westinghouse Savannah River Company, Aiken, South Carolina, Internal Memorandum to C. B. Shedrow, "Interim Management of Nuclear Materials EIS - Environmental Dosimetry Calculations," SRT-ETS-940079, June 3.
- Smith, W. B., 1989, *Draft Traffic Services Report, Savannah River Plant*, Wilbur B. Smith Associates, Columbia, South Carolina, March 24.
- SRARP (Savannah River Archaeological Research Program), 1989, *Archaeological Resource Management Plan of the Savannah River Archaeological Research Program*, Savannah River Archaeological Research Program, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia, South Carolina, December.
- Stewart, J., 1994, *Air Dispersion Modeling for Waste Management Environmental Impact Statement (U)*, WSRC-RP-94-1271, Westinghouse Savannah River Company, Aiken, South Carolina.
- Swygert, R., 1994, Westinghouse Savannah River Company, Aiken, South Carolina, Interoffice Memorandum to E. M. Rollins, Halliburton NUS Corporation, Aiken, South Carolina, "Savannah River Site Truck Traffic," September 30.
- Toblin, A., 1995, Halliburton NUS Corporation, Aiken, South Carolina, Interoffice Memorandum, "Calculations of Groundwater and Surface Water Radionuclide Concentrations Resulting from Disposal in Vaults and Trenches for SRS - Waste Management EIS," May 15.

TRB (Transportation Research Board), 1985, "Highway Capacity Manual," *National Research Council Special Report 209*, Washington, D.C.

Treyz, G. I., D. S. Rickman, and G. Shao, 1992, "The REMI Economic - Demographic Forecasting and Simulation Model," *International Regional Science Review*, Vol. 14, No. 3, pp. 221-253.

Turner, K., 1994, Westinghouse Savannah River Company, Human Resources, Aiken, South Carolina, personal communication with E. M. Rollins, Halliburton NUS Corporation, Aiken, South Carolina, "SRS Headcount," March 31.

USDA (U. S. Department of Agriculture), 1990, *Soil Survey of Savannah River Plant Area, Parts of Aiken, Barnwell, and Allendale Counties, South Carolina*, Soil Conservation Service, Washington, D.C.

USFWS (U.S. Fish and Wildlife Service), 1993, 58 FR 188, "50 CFR Part 17, Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species," p. 51144-51190.

Wike, L. D., R. W. Shipley, J. A. Bowers, A. L. Bryan, C. L. Cummins, B. R. Del Carmen, G. P. Friday, J. E. Irwin, H. E. Mackey, J. J. Mayer, E. A. Nelson, M. H. Paller, V. A. Rogers, W. L. Specht, and E. W. Wilde, 1994, *SRS Ecology Environmental Information Document*, WSRC-TR-93-496, Westinghouse Savannah River Company, Aiken, South Carolina.

WSRC (Westinghouse Savannah River Company), 1991a, *Savannah River Site Best Management Practices Plan*, WSRC-IM-90-49, Aiken, South Carolina, February.

WSRC (Westinghouse Savannah River Company), 1991b, *Savannah River Site Spill Prevention, Control, and Countermeasure Plan*, WSRC-IM-90-48, Aiken, South Carolina, January 21.

WSRC (Westinghouse Savannah River Company), 1991c, *Support Facilities Descriptions for the New Production Reactor at Savannah River - Heavy Water Reactor (U)*, WSRC-RP-89-263, Version 4, Aiken, South Carolina, April.

WSRC (Westinghouse Savannah River Company), 1992a, *Solid Waste Operations Erosion and Sedimentation Control Maintenance Program Plan - E-Area*, WSRC-IM-92-0693, Aiken, South Carolina, December.

- WSRC (Westinghouse Savannah River Company), 1992b, *Evaluation of Accident Risks in the Transportation of Hazardous Materials by Truck and Rail at the Savannah River Site (U)*, WSRC-RP-89-715, Revision 1, Aiken, South Carolina, September.
- WSRC (Westinghouse Savannah River Company), 1992c, *Toxic Chemical Hazard Classification and Risk Acceptance Guidelines for Use in DOE Facilities (U)*, WSRC-MS-92-206, Revision 1, Aiken, South Carolina, June.
- WSRC (Westinghouse Savannah River Company), 1993a, *Savannah River Site Storm Water Pollution Prevention Plan*, WSRC-IM-93-28, Aiken, South Carolina, April 1.
- WSRC (Westinghouse Savannah River Company), 1993b, *SCDHEC Regulation No. 62.5 Standard No. 2 and Standard No. 8, Compliance Modeling Input/Output Data*, ESH-ESS-93-0531, Aiken, South Carolina.
- WSRC (Westinghouse Savannah River Company), 1994a, *DOE Directive Compliance Assessment and Implementation Report*, WSRC-RP-93-668-044, Revision 1, Aiken, South Carolina, September 20.
- WSRC (Westinghouse Savannah River Company), 1994b, *HLW System Plan Revision 2*, HLW-OVP-94-0005, Aiken, South Carolina.
- WSRC (Westinghouse Savannah River Company), 1994c, *Draft 1994 Land-Use Baseline Report Savannah River Site*, Aiken, South Carolina, September.
- WSRC (Westinghouse Savannah River Company), 1994d, *1994 Savannah River Site ALARA Goals*, ESH-PAS-9400112, Aiken, South Carolina, March 4.
- WSRC (Westinghouse Savannah River Company), 1994e, *Bounding Accident Determination for the Accident Input Analysis of the SRS Waste Management Environmental Impact Statement*, WSRC-TR-94-0469, Revision 0, Aiken, South Carolina, October.
- WSRC (Westinghouse Savannah River Company), 1994f, *Solid Waste Accident Analysis in Support of the Savannah River Waste Management Environmental Impact Statement*, WSRC-TR-94-0265, Revision 0, Savannah River Site, Aiken, South Carolina, July.

WSRC (Westinghouse Savannah River Company), 1994g, *Liquid Waste Accident Analysis in Support of the Savannah River Waste Management Environmental Impact Statement*, WSRC-TR-94-0271, Revision 0, Savannah River Site, Aiken, South Carolina, July.

WSRC (Westinghouse Savannah River Company), 1994h, *AXAIR89Q Users Manual*, WSRC-RP-94-313, Aiken, South Carolina.

WSRC (Westinghouse Savannah River Company), 1994i, *Savannah River Site Environmental Report for 1993*, WSRC-TR-94-075, Aiken, South Carolina.

TC

## CHAPTER 5. FEDERAL AND STATE LAWS, CONSULTATIONS, AND REQUIREMENTS

This chapter identifies regulatory requirements and evaluates their applicability to the alternatives considered in this environmental impact statement (EIS). These requirements are established by major federal statutes that impose requirements on the U.S. Department of Energy (DOE). In addition, there are other federal and state laws, Executive Orders, DOE Orders, regulations, and other compliance orders and agreements applicable to the management of waste at the Savannah River Site (SRS). More detailed information on SRS regulatory requirements for waste management is available in *Final Environmental Impact Statement, Waste Management Activities for Groundwater Protection* (DOE 1987). Existing environmental permits at SRS are listed in Appendix B of the *Savannah River Site Environmental Report for 1993* (Arnett, Karapatakis, and Mamatey 1994). Table 5-1 summarizes the permit and approval status of SRS waste management facilities. | TE

Section 5.1 discusses regulatory requirements applicable to the no-action alternative. Section 5.2 addresses differences in the regulatory requirements that apply to the no-action alternative and the other alternatives, and any differences related to the waste volumes. A number of requirements apply to all the alternatives. When that is the case, Section 5.1 includes a discussion of the requirement, which is not repeated in Section 5.2.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 5.1 No-Action Alternative

#### 5.1.1 NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) of 1969 (42 USC §4321 *et seq.*) requires federal agencies to evaluate the effect proposed actions would have on the quality of the human environment and to document this evaluation with a detailed statement. NEPA requires consideration of environmental impacts of an action during the planning and decisionmaking stages of a project.

**Table 5-1. Permit and approval status of existing and planned SRS waste management facilities.**

Facility	NEPA <sup>a</sup>	Permitting and reporting requirements							Subjects considered in NEPA			
		AEA <sup>b</sup>	CERCLA <sup>c</sup>	EPCRA <sup>d</sup>	RCRA <sup>e</sup>	CWA <sup>f</sup>	SDWA <sup>g</sup>	CAA <sup>h</sup>	Wetlands/ floodplain Exec. Orders	Endangered Species Act/others	Environmental justice <sup>i</sup>	Cultural resources
E-Area Vaults	No action <sup>j</sup> Other NEPA <sup>k</sup>	S	NA	ON	NA	NA	P	NA	√	★	—	★
Low-Level Radioactive Waste Disposal Facility	No action Other NEPA	S	NA	ON	NA	NA	P	NA	★	★	—	★
Compactors	No action	S	NA	ON	NA	NA	P	NA	★	√	√	√
Consolidated Incineration Facility - Construction	No action Other NEPA	S	NA	ON	P	NA	P	CP	★	★	—	★
Consolidated Incineration Facility - Operation	Proposed action	S	NA	ON	NA	NA	P	PR	√	√	√	√
HW/MW Disposal Vaults	No action Other NEPA	S	NA	ON	PS	NA	P	NA	★	★	—	★
Mixed Waste Storage Buildings and Pads 20-22	No action Other NEPA	S	NA	ON	I/PS	NA	P	NA	★	★	—	★
Hazardous Waste Storage Facility	No action	NA	NA	ON	P	NA	P	NA	√	√	√	√
M-Area Vendor Treatment Facility	No action Other NEPA	S	NA	ON	NA	PS	P	CP/ OPS	★	★	—	★
M-Area Liquid Effluent Treatment Facility	No action	S	NA	ON	NA	P	P	PR	√	√	√	√
Process Waste Interim Treatment/Storage Facility	No action	S	NA	ON	I/PS	NA	P	PR	√	√	√	√
Burial Ground Solvent Tanks	No action	S	NA	ON	I	NA	P	NA	√	√	√	√
SRTC Mixed Waste Storage Tanks	No action	S	NA	ON	I	NA	P	NA	√	√	√	√
Transuranic Waste Storage Pads	No action Other NEPA	S	NA	ON	I	NA	P	NA	★	★	—	★
Experimental Transuranic Waste Assay Facility	No action	S	NA	ON	I	NA	P	NA	√	√	√	√
F- and H-Area Tank Farms	No action Other NEPA	S	NA	ON	NA	P	P	NA	★	★	—	★
Replacement HLW Evaporator	No action Other NEPA	S	NA	ON	NA	P	P	NA	★	★	√	★

5-2

**Table 5-1. (continued).**

Facility	NEPA <sup>a</sup>	Permitting and reporting requirements							Subjects considered in NEPA			
		AEA <sup>b</sup>	CERCLA <sup>c</sup>	EPCRA <sup>d</sup>	RCRA <sup>e</sup>	CWA <sup>f</sup>	SDWA <sup>g</sup>	CAA <sup>h</sup>	Wetlands/ floodplain Exec. Orders	Endangered Species Act/others	Environmental justice <sup>i</sup>	Cultural resources
F/H-Area Effluent Treatment Facility	No action Other NEPA	S	NA	ON	NA	P	P	NA	★	★	—	★
Defense Waste Processing Facility	No action Other NEPA	S	NA	ON	NA	P	P	CP	★	★	★	★
Organic Waste Storage Tank	No action Other NEPA	S	NA	ON	I/PS	NA	P	OP	★	★	★	★

- a. NEPA = National Environmental Policy Act.
- b. AEA = Atomic Energy Act.
- c. CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
- d. EPCRA = Emergency Planning and Community Right-to-Know Act.
- e. RCRA = Resource Conservation and Recovery Act.
- f. CWA = Clean Water Act.
- g. SDWA = Safe Drinking Water Act.
- h. CAA = Clean Air Act.
- i. The Executive Order on environmental justice was issued in 1994. NEPA documents prepared for facilities built before 1994 do not address environmental justice.
- j. Included in the no-action alternative of this EIS.
- k. Subject of a previous NEPA review (i.e., EIS, environmental assessment, or categorical exclusion).

- S = subject to requirements.
- NA = requirements not applicable.
- ON = ongoing consultation/reporting requirements.
- P = permitted or approved.
- Unk = requirements unknown.
- CP = construction permit.
- PS = permit application submitted.
- I = operating under an interim permit.
- OPS = operating permit has been submitted.
- PR = permit will be required.
- OP = operating permit.
- HW/MW = hazardous waste/mixed waste.
- TRU = transuranic waste.
- HLW = high-level waste.
- SRTC = Savannah River Technology Center.
  
- ★ = considered in previous NEPA review.
- √ = considered in this EIS.
- = previous NEPA documentation did not require an analysis of environmental justice.

TE | The Council on Environmental Quality has issued regulations that federal agencies must follow (40 CFR  
TE | 1500 - 1508); agencies were also directed to develop their own regulations to ensure compliance with  
TE | NEPA requirements. DOE's regulations can be found at 10 CFR 1021. An agency is required to prepare  
TE | an EIS when it proposes a major federal action that may significantly affect the environment.

TE | **Status** – Analyses presented in this EIS describe the environmental impacts of the alternatives.  
TE | Additional NEPA analyses may be required before some facilities could be constructed.

### 5.1.2 ATOMIC ENERGY ACT

TE | The Atomic Energy Act of 1954 (42 USC § 201 *et seq.*) makes the federal government responsible for  
regulatory control of the production, possession, and use of three types of radioactive material: source,  
special nuclear, and byproducts. The Atomic Energy Act also requires DOE to establish standards that  
protect health and minimize dangers to life or property from activities under DOE's jurisdiction.  
Pursuant to the Atomic Energy Act, DOE established an extensive system of standards and requirements,  
called DOE Orders, to ensure compliance with the Atomic Energy Act. The Atomic Energy Act and the  
Reorganization Plan No. 3 of 1970 [5 USC (app. at 1343)] and other related statutes gave the U.S.  
Environmental Protection Agency (EPA) responsibility and authority for developing generally applicable  
TE | environmental standards for protecting the environment from radioactive material. EPA has  
promulgated several regulations under this authority, including "Environmental Radiation Protection  
Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic  
Radioactive Wastes" (40 CFR 191).

TE | In response to public comments during the scoping period, DOE presents in Appendix H a comparison of  
alternative regulatory approaches for the disposal of low-level waste. The appendix presents an analysis  
of the similarities and differences in requirements established by DOE and the Nuclear Regulatory  
Commission for the disposal of low-level waste. Table H-1 correlates specific DOE and Nuclear  
Regulatory Commission requirements. The conclusion of the analysis is that DOE regulations are  
substantially equivalent to Nuclear Regulatory Commission regulations.

Appendix H also provides a comparative analysis of DOE and Nuclear Regulatory Commission  
low-level waste disposal requirements with EPA requirements for a hazardous waste landfill. The  
analysis indicates that the vaults proposed for disposal of low-level waste at SRS (discussed in  
Appendix B.8) exceed the EPA hazardous waste landfill requirements.

**Status** – Construction, prestartup evaluations, and operation of radioactive waste management facilities will meet the requirements in DOE Orders and other applicable regulations.

### **5.1.3 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT**

The Comprehensive Environmental Response, Compensation, and Liability Act (42 USC §9601 *et seq.*) (CERCLA; also called the Superfund Act) is administered by EPA. It provides a statutory framework for the cleanup of waste sites containing hazardous substances and requires that facilities have an emergency response program in the event of a release (or threat of release) of a hazardous substance to the environment. CERCLA also includes requirements of reporting to state and federal agencies releases of certain hazardous substances in excess of specified amounts. CERCLA and Executive Order 12580, "Superfund Implementation," require that federal facilities comply with the Act. Releases of hazardous substances occurring during cleanups at waste management facilities are subject to both CERCLA's requirements and to the requirements of DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information."

**Status** – DOE, the South Carolina Department of Health and Environmental Control (SCDHEC), and EPA have signed a Federal Facility Agreement to coordinate cleanups at SRS, as required by Section 120 of CERCLA. Since 1989, SRS has conducted cleanup activities under the framework established in the draft Federal Facility Agreement. The comprehensive remediation of SRS will continue as directed by the Federal Facility Agreement.

### **5.1.4 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT**

The Emergency Planning and Community Right-to-Know Act of 1986 (42 USC §11001 *et seq.*) requires emergency planning and notice to communities and government agencies of the presence and release of specific chemicals. EPA implements the Act under regulations found at 40 CFR 355, 370, and 372. Under Subtitle A of this Act, federal facilities, including those owned by DOE, provide a variety of information (such as inventories of specific chemicals used or stored, and releases that occur from these facilities) to state emergency response commissions and local emergency planning committees to ensure that emergency plans are ready to respond to accidental releases of hazardous substances. Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," requires federal agencies to comply with the Act.

**Status** – Each year SRS submits hazardous chemical inventory and toxic release inventory reports to SCDHEC and to local emergency planning organizations in Aiken, Allendale, and Barnwell Counties, South Carolina. Changes in facility operating status will lead to changes in chemical inventories and use of toxic chemicals; the hazardous chemical inventory and toxic release inventory reports will reflect these changes.

### 5.1.5 RESOURCE CONSERVATION AND RECOVERY ACT

TE | The Resource Conservation and Recovery Act (RCRA) regulates the treatment, storage, and disposal of hazardous and solid waste. RCRA and Executive Order 12088, "Federal Compliance with Pollution Control Standards," require federal facilities to comply with RCRA's requirements. Any state that wants to administer and enforce a hazardous waste program under the requirements of RCRA may apply to EPA for authorization of its program. EPA regulations implementing RCRA are found at 40 CFR 260 - 280. These regulations define hazardous wastes and set forth requirements governing transporting, handling, treating, storing, and disposing of hazardous wastes.

TE | The regulations imposed on managing hazardous wastes vary according to the type and quantity of waste. The method of treatment, storage, and disposal also impacts the extent and complexity of the requirements. RCRA establishes three distinct regulatory programs for different types of waste:

TC | Hazardous and Mixed Waste – EPA has delegated regulatory responsibility over hazardous and mixed (containing both radioactive and hazardous components) wastes to SCDHEC. EPA retains authority to restrict storage and disposal of certain kinds of hazardous wastes, which are referred to as "land disposal restriction wastes." Under the authority of the South Carolina Hazardous Waste Management Act, SCDHEC has established a program for regulating hazardous waste management (South Carolina Hazardous Waste Management Regulations R.61-79.260 through 270). SCDHEC is currently developing programs that will allow EPA to delegate authority over land-disposal-restriction wastes.

DOE and EPA signed a Federal Facility Compliance Agreement regarding land disposal restriction mixed wastes. Among other things, the Agreement requires SRS to provide status reports on construction and operation of various waste management facilities and to obtain permits for the construction and operation of additional facilities to meet SRS's treatment needs for mixed waste. SRS has provided, and will continue to provide, these reports and is preparing the required permit applications.

Underground Storage Tanks – Requirements under RCRA for underground storage tanks apply to tanks containing hazardous substances or petroleum products. Under the South Carolina Underground Storage Tank Act, SCDHEC established a program for implementing RCRA requirements and has issued permits for diesel fuel storage tanks at several SRS waste management facilities. Tanks with high-level radioactive waste are not regulated under RCRA; they are regulated under the Clean Water Act. Below-grade hazardous waste storage tanks are not regulated as underground storage tanks but as hazardous waste.

