Appendix C.10
Environmental Consequences Data

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Appendix C.10
Environmental Consequences Data

C.10.1 WASTE PROCESSING ALTERNATIVES AND OPTIONS

This section presents a summary of data that were used to discuss environmental consequences in the quantitative sections of Chapter 5. The data are presented for each alternative and option. For the Minimum INEEL Processing Alternative, data have been presented for impacts at both the Idaho National Engineering and Environmental Laboratory (INEEL) and the Hanford Site. Five categories of construction data, named in the first column of Table C.10-1, were discussed in Chapter 5 and summarized by discipline below. Eight categories of operations data, named in the first column of Table C.10-2, were discussed in Chapter 5 and are also summarized by discipline below.

Land Use - For the operations phase, the values presented in Table C.10-2 are estimates of the amount of land outside of established facility areas that would be disturbed if a particular waste processing alternative is implemented. Land use impacts are discussed in Section 5.2.1.

Socioeconomics - The values presented are the estimated peak year employment and total earnings for both construction and operational phases for each of the proposed waste processing activities for the period ***through*** 2035. These employment levels are not the result of substantial new job creation but reflect the retraining and reassignment of existing personnel. Waste processing related employment is discussed in Section 5.2.2. The employment levels reported in Section 5.2.2 do not distinguish between jobs that are retained and those that are newly generated. A detailed analysis of socioeconomic impacts is provided in Appendix C.1.

Air Resources - The values presented for the construction phase are for parameters associated with nonradiological airborne emissions from construction activities (i.e., operation of heavy equipment, etc.). The values presented for the operations phase are for parameters associated with both radiological and nonradiological airborne emissions during normal waste processing activities. Radiological parameters are the radiation doses from airborne radionuclide emissions that would be received by (a) a hypothetical person residing at the offsite location of highest predicted dose (called the offsite maximally exposed individual); (b) an INEEL worker who is assumed to spend all of his work time at the onsite area of highest predicted dose (called the noninvolved worker); and (c) the entire population located within 50 miles of the Idaho Nuclear Technology and Engineering Center (INTEC). These doses are calculated using a combination of historical monitored emissions data, projected emissions estimates, atmospheric dispersion modeling using annual average meteorological data measured near INTEC, and exposure and dose modeling.

Nonradiological parameters for the operations phase include: (a) maximum ambient air concentration of a criteria air pollutant, expressed in terms of the highest percentage of an applicable ambient air quality standard and allowable increment under Prevention of Significant Deterioration rules; (b) maximum ambient air concentration of carcinogenic and noncarcinogenic toxic air pollutants, expressed as the maximum percentage of any level allowed by State of Idaho regulations; and (c) maximum onsite concentration of toxic air pollutants, expressed as the maximum percentage of any occupational exposure limit. Nonradiological pollutant concentrations were calculated using a combination of historical monitored emissions data, projected emissions estimates, and atmospheric dispersion modeling using the ISC-3 ***and ISCST-3 codes*** and hourly meteorological data measured near INTEC, as described in Appendix C.2. ***In response to recommendations made by the U.S. National Park Service, the U.S. Department of Energy (DOE) also performed dispersion modeling using the CALPUFF model to assess potential impacts at Class I areas (Craters of the Moon National Wilderness Area and Yellowstone and Grand Teton National Parks).***

Health and Safety - Health and safety impacts for the construction and operational phases are presented in terms of radiological, nonradiological, and occupational injury impacts. The estimated radiation dose is presented for the onsite noninvolved ***worker*** and offsite maximally exposed individual. The ***total campaign collective worker*** dose and related increase in latent cancer fatalities

Table C.10-1. Summary of construction impacts by waste processing alternatives and options.[a]

				Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative		***Direct Vitrification Alternative***	
	Units	No Action Alternative	Continued Current Operations Alternative	Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	At INEEL	At Hanford	***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Socioeconomics														
Direct employment	Number of jobs	20	90	850	870	680	360	400	330	***550***	200	290	***350***	***670***
Indirect employment	Number of jobs	20	90	***830***	***840***	***650***	***350***	***390***	***320***	***530***	***190***	***280***	***340***	***650***
Total employment	Number of jobs	40	180	1.7×10^3	$\boldsymbol{1.7\times10^3}$	$\boldsymbol{1.3\times10^3}$	***710***	***790***	***650***	$\boldsymbol{1.1\times10^3}$	***390***	***570***	***690***	$\boldsymbol{1.3\times10^3}$
Total earnings	***2000*** dollars ***(millions)***	1.0	4.4	42	43	34	18	20	16	***27***	***9.8***	14	***17***	***33***
Air Resources														
Criteria pollutant emissions	Total tons	18	61	790	750	810	630	740	580	***340***	470	350	***610***	***760***
	Tons per year	3.5	18	250	250	240	180	200	160	***110***	120	59	***150***	***220***
Toxic air pollutant emissions	Total pounds	20	68	880	840	910	710	830	650	***370***	530	390	***670***	***840***
	Pounds per year	3.9	20	280	280	270	800	220	180	***120***	130	66	***170***	***240***
Fugitive dust emissions	Total tons	110	210	2.8×10^3	680	2.6×10^3	670	910	550	***240***	2.6×10^3	1.3×10^3	***630***	***850***
	Tons per year	22	46	490	200	430	190	240	150	***83***	420	220	***160***	***210***
Health and Safety														
Total campaign collective worker dose	Person-rem	***37***	***97***	***170***	***200***	***170***	***200***	***200***	***140***	***140***	***170***	NA[b]	***140***	***140***
Total worker latent cancer fatalities	Latent cancer fatalities	***0.015***	***0.039***	***0.069***	***0.078***	***0.069***	***0.078***	***0.078***	***0.054***	***0.054***	***0.069***	NA	***0.054***	***0.054***
Total recordable cases	Cases	***3.9***	14	***190***	***200***	***150***	***67***	81	***69***	***100***	***81***	230	***93***	***170***
Total lost workdays	Days	***30***	***110***	$\boldsymbol{1.5\times10^3}$	$\boldsymbol{1.5\times10^3}$	$\boldsymbol{1.1\times10^3}$	***520***	***620***	***530***	***770***	***620***	NR[c]	***710***	$\boldsymbol{1.3\times10^3}$
Utilities and Energy														
Potable water use	Million gallons per year	0.12	0.77	6.6	6.8	4.7	3.0	3.2	2.5	***4.1***	2.9	1.8	***2.4***	***4.7***
Baseline potable water use, INTEC operations	Million gallons per year	55	55	55	55	55	55	55	55	***55***	55	NA	***55***	***55***
Percent of baseline INTEC potable water use	Percentage	0.22	1.4	12	12	8.5	***5.5***	5.8	4.5	***7.5***	5.3	NA	***4.4***	***8.5***
Nonpotable water use	Million gallons per year	***0.041***	0.11	0.38	0.41	0.27	0.28	0.46	0.30	***0.15***	0.29	0.040	***0.31***	***0.30***
Baseline nonpotable water use, INTEC operations	Million gallons per year	400	400	400	400	400	400	400	400	***400***	400	NA	***400***	***400***

Table C.10-1. Summary of construction impacts by waste processing alternatives and options [a] (continued).

