APPENDIX C. OCCUPATIONAL AND PUBLIC HEALTH IMPACTS

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Table C-1. L-Lake - Radiological doses associated with the No-Action Alternative and resulting health effects to the offsite maximally exposed individual (current use) and the general public.[a]

	Maximally exposed individual[b]				Offsite population[c]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[d]	Lifetime dose[e] (rem)	Probability of fatal cancer[d]	Annual dose (person-rem)	Number of fatal cancers[d]	Lifetime dose[c] (person-rem)	Number of fatal cancers[d]
Ingestion:								
Soil	5.7×10^{-11}	2.8×10^{-14}	9.9×10^{-10}	5.0×10^{-13}	5.2×10^{-7}	2.6×10^{-10}	9.0×10^{-6}	4.5×10^{-9}
Soil dermal	1.1×10^{-11}	5.6×10^{-15}	2.0×10^{-10}	9.8×10^{-14}	1.0×10^{-7}	5.1×10^{-11}	1.8×10^{-6}	8.9×10^{-10}
Leafy vegetables	9.8×10^{-9}	4.9×10^{-12}	1.7×10^{-7}	8.6×10^{-11}	8.9×10^{-5}	4.5×10^{-8}	1.6×10^{-3}	7.8×10^{-7}
Other vegetables	7.7×10^{-8}	3.8×10^{-11}	1.3×10^{-6}	6.7×10^{-10}	7.0×10^{-4}	3.5×10^{-7}	1.2×10^{-2}	6.1×10^{-6}
Meat	4.8×10^{-9}	2.4×10^{-12}	8.3×10^{-8}	4.2×10^{-11}	4.3×10^{-5}	2.2×10^{-8}	7.6×10^{-4}	3.8×10^{-7}
Milk	1.7×10^{-8}	8.7×10^{-12}	3.1×10^{-7}	1.5×10^{-10}	1.6×10^{-4}	8.0×10^{-8}	2.8×10^{-3}	1.4×10^{-6}
Subtotal	1.1×10^{-7}	5.5×10^{-11}	1.9×10^{-6}	9.5×10^{-10}	9.9×10^{-4}	5.0×10^{-7}	1.7×10^{-2}	8.7×10^{-6}
Inhalation:								
Air	4.0×10^{-8}	2.0×10^{-11}	7.0×10^{-7}	3.5×10^{-10}	3.6×10^{-4}	1.8×10^{-7}	6.3×10^{-3}	3.2×10^{-6}
Resuspension	2.7×10^{-11}	1.4×10^{-14}	4.8×10^{-10}	2.4×10^{-13}	2.5×10^{-7}	1.2×10^{-10}	4.3×10^{-6}	2.2×10^{-9}
Subtotal	4.0×10^{-8}	2.0×10^{-11}	7.0×10^{-7}	3.5×10^{-10}	3.6×10^{-4}	1.8×10^{-7}	6.3×10^{-3}	3.2×10^{-6}
Total	1.5×10^{-7}	7.5×10^{-11}	2.6×10^{-6}	1.3×10^{-9}	1.4×10^{-3}	6.8×10^{-7}	2.4×10^{-2}	1.2×10^{-5}

a. For the No-Action Alternative, general public doses result only from the volatilization of tritium from L-Lake.
b. The offsite maximally exposed individual is a member of the public residing at the SRS boundary.
c. Offsite population within 80 kilometers (50 miles) of SRS.
d. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
e. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-2. L-Lake - Radiological doses associated with the No-Action Alternative and resulting health effects to the maximally exposed individual (future use).[a]

Exposure Pathway	Annual dose (rem)[b]			Probability of fatal cancer[c]	Lifetime dose (rem)[d]			Probability of fatal cancer[c]
	Recreational	Offsite	Total		Recreational	Offsite	Total	
Ingestion:								
Finfish[e]	3.8×10^{-4}	NA[f]	3.8×10^{-4}	1.9×10^{-7}	1.3×10^{-2}	NA	1.3×10^{-2}	6.5×10^{-6}
Leafy vegetables	NA	9.8×10^{-9}	9.8×10^{-9}	4.9×10^{-12}	NA	9.9×10^{-10}	9.9×10^{-10}	5.0×10^{-13}
Other vegetables	NA	7.7×10^{-8}	7.7×10^{-8}	3.8×10^{-11}	NA	1.3×10^{-6}	1.3×10^{-6}	6.7×10^{-10}
Meat	NA	4.8×10^{-9}	4.8×10^{-9}	2.4×10^{-12}	NA	8.3×10^{-8}	8.3×10^{-8}	4.2×10^{-11}
Milk	NA	1.7×10^{-8}	1.7×10^{-8}	8.7×10^{-12}	NA	3.1×10^{-7}	3.1×10^{-7}	1.5×10^{-10}
Soil	1.2×10^{-11}	5.7×10^{-11}	6.9×10^{-11}	3.4×10^{-14}	2.1×10^{-10}	9.9×10^{-10}	1.2×10^{-9}	6.0×10^{-13}
Soil dermal	1.7×10^{-9}	1.1×10^{-11}	1.7×10^{-9}	8.6×10^{-13}	3.0×10^{-8}	2.0×10^{-10}	3.0×10^{-7}	1.5×10^{-11}
Subtotal	3.8×10^{-4}	1.1×10^{-7}	3.8×10^{-4}	1.9×10^{-7}	1.3×10^{-2}	1.7×10^{-6}	1.3×10^{-2}	6.5×10^{-6}
Inhalation:								
Air	2.9×10^{-9}	4.0×10^{-8}	4.3×10^{-8}	2.1×10^{-11}	5.1×10^{-8}	7.0×10^{-7}	7.5×10^{-7}	3.7×10^{-10}
Resuspension	3.9×10^{-12}	2.7×10^{-11}	3.1×10^{-11}	1.6×10^{-14}	6.8×10^{-11}	4.8×10^{-10}	5.4×10^{-10}	2.7×10^{-13}
Subtotal	2.9×10^{-9}	4.0×10^{-8}	4.3×10^{-8}	2.1×10^{-11}	5.1×10^{-8}	7.0×10^{-7}	7.5×10^{-7}	3.7×10^{-10}
Total	3.8×10^{-4}	1.5×10^{-7}	3.8×10^{-4}	1.9×10^{-7}	1.3×10^{-2}	2.6×10^{-6}	1.3×10^{-2}	6.5×10^{-6}

a. The future land use scenario assumes recreational use of L-Lake. Doses to the maximally exposed individual result from exposure pathways related to tritium volatilization and contaminants existing in the surface water.
b. The dose received by the maximally exposed individual living at the site boundary (same as for current use).
c. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure period.
e. The fish ingestion dose was calculated using the measured concentration of cesium-137 in L-Lake fish: 0.833 pCi/g of edible flesh (Arnett, Mamatey, and Spitzer 1996).
f. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-3. L-Lake - Nonradiological hazard indexes and cancer risks associated with the No-Action Alternative for the offsite maximally exposed individual (future use).[a]

Exposure pathway	Hazard quotient				Hazard index[b]	Cancer risk		
	Barium	Magnesium	Manganese	Vanadium		Beryllium	Total annual	Lifetime[c]
Ingestion:								
Finfish	1.1×10^{-2}	4.3×10^{-4}	5.0×10^{-2}	1.8×10^{-4}	6.2×10^{-2}	1.6×10^{-7}	1.6×10^{-7}	1.1×10^{-5}
Swimming	7.5×10^{-6}	1.1×10^{-6}	1.7×10^{-5}	2.4×10^{-6}	2.8×10^{-5}	1.1×10^{-9}	1.1×10^{-9}	7.7×10^{-8}
Swimming dermal	1.5×10^{-5}	4.4×10^{-7}	3.3×10^{-5}	4.7×10^{-5}	9.5×10^{-5}	4.4×10^{-8}	4.4×10^{-8}	3.1×10^{-6}
Shoreline dermal	3.5×10^{-5}	1.1×10^{-6}	7.8×10^{-5}	1.1×10^{-4}	2.2×10^{-4}	1.0×10^{-7}	1.0×10^{-7}	7.0×10^{-6}
Shoreline	4.1×10^{-6}	6.2×10^{-7}	9.2×10^{-6}	1.3×10^{-6}	1.5×10^{-5}	6.2×10^{-10}	6.2×10^{-10}	4.3×10^{-8}
Total	1.1×10^{-2}	4.3×10^{-4}	5.0×10^{-2}	3.4×10^{-4}	6.2×10^{-2}	3.1×10^{-7}	3.1×10^{-7}	2.1×10^{-5}

a. The future land use scenario assumes recreational use of L-Lake. Impacts to the maximally exposed individual result from exposure pathways associated with contaminants existing in the surface water. The maximally exposed individual (current use) is not exposed to any nonradiological contaminants.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 70-year exposure period.

Table C-4. L-Lake - Involved worker (current use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

Exposure pathway	Individual worker				Worker population[b]			
	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	1.4×10^{-10}	5.6×10^{-14}	6.1×10^{-10}	2.4×10^{-13}	9.8×10^{-9}	3.9×10^{-12}	4.3×10^{-8}	1.7×10^{-11}
Soil dermal	1.2×10^{-11}	4.6×10^{-15}	5.0×10^{-11}	2.0×10^{-14}	8.1×10^{-10}	3.2×10^{-13}	3.5×10^{-9}	1.4×10^{-12}
Subtotal	1.5×10^{-10}	6.1×10^{-14}	6.6×10^{-10}	2.6×10^{-13}	1.1×10^{-8}	4.2×10^{-12}	4.6×10^{-8}	1.8×10^{-11}
Inhalation:								
Air	5.0×10^{-8}	2.0×10^{-11}	2.2×10^{-7}	8.6×10^{-11}	3.5×10^{-6}	1.4×10^{-9}	1.5×10^{-5}	6.0×10^{-9}
Resuspension	6.8×10^{-11}	2.7×10^{-14}	2.9×10^{-10}	1.2×10^{-13}	4.7×10^{-9}	1.9×10^{-12}	2.1×10^{-8}	8.2×10^{-12}
Subtotal	5.0×10^{-8}	2.0×10^{-11}	2.2×10^{-7}	8.6×10^{-11}	3.5×10^{-6}	1.4×10^{-9}	1.5×10^{-5}	6.1×10^{-9}
Total	5.0×10^{-8}	2.0×10^{-11}	2.2×10^{-7}	8.7×10^{-11}	3.5×10^{-6}	1.4×10^{-9}	1.5×10^{-5}	6.1×10^{-9}