Nonhazardous Solid Waste – Under the authority of the South Carolina Pollution Control Act and the South Carolina Solid Waste Policy and Management Act, SCDHEC established a program for regulating nonhazardous solid waste disposal units. South Carolina Municipal Solid Waste Landfill Regulations (R.61-107.258) implement RCRA regulations. South Carolina Construction, Demolition, and Land Clearing Debris Landfill Regulations (R.61-107.11) regulate landfills for the disposal of construction debris. South Carolina Industrial Landfill Regulations (R.61-66) regulate industrial landfills. Nonhazardous solid waste is not within the scope of this EIS.

**Status** – The SRS RCRA Part B permit was issued in 1987 and modified in 1992. The permit covers storage of wastes at four buildings, treatment at the Consolidated Incineration Facility, and maintenance and groundwater remediation at three closed waste units. Other waste management facilities at SRS are presently operating under interim status: SRS submitted to SCDHEC a permit application that covers those facilities' activities and they can continue to operate in conformance with regulatory requirements while applications are reviewed by the regulatory agencies and a final permit decision is issued. Additional waste management facilities (e.g., F- and H-Area tank farms, Replacement High-Level Waste Evaporator) are currently operating under or will operate under Clean Water Act permits. Although these facilities manage hazardous wastes, they are exempt from RCRA permitting requirements under its exclusion for wastewater treatment facilities.

Under the no-action alternative, commitments under the Land Disposal Restrictions Federal Facility Compliance Agreement to treat mixed waste would not be met because only ongoing waste management activities (primarily storage) would be continued.

The no-action alternative includes continued storage and limited ongoing treatment activities at existing waste management facilities that are permitted or operating under interim status. The no-action alternative includes several additional waste management activities that have not yet occurred, but for which NEPA reviews have been completed or will be completed prior to issuing a Record of Decision for this EIS. These activities include retrieval, sampling, and overpacking of transuranic waste drums

from mounded storage pads; preparation of waste (size reduction and repackaging) in anticipation of treatment; construction and operation of the M-Area Vendor Treatment Facility; and operation of the Mixed Waste Storage Buildings.

### 5.1.6 FEDERAL FACILITY COMPLIANCE ACT

TE | The Federal Facility Compliance Act, enacted on October 6, 1992, waives sovereign immunity for fines  
and penalties for violations of RCRA at federal facilities. However, DOE's immunity continues if DOE  
prepares plans for developing the treatment capacity for mixed waste stored or generated at its facilities.  
TC | The appropriate state agency or EPA must then issue a consent order requiring compliance with the plan.  
DOE is not subject to fines and penalties for RCRA violations involving mixed waste as long as it is in  
compliance with an approved plan and meets all other applicable regulations.

TE | **Status** – DOE published the Interim Mixed Waste Inventory Report in April 1993, annual updates, and  
periodic updates since, describing its inventory of mixed wastes and treatment capabilities. SRS  
prepared a site treatment plan (WSRC 1995), which identifies DOE's preferred approach for treating  
mixed waste at SRS. Under the no-action alternative, commitments under the site treatment plan would  
not be met because only ongoing waste management activities would be continued. The treatment  
TC | capacity required by SRS's plan would not be available and SRS would probably lose its immunity from  
fines and penalties.

### 5.1.7 CLEAN WATER ACT

The objectives of the Clean Water Act are to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 requires all branches of the federal government to comply with federal, state, interstate, and local requirements.

TE | In addition to setting water quality standards for the nation's waterways, the Clean Water Act establishes  
guidelines and limitations for discharges from point-sources and a permitting program known as the  
National Pollutant Discharge Elimination System. The National Pollutant Discharge Elimination System  
program is administered by the Water Management Division of EPA pursuant to regulations at 40 CFR  
122 *et seq.*

TE | The Clean Water Act also requires that EPA establish regulations for permits for stormwater discharges  
associated with industrial activity. Although such discharges require National Pollutant Discharge

Elimination System permits, regulations for separate stormwater permits have not yet been issued by EPA.

EPA has overall responsibility for enforcing the Clean Water Act, but has delegated to SCDHEC primary enforcement authority for waters located within South Carolina. Under the South Carolina Pollution Control Act, SCDHEC operates a permitting program. The Clean Water Act and state regulations do not apply to DOE discharges of radionuclides, which are subject to the Atomic Energy Act.

**Status** – SCDHEC has issued Clean Water Act permits for the F- and H-Area tank farms, Defense Waste Processing Facility, Z-Area Saltstone Facility, Replacement High-Level Waste Evaporator, F/H-Area Effluent Treatment Facility, and M-Area Liquid Effluent Treatment Facility. SCDHEC approved certain discharges from the outfalls at these facilities. DOE has submitted an industrial wastewater treatment permit application for the M-Area Vendor Treatment Facility. SRS is currently in compliance with Clean Water Act requirements.

#### 5.1.8 SAFE DRINKING WATER ACT

The Safe Drinking Water Act protects the quality of public water supplies and other sources of drinking water. It establishes drinking water quality standards that must be met. The Act and Executive Order 12088 direct federal facilities to comply with the Safe Drinking Water Act. EPA has promulgated regulations implementing the Safe Drinking Water Act at 40 CFR 100 - 149. The regulations specify that the average annual concentration of man-made radionuclides in drinking water as delivered to the user shall not produce a dose equivalent to the total body or an internal organ greater than 4 millirem of beta activity per year. EPA has overall regulatory responsibility for the Safe Drinking Water Act, but has delegated primary enforcement responsibility to SCDHEC for public water systems in South Carolina. Under the authority of the South Carolina Safe Drinking Water Act, SCDHEC has established a drinking water regulatory program. At SRS, Westinghouse Savannah River Company operates under the SCDHEC permit program for construction of water supplies. Under this program, Westinghouse Savannah River Company may construct water line extensions that are less than or equal to 2,500 feet long without obtaining construction and operating permits; water line extensions longer than 2,500 feet require formal construction and operating permits.

**Status** – Westinghouse Savannah River Company obtained a construction permit for the water line extension that will serve the Consolidated Incineration Facility.

### 5.1.9 CLEAN AIR ACT

The Clean Air Act establishes a national program to protect air quality and regulates sources of air pollution. Requirements include permits, emissions and operating standards, and monitoring. The Act is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Act and Executive Order 12028 require that each federal agency, such as DOE, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution.

TE | The Act requires EPA to establish National Ambient Air Quality Standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated effect of a regulated pollutant. It also requires establishment of national standards of performance for new or modified stationary sources of air pollutants (42 USC §7411) and requires specific emission increases to be evaluated to prevent significant deteriorations in air quality. Hazardous air pollutants, including radionuclides, are regulated separately. Air emissions are regulated by EPA in 40 CFR 50 - 99. In particular, radionuclide emissions are regulated under the National Emission Standard for Hazardous Air Pollutants program (40 CFR 61).

EPA has overall enforcement responsibility through a regulatory program (40 CFR 50 - 87); it can delegate primary authority to states. For facilities located within South Carolina, EPA has retained authority over DOE radionuclide emissions (40 CFR 61) and has delegated to SCDHEC lead responsibility for the rest of the regulated pollutants and other requirements. Under the authority of the South Carolina Pollution Control Act, SCDHEC established the state's air pollution control program. SCDHEC issues construction permits for construction and testing of facilities, and operating permits after satisfactory startup testing and inspection.

TE | **Status** – The Air Quality Control construction permit for the Consolidated Incineration Facility was granted by SCDHEC on November 25, 1992. Emergency power diesel generators are covered under this permit. The M-Area Vendor Treatment Facility emergency diesel generator is exempt from permitting requirements because of its limited capacity and expected use. SCDHEC has granted a permitting exemption for the emergency diesel generator at the Replacement High-Level Waste Evaporator. SRS is currently in compliance with the requirements of the Clean Air Act.

### 5.1.10 ENDANGERED SPECIES ACT AND OTHER STATUTES

The Endangered Species Act is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Endangered Species Act also promotes biodiversity of genes, communities, and ecosystems. The U.S. Department of Commerce (National Marine Fisheries Service) and the U.S. Department of the Interior (U.S. Fish and Wildlife Service) jointly administer the Act. Section 7 of the Act requires federal agencies to consult with the National Marine Fisheries Service or the U.S. Fish and Wildlife Service, as appropriate, to ensure that any action it authorizes, funds, or performs is not likely to jeopardize the continued existence of any endangered or threatened species or to result in the destruction or adverse modification of any critical habitat of such species unless the agency receives an exemption in accordance with Section 7(h).

Several other statutes require federal and state agencies to consider impacts that their actions would have on biological resources. These acts include the Fish and Wildlife Coordination Act, the Anadromous Fish Conservation Act, the Migratory Bird Treaty Act, the Bald Eagle Protection Act, and the South Carolina Nongame and Endangered Species Conservation Act.

**Status** – Prior to disturbing undeveloped land, DOE would consult with the U.S. Fish and Wildlife Service to determine the type and scope of a required biological assessment. This consultation would provide DOE with the information necessary to avoid or mitigate impacts to threatened and endangered species. Appendix J documents DOE's consultation with the U.S. Fish and Wildlife Service.

TE

TC

### 5.1.11 EXECUTIVE ORDERS 11990 AND 11988

Executive Order 11990, "Protection of Wetlands," requires government agencies to avoid short- and long-term adverse impacts to wetlands whenever a practicable alternative exists. Executive Order 11988, "Floodplain Management," directs federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken. Impacts to floodplains are to be avoided to the extent practicable. DOE issued regulations (10 CFR 1022) that establish procedures for compliance with these Executive Orders.

**Status** – Because no activities in wetlands would occur under the no-action alternative, no wetlands would be destroyed.

TC

### 5.1.12 EXECUTIVE ORDER 12898

Executive Order 12898, "Environmental Justice in Minority and Low-Income Populations," requires that each federal agency "make environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects due to its programs, policies, or activities on minority or low-income populations."

TE | **Status** – This EIS incorporates environmental justice into its analyses of the no-action alternative.

### 5.1.13 CULTURAL RESOURCES

Cultural resources on SRS are subject to the American Indian Religious Freedom Act (42 USC § 1996), the Native American Graves Protection and Repatriation Act (25 USC § 3001), and the National Historic Preservation Act (16 USC § 470 *et seq.*). The American Indian Religious Freedom Act of 1978 reaffirms Native American religious freedom under the First Amendment and protects and preserves the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions.

TE | The Act requires that federal actions avoid interfering with access to sacred locations and traditional resources that are integral to the practice of those religions. The Native American Graves Protection and Repatriation Act of 1990 directs the Secretary of the Interior to promote repatriation of federal archaeological collections and collections held by museums receiving federal funding that are culturally affiliated with Native American tribes. The American Indian Religious Freedom Act and the Native American Graves Protection and Repatriation Act require DOE to notify affected tribes if sites and items of religious importance or human remains and other objects belonging to Native Americans are discovered on SRS.

Construction of waste management facilities might unearth artifacts and destroy historic sites regulated by these statutes. Upon discovery (and before excavation) of human remains, the affiliated tribe(s) would be consulted to ensure the appropriate disposition of the human remains and any other objects. DOE has committed to providing the Yuchi Tribal Organization, Inc., the National Council of the Muskogee Creek, and the Indian People's Muskogee Tribal Town Confederacy copies of environmental impact documentation for DOE activities in the Central Savannah River Valley.

The National Historic Preservation Act, as amended, provides that sites with significant national historic value be placed on the National Register of Historic Places. There are no permits or certifications required under the Act. However, if a particular federal activity may impact a historic property, consultation with the Advisory Council on Historic Preservation is required and will usually lead to a

Memorandum of Agreement containing stipulations that must be followed to minimize adverse impacts. Coordination with the State Historic Preservation Officer also ensures that potentially significant sites are properly identified and appropriate mitigation actions are implemented.

**Status** – DOE will comply with these Acts with regard to artifacts discovered during implementation of the no-action alternative.

## 5.2 Other Alternatives

This section discusses the permit status for the construction and operation of waste management facilities that would be implemented under the moderate treatment configuration (alternative B). It also applies to facilities that would be implemented under the limited treatment (alternative A) and extensive treatment (alternative C) configurations.

	Min.	Exp.	Max.
No Action			
A			
B			
C			

### 5.2.1 EXPECTED WASTE FORECAST

**National Environmental Policy Act** – No change from the no-action alternative.

**Atomic Energy Act** – No change from the no-action alternative.

**Comprehensive Environmental Response, Compensation, and Liability Act** – No change from the no-action alternative.

**Emergency Planning and Community Right-to-Know Act** – No change from the no-action alternative.

**Resource Conservation and Recovery Act** – Facilities required for implementation of the moderate treatment alternative would be subject to RCRA, the South Carolina Hazardous Waste Management Act, and the South Carolina Hazardous Waste Management Location Standards.

All activities under the moderate treatment configuration would have to be coordinated and compatible with requirements of the Land Disposal Restrictions Federal Facility Compliance Agreement.

Treatment of low volume and one-time only waste streams in accordance with generator accumulation requirements (South Carolina Code of Laws of 1976, as amended, R.61-79.262.34) or via treatability studies is being considered. RCRA permitting requirements would not apply to these situations.

TE | **Federal Facility Compliance Act** – The *SRS Proposed Site Treatment Plan* (WSRC 1995), which identifies DOE's preferred approach to treating mixed wastes at SRS, was submitted to the state of South Carolina in accordance with requirements of the Federal Facility Compliance Act. The site treatment  
TE | plan addresses mixed wastes currently stored and those wastes SRS anticipates will be generated in the next 5 years. All mixed waste management activities would have to comply with the requirements of the approved site treatment plan and its implementing order.

**Clean Water Act** – No change from the no-action alternative.

TE | **Safe Drinking Water Act** – DOE does not know at this time which permitting requirements would apply to proposed projects, because the precise location and water supply requirements for these projects are unknown. Permits may be required if water-line extensions are needed for additional waste management facilities considered in the alternatives.

TE | **Clean Air Act** – The emission permit for construction of the Consolidated Incineration Facility was issued by SCDHEC in November 1992. Before the Consolidated Incineration Facility can operate, approval for startup must be granted. Air permits would be required for emergency power diesel generators for proposed new waste management facilities. At SRS, air quality permits must also be acquired before a construction permit is granted.

TC | **Endangered Species Act and Other Statutes** – The U.S. Fish and Wildlife Service has concurred with DOE's conclusion that DOE's plans to construct and operate additional waste management facilities within the uncleared portions of E-Area should not affect any threatened or endangered species. The concurrence letters are included in Appendix J.

TE | **Executive Orders 11990 and 11988** – Facilities and activities considered under the three alternatives may affect wetlands or floodplains, but this cannot be determined until the precise location of any additional facilities is known. Impacts to any wetland that could not be avoided would need to be identified as an unavoidable and irretrievable loss in this EIS. Under the alternatives, any impacts to wetlands would be lessened by mitigation as required by the Clean Water Act. Under 10 CFR 1022, floodplain and wetland assessments would be required for any proposed action in a floodplain or wetland.

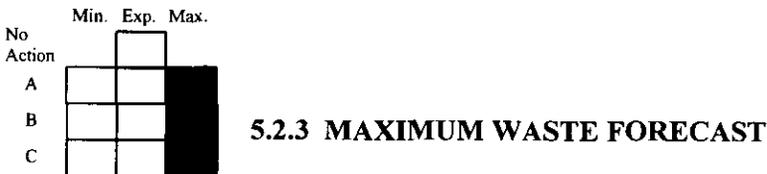
**Executive Order 12898** – No change from the no-action alternative.

**Cultural Resources** – No change from the no-action alternative.



The difference between the minimum and expected waste forecasts is that certain facilities may not be needed. Since the waste volumes anticipated in these configurations would require less treatment capacity, SRS may be able to implement additional low-volume or one-time only waste management options that would not require permit modifications (Clean Air Act, Clean Water Act, RCRA). SRS would receive wastes that it had the best capability to treat or dispose of, and would ship some of its own wastes to facilities better equipped to manage them.

TE



Regulatory requirements for the maximum waste forecast are the same as those for the expected case. However, permit modifications (Clean Air Act, Clean Water Act, and RCRA) might be required to accommodate the larger volumes of waste. Waste volumes anticipated under this forecast would require additional treatment, storage, and disposal capacity. Under this forecast, the current SRS RCRA permit would need to be modified to increase permitted and/or interim status waste management process capacities. The potential exists to impact wetlands with this forecast. Any impacts to wetlands would be mitigated, as required by the Clean Water Act.

TE

### 5.3 References

Arnett, M. W., L. K. Karapatakis, and A. R. Mamatey, 1994, *Savannah River Site Environmental Report for 1993*, WSRC-TR-94-075, Westinghouse Savannah River Company, Aiken, South Carolina.

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

TE

WSRC (Westinghouse Savannah River Company), 1995, *Savannah River Site Proposed Site Treatment Plant*, Westinghouse Savannah River Company, Aiken, South Carolina, WSRC-TR-94-0608.

## LIST OF PREPARERS

**NAME:** ROBERT K. ABERNETHY

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Marine Science, Louisiana State University and  
Agricultural and Mechanical College, 1986  
B.S., Wildlife Biology, North Carolina State University at  
Raleigh, 1978

**TECHNICAL EXPERIENCE:** Fifteen years experience in wetlands-related wildlife  
management and research, ecological research, coastal area  
management permitting, and regulations enforcement.

**EIS RESPONSIBILITY:** Prepared ecological resources sections in Chapters 3 and 4.

**NAME:** PHILIP B. ALLEN

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Geology, Western Kentucky University, 1989

**TECHNICAL EXPERIENCE:** Five years experience in geology, hydrogeology, and karst  
hydrology.

**EIS RESPONSIBILITY:** Prepared facility descriptions for Appendix B.

**NAME:** ADEL A. BAKR, Ph.D.

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Ph.D., Groundwater Hydrology, New Mexico Institute of  
Mining and Technology, 1976  
M.S., Geophysics, University of Alberta, 1971  
M.S., Isotope Hydrology, University of Cairo, 1969  
B.S., Geology and Physics, University of Assiout, 1963

**TECHNICAL EXPERIENCE:** Thirty years experience in designing, planning, conducting, and  
directing field investigations related to groundwater  
contamination and remediation in a wide range of geologic  
environments.

**EIS RESPONSIBILITY:** Prepared groundwater sections in Chapters 3 and 4.

**NAME:** **JOHN B. BLAND**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.A., Economics, University of South Carolina, 1982  
B.S., Mathematics, Wake Forest University, 1970

**TECHNICAL EXPERIENCE:** *Eleven years experience in environmental and emergency management and planning including emergency exercise development, control, and evaluation.*

**EIS RESPONSIBILITY:** Prepared environmental justice sections in Chapters 3 and 4.

**NAME:** **BRUCE H. BRADFORD, Ph.D.**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Ph.D., Civil Engineering, Colorado State University, 1974  
M.S., Civil Engineering, University of Missouri at Rolla, 1966  
B.S., Civil Engineering, University of Missouri at Rolla, 1965

**TECHNICAL EXPERIENCE:** Twenty-nine years experience in civil engineering, specializing in hydrology, hydraulics, and water resources. As Principal Investigator of the SRS Waste Management EIS, managed all facets of the National Environmental Policy Act process from scoping through distribution of the Final EIS.

**EIS RESPONSIBILITY:** Project Manager. Co-authored Chapter 1; comparison of alternatives and waste management technology screening and selection sections in Chapter 2; and Appendix C. Technical Reviewer.