	Units	No Action Alternative	Continued Current Operations Alternative	Separations Alternative: Full Separations Option	Separations Alternative: Planning Basis Option	Separations Alternative: Transuranic Separations Option	Non-Separations Alternative: Hot Isostatic Pressed Waste Option	Non-Separations Alternative: Direct Cement Waste Option	Non-Separations Alternative: Early Vitrification Option	Non-Separations Alternative: ***Steam Reforming Option***	Minimum INEEL Processing Alternative: At INEEL	Minimum INEEL Processing Alternative: At Hanford	***Direct Vitrification Alternative***: ***Vitrification Without Calcine Separations Option***	***Direct Vitrification Alternative***: ***Vitrification With Calcine Separations Option***
Utilities and Energy (continued)														
Percent of baseline INTEC nonpotable water use	Percentage	0.010	***0.028***	***0.095***	0.10	***0.068***	0.070	0.12	***0.075***	***0.038***	***0.073***	NA	***0.078***	***0.075***
Electricity use	Megawatt-hours per year	180	3.4×10^{3}	3.3×10^{3}	6.5×10^{3}	2.9×10^{3}	4.0×10^{3}	4.0×10^{3}	900	***3.1×10^{3}***	1.1×10^{3}	2.9×10^{3}	***1.1×10^{3}***	***3.5×10^{3}***
Baseline INTEC electricity use	Megawatt-hours per year	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	8.8×10^{4}	***8.8×10^{4}***	8.8×10^{4}	NA	***8.8×10^{4}***	***8.8×10^{4}***
Percent of INTEC electricity use	Percentage	0.20	3.9	***3.8***	7.4	3.3	4.5	4.5	1.0	***3.5***	1.3	NA	***1.3***	***4.0***
Sanitary wastewater	Million gallons per year	0.12	0.77	6.6	6.8	4.7	3.0	3.2	2.5	***4.1***	2.9	1.8	***2.4***	***4.7***
Baseline INTEC sanitary wastewater	Million gallons per year	55	55	55	55	55	55	55	55	***55***	55	NA	***55***	***55***
Percent of baseline INTEC sanitary wastewater	Percentage	0.22	1.4	12	12	8.5	5.5	5.8	4.5	***7.5***	5.3	NA	***4.4***	***8.5***
Fossil fuel use	Million gallons per year	6.6×10^{-3}	***0.036***	0.43	0.41	0.45	0.35	0.39	0.30	***0.26***	0.23	***0.092***	***0.66***	***0.81***
Baseline INTEC fossil fuel use	Million gallons per year	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	***0.98***	0.98	NA	***0.98***	***0.98***
Percent of baseline INTEC fossil fuel use	Percentage	***0.67***	***3.7***	***44***	***42***	***46***	***36***	***40***	***31***	***27***	***23***	NA	***67***	***83***
Waste and Materials[d]														
Mixed low-level waste generation[e]	Cubic meters	220	240	1.1×10^{3}[f]	1.1×10^{3}	1.1×10^{3}[f]	1.1×10^{3}	1.1×10^{3}	1.1×10^{3}	***1.1×10^{3}***	1.1×10^{3}	0	***1.1×10^{3}***	***1.1×10^{3}***
Low-level waste generation[e]	Cubic meters	0	20	330[f]	210	210[f]	260	340	310	***0***	110	0	***1.6×10^{3}***	***1.7×10^{3}***
Hazardous waste generation[e]	Cubic meters	0	30	790[f]	880	280[f]	790	560	640	***200***	340	20	***570***	***840***
Industrial waste generation[e]	Cubic meters	1.4×10^{3}	6.8×10^{3}	5.5×10^{4}[f]	6.0×10^{4}	3.9×10^{4}[f]	2.6×10^{4}	3.0×10^{4}	2.3×10^{4}	***2.4×10^{4}***	2.6×10^{4}	1.9×10^{4}	***2.3×10^{4}***	***4.3×10^{4}***

a. The categories of land use, traffic and transportation, and facility accidents do not have construction impacts.
b. NA = Not applicable or not assessed.
c. NR = Not reported.
d. Construction does not generate HLW ***or*** transuranic waste.
e. Values presented represent totals for the duration of the project.
f. This value represents the highest quantity among the disposal methods considered.

Table C.10-2. Summary of operations impacts by waste processing alternatives and options.

				Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative		***Direct Vitrification Alternative***	
	Units	No Action Alternative	Continued Current Operations Alternative	Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	At INEEL	At Hanford	***Vitrification Without Calcine Separations***	***Vitrification With Calcine Separations Option***
Land Use														
Open land converted to industrial use for new facilities	Acres	0	0	22[a]	0[a]	22[a]	0	0	0	***0***	22[a]	52	***0***	***0***
Socioeconomics[b]														
Direct employment	Number of jobs	***73***	280	440	480	320	460	530	330	***170***	330	740	***310***	***440***
Indirect employment	Number of jobs	***140***	***550***	***870***	***950***	***630***	***910***	***1.0×10^{3}***	***650***	***340***	***650***	***1.5×10^{3}***	***600***	***880***
Total employment	Number of jobs	***220***	***830***	***1.3×10^{3}***	***1.4×10^{3}***	***950***	***1.4×10^{3}***	***1.6×10^{3}***	***980***	***520***	***980***	***2.2×10^{3}***	***910***	***1.3×10^{3}***
Total earnings	***2000*** dollars ***(millions)***	***5.8***	***22***	***35***	***38***	***25***	***37***	***42***	***26***	***14***	***26***	***59***	***24***	***35***
Air Resources														
Dose to offsite maximally exposed individual	Millirem per year	6.0×10^{-4}	1.7×10^{-3}	1.2×10^{-4}	1.8×10^{-3}	6.0×10^{-5}	1.8×10^{-3}	1.7×10^{-3}	8.9×10^{-4}	***6.2×10^{-4}***	9.5×10^{-4}	2.8×10^{-5}	***6.5×10^{-4}***	***6.8×10^{-4}***
Dose to noninvolved worker	Millirem per year	7.0×10^{-6}	1.8×10^{-5}	4.4×10^{-5}	9.0×10^{-5}	3.4×10^{-5}	3.6×10^{-5}	3.0×10^{-5}	4.8×10^{-5}	***2.2×10^{-5}***	1.0×10^{-4}	1.3×10^{-5}	***2.3×10^{-5}***	***2.3×10^{-5}***
Collective dose to population within 50 miles of INTEC	Person-rem per year	***0.038***	***0.11***	***6.6×10^{-3}***	***0.11***	***3.6×10^{-3}***	***0.11***	***0.11***	***0.056***	***0.040***	***0.056***	1.3×10^{-3}	***0.045***	***0.047***
Maximum ambient concentration of criteria air pollutant (highest percent of ambient air quality standard - ***respirable particulates on public roads)***	Percentage	***13***	***13***	***14***	***14***	***13***	***13***	***13***	***13***	***13***	***13***	NA	***13***	***13***
Prevention of Significant Deterioration increment consumption (highest percent of allowable increment in Class I area - ***24-hour sulfur dioxide at Craters of the Moon)***	Percentage	***34***	***35***	***38***	***40***	***36***	***36***	***36***	***34***	***34***	***34***	NA	***34***	***38***
Prevention of Significant Deterioration increment consumption (highest percent of allowable increment in Class II area - ***24-hour sulfur dioxide; INEEL boundary and roads)***	Percentage	***38***	***38***	***38***	***38***	***38***	***38***	***38***	***38***	***38***	***38***	NA	***38***	***38***

Table C.10-2. Summary of operations impacts by waste processing alternatives and options (continued).

				Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative		***Direct Vitrification Alternative***	
	Units	No Action Alternative	Continued Current Operations Alternative	Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	At INEEL	At Hanford	***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Air Resources (continued)														
Maximum offsite concentration of carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration for carcinogens)	Percentage	***1.2***	***1.9***	***8.1***	***10***	***4.5***	***2.9***	***1.7***	***0.95***	***0.71***	***0.95***	NA	***1.7***	***9.5***
Maximum ambient (offsite or public road location) concentration of non-carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration)	Percentage	***0.03***	***0.05***	***0.18***	***0.23***	***0.10***	***0.08***	***0.07***	***0.03***	***0.02***	***0.02***	NA	***0.03***	***0.20***
Maximum onsite concentration of toxic air pollutant [highest percent of occupational exposure limit (8-hour time weighted average)]	Percentage	***0.013***	***0.32***	***0.69***	***0.88***	***0.49***	***0.33***	***0.33***	***0.017***	***0.085***	***0.16***	NA	***0.017***	***0.49***
Health and Safety														
Total campaign collective worker dose	Person-rem	***350***	***410***	***780***	***980***	***680***	***790***	***1.1×10^{3}***	***710***	***630***	***690***	350	***500***	***650***
Total worker latent cancer fatalities	Latent cancer fatalities	***0.14***	***0.16***	***0.31***	***0.39***	***0.27***	***0.31***	***0.43***	***0.29***	***0.25***	***0.27***	0.14	***0.20***	***0.26***
Integrated noninvolved worker dose	Millirem	2.5×10^{-4}	2.0×10^{-4}	9.2×10^{-4}	8.6×10^{-4}	7.1×10^{-4}	5.8×10^{-4}	3.6×10^{-4}	1.3×10^{-3}	***4.8×10^{-4}***	1.4×10^{-3}	2.3×10^{-5}	***4.8×10^{-4}***	***4.8×10^{-4}***
Integrated offsite maximally exposed individual dose	Millirem	***0.022***	***0.019***	2.5×10^{-3}	6.3×10^{-3}	1.3×10^{-3}	0.020	***0.019***	***0.031***	***0.022***	***0.024***	5.0×10^{-5}	***0.022***	***0.023***
Total recordable cases	Cases	***110***	***150***	***400***	***480***	***300***	***320***	***370***	***330***	***180***	***270***	27	***250***	***330***
Total lost workdays	Days	***850***	***1.1×10^{3}***	***3.0×10^{3}***	***3.7×10^{3}***	***2.3×10^{3}***	***2.5×10^{3}***	***2.9×10^{3}***	***2.5×10^{3}***	***1.4×10^{3}***	***2.0×10^{3}***	NR	***1.9×10^{3}***	***2.5×10^{3}***

Table C.10-2. Summary of operations impacts by waste processing alternatives and options (continued).

				Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative		***Direct Vitrification Alternative***	
	Units	No Action Alternative	Continued Current Operations Alternative	Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	At INEEL	At Hanford	***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Utilities and Energy														
Potable water use	Million gallons per year	1.4	2.7	4.0	5.8	2.8	3.8	4.8	2.9	***2.0***	2.8	4.8	***2.9***	***4.4***
Baseline potable water use, INTEC operations	Million gallons per year	55	55	55	55	55	55	55	55	***55***	55	NA	***55***	***55***
Percent of baseline INTEC potable water use	Percentage	2.5	4.9	***7.3***	11	5.1	6.9	8.7	5.3	***3.6***	5.1	NA	***5.3***	***8.0***
Nonpotable water use	Million gallons per year	14	62	5.0	69	53	89	62	6.3	***6.1***	6.3	500	***6.2***	***11***
Baseline nonpotable water use, INTEC operations	Million gallons per year	400	400	400	400	400	400	400	400	***400***	400	NA	***400***	***400***
Percent of baseline INTEC nonpotable water use	Percentage	3.5	16	1.3	17	13	22	16	1.6	***1.5***	1.6	NA	***1.6***	***2.8***
Electricity use	Megawatt-hours per year	1.2×10^4	1.8×10^4	4.0×10^4	5.0×10^4	2.9×10^4	3.3×10^4	2.8×10^4	3.9×10^4	***2.4×10^4***	2.5×10^4	6.6×10^5	***3.9×10^4***	***5.2×10^4***
Baseline INTEC electricity use	Megawatt-hours per year	8.8×10^4	8.8×10^4	8.8×10^4	8.8×10^4	8.8×10^4	8.8×10^4	8.8×10^4	8.8×10^4	***8.8×10^4***	8.8×10^4	NA	***8.8×10^4***	***8.8×10^4***
Percent of INTEC electricity use	Percentage	***14***	20	45	57	33	38	32	44	***27***	28	NA	***44***	***59***
Sanitary wastewater	Million gallons per year	1.4	2.7	4.0	5.8	2.8	3.8	4.8	2.9	***2.0***	2.8	4.8	***2.9***	***4.4***
Baseline INTEC sanitary wastewater	Million gallons per year	55	55	55	55	55	55	55	55	***55***	55	NA	***55***	***55***
Percent of baseline INTEC sanitary wastewater	Percentage	2.5	4.9	***7.3***	11	5.1	6.9	8.7	***5.3***	***3.6***	5.1	NA	***5.3***	***8.0***
Fossil fuel use	Million gallons per year	0.64	1.9	4.5	6.3	2.2	2.8	2.5	1.1	***0.40***	0.49	1.3	***1.3***	***5.0***