a. For the No-Action Alternative, workers are exposed to pathways associated with tritium volatilization and contaminants in the surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-5. L-Lake - Involved worker (future use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	3.1×10^{-9}	1.2×10^{-12}	4.2×10^{-8}	1.7×10^{-11}	2.2×10^{-7}	8.7×10^{-11}	2.9×10^{-6}	1.2×10^{-9}
Soil dermal	1.9×10^{-10}	7.7×10^{-14}	2.6×10^{-9}	1.0×10^{-12}	1.3×10^{-8}	5.4×10^{-12}	1.8×10^{-7}	7.2×10^{-11}
Subtotal	3.3×10^{-9}	1.3×10^{-12}	4.4×10^{-8}	1.8×10^{-11}	2.3×10^{-7}	9.2×10^{-11}	3.1×10^{-6}	1.2×10^{-9}
Inhalation:								
Air	1.1×10^{-6}	4.4×10^{-10}	1.5×10^{-5}	5.9×10^{-9}	7.7×10^{-5}	3.1×10^{-8}	1.0×10^{-3}	4.1×10^{-7}
Resuspension	1.5×10^{-9}	5.9×10^{-13}	2.0×10^{-8}	8.0×10^{-12}	1.0×10^{-7}	4.2×10^{-11}	1.4×10^{-6}	5.6×10^{-10}
Subtotal	1.1×10^{-6}	4.4×10^{-10}	1.5×10^{-5}	5.9×10^{-9}	7.7×10^{-5}	3.1×10^{-8}	1.0×10^{-3}	4.1×10^{-7}
Total	1.1×10^{-6}	4.4×10^{-10}	1.5×10^{-5}	5.9×10^{-9}	7.7×10^{-5}	3.1×10^{-8}	1.0×10^{-3}	4.1×10^{-7}

a. For the No-Action Alternative, workers are exposed to pathways associated with tritium volatilization and contaminants in the surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-6. L-Lake - Uninvolved worker radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker[b]				Worker population[c]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[d]	Lifetime dose (rem)[e]	Probability of fatal cancer[d]	Annual dose (person-rem)	Number of fatal cancers[d]	Lifetime dose (person-rem)[e]	Number of fatal cancers[d]
Ingestion:								
Soil	5.5×10^{-11}	2.2×10^{-14}	7.4×10^{-10}	3.0×10^{-13}	1.4×10^{-8}	5.5×10^{-12}	1.9×10^{-7}	7.4×10^{-11}
Soil dermal	3.5×10^{-12}	1.4×10^{-15}	4.7×10^{-11}	1.9×10^{-14}	8.8×10^{-10}	3.5×10^{-13}	1.2×10^{-8}	4.7×10^{-12}
Subtotal	5.8×10^{-11}	2.3×10^{-14}	7.9×10^{-10}	3.1×10^{-13}	1.5×10^{-8}	5.9×10^{-12}	2.0×10^{-7}	7.9×10^{-11}
Inhalation:								
Air	2.0×10^{-8}	7.8×10^{-12}	2.6×10^{-7}	1.0×10^{-10}	4.9×10^{-6}	2.0×10^{-9}	6.6×10^{-5}	2.6×10^{-8}
Resuspension	2.7×10^{-11}	1.1×10^{-14}	3.6×10^{-10}	1.5×10^{-13}	6.8×10^{-9}	2.7×10^{-12}	9.1×10^{-8}	3.6×10^{-11}
Subtotal	2.0×10^{-8}	7.8×10^{-12}	2.6×10^{-7}	1.0×10^{-10}	4.9×10^{-6}	2.0×10^{-9}	6.6×10^{-5}	2.6×10^{-8}
Total	2.0×10^{-8}	7.8×10^{-12}	2.6×10^{-7}	1.1×10^{-10}	4.9×10^{-6}	2.0×10^{-9}	6.6×10^{-5}	2.6×10^{-8}

a. For the No-Action Alternative, the uninvolved worker is exposed only to pathways associated with the volatilization of tritium from L-Lake.
b. The maximally exposed uninvolved worker is located at L-Area.
c. L-Area. Total uninvolved workers estimated to be 251 (Simpkins 1996).
d. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
e. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-7. L-Lake - Involved worker (current use) nonradiological hazard indexes and cancer risks associated with the No-Action Alternative.[a]

Exposure pathway	Hazard quotient				Hazard index[b]	Cancer risk		
	Barium	Magnesium	Manganese	Vanadium		Beryllium	Total annual	Lifetime[c]
Ingestion:								
Shoreline dermal	2.3×10^{-7}	7.0×10^{-9}	5.3×10^{-7}	7.4×10^{-7}	1.5×10^{-6}	7.0×10^{-7}	7.0×10^{-10}	3.5×10^{-9}
Shoreline	5.6×10^{-5}	8.5×10^{-6}	1.3×10^{-4}	1.8×10^{-5}	2.1×10^{-4}	8.4×10^{-9}	8.4×10^{-9}	4.2×10^{-8}
Total	5.6×10^{-5}	8.5×10^{-6}	1.3×10^{-4}	1.9×10^{-5}	2.1×10^{-4}	9.1×10^{-9}	9.1×10^{-9}	4.5×10^{-8}

a. For the No-Action Alternative, workers are exposed to pathways associated with tritium volatilization and contaminants in the surface water.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 5-year exposure period.

Table C-8. L-Lake - Involved worker (future use) nonradiological hazard indexes and cancer risks associated with the No-Action Alternative.[a]

Exposure pathway	Hazard quotient				Hazard index[b]	Cancer risk		
	Barium	Magnesium	Manganese	Vanadium		Beryllium	Total annual	Lifetime[c]
Ingestion:								
Shoreline dermal	3.8×10^{-6}	1.2×10^{-7}	8.9×10^{-6}	1.2×10^{-5}	2.5×10^{-5}	1.2×10^{-8}	1.2×10^{-8}	2.9×10^{-7}
Shoreline	6.1×10^{-6}	9.3×10^{-7}	1.4×10^{-5}	2.0×10^{-6}	2.3×10^{-5}	9.2×10^{-10}	9.2×10^{-10}	2.3×10^{-8}
Total	9.9×10^{-6}	1.0×10^{-6}	2.3×10^{-5}	1.4×10^{-5}	4.8×10^{-5}	1.3×10^{-8}	1.3×10^{-8}	3.1×10^{-7}

a. For the No-Action Alternative, workers are exposed to pathways associated with tritium volatilization and contaminants in the surface water.
b Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.

Table C-9. L-Lake - Radiological doses from atmospheric releases associated with the Shut Down and Deactivate Alternative and resulting health effects to the offsite maximally exposed individual.[a]

Exposure Pathway	Annual dose (rem)[b]						Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total			
Ingestion:									
Soil	4.6×10^{-12}	9.2×10^{-15}	1.4×10^{-12}	5.4×10^{-17}	1.4×10^{-12}	7.5×10^{-12}	3.7×10^{-15}	3.6×10^{-10}	1.8×10^{-13}
Soil dermal	9.2×10^{-13}	4.9×10^{-15}	2.8×10^{-10}	1.8×10^{-15}	5.9×10^{-11}	3.4×10^{-10}	1.7×10^{-13}	2.4×10^{-8}	1.2×10^{-11}
Leafy green vegetables	2.8×10^{-8}	5.5×10^{-11}	8.3×10^{-9}	3.2×10^{-13}	8.7×10^{-9}	4.5×10^{-8}	2.2×10^{-11}	2.2×10^{-6}	1.1×10^{-9}
Other vegetables	2.6×10^{-8}	5.2×10^{-11}	7.4×10^{-9}	2.9×10^{-13}	7.9×10^{-9}	4.2×10^{-8}	2.1×10^{-11}	2.0×10^{-6}	1.0×10^{-9}
Meat	1.2×10^{-8}	2.3×10^{-11}	8.6×10^{-14}	3.3×10^{-14}	3.5×10^{-11}	1.2×10^{-8}	5.8×10^{-12}	4.1×10^{-7}	2.0×10^{-10}
Milk	1.3×10^{-7}	7.3×10^{-11}	5.6×10^{-13}	4.2×10^{-15}	3.3×10^{-9}	1.3×10^{-7}	6.7×10^{-11}	4.8×10^{-6}	2.4×10^{-9}
Subtotal	2.0×10^{-7}	2.0×10^{-10}	1.6×10^{-8}	3.3×10^{-13}	2.0×10^{-8}	2.3×10^{-7}	1.2×10^{-10}	9.4×10^{-6}	4.7×10^{-9}
Inhalation:									
Air	3.4×10^{-10}	8.4×10^{-12}	1.9×10^{-8}	2.4×10^{-13}	7.7×10^{-8}	9.7×10^{-8}	4.8×10^{-11}	6.7×10^{-6}	3.4×10^{-9}
Resuspension	2.9×10^{-12}	7.4×10^{-14}	1.7×10^{-10}	2.1×10^{-15}	6.7×10^{-10}	8.4×10^{-10}	4.2×10^{-13}	5.9×10^{-8}	2.9×10^{-11}
Subtotal	3.4×10^{-10}	8.4×10^{-12}	1.9×10^{-8}	2.4×10^{-13}	7.8×10^{-8}	9.7×10^{-8}	4.9×10^{-11}	6.8×10^{-6}	3.4×10^{-9}
External:									
Soil	7.4×10^{-8}	1.3×10^{-9}	2.3×10^{-13}	1.7×10^{-11}	8.5×10^{-12}	7.5×10^{-8}	3.8×10^{-11}	2.7×10^{-6}	1.3×10^{-9}
Air	4.2×10^{-12}	7.7×10^{-14}	2.9×10^{-18}	9.5×10^{-16}	3.0×10^{-16}	4.3×10^{-12}	2.2×10^{-15}	1.5×10^{-10}	7.6×10^{-13}
Subtotal	7.4×10^{-8}	1.3×10^{-9}	2.3×10^{-13}	1.7×10^{-11}	8.5×10^{-12}	7.5×10^{-8}	3.8×10^{-11}	2.7×10^{-6}	1.3×10^{-9}
Total	2.7×10^{-7}	1.5×10^{-9}	3.5×10^{-8}	1.8×10^{-11}	9.7×10^{-8}	4.0×10^{-7}	2.0×10^{-10}	1.9×10^{-5}	9.4×10^{-9}

a. For the Shut Down and Deactivate Alternative, the general public exposures result from the atmospheric and aqueous transport of exposed L-Lake sediments.
b. The offsite maximally exposed individual is a member of the public residing at the SRS boundary.
c. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-10. L-Lake - Radiological doses from aqueous releases associated with the Shut Down and Deactivate Alternative and resulting health effects to the offsite maximally exposed individual.[a]