TE |

**NAME:** **JULEA F. BRADLEY**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Biology, Georgia Southern University, 1987

**TECHNICAL EXPERIENCE:** Five years experience in environmental studies, laboratory programs, and data validation programs; and technical and copy editing.

**EIS RESPONSIBILITY:** Editor. Contributed to the preparation of references sections. Performed number conversions.

**NAME:** **RONALD M. BURD**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Chemistry, Lebanon Valley College, 1950

**TECHNICAL EXPERIENCE:** Forty years experience in nuclear and fossil energy, water and wastewater management, and environmental science.

**EIS RESPONSIBILITY:** Prepared Foreword and Summary. Provided technical input to the Glossary, no-action alternative sections in Chapters 2 and 4, and mitigating measures section in Chapter 4.

**NAME:** **ROBIN F. CALLICOTT**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.A., History, University of South Carolina, 1982

**TECHNICAL EXPERIENCE:** Nine years experience evaluating legislative documents and writing material based on implications of Federal legislation pertaining to environment, health, judiciary, and trade matters.

**EIS RESPONSIBILITY:** Public participation lead. Contributed to the preparation of references sections.

**NAME:** **SHAWN D. CHESNEY**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Health Physics, University of Florida, 1994  
B.S., Health Physics, Bloomsburg University of Pennsylvania,  
1993

**TECHNICAL EXPERIENCE:** Six years experience in environmental health physics.

**EIS RESPONSIBILITY:** Provided technical input to Appendix E. Reviewed health and transportation sections in Chapter 4.

**NAME:** **STEPHEN A. DANKER**

**AFFILIATION:** U.S. Department of Energy, Savannah River Operations Office

**EDUCATION:** M.S., Wildlife Ecology, Mississippi State University, 1979  
B.S., Biology, St. Bernard College, 1970

**TECHNICAL EXPERIENCE:** Twelve years experience in environmental impact statements and impact analyses, and wetlands ecology.

**EIS RESPONSIBILITY:** DOE-SR reviewer for final EIS.

**NAME:** **GREGORY C. DeCAMP**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Biology, Bowling Green State University, 1976  
B.S., Chemistry, Xavier University, 1968

**TECHNICAL EXPERIENCE:** Twenty years applied environmental science and regulatory experience, including managing environmental program evaluations, environmental baseline studies and assessments, and environmental compliance programs involving hazardous waste management.

**EIS RESPONSIBILITY:** Reviewed Appendix H.

**NAME:** **ALAN A. ECKMYRE**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.E., Nuclear Engineering, State University of New York, 1981  
B.S., Business Administration, New York Institute of Technology, 1979

**TECHNICAL EXPERIENCE:** Sixteen years experience in nuclear engineering and environmental consulting.

**EIS RESPONSIBILITY:** Prepared Consolidated Incineration Facility section in Appendix B; waste and materials section in Chapter 3; and waste generation section in Chapter 4. Provided technical input to low-level waste treatment, storage, and disposal; and mixed waste treatment, storage, and disposal sections in Chapter 2.

**NAME:** **ROBERT T. EDGAR, Ph.D.**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Ph.D., Environmental Science, University of Texas at Dallas, 1987  
M.S., Environmental Science, University of Texas at Dallas, 1977  
M.S., Meteorology, New York University, 1971  
B.S., Mathematics, University of North Texas, 1969

**TECHNICAL EXPERIENCE:** Sixteen years technical and managerial experience in air quality monitoring.

**EIS RESPONSIBILITY:** Prepared air resources and nonradiological health sections in Chapters 3 and 4.

**NAME:** **DANIEL M. EVANS**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Planning, University of Tennessee at Knoxville, 1985  
B.A., Political Science, Knox College, 1976

**TECHNICAL EXPERIENCE:** Seventeen years experience in National Environmental Policy Act project management and technical review, socioeconomic impact analysis, transportation impact analysis, and air traffic impact analysis.

**EIS RESPONSIBILITY:** Management reviewer.

**NAME:** **MICHAEL R. FALLIN**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Mechanical and Nuclear Engineering, University of Maryland, 1977

**TECHNICAL EXPERIENCE:** Twenty years experience including mechanical and radiological waste system modification and design, and thermal hydraulic, heat transfer and radiological analyses.

**EIS RESPONSIBILITY:** Contributed to the preparation of Appendix D.

**NAME:** **D. SCOTT FLICKINGER**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.E.M., Natural Resources Economics and Policy, Duke University, 1988  
B.A., Biology and Political Science, Western Maryland College, 1985

**TECHNICAL EXPERIENCE:** Six years experience working with Comprehensive Environmental Response, Compensation, and Liability Act, and Resource Conservation and Recovery Act issues concerning permitting and waste handling.

**EIS RESPONSIBILITY:** Prepared transuranic waste sections in Chapter 2, and Appendix G.

**NAME:** **LESTER G. GERMANY**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Geology, Louisiana Tech University, 1967

**TECHNICAL EXPERIENCE:** Eight years experience with geoscience and environmental projects including groundwater protection.

**EIS RESPONSIBILITY:** Prepared geologic resources sections in Chapters 3 and 4.

**NAME:** **MORTON I. GOLDMAN, Sc.D.**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Sc.D., Massachusetts Institute of Technology, 1960  
M.S., Nuclear Engineering, Massachusetts Institute of Technology, 1960  
M.S., Sanitary Engineering, Massachusetts Institute of Technology, 1960  
B.S., Civil Engineering, New York University, 1948

**TECHNICAL EXPERIENCE:** Forty-five years experience managing complex technical projects including activities in site evaluation and selection, safety analysis, waste management system evaluations, environmental assessments, and impact evaluations for nuclear powerplants and industrial facilities.

**EIS RESPONSIBILITY:** Senior technical reviewer. Prepared Appendix H.

**NAME:** **ANDREW R. GRAINGER**

**AFFILIATION:** U.S. Department of Energy, Savannah River Operations Office

**EDUCATION:** M.S., Wildlife Ecology, Utah State University, 1978  
B.S., Natural Resources, Cornell University, 1975

**TECHNICAL EXPERIENCE:** Sixteen years experience in terrestrial ecology, facility siting, wetlands ecology, and endangered species.

**EIS RESPONSIBILITY:** DOE-SR reviewer for Draft EIS.

**NAME:** **KRISTINE A. GUNTHER**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.B.A., The University of Alabama, 1992  
B.A., Economics, Rhodes College, 1990

**TECHNICAL EXPERIENCE:** Two years experience in conducting socioeconomic studies.

**EIS RESPONSIBILITY:** Prepared socioeconomic and cultural resources sections in Chapters 3 and 4. Coordinated project scheduling for final EIS. | TE

**NAME:** **KATHRYN B. HAUER**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.A., English, College of William and Mary, 1985  
B.A., English, College of William and Mary, 1983

**TECHNICAL EXPERIENCE:** Eight years experience in technical writing, editing, and teaching in both government and business disciplines.

**EIS RESPONSIBILITY:** Editor.

**NAME:** MARY N. HOGANSON

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Biology, Winthrop College, 1989  
B.S., Biology, Newberry College, 1984

**TECHNICAL EXPERIENCE:** Eight years experience in environmental work including waste minimization and pollution prevention.

**EIS RESPONSIBILITY:** Prepared waste minimization and pollution prevention sections in Chapter 2. Provided technical input to waste minimization and pollution prevention strategy for low-level waste, storage and disposal; waste management/pollution prevention strategy for mixed waste; and waste management/pollution prevention strategy for transuranic waste sections in Chapter 2.

**NAME:** THOMAS HOLM-HANSEN

**AFFILIATION:** PRC Environmental Management, Inc.

**EDUCATION:** M.S., Environmental Health, University of Washington, 1981  
B.S., Biological Sciences, University of Connecticut, 1978

**TECHNICAL EXPERIENCE:** Twelve years experience managing radioactive and hazardous waste at DOE sites. Experience includes research, technology transfer, and operations and consulting.

**EIS RESPONSIBILITY:** Co-authored Appendix D.

**NAME:** DALE T. HULS

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S.M.E., Mechanical Engineering, University of Florida, 1991

**TECHNICAL EXPERIENCE:** Ten years experience including the preparation of system analysis reports, special programs, and procedures regarding nuclear operations at SRS.

**EIS RESPONSIBILITY:** Co-authored accidents sections in Chapter 4 and Appendix F.

**NAME:** E. JONATHAN JACKSON

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Soil Science, University of Wisconsin-Madison, 1987  
B.S., Molecular Biology, University of Wisconsin-Madison,  
1981

**TECHNICAL EXPERIENCE:** Twelve years environmental experience including five years hazardous materials management and regulatory compliance.

**EIS RESPONSIBILITY:** Provided technical input to decontamination and decommissioning and environmental restoration sections in Chapter 4.

**NAME:** WILLIAM E. JOYCE

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Chemical Engineering, University of Connecticut, 1968

**TECHNICAL EXPERIENCE:** Twenty-five years experience in environmental assessments, radiological dose assessments, and transportation impacts.

**EIS RESPONSIBILITY:** Provided technical input to radiological sections pertaining to occupational and public health in Chapter 4.

**NAME:** KARA B. LEVINSON

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Civil Engineering, University of Pittsburgh, 1983

**TECHNICAL EXPERIENCE:** Eleven years experience including senior engineer responsibilities in the areas of hazardous waste management and air.

**EIS RESPONSIBILITY:** Contributing author of waste forecast and hazardous waste sections in Chapter 2 and Appendix A. Assisted in preparation of Appendix B.

**NAME:** ANNE C. LOVELL

**AFFILIATION:** PRC Environmental Management, Inc.

**EDUCATION:** B.S., Chemical Engineering, Colorado School of Mines, 1985

**TECHNICAL EXPERIENCE:** Ten years experience in waste management including incineration, process engineering, engineering design, and innovative technologies.

**EIS RESPONSIBILITY:** Co-authored Appendix D.

**NAME:** LISA A. MATIS

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Mechanical Engineering, Stevens Institute of Technology, 1989  
B.S., Chemical Engineering, Stanford University, 1984

**TECHNICAL EXPERIENCE:** Ten years experience as a chemical-environmental engineer including technical support in planning and controlling Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act compliance activities.

**EIS RESPONSIBILITY:** Prepared hazardous and mixed waste treatment, storage, and disposal sections in Chapter 2. Provided technical input to Chapter 4 analyses. Technical reviewer.

**NAME:** ANDREW F. McCLURE, JR.

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Chemical Engineering, Carnegie Mellon University, 1966

**TECHNICAL EXPERIENCE:** Forty years experience in the water/wastewater field, with an emphasis on wastewater treatment activities including permit applications, and permit implementation and monitoring/reporting.

**EIS RESPONSIBILITY:** Prepared surface water sections in Chapters 3 and 4.

**NAME:** KEVIN M. MEEHAN  
**AFFILIATION:** Halliburton NUS Corporation  
**EDUCATION:** B.S., Mechanical Engineering, The Pennsylvania State University, 1990  
**TECHNICAL EXPERIENCE:** Four years experience in safety engineering and safety analysis.  
**EIS RESPONSIBILITY:** Co-authored accidents sections in Chapter 4 and Appendix F.

TE

**NAME:** ROBERT P. MOLINOWSKI  
**AFFILIATION:** PRC Environmental Management, Inc.  
**EDUCATION:** B.S., Electrical Engineering, Florida Institute of Technology, 1988  
**TECHNICAL EXPERIENCE:** Five years experience including engineering design and analysis review, and Naval nuclear operations and engineering.  
**EIS RESPONSIBILITY:** Co-authored Appendix D.

**NAME:** LOUISE S. MOORE  
**AFFILIATION:** Halliburton NUS Corporation  
**EDUCATION:** B.A., Geography, University of Maryland, 1968  
**TECHNICAL EXPERIENCE:** Twenty years experience in developing and leading environmental projects, including 16 years in the energy field.  
**EIS RESPONSIBILITY:** Assistant Project Manager. Prepared Chapter 1. Prepared land use, aesthetic and scenic resources sections in Chapters 3 and 4. Coordinated project scheduling. Technical reviewer.

**NAME:** PHILIP R. MOORE

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Wildlife Biology (Fisheries), Clemson University, 1983  
Post-baccalaureate study, Zoology, Clemson University,  
1977-1979  
B.A., English, University of South Carolina, 1975

**TECHNICAL EXPERIENCE:** Ten years experience in environmental impact assessment of hydroelectric, fossil, and nuclear powerplants.

**EIS RESPONSIBILITY:** Reviewed ecological resources section in Chapters 3 and 4.

**NAME:** J. LYNN MYRICK

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Geosciences, University of Arizona, 1993  
B.S., Geology and English, Vanderbilt University, 1991

**TECHNICAL EXPERIENCE:** Four years experience as a technical author and one year in environmental assessments.

**EIS RESPONSIBILITY:** Editor. Assisted with preparation of references sections. Performed number conversions.

**NAME:** RICHARD S. NUGENT, Ph.D.

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Ph.D., Marine Sciences, University of Miami, 1970  
M.S., Biology, Boston College, 1967  
B.S., Biology, Boston College, 1964

**TECHNICAL EXPERIENCE:** Twenty-five years experience in aquatic ecology, water quality, thermal studies, and environmental impact statements.

**EIS RESPONSIBILITY:** Assisted in document planning and identifying independent reviewers.

**NAME:** MEGHAN O. SHIKOSKI

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Technical and Science Communication, Drexel University, 1989  
B.S., Biology, Louisiana Tech University, 1986

**TECHNICAL EXPERIENCE:** Five years experience in environmental programs in both technical and management aspects.

**EIS RESPONSIBILITY:** Prepared low-level waste treatment, storage and disposal, and liquid high-level waste treatment storage, and disposal sections in Chapter 2.

**NAME:** JAMES L. OLIVER

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Biology (Fisheries), Murray State University, 1971

**TECHNICAL EXPERIENCE:** Twenty years experience in research and impact assessment projects for the U.S. Department of Interior and DOE. As Deputy Director of the Office of Environmental Sciences, provides reviews of environmental and natural resource management issues, and performs strategic planning for National Environmental Policy Act documentation for DOE.

**EIS RESPONSIBILITY:** Co-authored waste management technology screening and selection section of Chapter 2. Management reviewer.

**NAME:** RICHARD F. ORTHEN, Jr.

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.S., Chemistry, Emory University, 1979

**TECHNICAL EXPERIENCE:** Thirteen years experience in commercial and defense health physics programs, with an emphasis on effluent and environmental assessment.

**EIS RESPONSIBILITY:** Contributed to and reviewed hazardous waste transportation sections in Chapters 2 and 4 and supporting data in Appendix E.

**NAME:** **KAREN K. PATTERSON**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.A., Biology, Wake Forest University, 1977  
B.A., Biology, Randolph-Macon Woman's College, 1973

**TECHNICAL EXPERIENCE:** Twenty-one years experience in technical and management roles in multidisciplinary environmental programs.

**EIS RESPONSIBILITY:** Technical Editor. Contributed to Chapters 1, 2, 3, 4, and 5.

**NAME:** **HOWARD L. POPE**

**AFFILIATION:** U.S. Department of Energy, Savannah River Operations Office

**EDUCATION:** B.S., Mathematics and Physical Science, Tennessee Wesleyan College, 1986

**TECHNICAL EXPERIENCE:** Fifteen years experience in commercial nuclear power and transportation of hazardous wastes.

TE | **EIS RESPONSIBILITY:** Document Manager. Principal DOE-SR reviewer of Draft and Final EIS.

**NAME:** **EUGENE M. ROLLINS**

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S.P.H., Health Physics, University of North Carolina, 1976  
B.S., Nuclear Engineering, North Carolina State University, 1973

**TECHNICAL EXPERIENCE:** Seventeen years experience in radiological health protection in the commercial nuclear industry and DOE weapons complex.

**EIS RESPONSIBILITY:** Prepared traffic and transportation sections and occupational and public health sections in Chapters 3 and 4; and site contamination, and decontamination and decommissioning sections in Chapter 3. Provided technical input to low-level waste sections in Chapter 2, and decontamination and decommissioning and environmental restoration sections in Chapter 4.

**NAME:** ROBERT L. SCHLEGEL, PE

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Nuclear Engineering, Columbia University, 1961  
B.S., Chemical Engineering, Massachusetts Institute of  
Technology, 1959

**TECHNICAL EXPERIENCE:** Thirty-two years experience in radiological dose assessments.

**EIS RESPONSIBILITY:** Supported the preparation of occupational and public health sections in Chapter 4.

**NAME:** MICHAEL SEPTOFF

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Meteorology/Oceanography, New York University, 1968  
B.S., Meteorology, City College of New York, 1966

**TECHNICAL EXPERIENCE:** Twenty-nine years experience in meteorology, oceanography, regulatory compliance and permitting, air pollution assessments, risk assessments, and noise and cooling tower assessments.

**EIS RESPONSIBILITY:** Provided technical input to the atmospheric releases sections in Chapter 4.

**NAME:** PATRICIA L. SHAW-ALLEN

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Zoology/Ecotoxicology, Oklahoma State University, 1990  
B.S., Wildlife Management, University of New Hampshire,  
1987

**TECHNICAL EXPERIENCE:** Four years experience in aquatic toxicology/water quality, ecological risk assessments, natural resource management, and ecotoxicology.

**EIS RESPONSIBILITY:** Provided technical input to ecological resources sections in Chapter 4. Prepared Chapter 5.

**NAME:** JUDITH A. SHIPMAN

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** A.A., General Studies, University of South Carolina - Aiken, 1991

**TECHNICAL EXPERIENCE:** Seventeen years experience producing environmental-related documentation.

**EIS RESPONSIBILITY:** Editor. Readability reviewer.

**NAME:** JOSEPH A. SIGNORELLI

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Engineering, George Washington University, 1963  
B.S., Marine Engineering, Webb Institute, 1954

**TECHNICAL EXPERIENCE:** Thirty-one years experience including mechanical engineering for the DOE/Atomic Energy Commission, and the U.S. Navy.

**EIS RESPONSIBILITY:** Contributed to the preparation of Appendix C.

**NAME:** G. THOMAS ST. CLAIR, Ph.D.

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** Ph.D., Environmental Policy, Michigan State University, 1990  
M.S., Environmental Sciences, University of Michigan, 1972  
B.S., Biology, Adrian College, 1968

**TECHNICAL EXPERIENCE:** Twenty years experience managing environmental and regulatory projects and programs including technical management and direction as Director of Office of Environmental Services. Experience also includes solid and hazardous waste management; regulatory compliance oversight; environmental assessment and planning, and audits and appraisals; preparation of permit applications; and coordination of public involvement programs.

**EIS RESPONSIBILITY:** Prepared unavoidable adverse impacts and irreversible or irretrievable commitment of resources sections in Chapter 4.

**NAME:** KEVIN E. TAYLOR

**AFFILIATION:** PRC Environmental Management, Inc.

**EDUCATION:** M.S., Nuclear Engineering, Georgia Institute of Technology, 1994  
B.S., Physics, Clemson University, 1991

**TECHNICAL EXPERIENCE:** One-and-a-half years experience in hydrodynamics, mechanical engineering, thermodynamics, and environmental studies.

**EIS RESPONSIBILITY:** Co-authored Appendix D.

**NAME:** TOM J. TEMPLES

**AFFILIATION:** U.S. Department of Energy, Savannah River Operations Office

**EDUCATION:** M.S., Geology, University of Georgia, 1978  
B.S., Geology, Clemson University, 1976

**TECHNICAL EXPERIENCE:** Fifteen years experience as a petroleum exploration geologist and geophysicist. Recent experience includes coordinating National Environmental Policy Act document preparation and managing the geoscience and groundwater program for DOE-SR.