Table C.10-2. Summary of operations impacts by waste processing alternatives and options (continued).

				Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative		***Direct Vitrification Alternative***	
	Units	No Action Alternative	Continued Current Operations Alternative	Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	At INEEL	At Hanford	***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Utilities and Energy (continued)														
Baseline INTEC fossil fuel use	Million gallons per year	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	***0.10***	0.10	NA	***0.10***	***0.10***
Percent of baseline INTEC fossil fuel use	Percentage	640	1.9×10^{3}	4.5×10^{3}	6.3×10^{3}	2.2×10^{3}	2.8×10^{3}	2.5×10^{3}	1.1×10^{3}	***400***	490	NA	***1.3×10^{3}***	***5.0×10^{3}***
Waste and Materials[c]														
Mixed low-level waste generation	Cubic meters	1.3×10^{3}	3.2×10^{3}	***5.9×10^{3}[d]***	7.9×10^{3}	***5.3×10^{3}[d]***	6.4×10^{3}	8.6×10^{3}	6.0×10^{3}	***4.1×10^{3}***	5.7×10^{3}	0	***6.0×10^{3}***	***7.5×10^{3}***
Low-level waste generation	Cubic meters	190	9.5×10^{3}	1.2×10^{3}	1.0×10^{4}	960	1.0×10^{4}	1.0×10^{4}	750	***560***	700	1.5×10^{3}	***700***	***1.3×10^{3}***
Hazardous waste generation	Cubic meters	0	0	1.6×10^{3}	1.2×10^{3}	960[d]	4	4	4	***58***	40	23	***4.0***	***1.4×10^{3}***
Industrial waste generation	Cubic meters	1.4×10^{4}	1.9×10^{4}	5.3×10^{4}[d]	5.2×10^{4}	4.3×10^{4}[d]	4.3×10^{4}	5.0×10^{4}	4.2×10^{4}	***2.5×10^{4}***	3.5×10^{4}	6.7×10^{3}	***3.0×10^{4}***	***4.2×10^{4}***
Traffic and Transportation														
Estimated total latent cancer fatalities from cargo-related incident-free transportation	Latent cancer fatalities													
Truck		NA	***0.013***	***0.077***	***0.091***	0.23	0.47	***1.4***	0.98	***0.78***	***1.1***	NA	***0.99[e]***	***0.12[e]***
Rail		NA	9.1×10^{-5}	5.0×10^{-4}	6.3×10^{-4}	7.6×10^{-3}	9.4×10^{-4}	***2.7×10^{-3}***	***2.0×10^{-3}***	***3.0×10^{-3}***	***3.0×10^{-3}***	NA	***1.9×10^{-3}***	***5.9×10^{-4}[e]***
Estimated total number of latent cancer fatalities from cargo-related transportation accidents	Latent cancer fatalities													
Truck		NA	***5.7×10^{-4}***	8.9×10^{-5}	***6.7×10^{-4}***	***0.10***	***5.7×10^{-4}***	0.023	1.5×10^{-6}	***0.039***	0.018	NA	***1.5×10^{-6}***	***7.9×10^{-5}***
Rail		NA	***4.6×10^{-5}***	1.8×10^{-5}	***6.6×10^{-5}***	***0.038***	***4.6×10^{-5}***	1.3×10^{-3}	7.8×10^{-8}	***2.0×10^{-3}***	***2.9×10^{-3}***	NA	***9.9×10^{-8}[e]***	***1.2×10^{-5}***
Estimated total number of vehicle-related traffic fatalities from transportation accidents	Fatalities													
Truck		NA	8.9×10^{-3}	***0.10***	0.12	0.98	0.21	***0.63***	0.44	***0.42***	***0.51***	NA	***0.45[e]***	***0.13[e]***
Rail		NA	2.1×10^{-3}	0.026	0.030	0.13	0.038	0.11	0.080	***0.088***	***0.094***	NA	***0.077***	***0.027***

Table C.10-2. Summary of operations impacts by waste processing alternatives and options (continued).

	Units	No Action Alternative	Continued Current Operations Alternative	Separations Alternative: Full Separations Option	Separations Alternative: Planning Basis Option	Separations Alternative: Transuranic Separations Option	Non-Separations Alternative: Hot Isostatic Pressed Waste Option	Non-Separations Alternative: Direct Cement Waste Option	Non-Separations Alternative: Early Vitrification Option	Non-Separations Alternative: Steam Reforming Option	Minimum INEEL Processing Alternative: At INEEL	Minimum INEEL Processing Alternative: At Hanford	Direct Vitrification Alternative: Vitrification Without Calcine Separations Option	Direct Vitrification Alternative: Vitrification With Calcine Separations Option
Facility Accidents														
Estimated maximum latent cancer fatalities within 50 miles population from bounding accident	Latent cancer fatalities													
Abnormal event		270	270	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	NA	0.23	0.23
Design basis		29	29	29	29	29	29	29	29	29	29	NA	29	29
Beyond design basis		61	61	76	76	61	61	61	61	61	61	NA	61	76
Estimated maximum population dose from bounding accident	Person-rem													
Abnormal event		5.3×10^{5}	5.3×10^{5}	470	470	470	470	470	470	470	470	NA	470	470
Design basis		5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	5.7×10^{4}	NA	5.7×10^{4}	5.7×10^{4}
Beyond design basis		1.2×10^{5}	1.2×10^{5}	1.5×10^{5}	1.5×10^{5}	1.2×10^{5}	1.2×10^{5}	1.2×10^{5}	1.2×10^{5}	1.2×10^{5}	1.2×10^{5}	NA	1.2×10^{5}	1.5×10^{5}
Estimated dose to maximally exposed individual from bounding accident	Millirem													
Abnormal event		8.3×10^{4}	8.3×10^{4}	40	40	40	40	40	40	40	40	NA	40	40
Design basis		880	880	880	880	880	880	880	880	880	880	NA	880	880
Beyond design basis		1.4×10^{4}	1.4×10^{4}	1.7×10^{4}	1.7×10^{4}	1.4×10^{4}	1.4×10^{4}	1.4×10^{4}	1.4×10^{4}	1.4×10^{4}	1.4×10^{4}	NA	1.4×10^{4}	1.7×10^{4}
Estimated maximum dose to noninvolved worker from bounding accident	Millirem													
Abnormal event		5.7×10^{6}	5.7×10^{6}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	2.7×10^{3}	NA	2.7×10^{3}	2.7×10^{3}
Design basis		5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	5.9×10^{4}	NA	5.9×10^{4}	5.9×10^{4}
Beyond design basis		9.3×10^{5}	9.3×10^{5}	1.2×10^{6}	1.2×10^{6}	9.3×10^{5}	9.3×10^{5}	9.3×10^{5}	9.3×10^{5}	9.3×10^{5}	9.3×10^{5}	NA	9.3×10^{5}	1.2×10^{6}