Exposure Pathway	Annual dose (rem)[b]						Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total			
Ingestion:									
Drinking Water	3.0×10^{-10}	2.5×10^{-12}	7.7×10^{-10}	4.1×10^{-12}	1.4×10^{-9}	2.5×10^{-9}	1.2×10^{-12}	1.6×10^{-7}	8.1×10^{-11}
Finfish	7.6×10^{-9}	1.0×10^{-11}	2.4×10^{-9}	1.3×10^{-12}	8.6×10^{-10}	1.1×10^{-8}	5.4×10^{-12}	4.9×10^{-7}	2.5×10^{-10}
Swimming	5.0×10^{-13}	4.2×10^{-15}	1.3×10^{-12}	6.8×10^{-15}	2.3×10^{-12}	4.1×10^{-12}	2.1×10^{-15}	2.7×10^{-10}	1.3×10^{-13}
Swimming Dermal	1.0×10^{-13}	9.1×10^{-16}	2.6×10^{-10}	2.3×10^{-13}	9.7×10^{-12}	2.7×10^{-10}	1.4×10^{-13}	1.9×10^{-8}	9.4×10^{-12}
Shoreline Dermal	6.6×10^{-16}	1.5×10^{-17}	1.7×10^{-12}	1.5×10^{-15}	6.9×10^{-14}	1.8×10^{-12}	8.9×10^{-16}	1.2×10^{-10}	6.2×10^{-14}
Shoreline	1.3×10^{-14}	1.1×10^{-16}	3.4×10^{-14}	1.7×10^{-16}	6.0×10^{-14}	1.1×10^{-13}	5.4×10^{-17}	7.0×10^{-12}	3.5×10^{-15}
Subtotal	7.9×10^{-9}	1.3×10^{-11}	3.4×10^{-9}	5.7×10^{-12}	2.3×10^{-9}	1.4×10^{-8}	6.8×10^{-12}	6.7×10^{-7}	3.4×10^{-10}
External:									
Swimming	6.9×10^{-14}	5.6×10^{-15}	4.6×10^{-19}	1.9×10^{-14}	3.8×10^{-17}	9.4×10^{-14}	4.7×10^{-17}	2.6×10^{-12}	1.3×10^{-15}
Boating	3.5×10^{-14}	2.8×10^{-15}	2.3×10^{-19}	9.5×10^{-15}	1.9×10^{-17}	4.7×10^{-14}	2.4×10^{-17}	1.3×10^{-12}	6.6×10^{-16}
Shoreline	1.8×10^{-12}	1.2×10^{-13}	4.6×10^{-17}	4.4×10^{-13}	1.9×10^{-15}	2.4×10^{-12}	1.2×10^{-15}	6.7×10^{-11}	3.4×10^{-14}
Subtotal	1.9×10^{-12}	1.3×10^{-13}	4.6×10^{-17}	4.7×10^{-13}	2.0×10^{-15}	2.5×10^{-12}	1.3×10^{-15}	7.1×10^{-11}	3.5×10^{-14}
Total	7.9×10^{-9}	1.3×10^{-11}	3.4×10^{-9}	6.1×10^{-12}	2.3×10^{-9}	1.4×10^{-8}	6.8×10^{-12}	6.7×10^{-7}	3.4×10^{-10}

a. For the Shut Down and Deactivate Alternative, the general public exposures result from the atmospheric and aqueous transport of exposed L-Lake sediments.
b. For aqueous releases, the offsite maximally exposed individual is a member of the public residing along the Savannah River near the SRS boundary who uses the river as a drinking water source and for recreational activities and consumes fish caught in the river.
c. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure.

Table C-11. L-Lake - Radiological doses from atmospheric releases associated with the Shut Down and Deactivate Alternative and resulting health effects to the offsite population.[a]

Exposure Pathway	Population annual dose (person-rem)[b]						Number of fatal cancers[c]	Lifetime population dose (person-rem)[d]	Number of fatal cancers[c]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total			
Ingestion:									
Soil	5.2×10^{-9}	8.6×10^{-12}	1.2×10^{-9}	2.4×10^{-14}	1.2×10^{-9}	7.6×10^{-9}	3.8×10^{-12}	3.5×10^{-7}	1.8×10^{-10}
Soil dermal	1.0×10^{-9}	4.5×10^{-12}	2.4×10^{-7}	8.1×10^{-11}	5.1×10^{-8}	2.9×10^{-7}	1.4×10^{-10}	2.0×10^{-5}	1.0×10^{-8}
Leafy green vegetables	3.2×10^{-5}	5.2×10^{-8}	7.0×10^{-6}	1.4×10^{-10}	7.4×10^{-6}	4.6×10^{-5}	2.3×10^{-8}	2.1×10^{-3}	1.1×10^{-6}
Other vegetables	3.0×10^{-5}	4.9×10^{-8}	6.3×10^{-6}	1.3×10^{-10}	6.7×10^{-6}	4.3×10^{-5}	2.2×10^{-8}	2.0×10^{-3}	9.8×10^{-7}
Meat	1.3×10^{-5}	2.2×10^{-8}	7.3×10^{-11}	1.5×10^{-11}	2.9×10^{-8}	1.3×10^{-5}	6.6×10^{-9}	4.6×10^{-4}	2.3×10^{-7}
Milk	1.5×10^{-4}	6.8×10^{-8}	4.8×10^{-10}	1.9×10^{-12}	2.8×10^{-6}	1.5×10^{-4}	7.6×10^{-8}	5.3×10^{-3}	2.7×10^{-6}
Subtotal	2.2×10^{-4}	1.9×10^{-7}	1.4×10^{-5}	2.9×10^{-10}	1.7×10^{-5}	2.5×10^{-4}	1.3×10^{-7}	9.9×10^{-3}	4.9×10^{-6}
Inhalation:									
Air	3.8×10^{-7}	7.8×10^{-9}	1.6×10^{-5}	1.1×10^{-10}	6.5×10^{-5}	8.2×10^{-5}	4.1×10^{-8}	5.7×10^{-3}	2.9×10^{-6}
Resuspension	3.3×10^{-9}	6.9×10^{-11}	1.4×10^{-7}	9.5×10^{-13}	5.7×10^{-7}	7.1×10^{-7}	3.6×10^{-10}	5.0×10^{-5}	2.5×10^{-8}
Subtotal	3.8×10^{-7}	1.5×10^{-8}	1.6×10^{-5}	1.1×10^{-10}	6.5×10^{-5}	8.2×10^{-5}	4.1×10^{-8}	5.8×10^{-3}	2.9×10^{-6}
External:									
Soil	8.4×10^{-5}	1.2×10^{-6}	1.9×10^{-10}	7.5×10^{-9}	7.2×10^{-9}	8.5×10^{-5}	4.3×10^{-8}	3.0×10^{-3}	1.5×10^{-6}
Air	4.8×10^{-9}	7.2×10^{-11}	2.5×10^{-15}	4.2×10^{-13}	2.6×10^{-13}	4.9×10^{-9}	2.4×10^{-12}	1.7×10^{-7}	8.6×10^{-11}
Subtotal	8.4×10^{-5}	1.2×10^{-6}	1.9×10^{-10}	7.5×10^{-9}	7.2×10^{-9}	8.5×10^{-5}	4.3×10^{-8}	3.0×10^{-3}	1.5×10^{-6}
Total	3.0×10^{-4}	1.4×10^{-6}	3.0×10^{-5}	7.9×10^{-9}	8.2×10^{-5}	4.2×10^{-4}	2.1×10^{-7}	1.9×10^{-2}	9.3×10^{-6}

a. For the Shut Down and Deactivate Alternative, the general public exposures result from the atmospheric and aqueous transport of exposed L-Lake sediments.
b. Offsite population within 80 kilometers (50 miles) of SRS.
c. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-12. L-Lake - Radiological doses from aqueous releases associated with the Shut Down and Deactivate Alternative and resulting health effects to the offsite population.[a]

Exposure pathway	Port Wentworth		Beaufort/Jasper		Total population annual dose (person-rem)	Number of fatal cancers[c]	Total population lifetime dose[b] (person-rem)	Number of fatal cancers[c]
	Annual dose (person-rem)	Lifetime dose[b] (person-rem)	Annual dose (person-rem)	Lifetime dose[b] (person-rem)				
Drinking Water:								
Cs-137	1.5×10^{-6}	5.0×10^{-5}	4.0×10^{-6}	1.4×10^{-4}	5.5×10^{-6}	2.7×10^{-9}	1.9×10^{-4}	9.5×10^{-8}
Co-60	2.8×10^{-9}	2.1×10^{-8}	7.3×10^{-9}	5.6×10^{-8}	1.0×10^{-8}	5.0×10^{-12}	7.7×10^{-8}	3.8×10^{-11}
Pu-239/240	3.0×10^{-6}	2.1×10^{-4}	7.8×10^{-6}	5.5×10^{-4}	1.1×10^{-5}	5.4×10^{-9}	7.6×10^{-4}	3.8×10^{-7}
Pm-146	4.2×10^{-9}	3.4×10^{-8}	1.2×10^{-8}	9.5×10^{-8}	1.6×10^{-8}	8.1×10^{-12}	1.3×10^{-7}	6.4×10^{-11}
U-233/234	5.1×10^{-6}	3.6×10^{-4}	1.4×10^{-5}	9.8×10^{-4}	1.9×10^{-5}	9.5×10^{-9}	1.3×10^{-3}	6.7×10^{-7}
Total	9.5×10^{-6}	6.2×10^{-4}	2.6×10^{-5}	1.7×10^{-3}	3.5×10^{-5}	1.8×10^{-8}	2.3×10^{-3}	1.1×10^{-6}

a. For aqueous releases, doses are calculated for the 65,000 (Arnett, Mamatey, and Spitzer 1996) people using the Savannah River as a source of drinking water (Port Wentworth, Georgia and Beaufort and Jasper Counties, South Carolina).
b. Based on a 70-year exposure period. Doses are corrected for radioactive decay over the exposure period.
c. Based on a risk of 0.0005 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).