**EIS RESPONSIBILITY:** DOE-SR reviewer of Draft EIS.

**NAME:** CATHERINE J. THOMAS

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** B.A., Journalism, Texas A&M University, 1983

**TECHNICAL EXPERIENCE:** Ten years experience writing and editing for DOE-Savannah River procedures, National Environmental Policy Act documents, and newspapers.

**EIS RESPONSIBILITY:** Editor.

**NAME:** ALAN L. TOBLIN

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Chemical Engineering, University of Maryland, 1970  
B.E., Chemical Engineering, The Cooper Union, 1968

**TECHNICAL EXPERIENCE:** Twenty-two years experience in analyzing radiological and chemical contaminant transport in water resources.

**EIS RESPONSIBILITY:** Provided technical input to surface and groundwater resources in Chapter 4.

**NAME:** TIMOTHY A. WASHBURN

**AFFILIATION:** Halliburton NUS Corporation

**EDUCATION:** M.S., Biology, University of Richmond, 1979  
B.S., Biology, University of Richmond, 1977

**TECHNICAL EXPERIENCE:** Eighteen years experience in environmental and occupational health physics at commercial and government nuclear facilities.

**EIS RESPONSIBILITY:** Prepared transportation sections in Chapters 2 and 4 and supporting appendix data.

## **ACRONYMS, ABBREVIATIONS, USE OF SCIENTIFIC NOTATION, AND EXPLANATION OF NUMBER CONVERSIONS**

### **Acronyms**

AEA	Atomic Energy Act
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERPG	Emergency Response Planning Guidelines
FONSI	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
HWMF	Hazardous Waste Management Facility
NEPA	National Environmental Policy Act
PCB	Polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
SCDHEC	South Carolina Department of Health and Environmental Control
SDWA	Safe Drinking Water Act
SREL	Savannah River Ecology Laboratory
SRL	Savannah River Laboratory (renamed SRTC)
SRS	Savannah River Site
SRTC	Savannah River Technology Center

**Abbreviations for measurements**

cfm	cubic feet per minute
cfs	cubic feet per second
g	percentage of gravity (seismology)
g/L	grams per liter
gpm	gallons per minute
L	liter
lb	pound
mg	milligram
μ	micron
μCi	microcurie
μg	microgram
°C	degrees Celsius
°F	degrees Fahrenheit

**Visualizing units of measure**

1 mg/L	1 part per million; an example of a unit of one millionth is 1 second in 11.6 days
1 μg/L	1 part per billion; an example of a unit of one billionth is 1 second in 31.7 years

### Use of scientific notation

Very small and very large numbers are sometimes written using "scientific notation" or "E-notation" rather than as decimals or fractions. Both types of notation use exponents to indicate the power of ten as a multiplier (i.e.,  $10^n$ , or the number 10 multiplied by itself "n" times;  $10^{-n}$ , or the reciprocal of the number 10 multiplied by itself "n" times).

For example:  $10^3 = 10 \times 10 \times 10 = 1,000$

$$10^{-2} = \frac{1}{10 \times 10} = 0.01$$

In scientific notation, large numbers are written as a decimal between 1 and 10 multiplied by the appropriate power of 10:

4,900 is written  $4.9 \times 10^3 = 4.9 \times 10 \times 10 \times 10 = 4.9 \times 1,000 = 4,900$

0.049 is written  $4.9 \times 10^{-2}$

1,490,000 or 1.49 million is written  $1.49 \times 10^6$

A positive exponent indicates a number larger than or equal to one, a negative exponent indicates number less than one.

In some cases, a slightly different notation ("E-notation") is used, where " $\times 10$ " is replaced by "E" and the exponent is not superscripted. Using the above examples

$$4,900 = 4.9 \times 10^3 = 4.9E+03$$

$$0.049 = 4.9 \times 10^{-2} = 4.9E-02$$

$$1,490,000 = 1.49 \times 10^6 = 1.49E+06$$

## EXPLANATION OF NUMBER CONVERSIONS

The following rules were used in the conversion and rounding of numbers for this EIS:

1. Original numbers were converted from metric to English equivalents (or vice versa) according to standard conversion factors.
2. Original numbers were not rounded before they were converted.
3. Converted numbers were rounded to their appropriate level of precision; normally they were rounded to two significant figures including decimals, for numbers below 10,000. Numbers greater than 10,000 were normally rounded to three significant figures.
4. Figures greater than 100,000 were expressed in scientific notation to three significant figures (e.g., 1,450,000 would be expressed as  $1.45 \times 10^6$ ).
5. Metric units are referred to first, with English units in parentheses, regardless of which was the original number.
6. No conversions from English acres were computed for the Ecological Impacts sections in the Summary, Section 2.7, or Chapter 4.

Note: Slight variations in the same number used in different sections may occur because different computer spreadsheet software rounds or truncates numbers differently, or because the analysts rounded the numbers before or after calculations.

## GLOSSARY

activity - See *radioactivity*.

adsorption

The adhesion (attachment) of a substance to the surface of a solid or solid particles.

aggregate

Any of several hard, inert materials such as sand or gravel used for mixing with a cementing material to form concrete, mortar, or plaster.

air dispersion coefficients

Parameters that represent the dispersion of air pollutants with respect to distance from the source.

air quality

A measure of the levels of *constituents* in the air; they may or may not be pollutants.

air quality standards

The prescribed level of *constituents* in the outside air (*ambient air*) that should not be exceeded legally during a specified time in a specified area. (See *criteria pollutant*.)

air sampling

The collection and analysis of air samples for the purpose of measuring pollutants.

alpha particle

A positively charged particle consisting of two protons and two neutrons that is emitted from the nucleus of certain nuclides during radioactive decay. It is the least penetrating of the four common types of radiation (*alpha*, *beta*, *gamma*, and *neutron*).

alpha waste

Waste contaminated with alpha radioactivity measuring 10 to 100 *nanocuries* per gram of waste.

amalgam

An alloy of mercury with another metal that is solid or liquid at room temperature according to the amount of mercury present.

**ambient air**

The surrounding atmosphere, usually the outside air, as it exists around people, plants, and structures. It is not the air closest to emission sources.

**annulus**

The space between the two walls of a double-wall tank.

**aqueous**

Made from, with, or by water.

**aquifer**

A geologic formation that contains enough saturated, porous material to permit movement of groundwater and to yield groundwater to wells and springs.

**ash basin**

Settling pond where ash-laden water is retained to allow the ash to settle before the water is discharged.

**ashcrete**

The solid that results from mixing a liquid waste with cement.

**atmosphere**

The layer of air surrounding the Earth.

**Atomic Energy Commission (AEC)**

A five-member commission established after World War II to supervise the use of nuclear energy. The AEC was dissolved in 1975 and its functions transferred to the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration (ERDA), which later became the Department of Energy (DOE).

**atomic weight**

The relative weight of an atom of a chemical element based on the weight of the most abundant isotope of carbon, which is taken to be 12 (or, prior to 1962, the most abundant isotope of oxygen, which was taken as 16).

**attainment**

A measure of through-put capacity of a facility or system expressed as a percentage.

**backfill**

Material used to refill an excavation. In this EIS, backfill refers to material placed around waste storage containers.

**background exposure**

See *exposure to radiation*.

**background radiation**

Normal *radiation* present in the lower atmosphere from cosmic rays and earth sources. Background radiation varies considerably with location depending on elevation above sea level and natural *radioactivity* present in the earth or building materials such as granite.

**baseline**

Assessment of existing conditions before the addition of pollutants.

**becquerel**

The international unit of *radioactivity*, equal to one disintegration or other nuclear transformation per second.

**benthic region**

The bottom of a body of water. This region supports the benthos, a type of life that not only lives on but contributes to the character of the bottom of the body of water.

**benzene**

A clear, flammable, hazardous, aromatic organic compound (C<sub>6</sub>H<sub>6</sub>); it is a carcinogen.

**beta particle**

An elementary particle emitted from a nucleus during radioactive decay. It is negatively charged, is identical to an electron, and is easily stopped by a thin sheet of metal.

**biodiversity**

The variety of life, including all plants and animals within a region.

biological dose

The radiation dose, measured in *rem*, absorbed in biological material.

biological half-life

The time required by the body to eliminate half of an introduced substance through normal channels of elimination.

biota

The plant and animal life of a region.

blackwater

Water in coastal plains, creeks, swamps, and/or rivers that is dark or black due to dissolution of naturally occurring organic matter and certain minerals from soils and decaying vegetation.

blowdown

The withdrawal of water from an evaporating process to maintain a solid balance within specified limits of concentrations of those solids.

borehole

Fiberglass-lined circular hole (9-foot-diameter) augered to a depth of approximately 30 feet that holds forty-two 55-gallon drums of waste grouted in place.

borosilicate glass

A chemically resistant glass made primarily of silica and boron. As a waste form, high-level waste has been incorporated into the glass to form a leach-resistant nondispersible (immobilized) material.

bottomland hardwood forest

Forested wetlands containing a predominance of hardwood species such as oak, hickory, sweetgum, tulip poplar, bald cypress, and blackgum found adjacent to streams and rivers in the southeastern United States.

°C

Degree Celsius.  $^{\circ}\text{C} = \frac{5}{9} \times (^{\circ}\text{F} - 32)$ .

calcareous sands

Sands containing calcium carbonate; when these sands are treated with cold dilute hydrochloric acid, bubbling (effervescing) can be observed, representing the evolution of carbon dioxide.

cancer

A malignant tumor of potentially unlimited growth, capable of invading surrounding tissue or spreading to other parts of the body.

canister

A stainless-steel container in which immobilized radioactive waste is sealed.

canyon

A heavily shielded building used in the chemical processing of radioactive materials to recover special isotopes for national defense or other programmatic purposes. Operation and maintenance are by remote control.

capable

Determination if a geological *fault* has moved at or near the ground surface within the past 35,000 years.

capping

The process of sealing or covering a waste unit with an impermeable medium.

carcinogen

An agent capable of producing or inducing cancer.

carcinogenic

Capable of producing or inducing cancer.

Carolina bay

Shallow depressional wetland area found on the southeastern Atlantic Coastal Plain.

catchment basin

A basin to catch drainage or runoff.

### Category 2 species

Plant or animal species for which there is some evidence of vulnerability, but for which presently there is not enough data to support listing as threatened or endangered.

### celsius

Of or relating to a temperature scale that registers the freezing point of water as 0°C and the boiling point as 100°C under normal atmospheric pressure.

### Citizens Advisory Board

A formally chartered group of local private citizens who provide DOE with a consensus of public opinion on SRS issues.

### collective dose

The sum of the individual doses to all members of a specific population.

### committed dose equivalent

The dose equivalent calculated to be received by a tissue or organ over a 50-year period after the intake of a radionuclide into the body.

### committed effective dose equivalent

The sum of the committed dose equivalents to various tissues in the body.

### concentration

The quantity of a substance contained in a unit quantity of a medium (e.g., micrograms of aluminum per liter of water).

### condensate

Liquid water obtained by cooling the steam produced in an evaporator system.

### confidence level

The certainty of a particular point (measurement, amount, value) being within a statistically determined range.

### constituents

Parts or components of a chemical system.

criteria pollutant

Air pollutants for which the U.S. Environmental Protection Agency has established concentration standards; concentrations below the standards do not pose a threat to public health and welfare.

cumulative effects

Additive environmental, health, or socioeconomic effects that result from a number of similar activities in an area.

curie (Ci)

A unit of measure of radioactivity equal to 37,000,000,000 decays per second. A curie is also a quantity of any nuclide or mixture of nuclides having one curie of radioactivity.

daughter

A nuclide (also called decay product) formed by the radioactive decay of another nuclide, which is the "parent."

decay product

See *daughter*.

decay, radioactive

The spontaneous transformation of one nuclide into a different nuclide or into a different energy state of the same nuclide. The process results in the emission of nuclear radiation (alpha, beta, gamma, or neutron radiation).

decommissioning

The removal from service of facilities such as processing plants, waste tanks, and shallow land disposal units, and the reduction or stabilization of radioactive contamination. Decommissioning concepts include:

- Decontaminate, dismantle, and return area to original condition without restrictions.
- Partially decontaminate, isolate remaining residues, and continue surveillance and restrictions.

decontamination

The act of removing a chemical, biological, or radiologic contaminant from, or neutralizing its potential effect on, a person, object, or environment by washing, chemical action, mechanical cleaning, or other techniques.

defense waste

Nuclear waste generated by government defense programs as distinguished from waste generated by commercial and medical facilities.

derived concentration guide (DCG)

The concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 millirem. DCGs do not consider decay products when the parent radionuclide is the cause of the exposure.

destruction capability

The ability of a process to destroy an undesirable constituent or element.

detritiation

Removal of tritium.

direct disposal

Disposal without treatment.

disposal

Placement of waste in a safe place in such a manner that the materials remain permanently isolated from the environment.

dissociate (dissociation)

Separation of chemicals into their elemental or ionic state.

distillate

A liquid product condensed from vapor during evaporation.

dose

The energy imparted to matter by ionizing radiation. The unit of absorbed dose is the *rad*, equal to 0.01 *joules* per kilogram of irradiated material in any medium.

dose conversion factor

Factor used to calculate the cancer risk for a radiation dose.

dose equivalent

A term used to express the amount of effective radiation when modifying factors have been considered. It is the product of absorbed dose (*rads*) multiplied by a quality factor and other modifying factors. It is measured in rem (*Roentgen equivalent man*). (See *effective dose equivalent*.)

dose rate

The radiation dose delivered per unit time (e.g., rem per year).

E-Area vault

Project that consists of several types of facilities (i.e., below-grade concrete structures, on-grade concrete structures within an excavated area) that will store designated waste types (low-activity, intermediate-level tritiated and nontritiated, and long-lived waste) of low-level radioactive waste materials.

ecology

The study of the relationships between living things and their environments.

ecosystem

The community of living things and the physical environment in which they live.

effective dose equivalent

A quantity used to estimate the biological effect of *ionizing radiation*. It is the sum over all body tissues of the product of absorbed *dose*, the quality factor (to account for the different penetrating abilities of the various types of radiation), and the tissue weighting factor (to account for the different radiosensitivities of the various tissues of the body).

effluent

A liquid discharged into the environment, usually into surface streams. In this EIS, effluent refers to discharged wastes that are nonpolluting in their natural state or as a result of treatment.

effluent standards

Defined limits of waste discharge in terms of volume, content of contaminants, temperature, etc.

## EIS

Environmental impact statement; a legal document required by the National Environmental Policy Act (NEPA) of 1969, for Federal actions involving significant or potentially significant environmental impacts.

## eluate

The liquid resulting from removing the trapped material from an *ion-exchange* resin.

## Emergency Response Planning Guidelines (ERPG)

Values used to determine potential health effects from chemical accidents.

## emission standards

Legally enforceable limits on the quantities and kinds of air contaminants that may be emitted to the atmosphere.

## endangered species

Plant or animal species that are threatened with extinction.

## endemic

Found only within a certain locality.

## engineered trench

Reinforced, concrete-formed, walled 100-foot-long, 50-foot-wide disposal trench with steel covers over each area to minimize rainwater intrusion and direct drainage away from the trench. A leachate collection system installed below the floor of the trench monitors the performance of the disposal cells.

## environment

The sum of all external conditions and influences affecting the life, development, and ultimately, the survival of an organism.

environmental justice

The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Fair treatment implies that no population of people should be forced to shoulder a disproportionate share of the negative environmental impacts of pollution or environmental hazards due to a lack of political or economic strength.

environmental restoration

The assessment, cleanup, and restoration of sites contaminated with radioactive or hazardous substances during past production or disposal activities.

environmental transport

The movement through the environment of a substance, including the physical, chemical, and biological interactions undergone by the substance.

erosion

The process in which actions of wind or water carry away soil.

exceedance

A value over a prescribed limit.

exothermic

Of or indicating a chemical change accompanied by a release of heat.

Experimental Transuranic Waste Assay Facility (ETWAF)

The assay facility is utilized in alternative A - limited treatment configuration for each of the three waste forecasts.

exposure to radiation

The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background *ionizing radiation*. Occupational exposure is the exposure to *ionizing radiation* that occurs during a person's working hours. Population exposure is the exposure to a number of persons who inhabit an area.

**external radiation**

Being exposed to radiation from sources outside your body.

**°F**

Degree Fahrenheit.  $^{\circ}\text{F} = ^{\circ}\text{C} \times \frac{9}{5} + 32.$

**fall line**

A line drawn through the falls (or rapids) of successive rivers and roughly defining the area where streams pass from the harder rocks of the Piedmont to the softer rocks of the Coastal Plain.

**fallout**

The descent to earth and deposition on the ground of particulate matter (which is usually radioactive) from the atmosphere.

**fault**

A break in the Earth's crust along which movement has occurred.

**fauna**

Animals.

**fecal coliform**

Type of bacterial count used to show fecal (bodily waste) contamination levels in water.

**filtercake**

The dewatered residue from a filter, centrifuge, or other dewatering device.

**fiscal year**

Period of one year used to calculate financial data. As defined by the Federal government, this EIS uses a fiscal year which begins on October 1 and ends on September 30.

**fission products**

Nuclei from the fission of heavy elements (primary fission products); also, the nuclei formed by the decay of the primary fission products, many of which are radioactive.

**floodplain**

Level land built up by flowing stream deposition and periodically submerged by floodwater from that stream.

**flora**

Plants.

**gamma rays**

High-energy, short-wavelength electromagnetic radiation accompanying fission, radioactive decay, or nuclear reactions. Gamma rays are very penetrating and require relatively thick shields to absorb the rays effectively.

**genus/genera**

A group of structurally or phylogenetically related species.

**geology**

The science that deals with the Earth: the materials, processes, environments, and history of the planet, especially the lithosphere, including the rocks and their formation and structure.

**greater confinement disposal facility or vaults**

Storage facility (boreholes and engineered trenches) that will require minimum maintenance after closure for disposal of the high activity fraction of the low-level solid beta-gamma waste and low-level alpha waste.

**gross alpha radioactivity**

A measure of total alpha radioactivity.

**groundwater**

The supply of fresh water in an aquifer under the Earth's surface.

**half-life (radiological)**

The time in which half the atoms of a radioactive substance disintegrate to another nuclear form. Half-lives vary from millionths of a second to billions of years.

hazardous waste storage facility

Resource Conservation and Recovery Act (RCRA) *interim-status* or permitted temporary holding area of hazardous waste prior to treatment or disposal.

heavy metals

Metallic elements of high atomic mass, such as mercury, chromium, cadmium, lead, or arsenic, that are toxic to plants and animals at known concentrations.

HEPA filter

High-efficiency particulate air filter designed to remove 99.95 percent of the particles down to as small as 0.3 micrometer from a flowing air stream.

high-heat waste

Freshly generated waste that contains a large concentration of short-lived radionuclides from the first extraction cycle of a separations process. High-heat waste is aged to allow radioactive decay to prevent the potential discharge of harmful levels of radiation.

historic resources

The sites, districts, structures, and objects considered limited and nonrenewable because of their association with historic events, persons, or social or historic movements.

hydrolysis

A process of decomposition in which a compound is broken down and changed into other compounds by taking up the elements of water.

hydrostratigraphy

Names used to identify the water-bearing properties of rocks.

immobilization

Conversion of a material into a form that will resist environmental dispersion.

incineration

The burning of waste.

inhibited water

Water treated with chemicals to retard or halt corrosion, especially of metals.