a. Low-Activity Waste Disposal Facility.

b. Values presented are for peak year.

c. Values presented are totals for the duration of the project.

d. This value represents the highest quantity among the disposal methods considered.

e. Values presented for mixed transuranic waste/SBW transport to the Waste Isolation Pilot Plant.

over the entire period of waste processing activities are presented for the collective worker population. The annual offsite maximally exposed individual, ***noninvolved worker, and collective*** population radiological impact data are discussed in Section 5.2.10 for the waste processing options. The nonradiological data is presented in terms of the projected noncarcinogenic and carcinogenic toxic pollutant concentrations at the site boundary for the waste processing options. The pollutant concentrations and their hazard quotients (ratio of expected concentration to the Idaho regulatory standard) are discussed in Section 5.2.10. The projected occupational injury data associated with waste processing options is presented in terms of total lost workdays and total recordable cases that would occur over the entire ***construction and*** operations ***phases*** of each option. The projected lost workdays and total recordable case rates are based on INEEL historic injury rates multiplied by the predicted employment levels for each option. Further data on lost workdays and total recordable cases for peak employment years are discussed in Section 5.2.10.

Utilities and Energy - The values presented for the construction and operational phases are for water use (potable and non-potable), electricity use, sanitary wastewater, and fossil fuel use. They represent an estimate of the change in annual consumption (water, electricity, and fossil fuels) and generation (sanitary wastewater) that may result from proposed waste processing activities for each alternative and option. ***Baseline utilities and energy values (annual consumption value for the site for all operations) are presented along with the utility and energy use associated with each waste processing option and the subsequent percentage increase from the baseline value.*** Water use, electricity use, sanitary wastewater, and fossil fuel use, and related consequences are discussed in Section 5.2.12.

Waste and Materials - For the construction and operational phases, the generation of mixed low-level, low-level, hazardous, and industrial (nonhazardous and nonradiological) wastes (in cubic meters) is provided. The operational periods for the various alternatives and options would begin at different times, but the period of evaluation ends with the year 2035 in all cases. Correspondingly, the total waste generation values presented here are only for activities through the year 2035. The waste volumes are discussed in Section 5.2.13. It should be noted that the three options under the Separations Alternative in both tables include waste generation from the base case disposal option (i.e., disposal in a new Low-Activity Waste Disposal Facility) for the grouted low-level waste fraction. Section 5.2.13 includes waste generation estimates for other disposal options in addition to the base case.

Traffic and Transportation - For incident free high-level waste transportation ***and cargo related transportation accidents*** under the operations phase, the values in Table C.10-2 represent the total ***latent cancer*** fatalities from shipments of waste for each alternative by truck and rail. The estimated risks of latent cancer fatalities represent the radiological risk from transportation accidents. The estimated risk of vehicle related traffic fatalities represents the nonradiological risk from traffic accidents. Both quantities are based on the total number of shipments associated with each alternative. These data are an aggregate of the data presented in Section 5.2.9 and Appendix C.5.

Facility Accidents - For accidents under the operational phase, the maximally exposed individual***, noninvolved worker, and maximum population*** dose values in the tables are for the accident having the highest consequences to workers or the public. ***The estimated maximum latent cancer fatalities within the 50 mile population from bounding accidents are also presented.*** The accidents selected for reporting are not necessarily the same for workers and the general population. In each category (abnormal event, design basis, and beyond design basis), the accident with the highest consequences was selected, which may be different for workers and the general population. Accident analyses reported in this summary are based on waste processing-related activities only and are found in Section 5.2.14 and in Appendix C.4.

C.10.2 FACILITY DISPOSITION ALTERNATIVES

This section presents a summary of data that were used to discuss facility disposition in the

quantitative sections of Section 5.3. The data are presented for new facilities in Table C.10-3 and for existing facilities in Table C.10-4. In Table C.10-3, the data are presented for disposition ***of*** the new facilities that are associated with each of the waste processing options. All new facilities would be dispositioned to clean closure standards at the conclusion of all waste processing activities. Since there are no new facilities under the No Action Alternative, there is no column for No Action in Table C.10-3. Five disposition alternatives are under consideration for the existing facilities. In Table C.10-4, data are presented for each of the proposed disposition alternatives. Descriptions of these alternatives are provided in Section 5.3. Five categories of quantitative data were discussed in Section 5.3, are summarized by discipline below, and presented in Tables C.10-3 and C.10-4. Tables C.10-5 and C.10-6 present the result of the long-term facility disposition fate and transport modeling.

The long-term facility disposition modeling has been revised since the Draft EIS. Since publication of the Draft EIS, DOE has obtained revised waste stream inventory data and has modified certain model assumptions and parameters used in this analysis. Appendix C.9 presents further details on this revised long-term facility disposition fate and transport modeling.

Socioeconomics - The values presented are for the estimated peak year employment and income and are the estimated totals for the life of the disposition activity. These employment levels are not the result of substantial new job creation but reflect the retraining and reassignment of existing personnel. ***Facility disposition*** related employment is discussed in Section 5.3.2. A detailed analysis of socioeconomic impacts is provided in Appendix C.1.