Table C-13. L-Lake - Offsite maximally exposed individual nonradiological hazard indexes and cancer risks from atmospheric releases associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard index[b]	Annual cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Cadmium	Lead		Cadmium	Beryllium	Arsenic	Total	
Ingestion:											
Soil	3.3×10^{-12}	2.8×10^{-7}	2.0×10^{-8}	2.2×10^{-9}	1.2×10^{-8}	3.1×10^{-7}	NA[d]	1.6×10^{-13}	4.7×10^{-13}	6.3×10^{-13}	4.4×10^{-11}
Soil dermal	6.4×10^{-12}	5.4×10^{-8}	3.9×10^{-7}	8.6×10^{-8}	2.2×10^{-7}	7.5×10^{-7}	NA	6.2×10^{-12}	1.9×10^{-13}	6.4×10^{-12}	4.5×10^{-10}
Leafy green vegetables	2.0×10^{-8}	1.7×10^{-3}	1.2×10^{-4}	1.4×10^{-5}	6.7×10^{-5}	1.9×10^{-3}	NA	9.5×10^{-10}	2.8×10^{-9}	3.8×10^{-9}	2.6×10^{-7}
Other vegetables	2.1×10^{-8}	1.5×10^{-3}	1.0×10^{-4}	1.4×10^{-5}	5.9×10^{-5}	1.7×10^{-3}	NA	8.3×10^{-10}	2.5×10^{-9}	3.3×10^{-9}	2.3×10^{-7}
Meat	1.7×10^{-10}	1.4×10^{-3}	2.5×10^{-6}	1.6×10^{-7}	1.4×10^{-6}	1.4×10^{-3}	NA	1.6×10^{-11}	1.1×10^{-10}	1.3×10^{-10}	9.1×10^{-9}
Milk	4.7×10^{-9}	2.2×10^{-3}	7.8×10^{-6}	9.3×10^{-6}	4.5×10^{-6}	2.2×10^{-3}	NA	1.3×10^{-12}	1.1×10^{-10}	1.2×10^{-10}	8.1×10^{-9}
Subtotal	4.7×10^{-8}	6.5×10^{-3}	2.3×10^{-4}	3.7×10^{-5}	1.3×10^{-4}	6.9×10^{-3}	0.0×10^{0}	1.8×10^{-9}	5.6×10^{-9}	7.4×10^{-9}	5.2×10^{-7}
Inhalation:											
Air	1.8×10^{-8}	3.1×10^{-5}	2.2×10^{-6}	NA	1.3×10^{-6}	3.5×10^{-5}	7.3×10^{-12}	3.5×10^{-11}	4.6×10^{-10}	5.0×10^{-10}	3.5×10^{-8}
Resuspension	1.6×10^{-10}	2.7×10^{-7}	1.9×10^{-8}	NA	1.1×10^{-8}	3.0×10^{-7}	6.5×10^{-14}	3.1×10^{-13}	4.0×10^{-12}	4.3×10^{-12}	3.0×10^{-10}
Subtotal	1.8×10^{-8}	3.2×10^{-5}	2.3×10^{-6}	0.0×10^{0}	1.3×10^{-6}	3.5×10^{-5}	7.3×10^{-12}	3.5×10^{-11}	4.6×10^{-10}	5.0×10^{-10}	3.5×10^{-8}
Total	6.5×10^{-8}	6.5×10^{-3}	2.4×10^{-4}	3.7×10^{-5}	1.4×10^{-4}	6.9×10^{-3}	7.3×10^{-12}	1.8×10^{-9}	6.0×10^{-9}	7.9×10^{-9}	5.5×10^{-7}

a. Impacts to the maximally exposed individual result from exposure pathways associated with contaminants in the exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 70-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-14. L-Lake - Offsite maximally exposed individual nonradiological hazard indexes and cancer risks from aqueous releases associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard index[b]	Annual cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Cadmium	Lead		Beryllium	Cadmium	Arsenic		
Ingestion:											
Drinking Water	1.9×10^{-9}	1.6×10^{-3}	4.2×10^{-6}	1.3×10^{-7}	1.5×10^{-6}	1.6×10^{-3}	6.7×10^{-12}	NA[d]	4.2×10^{-11}	4.9×10^{-11}	3.4×10^{-9}
Finfish	9.3×10^{-9}	2.1×10^{-1}	1.0×10^{-5}	3.3×10^{-7}	1.8×10^{-6}	2.1×10^{-1}	1.6×10^{-12}	NA	5.2×10^{-11}	5.4×10^{-11}	3.8×10^{-9}
Swimming	3.1×10^{-12}	2.7×10^{-6}	6.9×10^{-9}	2.2×10^{-10}	2.4×10^{-9}	2.7×10^{-6}	1.1×10^{-14}	NA	6.9×10^{-14}	8.0×10^{-14}	5.6×10^{-12}
Swimming Dermal	6.2×10^{-12}	5.4×10^{-7}	1.4×10^{-7}	8.7×10^{-10}	9.7×10^{-12}	6.8×10^{-7}	4.4×10^{-13}	NA	2.7×10^{-14}	4.7×10^{-13}	3.3×10^{-11}
Shoreline Dermal	4.1×10^{-14}	3.6×10^{-9}	9.2×10^{-10}	5.8×10^{-11}	1.6×10^{-11}	4.6×10^{-9}	3.0×10^{-15}	NA	1.8×10^{-16}	3.2×10^{-15}	2.2×10^{-13}
Shoreline	8.2×10^{-14}	7.3×10^{-8}	1.8×10^{-10}	5.8×10^{-12}	6.5×10^{-11}	7.3×10^{-8}	3.0×10^{-16}	NA	1.8×10^{-15}	2.1×10^{-15}	1.5×10^{-13}
Total	1.1×10^{-8}	2.1×10^{-1}	1.4×10^{-5}	4.6×10^{-7}	3.3×10^{-6}	2.1×10^{-1}	8.8×10^{-12}	0.0×10^{0}	9.4×10^{-11}	1.0×10^{-10}	7.2×10^{-9}

a. Impacts to the maximally exposed individual result from exposure pathways associated with contaminants in the exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 70-year exposure period.
d. NA = not applicable; cadmium is not an ingestion carcinogen.

Table C-15. L-Lake - Involved worker (current use) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Annual dose (rem) Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total	Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
Ingestion:													
Soil	1.6×10^{-7}	1.4×10^{-9}	5.9×10^{-8}	1.3×10^{-11}	1.3×10^{-7}	3.5×10^{-7}	1.4×10^{-10}	1.7×10^{-6}	6.8×10^{-10}	2.5×10^{-5}	9.8×10^{-9}	1.2×10^{-4}	4.8×10^{-8}
Soil Dermal	1.4×10^{-8}	3.1×10^{-10}	4.9×10^{-6}	1.9×10^{-10}	2.5×10^{-7}	5.2×10^{-6}	2.1×10^{-9}	2.6×10^{-5}	1.0×10^{-8}	3.6×10^{-4}	1.5×10^{-7}	1.8×10^{-3}	7.3×10^{-7}
Subtotal	1.7×10^{-7}	1.7×10^{-9}	5.0×10^{-6}	2.0×10^{-10}	3.8×10^{-7}	5.6×10^{-6}	2.2×10^{-9}	2.8×10^{-5}	1.1×10^{-8}	3.9×10^{-4}	1.6×10^{-2}	1.9×10^{-3}	7.8×10^{-7}
Inhalation:													
Resuspension	2.1×10^{-9}	2.2×10^{-10}	1.4×10^{-7}	1.1×10^{-11}	1.2×10^{-6}	1.3×10^{-6}	5.4×10^{-10}	6.7×10^{-6}	2.7×10^{-9}	9.4×10^{-5}	3.8×10^{-8}	4.7×10^{-4}	1.9×10^{-7}
Subtotal	2.1×10^{-9}	2.2×10^{-10}	1.4×10^{-7}	1.1×10^{-11}	1.2×10^{-6}	1.3×10^{-6}	5.4×10^{-10}	6.7×10^{-6}	2.7×10^{-9}	9.4×10^{-5}	3.8×10^{-8}	4.7×10^{-4}	1.9×10^{-7}
External:													
Soil	2.2×10^{-4}	1.5×10^{-5}	7.9×10^{-10}	3.5×10^{-7}	4.1×10^{-8}	2.4×10^{-4}	9.4×10^{-8}	1.1×10^{-3}	4.4×10^{-7}	1.6×10^{-2}	6.6×10^{-6}	7.7×10^{-2}	3.1×10^{-5}
Subtotal	2.2×10^{-4}	1.5×10^{-5}	7.9×10^{-10}	3.5×10^{-7}	4.1×10^{-8}	2.4×10^{-4}	9.4×10^{-8}	1.1×10^{-3}	4.4×10^{-7}	1.6×10^{-2}	6.6×10^{-6}	7.7×10^{-2}	3.1×10^{-5}
Total	2.2×10^{-4}	1.5×10^{-5}	5.1×10^{-6}	3.5×10^{-7}	1.6×10^{-6}	2.4×10^{-4}	9.7×10^{-8}	1.1×10^{-3}	4.5×10^{-7}	1.7×10^{-2}	6.8×10^{-6}	7.9×10^{-2}	3.2×10^{-5}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from direct contact with and atmospheric resuspension of the exposed L-Lake sediments.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.
d. The number of involved workers is estimated to be 70.

Table C-16. L-Lake - Involved worker (future use) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Annual dose (rem)						Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Soil	3.6×10^{-6}	3.0×10^{-8}	1.3×10^{-6}	3.0×10^{-10}	2.8×10^{-6}	7.7×10^{-6}	3.1×10^{-9}	1.7×10^{-4}	6.8×10^{-8}	5.4×10^{-4}	2.2×10^{-7}	1.2×10^{-2}	4.8×10^{-6}
Soil Dermal	2.3×10^{-7}	5.1×10^{-9}	8.2×10^{-5}	3.2×10^{-9}	4.2×10^{-6}	8.7×10^{-5}	3.5×10^{-8}	2.2×10^{-3}	8.7×10^{-7}	6.1×10^{-3}	2.4×10^{-6}	1.5×10^{-1}	6.1×10^{-5}
Subtotal	3.8×10^{-6}	3.5×10^{-8}	8.3×10^{-5}	3.5×10^{-9}	7.0×10^{-6}	9.4×10^{-5}	3.8×10^{-8}	2.3×10^{-3}	9.3×10^{-7}	6.6×10^{-3}	2.6×10^{-6}	1.6×10^{-1}	6.5×10^{-5}
Inhalation:													
Resuspension	4.6×10^{-8}	4.9×10^{-9}	3.2×10^{-6}	2.3×10^{-10}	2.6×10^{-5}	2.9×10^{-5}	1.2×10^{-8}	7.3×10^{-4}	2.9×10^{-7}	2.0×10^{-3}	8.2×10^{-7}	5.1×10^{-2}	2.0×10^{-5}
Subtotal	4.6×10^{-8}	4.9×10^{-9}	3.2×10^{-6}	2.3×10^{-10}	2.6×10^{-5}	2.9×10^{-5}	1.2×10^{-8}	7.3×10^{-4}	2.9×10^{-7}	2.0×10^{-3}	8.2×10^{-7}	5.1×10^{-2}	2.0×10^{-5}
External:													
Soil	3.8×10^{-2}	2.8×10^{-3}	1.4×10^{-7}	6.2×10^{-5}	7.2×10^{-6}	4.1×10^{-2}	1.6×10^{-5}	7.4×10^{-1}	3.0×10^{-4}	2.9×10^{0}	1.1×10^{-3}	5.2×10^{1}	2.1×10^{-2}
Subtotal	3.8×10^{-2}	2.8×10^{-3}	1.4×10^{-7}	6.2×10^{-5}	7.2×10^{-6}	4.1×10^{-2}	1.6×10^{-5}	7.4×10^{-1}	3.0×10^{-4}	2.9×10^{0}	1.1×10^{-3}	5.2×10^{1}	2.1×10^{-2}
Total	3.8×10^{-2}	2.8×10^{-3}	8.7×10^{-5}	6.2×10^{-5}	4.0×10^{-5}	4.1×10^{-2}	1.6×10^{-5}	7.5×10^{-1}	3.0×10^{-4}	2.9×10^{0}	1.1×10^{-3}	5.2×10^{1}	2.1×10^{-2}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from direct contact with and atmospheric resuspension of the exposed L-Lake sediments.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.
d. The number of involved workers is estimated to be 70.