**insoluble sludge**

A thick layer of various heavy metals and long-lived radionuclides that will not dissolve and that separate out of the waste over time and settle to the bottom of the waste tank.

**institutional controls**

Actions that limit human activities at or near facilities where hazardous and/or radioactive wastes exist. They may include land and resource use restrictions, well drilling, prohibitions, building permit restrictions, and other types of restrictions.

**interim status**

The period of operation for facilities that require Resource Conservation and Recovery Act permits until the permitting process is complete.

**internal radiation**

Being exposed to radioactive materials inside the body.

**investigation-derived waste**

Contaminated material resulting from investigation activities at hazardous or radiological waste sites.

**ion**

An atom or molecule that has gained or lost one or more electrons and has become electrically charged.

**ion exchange**

Process in which a solution containing soluble ions to be removed is passed through a column of material that removes the soluble ions by exchanging them with ions from the material in the column. The process is usually reversible so that the trapped ions can be collected (eluted) and the column regenerated.

**ion-exchange medium**

A substance (e.g., a resin) that allows cesium or some other soluble ion to be removed from a solution.

**ionization**

The process that creates ions. Nuclear radiation, X-rays, high temperatures, and electric discharges can cause ionization.

ionizing radiation

Radiation capable of displacing electrons from atoms or molecules to produce ions.

irradiation

Exposure to radiation.

isotope

An atom of a chemical element with a specific atomic number and atomic mass. Isotopes of the same element have the same number of protons but different numbers of neutrons. Isotopes are identified by the name of the element and the total number of protons and neutrons in the nucleus. For example, plutonium-239 is a plutonium atom with 239 protons and neutrons.

joule

A unit of energy equal to the work done by a force of 1 newton acting through a distance of 1 meter. A newton is the unit of force needed to accelerate a mass of 1 kilogram 1 meter per second per second.

latent cancer fatalities

Deaths resulting from cancer that has become active following a period of inactivity.

leachate

Liquid that has percolated through solid waste or other media and that contains dissolved or suspended contaminants extracted from those materials.

leaching

The process in which a soluble component of a solid or mixture of solids is extracted as a result of percolation of water around and through the solid.

lithosphere

The solid part of the earth composed predominantly of rock.

lithostratigraphy

Description of geological formations based on the physical characteristics of rocks.

loam

A soil textural class with about equal proportions of sand, clay, and silt particles.

long-lived radionuclides

Radioactive isotopes with half-lives greater than approximately 30 years.

long-lived waste

Radioactive waste with a *half-life* which is sufficiently long to remain dangerous beyond the time its retention in a disposal unit can be assured (e.g., carbon-14 has a half-life of 5,730 years and so is considered a long-lived waste).

low-activity vaults

On-grade concrete module structures within an excavated area that provides waste storage capacity for waste containers of low-activity waste.

low-heat waste

Second or subsequent extraction cycle waste generated from a separations process. Low-heat waste contains few radionuclides and does not require aging (radioactive decay). Low-heat waste is also generated in reactor areas, the Defense Waste Processing Facility and other SRS production support facilities. (See *high-heat waste*.)

low-income communities

A community in which 25 percent or more of the population is identified as living in poverty.

low-level radioactive waste disposal facility

Disposal facility located within E-Area and consisting of E-Area Vaults, slit trenches, boreholes, greater confinement disposal vaults, and engineered low-level trenches.

lower limit of detection

The smallest concentration/amount of the component being measured that can be reliably detected in a sample at a 95 percent *confidence level*.

macroencapsulate

To seal (e.g., in a box or polymer) a contaminated component so that the contamination is contained.

material substitution

Replacing a hazardous material with a nonhazardous material to reduce the amount of hazardous waste generated.

## MAXIGASP

A computer program used to calculate doses or airborne releases of radioactivity to the maximally exposed member of the public.

## maximally exposed individual

A hypothetical member of the public assumed to receive the highest calculated dose.

## maximum contaminant levels (MCLs)

The maximum permissible level of a contaminant in water that is delivered to a user of a public water system.

## migration

The natural travel of a material through the air, soil, or groundwater.

## mothball

To place and maintain facilities in a condition practical to restart, conducting only those activities necessary for routine maintenance or to protect human health and the environment.

## nano

A prefix meaning one billionth ( $10^{-9}$ ) of any measurement.

## National Register of Historic Places

A list maintained by the National Park Service of architectural, historical, archaeological, and cultural sites of local, state, or national importance.

## natural radiation or natural radioactivity

*Background radiation.* Some elements are naturally radioactive, whereas others are induced to become radioactive by bombardment in a reactor or accelerator.

## NEPA

National Environmental Policy Act of 1969; it requires the preparation of an EIS for Federal projects that could present significant impacts to the environment.

## neutralization wastewater

Wastewater to which acid or alkali is added to adjust the *pH* to a preferred range.

neutron

An elementary particle with no electrical charge used to bombard the nuclei of various elements to produce fission and other nuclear reactions.

non-alpha waste

Waste contaminated with alpha radioactivity measuring less than 10 nanocuries per gram of waste.

nonprocess water

At SRS, *potable* water.

nonvolatile beta radioactivity

A measure of total beta radioactivity less the volatile isotopes.

NRC

Nuclear Regulatory Commission; the independent Federal commission that licenses and regulates commercial nuclear facilities.

nuclear energy

The energy liberated by a nuclear reactor (fission or fusion) or by radioactive decay.

nuclear radiation

Radiation, usually alpha, beta, gamma, or neutron, which emanates from an unstable atomic nucleus.

offgas

Exhaust emission from an air-emission control unit.

offsite population

In this EIS, all individuals located within an 80-kilometer (50-mile) radius of SRS.

organic compounds

Chemical compounds containing carbon and usually hydrogen and/or oxygen.

outcropping

Place where groundwater is discharged to the surface. Springs, swamps, and beds of streams and rivers are outcrops of the water table.

outfall

Place where liquid *effluents* enter the environment and may be monitored.

parameter

A characteristic element; any of a set of physical properties whose values determine the characteristics or behavior of something.

particulates

Solid particles small enough to become airborne.

pH

A measure of the hydrogen ion concentration in *aqueous* solution. Pure water has a pH of 7, acidic solutions have a pH less than 7, and basic solutions have a pH greater than 7.

people of color communities

A population that is classified by the U.S. Bureau of the Census as Black, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, or other nonwhite persons, the composition of which is at least equal to or greater than the state minority average of a defined area or jurisdiction.

percent attainment

Percent of the time a facility is available for operations.

permeability

Ability of rock, soil, or other substance to transmit a fluid.

person-rem

The radiation dose to a given population; the sum of the individual doses received by a population segment.

physiographic

Regions classified based on their physical geographic and geologic setting.

pollution

The addition of any undesirable agent to an *ecosystem* in excess of the rate at which natural processes can degrade, assimilate, or disperse it.

**pollution prevention**

The prevention, rather than control, of pollution using engineering solutions, material substitutions, and procedural changes to reduce the volume and/or toxicity of pollutants produced.

**postulated accident**

An accident that is forwarded as having occurred to produce the described effects.

**potable**

Drinkable; for domestic use.

**precipitate**

A solid (used as a noun).

To form a solid substance in a solution by a chemical reaction (used as a verb).

**precipitation**

The process of forming a precipitate from a solution.

**process well/water**

At SRS, water used within a system or process and not used as *potable* water.

**production well/water**

At SRS, water treated and used as *potable* water.

**prompt fatality**

Death that occurs immediately or within a short time (e.g., a few weeks) as a direct result of an event (e.g., accident).

**PSD (Prevention of significant deterioration)**

Establishes the acceptable amount of deterioration in air quality. When the air quality of an area meets the standards for a specific pollutant, the area is declared to be in attainment for that pollutant. When the air quality of an area does not meet the standard for a specific pollutant, the area is said to be a nonattainment area for that pollutant. PSD requirements allow maximum increases in ambient air pollutant concentrations (sulfur dioxide, particulates, nitrogen oxide) for construction or modification of facilities, which by definition do not "significantly deteriorate" the existing baseline air quality. (See *criteria pollutant*.)

## PUREX

An acronym for plutonium-uranium extraction.

## rad

Radiation absorbed dose; the basic unit of absorbed dose equal to the absorption of 0.01 *joules* per kilogram of absorbing material.

## radiation

The emitted particles and/or photons from the nuclei of radioactive atoms. A shortened term for ionizing radiation or nuclear radiation as distinguished from nonionizing radiation (microwaves, ultra-violet rays, etc.).

## radiation shielding

Reduction of radiation by interposing a shield of absorbing material between a radioactive source and a person, laboratory area, or radiation-sensitive device.

## radioactive waste

Materials from nuclear operations that are radioactive or are contaminated with radioactive materials for which there is no practical use or for which recovery is impractical.

## radioactivity

The spontaneous decay of unstable atomic nuclei, accompanied by the emission of radiation.

## radioisotopes

Radioactive isotopes. Some radioisotopes are naturally occurring (e.g., potassium-40), while others are produced by nuclear reactions.

## radiolysis

The decomposition of a material (usually water) into different molecules due to ionizing radiation. In water, radiolysis results in the production of hydrogen gas and oxygen.

## recycling

Return of a waste material either to the process that generated the waste or to another process to use or reuse the waste material beneficially; recovery of a useful or valuable material from waste.

rem (*Roentgen equivalent man*)

The unit of dose for biological absorption. It is equal to the product of the absorbed dose in *rads* and a quality factor and a distribution factor.

repository

A place for the disposal of immobilized high-level waste to isolate it from the environment.

resin

An *ion-exchange* medium; organic polymer used for the preferential removal of certain ions from a solution.

Richter scale

A scale of measure used in the United States to quantify earthquake intensity.

risk

In accident analysis, a measure of the impact of an accident considering the probability of the accident occurring and the consequences if it does occur (risk = probability × consequences).

roast, retort, and amalgamate

Heating mercury-contaminated equipment to drive off the mercury as a vapor, collecting and condensing the mercury to a liquid form. Amalgamate - alloying the liquid metal with other metals to create a semi-solid.

Roentgen

A measure of radiation exposure to gamma radiation in air.

runoff

The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually is returned to water bodies. Runoff can carry pollutants or harmless chemical constituents into receiving waters.

saltcake

Concentrated waste in the form of crystallized salts resulting from the evaporation of liquid high-level waste.

saltstone

Low-radioactivity fraction of high-level waste mixed with cement, flyash, and slag to form a concrete block.

sanitary landfill

A solid-waste disposal facility which is constructed in a manner that protects the environment; waste is spread in thin layers, compacted to the smallest practical volume, and covered with soil at the end of each work day.

satellite accumulation area

Hazardous waste collection points "at or near the point of generation" (as defined by RCRA).

scintillation

A flash of light produced in a fluorescent material by ionizing radiation. A technique used to measure the radioactivity of a sample.

scrub-shrub wetlands

Wetland areas dominated by woody vegetation less than 6 meters (20 feet) tall, including shrubs, young trees, and trees and shrubs that are small or stunted due to environmental conditions.

scrubber

Engineered equipment used to remove *constituents* from a gas stream by absorption and/or chemical reaction.

sedimentation

The settling of excess soil and mineral solids of small particle size (silt) contained in water.

sedimentation pond

Pond constructed specifically to trap excess soil and mineral solids and prevent their deposition in downstream waters and wetlands.

seepage basin

An excavation that receives wastewater. Insoluble materials settle out on the floor of the basin and soluble materials seep with the water through the soil column where they are removed partially by *ion exchange* with the soil. Construction may include dikes to prevent overflow or surface *runoff*.

seismic load

The force due to earthquakes.

seismicity

Refers to earth-movement events, usually earthquakes.

shield

Material used to reduce the intensity of radiation that would irradiate personnel or equipment.

siltation

The act of depositing sediment, as by a river.

slit trench

In this EIS, an excavated trench 6 meters wide and 6 meters deep of variable length used to store intermediate-level, bulky noncontainerized low-level (alpha and beta-gamma) and containerized offsite wastes.

sludge

The precipitated solids (primarily oxides and hydroxides) that settle to the bottom of the storage tanks containing liquid high-level waste.

slurry

A suspension of solid particles (*sludge*) in water.

socioeconomic

The societal and economic configuration of a group of people.

solvent

A substance, usually liquid, that can dissolve other substances.

source reduction

Activities that reduce or eliminate wastes before they are generated.

source term

The initial amount of radioactivity used to calculate exposure and doses to various receptor groups.

**standby (cold standby)**

Facility is maintained such that it can be brought back into operation with minimum effort.

**still bottoms**

The sludge that remains in the bottom of a distillation apparatus after the desired product has been evaporated and removed.

**storage**

Retention of radioactive waste in man-made containment, such as tanks or *vaults*, in a manner permitting retrieval (as distinguished from disposal, which implies no retrieval).

**stratigraphy**

Branch of geologic science concerned with the description, organization, and classification of layered rock units and associated non-layered rock units.

**sump**

An impermeable point of collection for liquids in a building or facility.

**Superfund**

A trust fund established by the Comprehensive Environmental Response, Compensation, and Liability Act and amended by the Superfund Amendment and Reauthorization Act that finances long-term remedial action for hazardous waste sites.

**supernatant, supernate**

The radioactive layer of highly mobile liquid containing soluble salts; the supernatant remains above the saltcake and/or insoluble sludge in a waste tank.

**surface water**

All the water on the Earth's surface (streams, ponds, etc.), as distinguished from groundwater, which is below the surface.

**suspect soil**

Soil that could be radiologically contaminated.

**standard pressure and temperature**

Air pressure at mean sea level (1 atmosphere); a temperature of 0°C.

**tank farm**

An installation of (usually interconnected) underground tanks for the storage of high-level radioactive liquid wastes.

**toxicity**

The quality or degree of being poisonous or harmful to plant or animal life.

**turbidity**

The degree to which water is muddied or clouded by suspended sediments.

**vault**

A reinforced concrete structure for storing strategic nuclear materials used in national defense or other programmatic purposes.

**vitriification**

Incorporation of a material into a glass form.

**volatile organic compounds**

An organic compound with a vapor pressure greater than 0.44 pounds per square inch at standard temperature and pressure.

**volatilized**

Caused to pass off as a vapor.

**waste acceptance criteria**

Criteria put forth by a waste management facility which defines the waste it will accept.

**waste certification criteria**

Criteria that must be met for transport, treatment, and disposal of waste.

**Waste Isolation Pilot Plant**

DOE facility located near Carlsbad, New Mexico, built to demonstrate the safe underground disposal of transuranic waste from numerous facilities owned by DOE.

**waste minimization**

Reduction of waste before treatment, storage, or disposal by source reduction or recycling activities.

**water quality standard**

Provisions of state or Federal law that consist of a designated use or uses for the waters of the United States and water quality standards for such waters based upon those uses. Water quality standards are used to protect the public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act.

**wind rose**

A map showing the direction and magnitude of the wind.

## **DISTRIBUTION LIST**

DOE is providing copies of the final EIS to federal, state, and local elected and appointed officials and agencies of government; Native American groups; federal, state, and local environmental and public interest groups; and other organizations and individuals listed below. Copies will be provided to other interested parties upon request.

## **A. UNITED STATES CONGRESS**

### **A.1 Senators from Affected and Adjoining States**

The Honorable Paul Coverdell  
United States Senate

The Honorable Jesse Helms  
United States Senate

The Honorable Ernest F. Hollings  
United States Senate

The Honorable Sam Nunn  
United States Senate

The Honorable Lauch Faircloth  
United States Senate

The Honorable Fred Thompson  
United States Senate

The Honorable Bill Frist  
United States Senate

The Honorable Strom Thurmond  
United States Senate

### **A.2 United States Senate Committees**

The Honorable Strom Thurmond  
Chairman  
Committee on Armed Services

The Honorable Sam Nunn  
Ranking Minority Member  
Committee on Armed Services

The Honorable Mark O. Hatfield  
Chairman  
Committee on Appropriations

The Honorable Robert C. Byrd  
Ranking Minority Member  
Committee on Appropriations

The Honorable Trent Lott  
Chairman  
Subcommittee on Strategic Forces  
Committee on Armed Services

The Honorable J. James Exon  
Ranking Minority Member  
Subcommittee on Strategic Forces  
Committee on Armed Services

The Honorable Pete V. Domenici  
Chairman  
Subcommittee on Energy and Water  
Development  
Committee on Appropriations

The Honorable J. Bennett Johnston  
Ranking Minority Member  
Subcommittee on Energy and Water  
Development  
Committee on Appropriations

### **A.3 Representatives from Affected and Adjoining States**

The Honorable James E. Clyburn  
U.S. House of Representatives

The Honorable John J. Duncan, Jr.  
U.S. House of Representatives

The Honorable Nathan Deal  
U.S. House of Representatives

The Honorable Lindsey Graham  
U.S. House of Representatives

The Honorable Jack Kingston  
U.S. House of Representatives

The Honorable Floyd Spence  
U.S. House of Representatives

The Honorable Cynthia McKinney  
U.S. House of Representatives

The Honorable John M. Spratt, Jr.  
U.S. House of Representatives

The Honorable Charlie Norwood  
U.S. House of Representatives

The Honorable Charles H. Taylor  
U.S. House of Representatives

The Honorable James H. Quillen  
U.S. House of Representatives

The Honorable Zach Wamp  
U.S. House of Representatives

The Honorable Mark Sanford  
U.S. House of Representatives

#### **A.4 United States House of Representatives Committees**

The Honorable Floyd Spence  
Chairman  
Committee on National Security

The Honorable Ronald V. Dellums  
Ranking Minority Member  
Committee on National Security

The Honorable Bob Livingston  
Chairman  
Committee on Appropriations

The Honorable David R. Obey  
Ranking Minority Member  
Committee on Appropriations

The Honorable Duncan Hunter  
Chairman  
Subcommittee on Military Procurement  
Committee on National Security

The Honorable Ike Skelton  
Ranking Minority Member  
Subcommittee on Military Procurement  
Committee on National Security

The Honorable John T. Myers  
Chairman  
Subcommittee on Energy and Water  
Development  
Committee on Appropriations

The Honorable Tom Bevill  
Ranking Minority Member  
Subcommittee on Energy and Water  
Development  
Committee on Appropriations

#### **B. FEDERAL AGENCIES**

Mr. Don Kilma  
Director, Eastern Office  
Advisory Council on Historic Preservation

Ms. Mary Lou Hoinkes  
Acting General Counsel  
U.S. Arms Control and Disarmament Agency

Mr. Robert Fairweather  
Chief  
Environmental Branch  
Office of Management and Budget

Major General R. M. Bunker  
Division Engineer  
South Atlantic Division  
U.S. Army Corps of Engineers

Mr. David Crosby  
Savannah District  
U.S. Army Corps of Engineers

Mr. Forester Einarsen  
Acting Chief  
Office of Environmental Policy  
U.S. Army Corps of Engineers

Mr. Clarence Ham  
Charleston District  
U.S. Army Corps of Engineers

Colonel R. V. Locurio  
Commander  
Savannah District  
U.S. Army Corps of Engineers

Lt. Colonel James T. Scott  
District Engineer  
Charleston District  
U.S. Army Corps of Engineers

State Conservationist  
Natural Resources Conservation Service  
U.S. Department of Agriculture

Site Coordinator  
U.S. General Accounting Office

Director  
Southeast Region  
National Marine Fisheries Service  
National Oceanic and Atmospheric  
Administration  
U.S. Department of Commerce