Air Resources - The values presented are for parameters associated with total radiological and nonradiological airborne emissions from normal disposition activities. Radiological parameters are the radiation doses from airborne radionuclide emissions that would be received by (a) a hypothetical person residing at the offsite location of highest predicted dose (called the offsite maximally exposed individual); (b) an INEEL worker who is assumed to spend all of his work time at the onsite area of highest predicted dose (called the noninvolved worker); and (c) the entire population located within 80 kilometers (50 miles) of INTEC. These doses are calculated using a combination of historical monitored emissions data, projected emissions estimates, atmospheric dispersion modeling using annual average meteorological data measured near INTEC, and exposure and dose modeling as described in Appendix C.2.

Nonradiological parameters include: (a) maximum ambient air concentration of a criteria air pollutant, expressed in terms of the highest percentage of an applicable ambient air quality standard and allowable increment under Prevention of Significant Deterioration rules; (b) maximum ambient ***(offsite)*** air concentration of carcinogenic and noncarcinogenic toxic air pollutants, expressed as the maximum percentage of health-based reference levels designated (for new facilities) by State of Idaho regulations; and (c) maximum onsite concentration of toxic air pollutants, expressed as the maximum percentage of any occupational exposure limit. Nonradiological pollutant concentrations were calculated using a combination of historical monitored emissions data, projected emissions estimates, and atmospheric dispersion modeling using the ISC-3 ***and ISCST-3 codes*** and hourly meteorological data measured near INTEC, as described in Appendix C.2.

Health and Safety - Health and safety impacts are presented in terms of total radiological and occupational injury impacts for the entire period of the disposition activities. The estimated increase in latent cancer fatalities is presented for the collective involved worker population. The dose to the collective involved worker group is based on expected radiological conditions from prior INEEL exposure data for similar facility operations. The projected occupational injury data associated with waste processing options is presented in terms of total lost workdays and total recordable cases that would occur over the entire operations phase of each option. The projected lost workdays and total recordable case rates are based on INEEL historic injury rates multiplied by the predicted employment levels for disposition activities following each waste processing option and for each disposition alternative for the existing facilities. Further data on lost workdays and total recordable cases are discussed in Section 5.3.8.

Table C.10-3. New facility disposition data.

	Units	Continued Current Operations Alternative	Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative	***Direct Vitrification Alternative***	
			Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***		***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Socioeconomics[a]												
Direct employment	Number of jobs	***58***	***790***	***660***	***730***	***450***	***420***	***320***	***280***	***320***	***340***	***710***
Indirect employment	Number of jobs	***56***	***760***	***640***	***710***	***440***	***400***	***310***	***270***	***310***	***330***	***690***
Total employment	Number of jobs	***110***	***1.6×10^{3}***	***1.3×10^{3}***	***1.4×10^{3}***	***890***	***820***	***630***	***550***	***640***	***670***	***1.4×10^{3}***
Total earnings	***2000*** dollars ***(millions)***	***4.4***	***59***	***50***	***55***	***34***	***31***	***24***	***21***	***24***	***26***	***54***
Air Resources												
Dose to maximum offsite individual	Millirem per year	1.1×10^{-10}	3.3×10^{-10}	3.9×10^{-10}	4.7×10^{-10}	1.8×10^{-10}	1.3×10^{-10}	1.4×10^{-10}	***2.4×10^{-10}***	5.6×10^{-10}	***2.1×10^{-10}***	***3.0×10^{-10}***
Dose to noninvolved worker	Millirem per year	2.0×10^{-11}	6.0×10^{-11}	7.0×10^{-11}	1.4×10^{-10}	3.7×10^{-11}	2.1×10^{-11}	2.8×10^{-11}	***4.3×10^{-11}***	1.6×10^{-10}	***4.3×10^{-11}***	***6.0×10^{-11}***
Collective dose to population within 50 miles of INTEC	Person-rem per year	***4.0×10^{-9}***	***1.2×10^{-8}***	***1.4×10^{-8}***	***1.3×10^{-8}***	***5.7×10^{-9}***	***4.5×10^{-9}***	***4.6×10^{-9}***	***8.8×10^{-9}***	***1.6×10^{-8}***	***7.0×10^{-9}***	***9.9×10^{-9}***
Maximum ambient concentration of criteria air pollutant (highest percent of ambient air quality standard - ***24-hour respirable particulates at public roads)***	Percentage	***15***	***20***	***21***	***19***	***19***	***19***	***18***	***15***	***19***	***18***	***20***
Maximum offsite concentration of carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration for carcinogens)	Percentage	0.65	2.1	2.6	1.8	1.9	2.1	1.7	***0.7***	2.0	***1.6***	***2.2***
Maximum ambient (offsite or public road location) concentration of non-carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration)	Percentage	0.13	0.43	0.53	0.36	0.38	0.43	0.35	***0.15***	0.4	***0.32***	***0.44***
Maximum onsite concentration of toxic air pollutant [highest percent of occupational exposure limit (8-hour time weighted average)]	Percentage	6.5	21	26	18	19	21	17	***7.2***	20	***16***	***22***

Table C.10-3. New facility disposition data (continued).

	Units	Continued Current Operations Alternative	Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative	*Direct Vitrification Alternative*	
			Full Separations Option	Planning Basis Option	Transuranic Separations Option	Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***		***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
Health and Safety												
Estimated latent cancer fatalities in involved worker population	Latent cancer fatalities	***0.017***	***0.11***	***0.11***	***0.077***	***0.12***	***0.084***	***0.068***	***0.033***	***0.055***	***0.071***	***0.12***
Total recordable cases	Cases	***9.2***	***74***	***74***	***54***	***79***	***54***	67	***19***	***45***	***68***	***79***
Total lost workdays	Days	***70***	***570***	***570***	***420***	***610***	***410***	***510***	***140***	***350***	***520***	***610***
Utilities and Energy												
Potable water use	Million gallons per year	1.2	5.2	5.6	4.2	4.9	5.5	3.8	***2.0***	3.5	***4.4***	***5.2***
Nonpotable water use	Million gallons per year	0.80	1.8	3.1	1.7	2.6	1.8	1.2	***1.6***	1.4	***1.4***	***2.5***
Electricity use	Megawatt-hours per year	490	1.3×10^3	1.8×10^3	1.1×10^3	1.4×10^3	1.4×10^3	1.1×10^3	***890***	1.1×10^3	***1.1×10^3***	***1.5×10^3***
Sanitary wastewater	Million gallons per year	1.2	5.2	5.6	4.2	4.9	5.5	3.8	***2.0***	3.5	***4.4***	***5.2***
Fossil fuel use	Million gallons per year	0.21	0.84	1.0	0.69	0.79	0.82	0.65	***0.30***	***0.47***	***0.68***	***0.93***
Waste and Materials												
Mixed low-level waste	Cubic meters	11	***900[b]***	480	***710[b]***	340	350	480	***69***	140	***530***	***900***
Low-level waste	Cubic meters	5.6×10^3	6.8×10^4	7.3×10^4	4.4×10^4	5.0×10^4	4.9×10^4	4.1×10^4	***1.5×10^4***	1.5×10^4	***4.1×10^4***	***8.0×10^4***
Hazardous waste	Cubic meters	260	***48[b]***	290	***50[b]***	340	410	160	***2.5×10^3***	56	***200***	***110***
Industrial waste	Cubic meters	4.8×10^3	***7.0×10^4[b]***	7.2×10^4	***4.4×10^4[b]***	6.8×10^4	9.5×10^4	8.0×10^4	***1.8×10^4***	2.8×10^4	***8.1×10^4***	***$7.7x10^4$***