Table C-17. L-Lake - Uninvolved worker (L-Area) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Annual dose (rem)[b]						Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Population annual dose (person-rem)[e]	Number of fatal cancers[c]	Population lifetime dose (person-rem)[d,e]	Number of fatal cancers[c]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Soil	2.9×10^{-11}	2.4×10^{-13}	1.0×10^{-11}	2.3×10^{-15}	2.3×10^{-11}	6.3×10^{-11}	2.5×10^{-14}	1.4×10^{-9}	5.6×10^{-13}	1.6×10^{-8}	6.3×10^{-12}	3.5×10^{-7}	1.4×10^{-10}
Soil Dermal	1.8×10^{-12}	4.1×10^{-14}	6.6×10^{-10}	2.5×10^{-14}	4.2×10^{-10}	1.1×10^{-9}	4.3×10^{-13}	2.7×10^{-8}	1.1×10^{-11}	2.7×10^{-7}	1.1×10^{-10}	6.8×10^{-6}	2.7×10^{-9}
Subtotal	3.1×10^{-11}	2.8×10^{-13}	6.7×10^{-10}	2.7×10^{-14}	4.4×10^{-10}	1.1×10^{-9}	4.6×10^{-13}	2.8×10^{-8}	1.1×10^{-11}	2.9×10^{-7}	1.1×10^{-10}	7.1×10^{-6}	2.9×10^{-9}
Inhalation:													
Air	1.7×10^{-9}	1.8×10^{-10}	1.1×10^{-7}	8.5×10^{-12}	1.0×10^{-6}	1.1×10^{-6}	4.4×10^{-10}	2.8×10^{-5}	1.1×10^{-8}	2.8×10^{-4}	1.1×10^{-7}	7.0×10^{-3}	2.8×10^{-6}
Resuspension	1.8×10^{-11}	1.9×10^{-12}	1.2×10^{-9}	9.2×10^{-14}	1.1×10^{-8}	1.2×10^{-8}	4.8×10^{-12}	3.0×10^{-7}	1.2×10^{-10}	3.0×10^{-6}	1.2×10^{-9}	7.5×10^{-5}	3.0×10^{-8}
Subtotal	1.7×10^{-9}	1.8×10^{-10}	1.1×10^{-7}	8.6×10^{-12}	1.0×10^{-6}	1.1×10^{-6}	4.5×10^{-10}	2.8×10^{-5}	1.1×10^{-8}	2.8×10^{-4}	1.1×10^{-7}	7.0×10^{-3}	2.8×10^{-6}
External:													
Soil	3.1×10^{-7}	2.2×10^{-8}	1.1×10^{-12}	4.9×10^{-10}	9.9×10^{-11}	3.3×10^{-7}	1.3×10^{-10}	6.1×10^{-6}	2.4×10^{-9}	8.3×10^{-5}	3.3×10^{-8}	1.5×10^{-3}	6.1×10^{-7}
Air	1.4×10^{-11}	1.1×10^{-12}	1.2×10^{-17}	2.2×10^{-14}	2.5×10^{-15}	1.5×10^{-11}	6.0×10^{-15}	2.7×10^{-10}	1.1×10^{-13}	3.8×10^{-9}	1.5×10^{-12}	6.9×10^{-8}	2.8×10^{-11}
Subtotal	3.1×10^{-7}	2.2×10^{-8}	1.1×10^{-12}	4.9×10^{-10}	9.9×10^{-11}	3.3×10^{-7}	1.3×10^{-10}	6.1×10^{-6}	2.4×10^{-9}	8.3×10^{-5}	3.3×10^{-8}	1.5×10^{-3}	6.1×10^{-7}
Total	3.1×10^{-7}	2.2×10^{-8}	1.1×10^{-7}	5.0×10^{-10}	1.0×10^{-6}	1.5×10^{-6}	5.8×10^{-10}	3.4×10^{-5}	1.4×10^{-8}	3.7×10^{-4}	1.5×10^{-7}	8.6×10^{-3}	3.4×10^{-6}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. The maximally exposed uninvolved worker is located at L-Area.
c. Based on a risk of *0.0004 latent fatal cancers per person-rem of radiation exposure* (NCRP 1993).
d. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.
e. L-Area. Total uninvolved workers estimated to be 251 (Simpkins 1996).

Table C-18. L-Lake - Uninvolved worker (P-Area) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Annual dose (rem)						Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Soil	8.5×10^{-12}	7.1×10^{-14}	3.1×10^{-12}	7.0×10^{-16}	7.0×10^{-12}	1.9×10^{-11}	7.5×10^{-15}	4.1×10^{-10}	1.7×10^{-13}	2.0×10^{-9}	7.9×10^{-13}	4.4×10^{-8}	1.7×10^{-11}
Soil Dermal	5.3×10^{-13}	1.2×10^{-14}	2.0×10^{-10}	7.5×10^{-15}	1.3×10^{-10}	3.3×10^{-10}	1.3×10^{-13}	8.1×10^{-9}	3.3×10^{-12}	3.4×10^{-8}	1.4×10^{-11}	8.5×10^{-7}	3.4×10^{-10}
Subtotal	9.0×10^{-12}	8.3×10^{-14}	2.0×10^{-10}	8.2×10^{-15}	1.3×10^{-10}	3.4×10^{-10}	1.4×10^{-13}	8.5×10^{-9}	3.4×10^{-12}	3.6×10^{-8}	1.4×10^{-11}	9.0×10^{-7}	3.6×10^{-10}
Inhalation:													
Air	5.0×10^{-10}	5.3×10^{-11}	3.4×10^{-8}	2.5×10^{-12}	3.0×10^{-7}	3.4×10^{-7}	1.3×10^{-10}	8.4×10^{-6}	3.4×10^{-9}	3.5×10^{-5}	1.4×10^{-8}	8.8×10^{-4}	3.5×10^{-7}
Resuspension	5.4×10^{-12}	5.7×10^{-13}	3.7×10^{-10}	2.7×10^{-14}	3.2×10^{-9}	3.6×10^{-9}	1.4×10^{-12}	9.0×10^{-8}	3.6×10^{-11}	3.8×10^{-7}	1.5×10^{-10}	9.5×10^{-6}	3.8×10^{-9}
Subtotal	5.1×10^{-10}	5.4×10^{-11}	3.4×10^{-8}	2.5×10^{-12}	3.0×10^{-7}	3.4×10^{-7}	1.3×10^{-10}	8.5×10^{-6}	3.4×10^{-9}	3.6×10^{-5}	1.4×10^{-8}	8.9×10^{-4}	3.6×10^{-7}
External:													
Soil	9.1×10^{-8}	6.5×10^{-9}	3.4×10^{-13}	1.4×10^{-10}	2.9×10^{-11}	9.8×10^{-8}	3.9×10^{-11}	1.8×10^{-6}	7.1×10^{-10}	1.0×10^{-5}	4.1×10^{-9}	1.9×10^{-4}	7.5×10^{-8}
Air	4.3×10^{-12}	3.3×10^{-13}	3.6×10^{-18}	6.6×10^{-15}	7.6×10^{-16}	4.6×10^{-12}	1.9×10^{-15}	8.4×10^{-11}	3.4×10^{-14}	4.9×10^{-10}	1.9×10^{-13}	8.8×10^{-9}	3.5×10^{-12}
Subtotal	9.1×10^{-8}	6.5×10^{-9}	3.4×10^{-13}	1.4×10^{-10}	2.9×10^{-11}	9.8×10^{-8}	3.9×10^{-11}	1.8×10^{-6}	7.1×10^{-10}	1.0×10^{-5}	4.1×10^{-9}	1.9×10^{-4}	7.5×10^{-8}
Total	9.2×10^{-8}	6.6×10^{-9}	3.5×10^{-8}	1.5×10^{-10}	3.0×10^{-7}	4.4×10^{-7}	1.7×10^{-10}	1.0×10^{-5}	4.1×10^{-9}	4.6×10^{-5}	1.8×10^{-8}	1.1×10^{-3}	4.3×10^{-7}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.
d. P-Area. Total uninvolved workers estimated to be105 (Simpkins 1996).