Mr. Larry Hardy  
Area Supervisor  
Habitat Conservation Division  
Southeast Region  
National Marine Fisheries Service  
National Oceanic and Atmospheric  
Administration  
U.S. Department of Commerce

Ms. Loretta L. Dunn  
Assistant Secretary  
Legislative and Intergovernmental Affairs  
U.S. Department of Commerce

Mr. Andreas Mager, Jr.  
Assistant Regional Director  
Southeast Region  
National Marine Fisheries Service  
National Oceanic and Atmospheric  
Administration  
U.S. Department of Commerce

Mr. Charles Oravetz  
Chief  
Protected Species Management Branch  
Southeast Regional Office  
National Marine Fisheries Service  
National Oceanic and Atmospheric  
Administration  
U.S. Department of Commerce

Mr. Harold P. Smith, Jr.  
Assistant to the Secretary for Atomic Energy  
U.S. Department of Defense

Mr. Kenneth W. Holt  
NEPA Coordinator  
Centers For Disease Control and Prevention  
U.S. Department of Health and Human Services

Mr. Willie Taylor  
Director  
Office of Environmental Policy and Compliance  
U.S. Department of the Interior

Mr. Glenn G. Patterson  
District Chief  
Water Resources Division  
Geological Survey  
U.S. Department of Interior

Mr. Edward Stern  
Director  
Office of Regulatory Analysis  
Occupational Safety and Health Administration  
U.S. Department of Labor

Director  
Office of Governmental Relations  
U.S. Department of Energy

Mr. Michael W. Conley  
Assistant Inspector General for Inspections  
U.S. Department of Energy

Ms. Judith M. Demaire  
Assistant Inspector General for Policy, Planning  
and Management  
Office of Inspector General  
U.S. Department of Energy

Mr. Bruce Demars  
Director  
Office of Naval Reactors  
U.S. Department of Energy

Mr. Daniel A. Dreyfus  
Director  
Office of Civilian Radioactive Waste  
Management  
U.S. Department of Energy

Mr. Neal Goldenberg  
Director  
Office of Nuclear Safety, Policy and Standards  
U.S. Department of Energy

Mr. Gregory P. Rudy  
Director  
Executive Director Policy, Planning and NEPA  
Coordination  
U.S. Department of Energy

Mr. John E. Scolah  
Operations Division  
Office of Nuclear Materials Production  
U.S. Department of Energy

J. M. Steele  
Office of Naval Reactors  
U.S. Department of Energy

Mr. Anthony Adduci  
NEPA Compliance Officer  
Oakland Operations Office  
U.S. Department of Energy

Mr. Leaf Erickson  
Director  
Tank Waste Retrieval Treatment and  
Immobilization Office  
U.S. Department of Energy

Mr. Jeff Crane  
SRS Remedial Project Manager  
Region IV  
U.S. Environmental Protection Agency

Mr. Joseph R. Franzmathes  
Assistant Regional Administrator  
Office of Policy and Management  
Region IV  
U.S. Environmental Protection Agency

Marion D. Hopkins  
Federal Activities Branch  
Office of Policy and Management  
Region IV  
U.S. Environmental Protection Agency

Mr. Arthur G. Linton  
Federal Facilities Coordinator  
Federal Activities Branch  
Office of Policy and Management  
Region IV  
U.S. Environmental Protection Agency

Mr. Heinz Mueller  
Environmental Policy Section  
Federal Activities Branch  
Office of Policy and Management  
Region IV  
U.S. Environmental Protection Agency

Mr. Greer C. Tidwell  
Administrator  
Region IV  
U.S. Environmental Protection Agency

Ms. Camilla Warren  
Chief  
DOE Remedial Section  
Region IV  
U.S. Environmental Protection Agency

Mr. Mike Arnett  
Region IV  
U.S. Environmental Protection Agency

Mr. Jon Richards  
Region IV  
U.S. Environmental Protection Agency

Mr. Robert M. Bernero  
Director  
Nuclear Material Safety Safeguards  
U.S. Nuclear Regulatory Commission

Mr. Ken Clark  
Region II Public Affairs Officer  
U.S. Nuclear Regulatory Commission

Argonne National Laboratory  
(U.S. Department of Energy Laboratory)

Dr. Anthony Dvorak  
Argonne National Laboratory  
(U.S. Department of Energy Laboratory)

Mr. Steve Folga  
Argonne National Laboratories

Mr. Philip H. Kier  
Argonne National Laboratory  
(U.S. Department of Energy Laboratory)

Dr. Libby Stull  
Argonne National Laboratory  
(U.S. Department of Energy Laboratory)

Ms. Ann Pendergrass  
Los Alamos National Laboratory  
(U.S. Department of Energy Laboratory)

Mr. J. R. Trabalka  
Oak Ridge National Laboratory  
(U.S. Department of Energy Laboratory)

Ms. Mary Young  
Sandia Laboratory  
(U.S. Department of Energy Laboratory)

## **C. STATE OF SOUTH CAROLINA**

### **C.1 State Offices and Legislature**

The Honorable David M. Beasley  
Governor of South Carolina

The Honorable Bob Peeler  
Lieutenant Governor of South Carolina

The Honorable Charles Condon  
Attorney General

Dr. Fred Carter  
Senior Executive Assistant of Finance and  
Administration  
Office of Executive Policy and Programs

Mr. Tucker Eskew  
Press Secretary  
Office of the Governor

Mr. Douglas McKay, III  
Senior Executive Assistant for Economic  
Development  
Office of the Governor

Mr. Richard B. Scott, III  
Office of the Governor  
Division of Economic Development

Mr. Warren Tompkins  
Chief of Staff  
Office of the Governor

The Honorable James L. Mann Cromer, Jr.  
South Carolina Joint Legislative Committee on  
Energy

The Honorable Phil P. Leventis  
Chairman  
Committee on Agriculture & Natural Resources  
South Carolina Senate

The Honorable Thomas N. Rhoad  
Chairman  
Committee on Agriculture, Natural Resources &  
Environmental Affairs

The Honorable John C. Lindsay  
South Carolina Joint Legislative Committee on  
Energy

The Honorable John L. Scott  
South Carolina Joint Legislative Committee on  
Energy

The Honorable Thomas L. Moore  
South Carolina Joint Legislative Committee on  
Energy

Administrative Assistant  
South Carolina Joint Legislative Committee on  
Energy

The Honorable Harvey S. Peeler, Jr.  
South Carolina Joint Legislative Committee on  
Energy

Dr. John F. Clark  
South Carolina Joint Legislative Committee on  
Energy

## **C.2 State and Local Agencies and Officials**

Dr. George Vogt  
South Carolina Department of Archives and  
History

Chief  
Bureau of Drinking Water Protection  
South Carolina Department of Health and  
Environmental Control

Commissioner  
South Carolina Department of Health and  
Environmental Control

Mr. Alton C. Boozer  
Chief  
Bureau of Environmental Quality Control Labs  
South Carolina Department of Health and  
Environmental Control

Mr. M. K. Batavia, PE  
South Carolina Department of Health and  
Environmental Control

Chief  
Bureau of Radiological Health  
South Carolina Department of Health and  
Environmental Control

Mr. Ronald Kinney  
South Carolina Department of Health and  
Environmental Control

Ms. Myra Reece  
Director, Lower Savannah District Office  
South Carolina Department of Health and  
Environmental Control

Chief  
Bureau of Solid and Hazardous Waste  
Management  
South Carolina Department of Health and  
Environmental Control

Chief  
Bureau of Air Quality Control  
South Carolina Department of Health and  
Environmental Control

Mr. Alan Coffey  
Bureau of Solid and Hazardous Waste  
Management  
South Carolina Department of Health and  
Environmental Control

Mr. G. Kendall Taylor  
Division of Hydrogeology  
Bureau of Solid and Hazardous Waste  
South Carolina Department of Health and  
Environmental Control

Sharon Cribb  
Nuclear Emergency Planning  
Bureau of Solid and Hazardous Waste  
South Carolina Department of Health and  
Environmental Control

Chief  
Bureau of Water Pollution Control  
South Carolina Department of Health and  
Environmental Control

Mr. Lewis Shaw  
Deputy Commissioner  
Environmental Quality Control  
South Carolina Department of Health and  
Environmental Control

Stacy Richardson  
Environmental Quality Control Administration  
South Carolina Department of Health and  
Environmental Control

Ms. Frances Ann Ragan  
Federal Facility Liaison  
Environmental Quality Control  
South Carolina Department of Health and  
Environmental Control

Mr. William L. McIlwain  
South Carolina Project Notification and Review  
South Carolina Department of Highways and  
Public Transportation

South Carolina Department of Health and  
Environmental Control

Mr. Dean Moss  
General Manager  
Beaufort-Jasper (SC) Water and Sewer  
Authority

Mr. Virgil Autry  
Director  
South Carolina Department of Health and  
Environmental Control

Mr. W. M. Dubose, III  
Director of Preconstruction  
South Carolina Department of Highways and  
Public Transportation

Mr. Ian D. Hill  
Intergovernmental Review Coordinator  
State Historic Preservation Office  
South Carolina Department of Archives and  
History

Ms. Beth Partlow  
Governors Division of Natural Resources  
South Carolina Project Notification and Review  
Office of the Governor

Mr. Eric Thompson  
Lower Savannah Regional Planning and  
Development Council  
South Carolina Project Notification and Review  
Office of the Governor

## **D. STATE OF GEORGIA**

### **D.1 State Offices and Legislature**

The Honorable Zell Miller  
Governor of Georgia

The Honorable Pierre Howard  
Lieutenant Governor of Georgia

The Honorable Michael Bowers  
Attorney General

The Honorable Hugh M. Gillis, Sr.  
Chairman  
Committee on Natural Resources  
Georgia Senate

## **D.2 State and Local Agencies and Officials**

Mr. James C. Hardeman, Jr.  
Environmental Protection Division  
Georgia Department of Natural Resources  
Environmental Radiation Programs

Program Manager  
Surface Water Supply  
Georgia Department of Natural Resources

Mr. J. L. Setser  
Program Coordination Branch  
Environmental Radiation Programs  
Environmental Protection Division  
Georgia Department of Natural Resources

Mr. Dave Rutherford  
Metropolitan Planning Commission  
Savannah, GA

## **E. STATE OF TENNESSEE**

Mr. Michael H. Mobley  
Division of Radiological Health  
Department of Environment and Conservation  
Nashville, TN

## **F. STATE SINGLE POINTS OF CONTACT**

Administrator  
Georgia State Clearinghouse  
Office of Planning and Budget

Ms. Omeagia Burgess  
South Carolina Grant Services  
Office of the Governor

Chrys Baggett  
Director  
North Carolina Department of Administration

Mr. Charles W. Brown  
Tennessee State Planning Office  
Office of the Governor

## **G. NATIVE AMERICAN GROUPS**

The Honorable Gilbert Blue  
Chairman  
Catawba Indian Nation

The Honorable Bill S. Fife  
Principal Chief  
Muscogee (Creek) Nation

The Honorable Tony Hill, Micco  
Tribal Town Center Organization

Project Director  
Yuchi Tribal Organization, Inc.

## H. CITIZENS ADVISORY BOARD MEMBERS

Ms. Julie Arbogast

Ms. Anne N. Brown

Ms. Lenola Cooks

Mr. Thomas W. Costikyan

Mr. Brian Costner  
Energy Research Foundation

Mr. Myles N. Grant, I

Mr. Thomas Greene

Ms. Alice Hollingsworth

Mr. Thelonious A. Jones

Reverend Walter Jones

Mr. J. Walter Joseph

Mr. William F. Lawless  
Departments of Mathematics and Psychology  
Paine College

Ms. Ann G. Loadholt

Ms. Kathryn May

Dr. Mildred McClain  
Citizens for Environmental Justice

Mr. Larry McKinney

Ms. Jo-Ann Nestor

Mr. Lane D. Parker

Dr. Kamalakar B. Raut

Mr. Andrew W. Rea  
Executive Director  
Citizens for Clean Air & Water

Mr. Robert H. Slay

Ms. Perjetta K. Smith

Mrs. Patricia J. Tousignant

Ms. Beaurine H. Wilkins

Mr. Vernon Zimmerman

## I. ENVIRONMENTAL AND PUBLIC INTEREST GROUPS

### I.1 National

Mr. Rudy Oswald  
Secretary-Treasurer  
AFL-CIO  
Washington, DC

Mr. Bill Sharpe  
Counsel  
Defenders of Wildlife  
Washington, DC

Mr. Frederick Krupp  
Executive Director

Environmental Defense Fund, Inc.  
National Headquarters  
New York, NY

Mr. Michael Bean  
Legislative Director  
Environmental Defense Fund, Inc.  
Washington, DC

Mr. David Albright  
Federation of American Scientists  
Washington, DC

Mr. Brent Blackwelder  
President  
Friends of the Earth  
Washington, DC

Mr. Tom Clements  
Greenpeace  
Washington, DC

Ms. Pamela Murphy  
Project Manager  
League of Women Voters  
Washington, DC

Ms. Ann Rentiers  
National Environmental Policy Institute  
Washington, DC

Dr. Jay D. Hair  
National Wildlife Federation  
Washington, DC

Mr. Ashok Gupta  
Natural Resources Defense Council  
New York, NY

Mr. Christopher Paine  
Senior Research Associate  
Natural Resources Defense Council, Inc.  
Washington, DC

Andrew Caputo  
Natural Resources Defense Council  
Washington, DC

Mr. Steven Dolley  
Nuclear Control Institute  
Washington, DC

Mr. Michael Mariotte  
Nuclear Information Resource Service  
Washington, DC

Daryl Kimball  
Physicians for Social Responsibility  
Washington, DC

Ms. Patty McCleary  
National Conservation Representative  
The Sierra Club  
National Headquarters  
San Francisco, CA

Ms. Mamatha Gowda  
Associate Representative for Global Warming  
and Energy Programs  
The Sierra Club  
Washington, DC

Mr. Burt Glass  
Peace Action  
Washington, DC

Mr. Ed Rothschild  
Citizen Action, Inc.  
Washington, DC

Mr. Paul Schwartz  
Public Policy Advocate  
Clean Water Action Project  
Washington, DC

Ms. Susan Boyd  
Executive Director  
Concern, Inc.

Ms. Margaret Morgan-Hubbard  
Executive Director  
Environmental Action, Inc.  
Takoma Park, MD

Dr. Jan Beyea  
Chief Scientist  
National Audubon Society  
New York, NY

Ms. Liz Raisbeck  
Senior Vice President  
National Audubon Society  
Washington, DC

Ms. Meg Power  
National Community Action Foundation  
Washington, DC

Mr. Paul Moorehead  
Executive Director  
National Congress of American Indians  
Washington, DC

Mr. Witney Fosburgh  
Director of Fisheries  
National Fish and Wildlife Foundation  
Washington, DC

Mr. George Abney  
Legislative Assistant  
National Trust for Historic Preservation  
Washington, DC

Mr. Tom Donnelly  
Executive Vice President  
National Water Resources Association  
Arlington, VA

Mr. Bill Magavern  
Director, Critical Mass Energy Project  
Public Citizen  
Washington, DC

Mr. Alden Meyer  
Director  
Climate/Energy Program  
Union of Concerned Scientists  
Washington, DC

## **I.2 State and Local**

Ms. Qasimah P. Boston  
Citizens for Environmental Justice  
Savannah, GA

Dr. Mildred McClain  
Citizens for Environmental Justice  
Savannah, GA

Debra K. Hasan  
Citizens for Environmental Justice  
Savannah, GA

Mr. Brian Costner  
Energy Research Foundation  
Columbia, SC

Ms. Anna Aurilio  
Staff Scientist  
U.S. Public Interest Research Group  
Washington, DC

Mrs. Pat Harris  
Resources, Planning, and Economics Assistant  
The Wilderness Society  
Washington, DC

Mr. Thomas Franklin  
Policy Director  
The Wildlife Society  
Bethesda, MD

Ms. Kathryn Fuller  
President  
World Wildlife Fund  
Washington, DC

Mr. David Roodman  
Research Assistant  
Worldwatch Institute  
Washington, DC

Ms. Amanda W. Everette  
Greenpeace U.S.A., Inc.  
Savannah, GA

Mr. Ronnie Geiselhart  
Chamber of Commerce of Greater North  
Augusta  
North Augusta, SC

Ms. Charlotte Marsala  
Resident Home Owners Coalition  
Hilton Head Island, SC

Dr. Mary T. Kelly  
League of Women Voters of South Carolina  
Columbia, SC

Mrs. Joan O. King  
20/20 Vision  
Santee, GA

Executive Director  
The SC Wildlife Federation  
Columbia, SC

Mr. Timothy Kulik  
Georgians Against Nuclear Energy (GANE)  
Stone Mountain, GA

Mr. Rod McCoy  
Georgians Against Nuclear Energy (GANE)  
Atlanta, GA

Ms. Nancy White Norkus  
Coastnet  
Beaufort, SC

## J. OTHER GROUPS AND INDIVIDUALS

Ms. Eve Al-Arnasi

Lewis and Clark Law School

Dave Alford

Mr. James E. Bolen

Mr. Peter Allan

Mr. Sam W. Booher

Dr. Dave Amick  
Raytheon Engineers & Constructors

Edmund D. Boothe  
Aiken Technical College

Mr. Paul Anthony

R. P. Borsody

Mr. Randy Balice, Ph.D.

Mr. John Boswell

Mr. John Barghusen  
Meta Inc.

Mr. Carlos W. Bowen

Marya Barker

Ms. Gaile Boyd

Mr. Gary A. Benda  
U.S. Energy Corp.

Mr. Steve Bren  
Science Applications International Corporation

Ms. Phyllis Bennent

Mr. Scott Bronstein  
Atlanta Constitution

Mr. David Bennert  
Clemson University  
ESE

Ms. Elizabeth R. Brown  
Charleston Deanery  
SC Council of Catholic Woman

Mr. Rob Bleil  
Rust Geotech, Inc.

Ms. Jean O. Brown

Mr. William L. Boettinger

Mr. Ted Brzinski  
Parson Engineering Science, Inc.

Professor John A. Bogdanski

Mr. Frank Bugg  
Deputy Superintendent  
Georgia Public Television

Ms. Beth Burgoyne  
Scientech

Mr. Richard Burnette  
Environmental Protection Specialist

E. L. Cagle, Jr.

Dr. Teresa Castelao-Lawless  
Grand Valley State University  
Philosophy Dept., LSH215

Mr. Michael S. Chan  
Southern Defense Systems, Inc.

Dr. Kailash Chandra

Ms. Ann Maric Choephel  
Tetrattech, Inc.

Mr. Inn Choi  
Battelle Pacific North West Laboratory

S. W. Corbett

Ms. Judy Cornett  
BNFL

Dr. John Cowles  
TRW

Ms. Deborah B. Crews

Mr. William A. Cross  
Executive Vice President  
Southern Technical Services, Inc.

Mr. Joseph Cruz

Mr. John D'Souza

Mr. Chris Day

Mr. Robert Deegan  
Sierra Club Nuclear Waste

Ms. Shirly O. Dennis

Mr. Carl Di-Bella  
Nuclear Technical Review Board

Mr. John Dimarzio

Mr. James Doenges  
Mac Technical Services

Mr. John F. Doherty, J.D.

Ms. Gledys Drake

Ms. Connie Drury  
Rogers and Associates Engineering Corporation

Mr. Dennis DuPont  
RUST Geotech, Inc.