a. Peak ***year*** values.

b. Values represent the highest quantity among the disposal methods considered.

Table C.10-4. Existing facility disposition data.

		Alternatives									
		Clean Closure		Performance based Closure		Closure to landfill standards		Performance based closure with Class A grout disposal		Performance based closure with Class C grout disposal	
	Units	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets
Socioeconomics											
Direct employment	Number of jobs	***280***	***58***	20	***55***	***12***	***27***	***11***	***11***	***49***	***49***
Indirect employment	Number of jobs	***270***	***56***	***19***	***53***	***12***	***26***	***11***	***11***	***47***	***47***
Total employment	Number of jobs	***550***	***110***	***39***	110	***24***	***53***	***22***	***22***	***96***	***96***
Total earnings	***2000*** dollars ***(millions)***	***21***	***4.4***	***1.5***	***4.1***	***0.90***	***2.0***	***0.83***	***0.83***	***3.7***	***3.7***
Air resources											
Dose to offsite maximally exposed individual	Millirem per year	1.2×10^{-9}	1.0×10^{-10}	1.5×10^{-10}	1.3×10^{-10}	1.1×10^{-9}	9.2×10^{-10}	1.5×10^{-10}	1.3×10^{-10}	1.5×10^{-10}	1.3×10^{-10}
Dose to noninvolved worker	Millirem per year	1.2×10^{-9}	2.3×10^{-11}	1.5×10^{-10}	3.0×10^{-11}	1.1×10^{-9}	2.2×10^{-10}	1.5×10^{-10}	3.0×10^{-11}	1.5×10^{-10}	3.0×10^{-11}
Collective dose to population within 50 miles of INTEC	Person-rem per year	$\boldsymbol{3.7\times10^{-8}}$	$\boldsymbol{6.6\times10^{-9}}$	$\boldsymbol{4.6\times10^{-9}}$	$\boldsymbol{8.6\times10^{-9}}$	$\boldsymbol{3.4\times10^{-8}}$	$\boldsymbol{6.1\times10^{-8}}$	$\boldsymbol{4.7\times10^{-9}}$	$\boldsymbol{8.6\times10^{-9}}$	$\boldsymbol{4.7\times10^{-9}}$	$\boldsymbol{8.6\times10^{-9}}$
Maximum ambient concentration of criteria air pollutant (highest percent of ambient air quality standard)	Percentage	***14***	***13***	***13***	***13***	***13***	***13***	***13***	***13***	***13***	***13***
Maximum offsite concentration of carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration for carcinogens)	Percentage	0.19	9.0×10^{-3}	***0.037***	8.0×10^{-3}	***0.026***	8.0×10^{-3}	***0.023***	***0.012***	***0.023***	***0.012***
Maximum ambient (offsite or public road location) concentration of non-carcinogenic toxic air pollutant (highest percent of State of Idaho acceptable air concentration)	Percentage	***0.038***	2.0×10^{-3}	8.0×10^{-3}	2.0×10^{-3}	5.0×10^{-3}	2.0×10^{-3}	5.0×10^{-3}	2.0×10^{-3}	5.0×10^{-3}	2.0×10^{-3}
Maximum onsite concentration of toxic air pollutant [highest percent of occupational exposure limit (8-hour time weighted average)]	Percentage	1.9	0.09	0.37	0.08	0.26	0.08	0.23	0.12	0.23	0.12

Table C.10-4. Existing facility disposition data (continued).

		Alternatives									
		Clean Closure		Performance based Closure		Closure to landfill standards		Performance based closure with Class A grout disposal		Performance based closure with Class C grout disposal	
	Units	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets	Tank Farm	Bin Sets
Health and Safety											
Estimated latent cancer fatalities in involved worker population	Latent cancer fatalities	***0.76***	***0.15***	***0.042***	***0.12***	***0.020***	***0.057***	***0.026***	***0.080***	***0.026***	***0.080***
Total recordable cases	Cases	***280***	***56***	***16***	***43***	***7.5***	***21***	***9.8***	***30***	***9.8***	***30***
Total lost workdays	Days	***2.1×10^{3}***	***430***	***120***	***330***	***58***	***160***	***75***	***230***	***75***	***230***
Utilities and Energy											
Potable water use	Million gallons per year	2.0	0.32	0.11	0.31	0.06	0.15	0.13	0.52	0.14	***0.55***
Nonpotable (process) water use	Million gallons per year	0.05	3.9×10^{-3}	0.06	0.01	0.09	***0.011***	0.05	0.03	0.05	0.03
Electricity use	Megawatt-hours per year	7.3×10^{3}	3.2×10^{3}	4.4×10^{3}	6.0×10^{3}	1.2×10^{3}	990	4.6×10^{3}	1.5×10^{3}	4.6×10^{3}	1.5×10^{3}
Sanitary wastewater	Million gallons per year	2.0	0.32	0.13	0.32	0.10	0.16	0.14	0.52	0.15	0.56
Fossil fuel use	Million gallons per year	0.08	3.9×10^{-3}	0.02	6.6×10^{-3}	***0.011***	5.2×10^{-3}	***0.010***	5.2×10^{-3}	***0.010***	5.0×10^{-3}
Waste and Materials											
Mixed low-level waste	Cubic meters	1.1×10^{4}	180	120	85	480	33	120	540	120	540
Low-level waste	Cubic meters	1.1×10^{3}	4.6×10^{3}	0	150	0	150	0	0	0	0
Hazardous waste	Cubic meters	0	130	79	100	0	100	27	28	27	28
Industrial waste	Cubic meters	1.6×10^{5}	2.4×10^{4}	1.9×10^{3}	3.6×10^{3}	1.7×10^{3}	3.6×10^{3}	1.5×10^{3}	1.5×10^{4}	1.5×10^{3}	1.5×10^{4}

Table C.10-5. Lifetime radiation dose (millirem) for Tc-99 and I-129 by receptor and facility disposition scenario.