Table C-19. L-Lake - Uninvolved worker (R-Area) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Annual dose (rem)						Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Soil	3.2×10^{-12}	2.7×10^{-14}	1.2×10^{-12}	1.2×10^{-12}	2.7×10^{-12}	7.1×10^{-12}	2.8×10^{-15}	1.6×10^{-10}	6.3×10^{-14}	3.5×10^{-11}	1.4×10^{-14}	7.9×10^{-10}	3.1×10^{-13}
Soil Dermal	2.0×10^{-13}	4.5×10^{-15}	7.5×10^{-11}	2.8×10^{-15}	4.6×10^{-11}	1.2×10^{-10}	4.9×10^{-14}	3.0×10^{-9}	1.2×10^{-12}	6.1×10^{-10}	2.4×10^{-13}	1.5×10^{-8}	6.1×10^{-12}
Subtotal	3.4×10^{-12}	3.2×10^{-14}	7.7×10^{-11}	3.1×10^{-15}	4.9×10^{-11}	1.3×10^{-10}	5.1×10^{-14}	3.2×10^{-9}	1.3×10^{-12}	6.4×10^{-10}	2.6×10^{-13}	1.6×10^{-8}	6.4×10^{-12}
Inhalation:													
Air	1.7×10^{-10}	1.8×10^{-11}	1.2×10^{-8}	8.9×10^{-13}	1.0×10^{-7}	1.2×10^{-7}	4.7×10^{-11}	2.9×10^{-6}	1.2×10^{-9}	5.8×10^{-7}	2.3×10^{-10}	1.5×10^{-5}	5.8×10^{-9}
Resuspension	2.0×10^{-12}	2.1×10^{-13}	1.4×10^{-10}	1.0×10^{-14}	1.2×10^{-9}	1.3×10^{-9}	5.3×10^{-13}	3.3×10^{-8}	1.3×10^{-11}	6.6×10^{-9}	2.7×10^{-12}	1.7×10^{-7}	6.6×10^{-11}
Subtotal	1.7×10^{-10}	1.9×10^{-11}	1.2×10^{-8}	9.0×10^{-13}	1.1×10^{-7}	1.2×10^{-7}	4.7×10^{-11}	2.9×10^{-6}	1.2×10^{-9}	5.9×10^{-7}	2.3×10^{-10}	1.5×10^{-5}	5.9×10^{-9}
External:													
Soil	3.4×10^{-8}	2.4×10^{-9}	1.3×10^{-13}	5.5×10^{-11}	1.1×10^{-11}	3.6×10^{-8}	1.5×10^{-11}	6.6×10^{-7}	2.7×10^{-10}	1.8×10^{-7}	7.3×10^{-11}	3.3×10^{-6}	1.3×10^{-9}
Air	1.5×10^{-12}	1.1×10^{-13}	1.2×10^{-18}	2.3×10^{-15}	2.6×10^{-16}	1.6×10^{-12}	6.5×10^{-16}	2.9×10^{-11}	1.2×10^{-14}	8.1×10^{-12}	3.2×10^{-15}	1.5×10^{-10}	5.9×10^{-14}
Subtotal	3.4×10^{-8}	2.4×10^{-9}	1.3×10^{-13}	5.5×10^{-11}	1.1×10^{-11}	3.6×10^{-8}	1.5×10^{-11}	6.6×10^{-7}	2.7×10^{-10}	1.8×10^{-7}	7.3×10^{-11}	3.3×10^{-6}	1.3×10^{-9}
Total	3.4×10^{-8}	2.4×10^{-9}	1.2×10^{-8}	5.6×10^{-11}	1.1×10^{-7}	1.5×10^{-7}	6.2×10^{-11}	3.6×10^{-6}	1.4×10^{-9}	7.7×10^{-7}	3.1×10^{-10}	1.8×10^{-5}	7.2×10^{-9}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.
d. R-Area. Total uninvolved workers estimated to be five (Simpkins 1996).

Table C-20. L-Lake - Involved worker (current use) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index[b]	Cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Lead	Cadmium		Cadmium	Beryllium	Arsenic	Total annual	
Ingestion:											
Soil	9.5×10^{-8}	5.3×10^{-3}	3.8×10^{-4}	2.3×10^{-4}	4.5×10^{-5}	6.0×10^{-3}	NA[d]	3.1×10^{-9}	9.7×10^{-9}	1.3×10^{-8}	6.4×10^{-8}
Soil Dermal	7.8×10^{-8}	4.5×10^{-4}	3.2×10^{-3}	9.5×10^{-5}	7.4×10^{-4}	4.5×10^{-3}	NA	4.9×10^{-8}	1.6×10^{-9}	5.1×10^{-8}	2.5×10^{-7}
Subtotal	1.7×10^{-7}	5.8×10^{-3}	3.5×10^{-3}	3.2×10^{-4}	7.8×10^{-4}	1.0×10^{-2}	0.0×10^{0}	5.2×10^{-8}	1.1×10^{-8}	6.4×10^{-8}	3.2×10^{-7}
Inhalation:											
Resuspension	9.4×10^{-8}	1.1×10^{-4}	7.7×10^{-6}	1.5×10^{-5}	NA	1.3×10^{-4}	4.1×10^{-11}	1.2×10^{-10}	1.7×10^{-9}	1.9×10^{-9}	9.3×10^{-9}
Subtotal	9.4×10^{-8}	1.1×10^{-4}	7.7×10^{-6}	1.5×10^{-5}	0.0×10^{0}	1.3×10^{-4}	4.1×10^{-11}	1.2×10^{-10}	1.7×10^{-9}	1.9×10^{-9}	9.3×10^{-9}
Total	2.7×10^{-7}	5.9×10^{-3}	3.6×10^{-3}	3.4×10^{-4}	7.8×10^{-4}	1.1×10^{-2}	4.1×10^{-11}	5.3×10^{-8}	1.3×10^{-8}	6.6×10^{-8}	3.3×10^{-7}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from direct contact with and atmospheric resuspension of the exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 5-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-21. L-Lake - Involved worker (future use) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index[b]	Cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Lead	Cadmium		Cadmium	Beryllium	Arsenic	Total annual	
Ingestion:											
Soil	2.1×10^{-6}	1.2×10^{-1}	8.4×10^{-3}	5.0×10^{-3}	9.9×10^{-4}	1.3×10^{-1}	NA[d]	6.8×10^{-8}	2.2×10^{-7}	2.9×10^{-7}	7.2×10^{-6}
Soil Dermal	1.3×10^{-6}	7.5×10^{-3}	5.3×10^{-2}	1.6×10^{-3}	1.2×10^{-2}	7.4×10^{-2}	NA	8.2×10^{-7}	2.7×10^{-8}	8.5×10^{-7}	2.1×10^{-5}
Subtotal	3.4×10^{-6}	1.3×10^{-1}	6.1×10^{-2}	6.6×10^{-3}	1.3×10^{-2}	2.1×10^{-1}	0.0×10^{0}	8.9×10^{-7}	2.5×10^{-7}	1.1×10^{-6}	2.8×10^{-5}
Inhalation:											
Resuspension	2.1×10^{-6}	2.4×10^{-3}	1.7×10^{-4}	3.3×10^{-4}	NA	2.9×10^{-3}	9.0×10^{-10}	2.7×10^{-9}	3.7×10^{-8}	4.1×10^{-8}	1.0×10^{-6}
Subtotal	2.1×10^{-6}	2.4×10^{-3}	1.7×10^{-4}	3.3×10^{-4}	0.0×10^{0}	2.9×10^{-3}	9.0×10^{-10}	2.7×10^{-9}	3.7×10^{-8}	4.1×10^{-8}	1.0×10^{-6}
Total	5.5×10^{-6}	1.3×10^{-1}	6.1×10^{-2}	6.9×10^{-3}	1.3×10^{-2}	2.1×10^{-1}	9.0×10^{-10}	8.9×10^{-7}	2.8×10^{-7}	1.2×10^{-6}	2.9×10^{-5}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from direct contact with and atmospheric resuspension of the exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-22. L-Lake - Uninvolved worker (L-Area) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index[b]	Annual cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Cadmium	Lead		Cadmium	Beryllium	Arsenic	Total	
Ingestion:											
Soil	1.7×10^{-11}	9.4×10^{-7}	6.7×10^{-8}	7.9×10^{-9}	4.0×10^{-8}	1.1×10^{-6}	NA[d]	5.5×10^{-13}	1.7×10^{-12}	2.3×10^{-12}	5.6×10^{-11}
Soil Dermal	1.1×10^{-11}	6.0×10^{-8}	4.2×10^{-7}	1.0×10^{-7}	1.2×10^{-8}	6.0×10^{-7}	NA	6.8×10^{-12}	2.2×10^{-13}	7.1×10^{-12}	1.8×10^{-10}
Subtotal	2.8×10^{-11}	1.0×10^{-6}	4.9×10^{-7}	1.1×10^{-7}	5.2×10^{-8}	1.7×10^{-6}	0.0×10^{0}	7.4×10^{-12}	1.9×10^{-12}	9.3×10^{-12}	2.3×10^{-10}
Inhalation:											
Air	7.5×10^{-8}	8.5×10^{-5}	6.1×10^{-6}	NA	1.2×10^{-5}	1.0×10^{-4}	3.2×10^{-11}	9.6×10^{-11}	1.3×10^{-9}	1.4×10^{-9}	3.6×10^{-8}
Resuspension	8.1×10^{-10}	9.3×10^{-7}	6.6×10^{-8}	NA	1.3×10^{-7}	1.1×10^{-6}	3.5×10^{-13}	1.1×10^{-12}	1.5×10^{-11}	1.6×10^{-11}	4.1×10^{-10}
Subtotal	7.5×10^{-8}	8.6×10^{-5}	6.1×10^{-6}	0.0×10^{0}	1.2×10^{-5}	1.0×10^{-4}	3.2×10^{-11}	9.7×10^{-11}	1.3×10^{-9}	1.4×10^{-9}	3.6×10^{-8}
Total	7.5×10^{-8}	8.7×10^{-5}	6.6×10^{-6}	1.1×10^{-7}	1.2×10^{-5}	1.1×10^{-4}	3.2×10^{-11}	1.1×10^{-10}	1.3×10^{-9}	1.4×10^{-9}	3.6×10^{-8}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-23. L-Lake - Uninvolved worker (P-Area) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard index[b]	Annual cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Cadmium	Lead		Cadmium	Beryllium	Arsenic	Total	
Ingestion:											
Soil	5.0×10^{-12}	2.8×10^{-7}	2.0×10^{-8}	2.3×10^{-9}	1.2×10^{-8}	3.1×10^{-7}	NA[d]	1.6×10^{-13}	5.1×10^{-13}	6.7×10^{-13}	1.7×10^{-11}
Soil Dermal	3.2×10^{-12}	1.8×10^{-8}	1.2×10^{-7}	2.9×10^{-8}	3.8×10^{-9}	1.7×10^{-7}	NA	2.1×10^{-12}	6.4×10^{-14}	2.1×10^{-12}	5.3×10^{-11}
Subtotal	8.2×10^{-12}	3.0×10^{-7}	1.4×10^{-7}	3.2×10^{-8}	1.6×10^{-8}	4.9×10^{-7}	0.0×10^{0}	2.2×10^{-12}	5.7×10^{-13}	2.8×10^{-12}	7.0×10^{-11}
Inhalation:											
Air	2.3×10^{-8}	2.6×10^{-5}	1.8×10^{-6}	NA	3.6×10^{-6}	3.1×10^{-5}	9.7×10^{-12}	2.9×10^{-11}	4.0×10^{-10}	4.4×10^{-10}	1.1×10^{-8}
Resuspension	2.4×10^{-10}	2.7×10^{-7}	2.0×10^{-8}	NA	3.8×10^{-8}	3.3×10^{-7}	1.0×10^{-13}	3.1×10^{-13}	4.3×10^{-12}	4.7×10^{-12}	1.2×10^{-10}
Subtotal	2.3×10^{-8}	2.6×10^{-5}	1.8×10^{-6}	0.0×10^{0}	3.6×10^{-6}	3.1×10^{-5}	9.8×10^{-12}	2.9×10^{-11}	4.0×10^{-10}	4.4×10^{-10}	1.1×10^{-8}
Total	2.3×10^{-8}	2.6×10^{-5}	1.9×10^{-6}	3.2×10^{-8}	3.6×10^{-6}	3.2×10^{-5}	9.8×10^{-12}	3.1×10^{-11}	4.0×10^{-10}	4.4×10^{-10}	1.1×10^{-8}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-24. L-Lake - Uninvolved worker (R-Area) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index[b]	Annual cancer risk				Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Cadmium	Lead		Cadmium	Beryllium	Arsenic	Total	
Ingestion:											
Soil	1.9×10^{-12}	1.0×10^{-7}	7.5×10^{-9}	8.8×10^{-10}	4.5×10^{-9}	1.1×10^{-7}	NA[d]	6.1×10^{-14}	1.9×10^{-13}	2.5×10^{-13}	6.3×10^{-12}
Soil Dermal	1.2×10^{-12}	6.6×10^{-9}	4.7×10^{-8}	1.1×10^{-8}	1.4×10^{-9}	6.6×10^{-8}	NA	7.5×10^{-13}	2.4×10^{-14}	7.8×10^{-13}	1.9×10^{-11}
Subtotal	3.1×10^{-12}	1.1×10^{-7}	5.5×10^{-8}	1.2×10^{-8}	5.9×10^{-9}	1.8×10^{-7}	0.0×10^{0}	8.1×10^{-13}	2.1×10^{-13}	1.0×10^{-12}	2.6×10^{-11}
Inhalation:											
Air	7.7×10^{-9}	8.8×10^{-6}	6.3×10^{-7}	NA	1.2×10^{-6}	1.1×10^{-5}	3.3×10^{-12}	1.0×10^{-11}	1.4×10^{-10}	1.5×10^{-10}	3.8×10^{-9}
Resuspension	9.0×10^{-11}	1.0×10^{-7}	7.4×10^{-9}	NA	1.4×10^{-8}	1.2×10^{-7}	3.9×10^{-14}	1.2×10^{-13}	1.6×10^{-12}	1.8×10^{-12}	4.4×10^{-11}
Subtotal	7.8×10^{-9}	8.9×10^{-6}	6.4×10^{-7}	0.0×10^{0}	1.2×10^{-6}	1.1×10^{-5}	3.4×10^{-12}	1.0×10^{-11}	1.4×10^{-10}	1.5×10^{-10}	3.8×10^{-9}
Total	7.8×10^{-9}	9.0×10^{-6}	6.9×10^{-7}	1.2×10^{-8}	1.2×10^{-6}	1.1×10^{-5}	3.4×10^{-12}	1.1×10^{-11}	1.4×10^{-10}	1.5×10^{-10}	3.9×10^{-9}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the atmospheric transport of exposed L-Lake sediments.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.
d. NA = not applicable; the contaminant is not transferred through the listed exposure pathway.