Mr. Dale Dusenbury  
North Carolina Department of Environment,  
Health & Natural Resources  
Division of Radiological Protection

Mr. Dave Ecklund

Mr. Jerry Edmonds

Ms. Anne H. Ehrlich  
Department of Biological Sciences  
Stanford University

Ms. Maureen Eldridge  
Military Production Network

R. H. Englemann

Ms. Ardes Evje  
Battelle

Mr. Frank Carlton Fiery

Mr. Jim Fiorillo

Dr. William Fleming  
SRA Technologies, Inc.

Mr. Patrick C. Flynn  
Hilton Head Plantation Utilities, Inc.

Mr. John Huff  
STRA

Mr. Robert W. Folsom

Mr. Charles E. Irvin

Diane & Max Forkel

W. N. Jackson

Professor H. Paul Friesema  
Center for Urban Affairs and Policy Research  
Northwestern University

Mr. Cliff Jarman  
B&RE

Mr. Glen Galen  
Bechtel Environmental

Ms. Gail F. Jernigan

Ms. Jennifer Jones  
STRA

Mr. Ben Gannon  
Mr. Carlos Garcia  
Raytheon Engineers & Constructors

Mr. Ron Kaz

Mr. Ron Kear  
Dames and Moore

Colonel George A. Gibson

Mr. Don Gordon

Ms. Sharon L. Kidwell  
Performance Development Corp.

Dr. Stanton Green

Mr. Ronald E. Knotts, Sr.

Dr. Martha M. Griffin  
Physical Science Department  
Columbia College

Mr. Hugo Krispyn  
Edge Productions

Mrs. Robert Hackney

Mr. Joseph Kriz

Mr. John D. Haefner

Mr. Terry Kuykendall  
Parson Engineering Science, Inc.

Jan Hagers

David Lakin  
British Embassy

Mr. Stephen D. Hale  
Augusta Chronicle

Mr. Dewey E. Large  
Scientific Ecology Group, Inc.

Ms. Krista Harris

Mr. Bruce Henderson  
Charlotte Observer

Mr. Larry Long  
Martin-Marietta Energy Systems, Inc.  
Oak Ridge National Laboratory

Ms. Linda Hensley  
Stone & Webster Engineering Corporation

Mr. Arthur C. Long  
General Physics Corp.

Dr. Tom Hinton  
SREL

Mr. James C. Loomis  
Cetacean Relations Society

Tolly Honeycutt

Mr. Steve Maheras

Mr. Sam P. Manning

Mr. Joe Martillotti  
Texas Department of Health  
Bureau of Radiation Control

Dr. Laurie E. Martin  
University of South Carolina

Ms. Sherry Martin  
Raytheon Engineers & Constructors

Mrs. Bob Matthews

Mr. Carl A. Mazzola  
Stone & Webster Engineering Corporation

William A. McCarthy

Mr. Clifton M. McClure  
Consumer Fuels Corporation

Mr. James D. McDaniel

Mr. William R. McDonell

Mr. Mike McKenzie-Carter

Mr. John Emmette McLaughlin, Jr.

Mr. Thomas McMeekin

Mr. J. S. Medford  
Duke Engineering & Services

Rachel Meldrum

Mr. Chuck Mengan  
Parson Engineering Science, Inc.

Mr. George M. Minot

Nick Monaco  
META

Ms. Louise M. Montgomery

Mr. Robert J. Mullin  
TVA - Nuclear Fuel

Mr. & Mrs. Fred Nadelman

Mr. R. I. Newman

Stephen C. Newman  
Raytheon Engineers & Constructors

Mr. Jack Nobbs  
Raytheon Engineers & Constructors  
Rowena Nylund

Markie Oliver

Mr. William H. Ollinger  
Southern Nuclear Operating Company

Mr. Robert F. Overman

Ms. Barbara Reed Partrich  
Lexington District 5  
Irmo High

Ms. Barbara Patrick

Susan Payne  
Savannah River Regional Diversification  
Initiative

Mr. Jeff Petraglia

Mr. John Petring  
Ogden

Jan Phelps  
RUST Federal Services

Ms. Lyn Phillips

Mr. Clifford D. Ponder

Mr. Ron Pound  
Environmental Projects Newsletter

Ms. Wendy Powell  
Sciencetech

Ms. Marsha Rabb  
Science Applications International Corporation

Dick Ransom

Mr. Jeff Ray

William Reinig

Mr. James M. Rivers

Mr. John E. Rogers

Mr. Ken Schaub

Ms. Kathy Schwendenman  
Advanced Sciences, Inc.

Mr. John P. Seibels, Jr.

Ms. Arlene B. Selber  
Vice President  
Parson Engineering Science, Inc.

Dr. Harry E. Shealy, Jr.  
Professor of Biology  
University of South Carolina at Aiken

M. H. Shekastehband

John Shideler

Mr. Daniel W. Smith

Jason R. Smith

C. Wesley Smith, P.C.  
Attorney At Law

Mr. John C. Snedeker  
President  
Synergistic Dynamics, Inc.

S. Dennison Sprague

Mr. Norm Stanley

Ms. Jo Anne Steele  
Tetra Tech, Inc.

Mr. William C. Stegall, Jr.  
RUST Federal Services

Mrs. Karen J. Stein

Mr. William Paul Stephens  
Plasma Chem, Inc.

Dr. John Stewart

Mr. Edward S. Syrjala

Mr. Robert Thomas

Mrs. Elvira E. Thompson

Dr. Robert P. Thompson  
Dept. of Cell Biology  
MUSC

Dr. Wayne Tolbert  
Sr. Program Manager  
Science Applications International Corporation

Mr. John Twondly

Mr. James R. Tyler  
Director  
Environmental Services  
Innovative Technology Systems, Inc.

Linda VanSickle  
Exploration Resources

Raymond Vinton  
Babcock and Wilcox

Dr. David H. Vomacka  
c/o Woolpert

Mr. James W. Voss  
Director  
Nuclear Services  
Golder Associates  
Mr. John Walker  
CDM Federal Programs Corp.

Mr. John Walker  
Nuclear Waste Project Office  
Capital Complex

Frank S. Watters

Kim Welsch  
Westinghouse  
Hanford Co.

Mr. Stephen R. White

Robert H. Wilcox

Mr. Alex Will

Daniel Williams

Ms. Theresa Wolfe  
Librarian  
Ecology and Environment, Inc.  
Buffalo Corporate Center

Mr. Roger Wong  
North Carolina Department of Environment,  
Health & Natural Resources

Carl W. Zeh

## **K. READING ROOMS**

Ms. Felicia Yeh  
Technical Services Librarian  
South Carolina State Library

Freedom of Information Reading Room  
U.S. Department of Energy, Forrestal Building  
Washington, DC

Freedom of Information Public Document  
Room  
University of South Carolina at Aiken  
Aiken, SC

## INDEX FOR VOLUME I

- Accidents S-18, S-19, 2-16, 4-35, 4-38, 4-39, 40, 42, 43, 44, 4-56, 4-58, 4-59, 4-60, 4-62, 4-67, 4-103, 4-104, 4-105, 4-106, 4-107, 4-119, 4-121, 4-126, 4-128, 4-129, 4-130, 4-164, 4-166, 4-167, 4-168, 4-182, 4-188, 4-189, 4-191, 4-224, 4-243, 4-249, 4-250, 4-252
- Air emissions 2-42, 3-28, 4-20, 45, 48, 4-54, 4-82, 4-84, 4-87, 4-88, 4-89, 4-109, 4-145, 4-148, 4-149, 4-171, 4-206, 4-207, 4-209, 4-210, 4-211, 4-232, 4-234, 4-263, 4-268, 5-11
- Air quality 3-28, 3-29, 3-31, 4-18, 4-19, 4-39, 4-52, 4-82, 4-85, 4-87, 4-88, 4-89, 4-113, 4-116, 4-119, 4-143, 4-148, 4-149, 4-173, 4-178, 4-181, 4-204, 4-209, 4-210, 4-211, 4-236, 4-240, 4-243, 4-253, 4-259, 4-263, 4-268, 5-11, 5-15
- Alpha vitrification facility S-13, S-14, 2-6, 2-140, 2-143, 2-147, 2-148, 2-151, 2-152, 2-153, 2-155, 2-157, 2-158, 2-159, 2-161, 2-162, 2-163, 2-165, 2-166, 2-172, 2-174, 2-186, 2-187, 2-188, 2-189, 2-191, 2-194, 2-197, 4-131, 4-132, 4-141, 4-170, 4-171, 4-191, 4-203, 4-234, 4-256, 4-261, 4-263
- Alpha waste S-5, S-12, S-13, S-14, 2-4, 2-5, 2-6, 2-10, 2-12, 2-14, 2-68, 2-70, 2-71, 2-75, 2-80, 2-92, 2-94, 2-110, 2-111, 2-127, 2-129, 2-131, 2-132, 2-133, 2-134, 2-140, 2-145, 2-152, 2-155, 2-161, 2-162, 2-163, 2-164, 2-165, 2-166, 2-172, 2-191, 2-193, 2-194, 2-195, 2-196, 2-197, 3-80, 4, 4-6, 4-9, 4-14, 4-22, 45, 4-69, 4-131, 4-132, 4-143, 4-145, 4-192, 4-206, 4-261
- Amalgamation 2-83, 2-125, 2-155, 2-157, 2-165, 4-131
- Aqueous waste storage tank 2-76
- AXAIR89Q 4-60
- Beaver Dam Creek 3-15, 3-19, 3-21, 3-37
- Biota 3-36, 4-17, 4-24
- Burial ground 2-14, 2-15, 2-108, 3-61
- Cancer risk 4-45, 4-53, 4-109, 4-113, 4-116, 4-119, 4-175, 4-179, 4-182, 4-236, 4-240, 4-242, 4-243
- Carolina bay 3-31, 3-33
- Cesium 2-16, 3-27, 3-59, 3-60, 3-62, 3-93, 4-17, 4-253
- Clean Water Act 4-15, 5-7, 5-8, 5-9, 5-15
- Compactors S-12, S-13, S-14, 2-56, 2-57, 2-106, 2-109, 2-117, 2-148, 2-149, 2-176, 2-182, 4-3, 4-20, 4-84
- Consolidated Incineration Facility S-5, S-7, S-9, S-11, S-12, S-13, S-14, 1-3, 1-4, 1-6, 2-5, 2-6, 2-21, 2-64, 2-65, 2-75, 2-94, 2-107, 2-111, 2-118, 2-122, 2-123, 2-124, 2-126, 2-134, 2-140, 2-145, 2-147, 2-148, 2-151, 2-152, 2-155, 2-156, 2-157, 2-158, 2-161, 2-162, 2-165, 2-166, 2-172, 2-178, 2-180, 2-181, 2-182, 2-184, 2-186, 2-187, 2-188, 2-189, 2-197, 3-66, 3-85, 4-2, 4-67, 4-69, 4-80, 4-81, 4-82, 4-84, 4-85, 4-101, 4-108, 4-109, 4-111, 4-129, 4-131, 4-141, 4-143, 4-145, 4-146, 4-170, 4-171, 4-191, 4-192, 4-202, 4-203, 4-206, 4-207, 4-225, 4-231, 4-232, 4-234, 4-255, 4-256, 4-261, 4-263, 5-7, 5-10, 5-11, 5-15
- Containment building S-9, 2-94, 2-99, 2-106, 2-111, 2-122, 2-123, 2-124, 2-125, 2-126, 2-127, 2-134, 2-140, 2-142, 2-151, 2-152, 2-155, 2-156, 2-159, 2-165, 2-172, 2-182, 2-186, 2-187, 2-188, 2-189, 2-191, 2-197, 4-69, 4-80, 4-81, 4-82, 4-84, 4-102, 4-108, 4-109, 4-131, 4-141, 4-143, 4-145, 4-146, 4-164, 4-170, 4-171, 4-191, 4-192, 4-202,

- 4-203, 4-204, 4-206, 4-207, 4-224, 4-231,  
4-234, 4-261, 4-263
- Cultural resources S-17, 4-31, 4-32, 4-91, 4-98,  
4-99, 4-158, 4-160, 4-161, 4-220, 4-221,  
4-262, 5-13
- Cumulative impacts S-7, 1-4, 1-9, 2-8, 4-2,  
4-257, 4-259, 4-261, 4-262, 4-263
- Decontamination and decommissioning S-6,  
S-8, S-12, S-15, 1-1, 2-1, 2-2, 2-9, 2-10, 2-13,  
2-14, 2-15, 2-19, 2-23, 2-26, 2-28, 2-29, 2-31,  
2-34, 2-36, 2-39, 2-43, 2-52, 2-109, 3-40,  
3-66, 3-85, 3-87, 3-88, 3-89
- Defense Waste Processing Facility S-1, S-3,  
S-8, S-11, 1-1, 1-5, 1-7, 1-8, 1-9, 1-10, 1-11,  
2-1, 2-10, 2-21, 2-24, 2-49, 2-51, 2-52, 2-53,  
2-54, 2-62, 2-64, 2-65, 2-67, 2-73, 2-74, 2-75,  
2-76, 2-80, 2-94, 2-106, 2-107, 2-108, 2-122,  
2-123, 2-124, 2-155, 2-156, 2-157, 2-166,  
2-186, 2-187, 2-188, 2-197, 3-28, 3-51, 3-66,  
3-80, 3-88, 4-3, 4-9, 4-14, 4-17, 4-18, 4-19,  
4-45, 4-48, 4-50, 4-53, 4-80, 4-82, 4-84,  
4-109, 4-141, 4-145, 4-171, 4-192, 4-202,  
4-204, 4-206, 4-232, 4-234, 4-258, 4-259,  
4-262, 4-263, 4-265, 4-266, 4-268, 5-9
- Earthquakes 3-6, 3-7, 4-58
- Ecology 3-32, 3-36, 3-39
- Effluents S-12, 2-53, 3-14, 3-19, 3-20, 3-21,  
3-80, 4-2, 4-54
- Employment S-19, 3-40, 3-42, 3-55, 4-29, 4-30,  
4-31, 4-36, 4-92, 4-93, 4-94, 4-95, 4-96,  
4-153, 4-154, 4-155, 4-157, 4-158, 4-214,  
4-215, 4-216, 4-217, 4-218, 4-265
- Environmental Justice 3-44, 4-53, 4-54, 4-56,  
4-58, 4-113, 4-117, 4-119, 4-175, 4-179,  
4-182, 4-236, 4-240, 4-243, 4-262, 5-13
- Environmental restoration S-6, S-8, S-15, 1-1,  
1-2, 2-1, 2-9, 2-10, 2-13, 2-14, 2-19, 2-21,  
2-23, 2-24, 2-26, 2-29, 2-30, 2-31, 2-34, 2-36,  
2-39, 2-40, 2-42, 2-43, 2-72, 2-80, 2-99,  
2-108, 2-109, 2-133, 2-164, 3-40, 3-66, 3-81,  
3-88, 3-89, 3-90, 4-12, 4-262
- Erosion 3-4, 4-6, 4-9, 4-15, 4-24, 4-79, 4-81,  
4-142, 4-202, 4-203, 4-204
- Evaporators, 2-51, 2-52, 2-53, 2-73, 2-114,  
2-145, 2-175, 4-3, 4-18, 4-20, 4-80, 4-84,  
4-141, 4-202
- Experimental Transuranic Waste Assay Facility  
S-12, 2-68, 2-70, 2-75, 2-109, 2-129, 2-131,  
2-132, 2-133, 4-4
- Fourmile Branch 3-11, 3-15, 3-19, 3-37, 4-14
- Greater confinement disposal 2-58
- Groundwater S-17, S-18, 1-5, 2-23, 2-30, 2-36,  
2-60, 2-62, 2-64, 2-66, 2-72, 2-74, 2-75,  
2-108, 2-118, 2-187, 3-7, 3-9, 3-11, 3-13,  
3-14, 3-61, 3-91, 3-96, 4-3, 4-4, 4-9, 4-10,  
4-11, 4-12, 4-13, 4-14, 4-15, 4-16, 4-17, 4-20,  
4-50, 4-76, 4-77, 4-78, 4-79, 4-80, 4-138,  
4-139, 4-140, 4-141, 4-198, 4-199, 4-200,  
4-201, 4-203, 4-253, 4-254, 4-256, 4-262,  
5-1, 5-7
- Hazardous waste S-5, S-6, S-8, S-9, S-11, S-12,  
S-13, S-14, 1-1, 2-2, 2-6, 2-10, 2-13, 2-14,  
2-15, 2-18, 2-23, 2-24, 2-30, 2-31, 2-35, 2-36,  
2-40, 2-41, 2-44, 2-45, 2-47, 2-48, 2-60, 2-61,  
2-66, 2-67, 2-74, 2-76, 2-80, 2-81, 2-92, 2-99,  
2-100, 2-101, 2-104, 2-105, 2-106, 2-109,  
2-111, 2-117, 2-118, 2-119, 2-126, 2-130,  
2-134, 2-140, 2-142, 2-149, 2-150, 2-151,  
2-152, 2-153, 2-158, 2-165, 2-172, 2-182,  
2-183, 2-184, 2-188, 3-6, 3-66, 3-80, 3-81,  
3-85, 3-94, 4-3, 4-10, 4-20, 4-35, 4-37, 4-38,  
4-39, 4-43, 4-49, 4-69, 4-76, 4-84, 4-109,  
4-131, 4-132, 4-139, 4-140, 4-143, 4-145,  
4-146, 4-162, 4-192, 4-199, 4-206, 4-231,  
5-4, 5-6, 5-7
- Hazardous Waste/Mixed Waste Disposal Vaults  
2-67, 2-72, 2-108, 2-125, 2-158, 2-188
- Hazardous Waste Storage Facility 2-60

Health effects 4-22, 4-35, 4-39, 4-44, 4-45,  
4-48, 4-54, 4-59, 4-62, 4-67, 4-85, 4-87, 4-89,  
4-103, 4-108, 4-109, 4-111, 4-116, 4-117,  
4-119, 4-146, 4-150, 4-164, 4-170, 4-171,  
4-173, 4-178, 4-179, 4-181, 4-182, 4-207,  
4-211, 4-224, 4-231, 4-232, 4-234, 4-239,  
4-240, 4-242, 4-265, 4-266

Incineration S-3, S-5, S-7, S-9, S-11, S-12,  
S-13, S-14, S-17, 1-3, 1-4, 1-5, 1-6, 2-5, 2-6,  
2-7, 2-19, 2-21, 2-64, 2-65, 2-75, 2-83, 2-88,  
2-94, 2-104, 2-106, 2-107, 2-111, 2-118,  
2-122, 2-123, 2-124, 2-125, 2-126, 2-134,  
2-140, 2-145, 2-147, 2-148, 2-151, 2-152,  
2-155, 2-156, 2-157, 2-158, 2-161, 2-162,  
2-165, 2-166, 2-172, 2-178, 2-180, 2-181,  
2-182, 2-184, 2-186, 2-187, 2-188, 2-189,  
2-197, 2-198, 3-66, 3-85, 4-2, 4-4, 4-67, 4-69,  
4-80, 4-81, 4-82, 4-84, 4-85, 4-101, 4-108,  
4-109, 4-111, 4-129, 4-131, 4-141, 4-143,  
4-145, 4-146, 4-170, 4-171, 4-191, 4-192,  
4-202, 4-203, 4-206, 4-207, 4-225, 4-226,  
4-227, 4-231, 4-232, 4-234, 4-255, 4-256,  
4-261, 4-263, 5-7, 5-10, 5-11, 5-15