Facility	Maximally exposed resident	Future industrial worker	Intruder	Recreational user
No Action				
Tank Farm	84	4.4	5.1×10^{4}	0.64
Bin sets	490	25	2.3×10^{-4}	3.7
Performance-Based Closure or Closure to Landfill Standards				
Tank Farm	4.4	0.36	1.9×10^{4}	0.057
Bin sets	1.3	0.070	6.6×10^{-9}	0.010
New Waste Calcining Facility	0.034	1.7×10^{-3}	9.1×10^{-11}[a]	2.4×10^{-4}
Process Equipment Waste Evaporator	0.036	1.8×10^{-3}	9.6×10^{-11}[a]	2.6×10^{-4}
Performance-Based Closure with Class A Grout Disposal				
Tank Farm[b]	5.0	0.44	2.0×10^{4}	0.070
Bin sets[b]	2.2	0.19	6.7×10^{-9}	0.030
Performance-Based Closure with Class C Grout Disposal				
Tank Farm[c]	4.6	0.38	2.5×10^{5}	0.061
Bin sets[c]	2.1	0.16	2.4×10^{-7}	0.025
Class A or C Grout Disposal in a New Low-Activity Waste Disposal Facility				
Class A disposal facility	6.9	0.95	2.8×10^{-6}	0.16
Class C disposal facility	5.8	0.72	4.4×10^{-3}	0.12

a. Direct radiation dose to intruder from exposure to residual activity in closed New Waste Calcining Facility and Process Equipment Waste Evaporator was not assessed. Doses shown for these facilities are from groundwater pathway.
b. Includes residual contamination plus Class A-type grout.
c. Includes residual contamination plus Class C-type grout.

Table C.10-6. Noncarcinogenic health hazard quotients.

Contaminant	Cadmium			Fluoride			Nitrate		
Facility	Maximally exposed resident	Future industrial worker	Recreational user	Maximally exposed resident	Future industrial worker	Recreational user	Maximally exposed resident	Future industrial worker	Recreational user
No Action									
Tank Farm	0.040	8.5×10^{-3}	9.7×10^{-4}	1.6×10^{-4}	1.9×10^{-5}	3.8×10^{-6}	0.047	3.8×10^{-3}	6.5×10^{-4}
Bin sets	0.81	0.17	0.020	7.1×10^{-3}	8.3×10^{-4}	1.7×10^{-4}	3.6×10^{-3}	2.9×10^{-4}	5.0×10^{-5}
Performance-Based Closure or Closure To Landfill Standards									
Tank Farm	5.3×10^{-3}	1.0×10^{-3}	1.2×10^{-4}	1.1×10^{-6}	1.3×10^{-7}	2.7×10^{-8}	1.7×10^{-4}	1.4×10^{-5}	2.4×10^{-6}
Bin sets	6.1×10^{-3}	1.3×10^{-3}	2.8×10^{-3}	6.0×10^{-5}	7.1×10^{-6}	1.4×10^{-6}	5.6×10^{-5}	4.6×10^{-6}	7.8×10^{-7}
NWCF	- [a]	-	-	3.8×10^{-6}	4.5×10^{-7}	9.2×10^{-8}	8.9×10^{-7}	7.2×10^{-8}	1.2×10^{-8}
PEW Evaporator	-	-	-	1.1×10^{-5}	1.3×10^{-6}	2.7×10^{-7}	9.2×10^{-7}	7.5×10^{-8}	1.3×10^{-8}
Performance-Based Closure with Class A Grout Disposal									
Tank Farm[b]	0.088	0.019	2.1×10^{-3}	7.2×10^{-4}	8.5×10^{-5}	1.7×10^{-5}	6.9×10^{-3}	5.6×10^{-4}	9.6×10^{-5}
Bin sets[b]	0.12	0.026	5.5×10^{-3}	1.0×10^{-3}	1.2×10^{-4}	2.5×10^{-5}	0.035	2.9×10^{-3}	4.9×10^{-4}
Performance-Based Closure with Class C Grout Disposal									
Tank Farm[c]	0.040	8.4×10^{-3}	9.6×10^{-4}	3.8×10^{-4}	4.5×10^{-5}	9.3×10^{-6}	9.1×10^{-4}	7.5×10^{-5}	1.3×10^{-5}
Bin sets[c]	0.14	0.031	6.1×10^{-3}	1.2×10^{-3}	1.5×10^{-4}	3.0×10^{-5}	0.028	2.3×10^{-3}	1.4×10^{-4}
Class A or C Grout Disposal In a New Low-Activity Waste Disposal Facility									
Class A disposal facility	0.96	0.20	0.023	9.1×10^{-3}	1.1×10^{-3}	2.2×10^{-4}	9.8×10^{-3}	8.0×10^{-4}	1.4×10^{-4}
Class C disposal facility	1.1	0.23	0.026	0.011	1.3×10^{-3}	2.6×10^{-4}	2.8×10^{-3}	2.3×10^{-4}	3.9×10^{-5}

a. A dash indicates that there is no quantifiable exposure to this toxicant.

b. Includes residual contamination plus Class A-type grout.

c. Includes residual contamination plus Class C-type grout.

NWCF = New Waste Calcining Facility; PEW = Process Equipment Waste.

Utilities and Energy - The values presented are for water use (potable and non-potable), electricity use, sanitary wastewater, and fossil fuel use. They represent the utility and energy requirements for disposition (clean ***closure***) ***of*** new facilities built to support the various waste processing alternatives and disposition ***of*** existing facilities, depending on the facility disposition alternative selected. Water use, electricity use, sanitary wastewater, and fossil fuel use and related consequences are discussed in Section 5.2.12.

Waste and Materials - The data presented represent the total generation of mixed low-level, low-level, hazardous, and industrial nonhazardous and nonradiological wastes (in cubic meters) from the disposition activities over the entire disposition period. The waste volumes are discussed in Section 5.3.11.