Table C-25. Pen Branch - Involved worker (current use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	4.4×10^{-10}	1.8×10^{-13}	5.9×10^{-9}	2.4×10^{-12}	3.1×10^{-8}	1.2×10^{-11}	4.1×10^{-7}	1.7×10^{-10}
Soil dermal	3.7×10^{-11}	1.5×10^{-14}	5.0×10^{-10}	2.0×10^{-13}	2.6×10^{-9}	1.0×10^{-12}	3.5×10^{-8}	1.4×10^{-11}
Subtotal	4.8×10^{-10}	1.9×10^{-13}	6.4×10^{-9}	2.6×10^{-12}	3.3×10^{-8}	1.3×10^{-11}	4.5×10^{-7}	1.8×10^{-10}
Inhalation:								
Resuspension	1.4×10^{-11}	5.4×10^{-15}	1.8×10^{-10}	7.3×10^{-14}	9.5×10^{-10}	3.8×10^{-13}	1.3×10^{-8}	5.1×10^{-12}
Subtotal	1.4×10^{-11}	5.4×10^{-15}	1.8×10^{-10}	7.3×10^{-14}	9.5×10^{-10}	3.8×10^{-13}	1.3×10^{-8}	5.1×10^{-12}
Total	4.9×10^{-10}	2.0×10^{-13}	6.6×10^{-9}	2.6×10^{-12}	3.4×10^{-8}	1.4×10^{-11}	4.6×10^{-7}	1.8×10^{-10}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-26. Pen Branch - Involved worker (future use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	9.9×10^{-9}	4.0×10^{-12}	1.3×10^{-7}	5.3×10^{-11}	6.9×10^{-7}	2.8×10^{-10}	9.3×10^{-6}	3.7×10^{-9}
Soil dermal	6.2×10^{-10}	2.5×10^{-13}	8.4×10^{-9}	3.4×10^{-12}	4.4×10^{-8}	1.7×10^{-11}	5.9×10^{-7}	2.3×10^{-10}
Subtotal	1.1×10^{-8}	4.2×10^{-12}	1.4×10^{-7}	5.7×10^{-11}	7.4×10^{-7}	2.9×10^{-10}	9.9×10^{-6}	4.0×10^{-9}
Inhalation:								
Resuspension	3.0×10^{-10}	1.2×10^{-13}	4.0×10^{-9}	1.6×10^{-12}	2.1×10^{-8}	8.4×10^{-12}	2.8×10^{-7}	1.1×10^{-10}
Subtotal	3.0×10^{-10}	1.2×10^{-13}	4.0×10^{-9}	1.6×10^{-12}	2.1×10^{-8}	8.4×10^{-12}	2.8×10^{-7}	1.1×10^{-10}
Total	1.1×10^{-8}	4.3×10^{-12}	1.5×10^{-7}	5.8×10^{-11}	7.6×10^{-7}	3.0×10^{-10}	1.0×10^{-5}	4.1×10^{-9}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-27. Fourmile Branch - Involved worker (current use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	5.8×10^{-11}	2.3×10^{-14}	7.8×10^{-10}	3.1×10^{-13}	4.1×10^{-9}	1.6×10^{-12}	5.5×10^{-8}	2.2×10^{-11}
Soil dermal	4.9×10^{-12}	2.0×10^{-15}	6.6×10^{-11}	2.7×10^{-14}	3.5×10^{-10}	1.4×10^{-13}	4.6×10^{-9}	1.9×10^{-12}
Subtotal	6.3×10^{-11}	2.5×10^{-14}	8.5×10^{-10}	3.4×10^{-13}	4.4×10^{-9}	1.8×10^{-12}	5.9×10^{-8}	2.4×10^{-11}
Inhalation:								
Resuspension	1.8×10^{-12}	7.2×10^{-16}	2.4×10^{-11}	9.7×10^{-15}	1.3×10^{-10}	5.0×10^{-14}	1.7×10^{-9}	6.8×10^{-13}
Subtotal	1.8×10^{-12}	7.2×10^{-16}	2.4×10^{-11}	9.7×10^{-15}	1.3×10^{-10}	5.0×10^{-14}	1.7×10^{-9}	6.8×10^{-13}
Total	6.5×10^{-11}	2.6×10^{-14}	8.7×10^{-10}	3.5×10^{-13}	4.5×10^{-9}	1.8×10^{-12}	6.1×10^{-8}	2.4×10^{-11}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-28. Fourmile Branch - Involved worker (future use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	1.3×10^{-9}	5.2×10^{-13}	1.7×10^{-8}	7.0×10^{-12}	9.1×10^{-8}	3.6×10^{-11}	1.2×10^{-6}	4.9×10^{-10}
Soil dermal	8.2×10^{-10}	3.3×10^{-14}	1.1×10^{-9}	4.4×10^{-13}	5.8×10^{-9}	2.3×10^{-12}	7.7×10^{-8}	3.1×10^{-11}
Subtotal	1.4×10^{-9}	5.5×10^{-13}	1.9×10^{-8}	7.4×10^{-12}	9.7×10^{-8}	3.9×10^{-11}	1.3×10^{-6}	5.2×10^{-10}
Inhalation:								
Resuspension	4.1×10^{-11}	1.6×10^{-14}	5.4×10^{-10}	2.2×10^{-13}	2.8×10^{-9}	1.1×10^{-12}	3.8×10^{-8}	1.5×10^{-11}
Subtotal	4.1×10^{-11}	1.6×10^{-14}	5.4×10^{-10}	2.2×10^{-13}	2.8×10^{-9}	1.1×10^{-12}	3.8×10^{-8}	1.5×10^{-11}
Total	1.4×10^{-9}	5.7×10^{-13}	1.9×10^{-8}	7.7×10^{-12}	1.0×10^{-7}	4.0×10^{-11}	1.3×10^{-6}	5.4×10^{-10}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-29. Steel Creek - Involved worker (current use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	3.1×10^{-10}	1.2×10^{-13}	4.2×10^{-9}	1.7×10^{-12}	2.2×10^{-8}	8.7×10^{-12}	2.9×10^{-7}	1.2×10^{-10}
Soil dermal	2.6×10^{-11}	1.1×10^{-14}	3.5×10^{-10}	1.4×10^{-13}	1.8×10^{-9}	7.4×10^{-13}	2.5×10^{-8}	9.9×10^{-12}
Subtotal	3.4×10^{-10}	1.3×10^{-13}	4.5×10^{-9}	1.8×10^{-12}	2.4×10^{-8}	9.4×10^{-12}	3.2×10^{-7}	1.3×10^{-10}
Inhalation:								
Resuspension	9.6×10^{-12}	3.8×10^{-15}	1.3×10^{-10}	5.2×10^{-14}	6.7×10^{-10}	2.7×10^{-13}	9.0×10^{-9}	3.6×10^{-12}
Subtotal	9.6×10^{-12}	3.8×10^{-15}	1.3×10^{-10}	5.2×10^{-14}	6.7×10^{-10}	2.7×10^{-13}	9.0×10^{-9}	3.6×10^{-12}
Total	3.5×10^{-10}	1.4×10^{-13}	4.7×10^{-9}	1.9×10^{-12}	2.4×10^{-8}	9.7×10^{-12}	3.3×10^{-7}	1.3×10^{-10}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-30. Steel Creek - Involved worker (future use) radiological doses associated with the No-Action Alternative and resulting health effects.[a]