Income 3-42, 3-44, 3-47, 3-49, 4-29, 4-53,  
4-54, 4-56, 4-58, 4-93, 4-95, 4-98, 4-113,  
4-153, 4-158, 4-175, 4-214, 4-217, 4-220,  
4-236, 5-13

Ion exchange 2-17, 2-18, 2-62, 2-74, 2-83, 4-4,  
4-20, 4-84, 4-203

Irreversible and irretrievable commitment of  
resources 4-252, 4-256, 4-257

Land use 3-31, 3-40, 4-29, 4-91, 4-92, 4-128,  
4-152, 4-189, 4-213, 4-214, 4-250

Latent cancer fatalities S-5, 2-4, 4-39, 4-41,  
4-43, 4-44, 4-45, 4-46, 4-48, 4-103, 4-104,  
4-105, 4-106, 4-107, 4-165, 4-166, 4-167,  
4-168, 4-169, 4-225, 4-226, 4-227, 4-228,  
4-229, 4-230, 4-259, 4-265, 4-266

Liquid Effluent Treatment Facility 2-13, 2-44,  
2-46, 2-66, 2-109, 2-123, 2-124, 2-156, 4-16,  
4-202, 5-9

Liquid releases 4-17, 4-266

Low-level waste 1-4, 1-7

Macroencapsulation S-9, 2-83, 2-95, 2-123,  
2-129, 2-133, 2-157, 2-187, 2-194, 4-69,  
4-132, 4-192

Mercury 2-13, 2-18, 2-120, 2-123, 2-125,  
2-126, 2-155, 2-156, 2-157, 2-165, 2-184,  
2-187, 2-188, 2-189, 2-198, 2-94, 2-104,  
2-105, 3-16, 3-18, 3-31, 3-93, 3-96, 4-13,  
4-69, 4-128, 4-131, 4-192

Mixed waste S-3, S-4, S-5, S-6, S-7, S-11,  
S-12, S-14, 1-3, 1-4, 1-6, , 2-3, 2-4, 2-7, 2-10,  
2-13, 2-15, 2-17, 2-23, 2-29, 2-35, 2-36, 2-40,  
2-42, 2-44, 2-45, 2-46, 2-60, 2-62, 2-63, 2-64,  
2-65, 2-66, 2-67, 2-70, 2-72, 2-74, 2-75, 2-76,  
2-80, 2-92, 2-93, 2-94, 2-95, 2-99, 2-100,  
2-101, 2-104, 2-105, 2-106, 2-107, 2-108,  
2-111, 2-112, 2-113, 2-116, 2-118, 2-120,  
2-121, 2-122, 2-123, 2-124, 2-125, 2-126,  
2-127, 2-131, 2-134, 2-135, 2-140, 2-141,  
2-142, 2-143, 2-144, 2-149, 2-151, 2-153,  
2-154, 2-155, 2-156, 2-157, 2-158, 2-159,  
2-165, 2-172, 2-173, 2-174, 2-175, 2-182,  
2-184, 2-185, 2-186, 2-187, 2-188, 2-189,  
2-190, 2-191, 2-197, 3-66, 3-81, 3-89, 3-90,  
4-2, 4-4, 4-6, 4-9, 4-14, 4-19, 4-20, 4-42,  
4-48, 4-49, 4-62, 4-67, 4-69, 4-82, 4-84, 4-85,  
4-103, 4-104, 4-105, 4-106, 4-107, 4-108,  
4-109, 4-121, 4-126, 4-131, 4-132, 4-145,  
4-164, 4-171, 4-182, 4-188, 4-191, 4-192,  
4-206, 4-224, 4-232, 4-234, 4-239, 4-249,  
4-253, 4-256, 4-261, 4-263, 5-6, 5-7, 5-8,  
5-15

Mixed Waste Management Facility 2-29, 2-39,  
2-40, 2-135, 3-94, 3-96

Mixed waste storage building 2-23, 2-64, 2-65,  
2-75, 2-762-122, 2-123, 2-155, 2-156, 2-186,  
3-66, 4-14, 4-20, 4-48, 4-82, 4-145, 4-206,  
4-261

Mixed waste storage pad 2-76, 2-122, 2-155,  
2-187

New Waste Transfer Facility S-11, 2-51, 2-52,  
2-53, 2-54, 2-73, 2-107

Occupational and public health 4-45, 4-108

Organic waste 2-64, 2-65, 2-66, 2-75, 2-76,  
2-123, 2-156, 2-187, 4-14, 4-19, 4-48, 4-53,  
4-67

Organic waste storage tanks 2-64, 2-65, 2-66,  
2-75, 2-76, 4-14, 4-19, 4-48, 4-53, 4-67

Plutonium S-3, 1-5, 1-8, 1-9, 2-9, 2-16, 2-21,  
2-24, 2-35, 2-36, 2-101, 2-106, 2-108, 2-122,  
2-130, 2-131, 2-134, 2-162, 2-164, 2-191,  
2-193, 2-194, 2-196, 3-16, 3-27, 3-62, 3-88,  
3-89, 4-11, 4-253, 4-258, 4-260, 4-262,  
4-263, 4-265, 4-266, 4-268

Pollution prevention S-11, 2-2, 2-41, 2-42, 4-9,  
4-81, 4-142, 4-204

Population S-15, 2-88, 2-125, 2-147, 2-178,  
3-37, 3-42, 3-43, 3-44, 3-46, 3-47, 3-56, 3-57,  
3-59, 3-60, 3-64, 4-22, 4-24, 4-26, 4-29, 4-37,  
4-38, 4-39, 4-40, 4-41, 4-44, 4-45, 4-46, 4-48,  
4-49, 4-50, 4-52, 4-53, 4-56, 4-59, 4-60, 4-62,  
4-85, 4-87, 4-88, 4-89, 4-93, 4-95, 4-96,  
4-104, 4-106, 4-107, 4-109, 4-111, 4-119,  
4-121, 4-122, 4-125, 4-126, 4-146, 4-148,  
4-149, 4-150, 4-153, 4-158, 4-166, 4-167,  
4-168, 4-169, 4-173, 4-181, 4-182, 4-189,  
4-207, 4-209, 4-210, 4-211, 4-214, 4-217,  
4-225, 4-226, 4-228, 4-229, 4-230, 4-231,  
4-234, 4-236, 4-242, 4-243, 4-249, 4-250,  
4-254, 4-265, 4-266, 5-11

Process Waste Interim Treatment/Storage  
Facility 2-62, 2-66, 2-74, 2-123, 2-156,  
2-187, 3-81

Public health S-17, 4-45, 4-108, 4-179, 4-268,  
5-11

Radiation dose 2-11, 2-12, 2-15, 3-56, 3-57,  
3-59, 3-64, 4-39, 4-46, 4-54, 4-56, 4-231

Radiation exposure 2-13, 2-16, 3-57, 3-58,  
3-64, 4-39, 4-40, 4-41, 4-62, 4-108, 4-253,  
4-266

Recycling S-3, S-13, S-14, 1-2, 1-5, 1-9, 1-10,  
2-9, 2-28, 2-35, , 2-41, 2-43, 2-44, 2-45, 2-46,  
2-47, 2-48, 2-49, 2-60, 2-74, 2-112, 2-118,  
2-120, 2-142, 2-143, 2-144, 2-151, 2-155,  
2-157, 2-174, 2-186, 2-198, 3-81, 4-192,  
4-258

Risk S-19, 2-17, 2-81, 2-88, 2-143, 3-64, 3-87,  
4-39, 4-41, 4-43, 4-45, 4-53, 4-60, 4-62, 4-67,  
4-103, 4-105, 4-107, 4-108, 4-109, 4-113,  
4-116, 4-119, 4-121, 4-126, 4-128, 4-129,  
4-130, 4-165, 4-167, 4-169, 4-170, 4-175,  
4-179, 4-181, 4-182, 4-188, 4-189, 4-191,  
4-225, 4-228, 4-229, 4-230, 4-232, 4-236,  
4-240, 4-242, 4-243, 4-249, 4-250, 4-252,  
4-254, 4-260, 4-266, 4-268

Safe Drinking Water Act, 2-31, 5-9, 5-15

Sanitary waste S-1, 1-1, 2-26, 3-19, 3-20

Savannah River S-1, S-3, S-4, S-18, 1-1, 1-5,  
1-7, 2-1, 2-7, 2-10, 2-19, 2-21, 2-23, 2-41,  
2-51, 2-62, 2-65, 2-74, 2-76, 2-81, 2-107,  
2-109, 2-123, 2-156, 2-187, 3-1, 3-2, 3-4, 3-7,  
3-9, 3-11, 3-14, 3-15, 3-16, 3-17, 3-19, 3-20,  
3-21, 3-27, 3-29, 3-31, 3-32, 3-33, 3-36, 3-37,  
3-38, 3-39, 3-40, 3-44, 3-51, 3-52, 3-59, 3-60,  
3-81, 3-88, 4-2, 4-4, 4-9, 4-16, 4-20, 4-25,  
4-26, 4-27, 4-31, 4-32, 4-49, 4-50, 4-52, 4-56,  
4-58, 4-59, 4-84, 4-99, 4-142, 4-145, 4-160,  
4-161, 4-207, 4-220, 4-221, 4-254, 4-257,  
4-259, 4-263, 5-1, 5-9, 5-10, 5-13

SCDHEC 2-13, 2-52, 2-66, 2-67, 2-70, 2-72,  
2-125, 2-158, 2-188, 3-6, 3-15, 3-16, 3-18,  
3-21, 3-29, 3-30, 3-31, 3-66, 3-81, 3-90, 3-91,  
3-92, 3-94, 4-9, 4-16, 4-17, 4-19, 4-20, 4-21,  
4-81, 4-84, 4-85, 4-145, 4-204, 4-206, 4-261,  
4-263, 4-9, 4-81, 4-142, 4-202, 4-204, 5-5,  
5-6, 5-7, 5-9, 5-11, 5-15

Shallow land disposal S-5, S-11, S-12, S-13,  
S-14, S-17, 2-4, 2-54, 2-56, 2-57, 2-59, 2-64,  
2-65, 2-67, 2-73, 2-74, 2-83, 2-84, 2-92,  
2-104, 2-108, 2-111, 2-116, 2-117, 2-118,  
2-120, 2-122, 2-125, 2-126, 2-140, 2-143,  
2-145, 2-147, 2-148, 2-149, 2-151, 2-152,  
2-153, 2-156, 2-157, 2-158, 2-161, 2-162,  
2-163, 2-165, 2-166, 2-172, 2-178, 2-180,  
2-181, 2-182, 2-184, 2-186, 2-188, 2-189,  
2-197, 2-198, 4-3, 4-4, 4-9, 4-10, 4-13, 4-77,  
4-78, 4-131, 4-139, 4-141, 4-191, 4-192,  
4-202, 4-261, 4-262

Site treatment plan S-4, S-5, S-6, 1-3, 2-3, 2-15,  
2-36, 2-80, 2-87, 2-92, 2-93, 2-94, 2-95, 2-99,  
2-100, 5-8, 5-15

Slit trench, 2-54, 2-57, 2-58, 2-59, 2-73, 2-77,  
4-10, 4-11, 4-14, 4-77, 4-78, 4-139, 4-140,  
4-199, 4-200, 4-201, 4-253, 4-256, 4-261

Smelter, 2-112, 2-140, 2-142, 2-147, 2-148,  
2-149, 2-172, 2-180, 2-181, 4-139, 4-140,  
4-199, 4-200, 4-201

Socioeconomics S-17, 3-40, 4-2, 4-153, 4-157,  
4-93, 4-95, 4-214, 4-216, 4-217, 4-265

Soil Sort Facility 2-159, 2-165, 2-107, 2-111,  
2-113, 2-122, 2-124, 2-127, 2-134, 2-172,  
2-178, 2-180, 2-181, 2-191, 2-197, 4-69,  
4-80, 4-82, 4-108, 4-109, 4-191, 4-204,  
4-206, 4-207, 4-231, 4-234, 4-261

Soils S-17, 2-10, 2-12, 2-13, 2-24, 2-36, 2-44,  
2-56, 2-72, 2-73, 2-80, 2-84, 2-99, 2-104,  
2-106, 2-112, 2-113, 2-116, 2-117, 2-122,  
2-124, 2-126, 2-141, 2-143, 2-144, 2-147,  
2-148, 2-149, 2-153, 2-157, 2-173, 2-174,  
2-175, 2-178, 2-180, 2-181, 2-186, 2-189,  
2-197, 3-4, 3-25, 4-6, 4-9, 4-13, 4-14, 4-70,  
4-77, 4-79, 4-90, 4-91, 4-132, 4-133, 4-191,  
4-193, 4-199, 4-200, 4-201

Solvent storage tank 2-62, 2-66, 2-74, 2-76

SRS Stormwater Pollution Prevention Plan  
4-16, 4-79, 4-202, 4-203

Stormwater permit 5-9

Supernatant 2-10, 2-94, 3-88

Surface water S-17, 2-53, 3-15, 3-59, 3-91,  
4-11, 4-15, 4-16, 4-24, 4-79, 4-80, 4-81,  
4-141, 4-142, 4-202, 4-203, 4-204, 4-254,  
4-262, 4-263

Threatened and endangered species 2-71, 2-72,  
4-91, 4-128, 4-151, 4-189, 4-212, 4-250,  
4-255, 5-12

Tornadoes 3-22, 3-23, 4-58

Transuranic waste S-1, S-4, S-7, S-9, S-11,  
S-12, S-13, S-18, 2-1, 2-2, 2-4, 2-5, 2-9, 2-12,  
2-13, 2-14, 2-16, 2-17, 2-19, 2-23, 2-29, 2-36,  
2-41, 2-43, 2-68, 2-69, 2-70, 2-71, 2-75, 2-76,  
2-80, 2-81, 2-83, 2-84, 2-87, 2-88, 2-92,  
2-100, 2-101, 2-109, 2-110, 2-111, 2-122,  
2-127, 2-128, 2-129, 2-130, 2-131, 2-132,  
2-133, 2-134, 2-135, 2-140, 2-155, 2-159,  
2-160, 2-161, 2-162, 2-163, 2-164, 2-165,  
2-166, 2-172, 2-187, 2-191, 2-192, 2-193,  
2-194, 2-195, 2-196, 2-197, 2-198, 3-1, 3-66,  
3-75, 3-80, 3-89, 4-4, 4-37, 4-42, 4-43, 4-67,  
4-131, 4-132, 4-143, 4-145, 4-146, 4-163,  
4-164, 4-170, 4-171, 4-188, 4-191, 4-202,  
4-206, 4-207, 4-223, 4-224, 4-231, 4-234,  
4-261, 4-263, 5-8

Transuranic waste characterization/certification  
facility S-9, S-13, 2-5, 2-111, 2-127, 2-129,  
2-130, 2-131, 2-132, 2-133, 2-134, 2-135,  
2-140, 2-161, 2-162, 2-163, 2-166, 2-172,  
2-191, 2-193, 2-194, 2-197, 4-67, 4-69, 4-84,  
4-102, 4-108, 4-109, 4-131, 4-143, 4-145,  
4-146, 4-164, 4-170, 4-171, 4-191, 4-202,  
4-206, 4-207, 4-224, 4-231, 4-261

Transuranic waste storage pads S-12, 2-23,  
2-68, 2-70, 2-71, 2-75, 2-122, 2-129, 2-130,  
2-132, 2-133, 2-134, 2-135, 2-161, 2-162,  
2-164, 2-166, 2-193, 2-195, 2-196, 2-198,  
4-69, 4-82, 4-84, 4-85, 4-101, 4-102, 4-108,  
4-109, 4-121, 4-126, 4-129, 4-130, 4-4,  
4-108, 4-129, 4-130, 4-170, 4-231

Treatability variance 2-64, 2-67, 2-75, 2-95,  
2-129, 2-131, 2-157, 2-163, 2-194

Tritium S-3, S-18, 1-2, 1-5, 1-9, 1-10, 2-10,  
2-11, 2-12, 2-13, 2-19, 2-21, 2-35, 2-58,  
2-123, 2-156, 3-11, 3-13, 3-15, 3-16, 3-18,  
3-21, 3-26, 3-27, 3-62, 3-75, 3-88, 3-91, 3-92,  
3-93, 3-96, 4-13, 4-16, 4-17, 4-76, 4-138,  
4-139, 4-199, 4-200, 4-201, 4-231, 4-258

Unavoidable adverse impacts 4-2, 4-252,  
4-253, 4-254

Upper Three Runs S-18, 4-14, 4-17, 4-24, 4-26,  
4-80, 4-141, 4-202, 4-254

Vitrification S-5, S-9, S-11, S-13, S-14, S-17,  
1-6, 1-8, 2-6, 2-10, 2-21, 2-64, 2-66, 2-75,  
2-80, 2-83, 2-84, 2-88, 2-94, 2-99, 2-104,  
2-105, 2-106, 2-107, 2-109, 2-110, 2-123,  
2-124, 2-140, 2-143, 2-145, 2-147, 2-148,  
2-151, 2-152, 2-153, 2-155, 2-156, 2-157,  
2-158, 2-159, 2-161, 2-162, 2-163, 2-165,  
2-166, 2-172, 2-174, 2-186, 2-187, 2-188,  
2-189, 2-191, 2-194, 2-197, 3-1, 3-80, 3-88,  
4-14, 4-80, 4-131, 4-132, 4-141, 4-143,  
4-145, 4-146, 4-164, 4-170, 4-171, 4-191,  
4-192, 4-202, 4-203, 4-206, 4-207, 4-224,  
4-231, 4-234, 4-256, 4-259, 4-261, 4-263

Vitrification facility 2-109, 2-110

Waste acceptance criteria S-4, S-13, 2-4, 2-14,  
2-56, 2-57, 2-67, 2-68, 2-70, 2-80, 2-92,  
2-100, 2-101, 2-116, 2-125, 2-130, 2-131,  
2-194, 4-11

Waste Certification Facility S-12, 2-68, 2-70,  
2-75, 2-109, 2-129, 2-131, 2-132, 2-133, 4-4,  
4-69

Waste Isolation Pilot Plant S-4, S-13, 2-4, 2-5,  
2-6, 2-14, 2-15, 2-70, 2-80, 2-83, 2-84, 2-92,  
2-100, 2-101, 2-106, 2-111, 2-127, 2-129,  
2-130, 2-131, 2-132, 2-134, 2-135, 2-140,  
2-161, 2-162, 2-163, 2-164, 2-165, 2-166,  
2-172, 2-191, 2-193, 2-194, 2-195, 2-196,  
2-197, 4-132, 4-191

Waste minimization S-9, S-11, 2-2, 2-23, 2-41,  
2-42, 2-43, 2-44, 2-73, 2-112, 2-141, 2-143,  
2-173, 2-174, 3-75, 4-3

Wastewater, 2-10, 2-21, 2-42, 2-49, 2-51, 2-53,  
2-54, 2-66, 2-71, 2-126, 2-152, 2-157, 2-189,  
3-19, 3-20, 3-66, 4-15, 4-16, 4-17, 4-18, 4-24,  
4-79, 4-80, 4-81, 4-141, 4-142, 4-202, 4-203,  
4-204, 4-254, 4-258, 4-263, 5-7, 5-9

Wetlands S-15, 2-72, 3-31, 3-33, 3-36, 4-23,  
4-24, 4-29, 4-90, 4-91, 4-151, 4-212, 4-213,  
4-255, 5-12, 5-15