	Individual worker				Worker population[b]			
Exposure pathway	Annual dose (rem)	Probability of fatal cancer[c]	Lifetime dose (rem)[d]	Probability of fatal cancer[c]	Annual dose (person-rem)	Number of fatal cancers[c]	Lifetime dose (person-rem)[d]	Number of fatal cancers[c]
Ingestion:								
Soil	7.0×10^{-9}	2.8×10^{-12}	9.4×10^{-8}	3.8×10^{-11}	4.9×10^{-7}	2.0×10^{-10}	6.6×10^{-6}	2.6×10^{-9}
Soil dermal	4.4×10^{-10}	1.8×10^{-13}	5.9×10^{-9}	2.4×10^{-12}	3.1×10^{-8}	1.2×10^{-11}	4.1×10^{-7}	1.7×10^{-10}
Subtotal	7.4×10^{-9}	3.0×10^{-12}	1.0×10^{-7}	4.0×10^{-11}	5.2×10^{-7}	2.1×10^{-10}	7.0×10^{-6}	2.8×10^{-9}
Inhalation:								
Resuspension	2.1×10^{-10}	8.4×10^{-14}	2.8×10^{-9}	1.1×10^{-12}	1.5×10^{-8}	5.9×10^{-12}	2.0×10^{-7}	7.9×10^{-11}
Subtotal	2.1×10^{-10}	8.4×10^{-14}	2.8×10^{-9}	1.1×10^{-12}	1.5×10^{-8}	5.9×10^{-12}	2.0×10^{-7}	7.9×10^{-11}
Total	7.6×10^{-9}	3.1×10^{-12}	1.0×10^{-7}	4.1×10^{-11}	5.4×10^{-7}	2.1×10^{-10}	7.2×10^{-6}	2.9×10^{-9}

a. For the No-Action Alternative, the involved worker exposures result from increased concentrations of tritium in surface water.
b. The number of involved workers is estimated to be 70.
c. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
d. Based on a 25-year exposure period. Doses are corrected for radioactive decay over the exposure period.

Table C-31. Steel Creek - Involved worker (current use) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Individual annual dose (rem)						Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Shoreline Dermal	1.2×10^{-12}	2.7×10^{-14}	3.1×10^{-9}	2.8×10^{-12}	1.2×10^{-10}	3.3×10^{-9}	1.3×10^{-12}	1.6×10^{-8}	6.5×10^{-12}	2.3×10^{-7}	9.1×10^{-11}	1.1×10^{-6}	4.5×10^{-10}
Shoreline	1.4×10^{-11}	1.2×10^{-13}	3.6×10^{-11}	2.0×10^{-13}	6.4×10^{-11}	1.1×10^{-10}	4.6×10^{-14}	5.7×10^{-10}	2.3×10^{-13}	8.0×10^{-9}	3.2×10^{-12}	4.0×10^{-8}	1.6×10^{-11}
Subtotal	1.5×10^{-11}	1.5×10^{-13}	3.2×10^{-9}	3.0×10^{-12}	1.9×10^{-10}	3.4×10^{-9}	1.3×10^{-12}	1.7×10^{-8}	6.7×10^{-12}	2.4×10^{-7}	9.4×10^{-11}	1.2×10^{-6}	4.7×10^{-10}
External:													
Shoreline	3.1×10^{-8}	2.2×10^{-9}	8.1×10^{-13}	8.3×10^{-9}	3.4×10^{-11}	4.2×10^{-8}	1.7×10^{-11}	1.9×10^{-7}	7.4×10^{-11}	2.9×10^{-6}	1.2×10^{-9}	1.3×10^{-5}	5.2×10^{-9}
Subtotal	3.1×10^{-8}	2.2×10^{-9}	8.1×10^{-13}	8.3×10^{-9}	3.4×10^{-11}	4.2×10^{-8}	1.7×10^{-11}	1.9×10^{-7}	7.4×10^{-11}	2.9×10^{-6}	1.2×10^{-9}	1.3×10^{-5}	5.2×10^{-9}
Total	3.1×10^{-8}	2.2×10^{-9}	3.2×10^{-9}	8.3×10^{-9}	2.2×10^{-10}	4.5×10^{-8}	1.8×10^{-11}	2.0×10^{-7}	8.1×10^{-11}	3.1×10^{-6}	1.3×10^{-9}	1.4×10^{-5}	5.7×10^{-9}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from the aqueous transport of exposed L-Lake sediments in Steel Creek.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 5-year exposure period. Doses are corrected for radioactive decay over the exposure period.
d. The number of involved workers is estimated to be 70.

Table C-32. Steel Creek - Involved worker (future use) radiological doses associated with the Shut Down and Deactivate Alternative and resulting health effects.[a]

Exposure Pathway	Individual annual dose (rem)						Probability of fatal cancer[b]	Lifetime dose (rem)[c]	Probability of fatal cancer[b]	Population annual dose (person-rem)[d]	Number of fatal cancers[b]	Population lifetime dose (person-rem)[c,d]	Number of fatal cancers[b]
	Cs-137	Co-60	Pu-239/240	Pm-146	U-233/234	Total							
Ingestion:													
Shoreline Dermal	2.0×10^{-11}	4.5×10^{-13}	5.2×10^{-8}	4.7×10^{-11}	2.1×10^{-9}	5.4×10^{-8}	2.2×10^{-11}	1.4×10^{-6}	5.4×10^{-10}	3.8×10^{-6}	1.5×10^{-9}	9.5×10^{-5}	3.8×10^{-8}
Shoreline	3.2×10^{-10}	2.7×10^{-12}	8.1×10^{-10}	4.3×10^{-12}	1.5×10^{-9}	2.6×10^{-9}	1.1×10^{-12}	6.4×10^{-8}	2.6×10^{-11}	1.8×10^{-7}	7.4×10^{-11}	4.5×10^{-6}	1.8×10^{-9}
Subtotal	3.4×10^{-10}	3.2×10^{-12}	5.3×10^{-8}	5.1×10^{-11}	3.6×10^{-9}	5.7×10^{-8}	2.3×10^{-11}	1.4×10^{-6}	5.7×10^{-10}	4.0×10^{-6}	1.6×10^{-9}	9.9×10^{-5}	4.0×10^{-8}
External:													
Shoreline	6.8×10^{-7}	4.9×10^{-8}	1.8×10^{-11}	1.9×10^{-7}	7.5×10^{-10}	9.2×10^{-7}	3.7×10^{-10}	1.5×10^{-5}	6.4×10^{-9}	6.4×10^{-5}	2.6×10^{-8}	1.0×10^{-3}	4.1×10^{-7}
Subtotal	6.8×10^{-7}	4.9×10^{-8}	1.8×10^{-11}	1.9×10^{-7}	7.5×10^{-10}	9.2×10^{-7}	3.7×10^{-10}	1.5×10^{-5}	6.4×10^{-9}	6.4×10^{-5}	2.6×10^{-8}	1.0×10^{-3}	4.1×10^{-7}
Total	6.8×10^{-7}	4.9×10^{-8}	5.3×10^{-8}	1.9×10^{-7}	4.3×10^{-9}	9.7×10^{-7}	3.9×10^{-10}	1.6×10^{-5}	6.8×10^{-9}	6.8×10^{-5}	2.7×10^{-8}	1.1×10^{-3}	4.5×10^{-7}

a. For the Shut Down and Deactivate Alternative, the involved worker exposures result from the aqueous transport of exposed L-Lake sediments in Steel Creek.
b. Based on a risk of 0.0004 latent fatal cancers per person-rem of radiation exposure (NCRP 1993).
c. Based on a 25-year exposure period. Doses are decay corrected for radioactive decay over the exposure period.
d. The number of involved workers is estimated to be 70.

Table C-33. Steel Creek - Involved worker (current use) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index	Annual cancer risk			Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Lead	Cadmium		Beryllium	Arsenic	Total	
Ingestion:										
Shoreline Dermal	7.4×10^{-11}	6.6×10^{-6}	1.6×10^{-6}	2.9×10^{-8}	1.1×10^{-7}	8.4×10^{-6}	5.3×10^{-12}	3.3×10^{-13}	5.7×10^{-12}	2.8×10^{-11}
Shoreline	8.7×10^{-11}	7.7×10^{-5}	1.9×10^{-7}	6.9×10^{-8}	6.1×10^{-9}	7.7×10^{-5}	3.1×10^{-13}	1.9×10^{-12}	2.2×10^{-12}	1.1×10^{-11}
Total	1.6×10^{-10}	8.4×10^{-5}	1.8×10^{-6}	9.8×10^{-8}	1.1×10^{-7}	8.6×10^{-5}	5.7×10^{-12}	2.2×10^{-12}	7.9×10^{-12}	3.9×10^{-11}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the aqueous transport of exposed L-Lake sediments in Steel Creek.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 5-year exposure period.

Table C-34. Steel Creek - Involved worker (future use) nonradiological hazard indexes and cancer risks associated with the Shut Down and Deactivate Alternative.[a]

Exposure Pathway	Hazard quotient					Hazard Index	Annual cancer risk			Lifetime cancer risk[c]
	Manganese	Thallium	Antimony	Lead	Cadmium		Beryllium	Arsenic	Total	
Ingestion:										
Shoreline Dermal	1.2×10^{-9}	1.1×10^{-4}	2.7×10^{-5}	4.9×10^{-7}	1.8×10^{-6}	1.4×10^{-4}	8.9×10^{-11}	5.5×10^{-12}	9.5×10^{-10}	2.4×10^{-9}
Shoreline	2.0×10^{-9}	1.7×10^{-3}	4.4×10^{-6}	1.5×10^{-6}	1.4×10^{-7}	1.7×10^{-3}	7.1×10^{-12}	4.4×10^{-11}	5.1×10^{-11}	1.3×10^{-9}
Total	3.2×10^{-9}	1.8×10^{-3}	3.2×10^{-5}	2.0×10^{-6}	1.9×10^{-6}	1.8×10^{-3}	9.6×10^{-11}	4.9×10^{-11}	1.5×10^{-10}	3.6×10^{-9}

a. For the Shut Down and Deactivate Alternative, the uninvolved worker is exposed by the aqueous transport of exposed L-Lake sediments in Steel Creek.
b. Hazard index is the sum of hazard quotients added across exposure pathways or pollutants.
c. Based on a 25-year exposure period.