5.3.5 WATER RESOURCES

5.3.5.1 Short-Term Impacts

Facility disposition activities would be carried out after HLW ***management*** facilities are no longer operational. HLW ***management*** facilities would be decontaminated to the extent practicable, then, depending on the facility disposition option selected and the facility in question, they would be entombed and left standing, partially removed, completely removed, or returned to (restricted) industrial use. Long-term impacts to human health from transport of residual contamination in environmental media such as groundwater are discussed in Appendix C.9 and summarized in Section 5.3.8.

New facilities for all alternatives would be located primarily in the northern portion of INTEC. A U.S. Geological Survey modeling study (Berenbrock and Kjelstrom 1998) indicates that those areas are in the 100-year floodplain. However, Big Lost River flows and frequencies based on paleohydrologic geomorphic, stream gauge, and two-dimensional modeling data indicate that no part of INTEC would be inundated by Big Lost River 100- and 500-year flow events (BOR 1999).

All newly constructed facilities necessary to implement the waste processing alternatives would be designed and constructed consistent with measures that facilitate clean closure. Under Clean Closure, radioactive and hazardous constituents would be removed from the site or treated so that residual contamination is no higher than background levels. This could require removal of all buildings, vaults, tanks, transfer piping, and contaminated soil. No post-closure monitoring would be required because potential sources of contamination would no longer be present. Unrestricted industrial use of clean-closed facilities and sites will be permissible. Impacts to water resources would not be expected ***from the disposition of new facilities***.

For Performance-Based Closure, most aboveground structures would be razed and most below-ground structures (tanks, vaults, and transfer piping) would be decontaminated, stabilized with grout, and left in place. The concentration of residual waste would be reduced to meet the closure performance standard(s) in an approved closure plan. Under Performance-Based Closure, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

For the Closure to Landfill Standards Alternative, waste residues within tanks, vaults, and piping would be stabilized with grout to minimize the release of contaminants to the environment. An engineered cap would be placed over vaults and tanks to minimize the intrusion of water that could leach waste residues to the environment. The structural integrity and effectiveness of the cap would be monitored in accordance with state and Federal regulations for closure effectiveness, as would groundwater in the vicinity. Closure to Landfill Standards would also have potential for impacts to water resources because waste residues would be left in place, although stabilized with grout. Section 5.3.8 analyzes potential human health impacts from these residual concentrations of contaminants.

Under Performance-Based Closure with Class A Grout Disposal, facilities would be closed as described under the Performance-Based Closure Alternative, but following completion of these activities low-level waste Class A type grout (produced under the Full Separations Option or

Planning Basis Option) would be disposed of in the Tank Farm and bin sets. Under this alternative, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

Under Performance-Based Closure with Class C Grout Disposal, facilities would be closed as described under the Performance-Based Closure Alternative, but following completion of these activities low-level waste Class C type Grout (produced under the Transuranic Separations Option) would be disposed of in the Tank Farm and bin sets. Under this alternative, small amounts of residual waste could leach into groundwater; however, concentrations of these wastes in groundwater would be below levels known to cause adverse health effects (see Section 5.3.8). The closed facility would be monitored for the long term, as would groundwater in the vicinity.

5.3.5.2 Long-Term Impacts

In addition to the short-term impacts evaluated in Section 5.3.5.1, DOE has also calculated the potential long-term impacts that may occur as a result of closure activities. Because the residual contamination that could be released to the environment is underground, the primary means by which contamination could reach receptors is through leaching into the soil surrounding the facilities and eventually into ***the Snake River Plain Aquifer*** near the facilities.

No additional long-term impacts would be expected from implementing any of the waste processing alternatives because all newly constructed facilities would be designed and constructed consistent with measures that facilitate clean closure.

DOE performed modeling of the movement of contaminants using the computer codes MEPAS and TETRAD. Contaminants were postulated to leach from the facilities following an assumed instantaneous structural failure at 500 years post-closure. After this structural failure occurs, rainwater is assumed to infiltrate and leach some of the contaminants and transport them downward to the aquifer.

DOE calculated the maximum concentration of the individual contaminants in the aquifer for comparison to the EPA drinking water standards in 40 CFR 141. Concentrations of nonradiological constituents may be directly compared to the standards while beta-gamma emitting contaminants must be compared to the drinking water standards in terms of radiation dose based on a ***hypothetical*** individual who drinks the water.

Table 5.3-***8*** presents a comparison of the concentrations (for nonradiological constituents), radiation dose (for radiological contaminants), and drinking water standards for the various facility disposition alternatives. As the table shows, there are a few instances where the peak groundwater concentration could exceed the respective maximum contaminant level. With the exception of technetium-99 in the bin sets - No Action scenario, all radionuclide concentrations are well below their MCLs. ***With the exception of cadmium, all nonradionuclide concentrations are within currently specified limits. Cadmium concentrations could exceed the maximum contaminant level under the bin sets - No Action scenario and the scenarios involving disposal of Class A or C-type grout in a Low-Activity Waste Disposal Facility. Additional details regarding methodology and results of the long-term facility disposition modeling are presented in Appendix C.9.***

5.3.6 ECOLOGICAL RESOURCES

Facility disposition includes a number of activities that would occur after HLW ***management*** facilities are no longer operational. After waste management operations are completed, HLW treatment and storage facilities at INTEC would be deactivated. ***The INEEL Comprehensive Land Use Plan*** (DOE 1997) discusses the changing mission of INTEC and the planned disposition of surplus facilities. It notes that DOE's goal is to place surplus INEEL facilities in a safe, stable shutdown condition and monitor them while awaiting decommissioning. HLW ***management*** facilities would be decontaminated to the extent practicable, then, depending on the

Table 5.3-8. Projected long-term peak groundwater concentrations for contaminants associated with the facility disposition scenarios.

Contaminant	Contaminant concentration (picocuries per liter or milligrams per liter): Calculated peak groundwater concentration	Contaminant concentration (picocuries per liter or milligrams per liter): Reference maximum contaminant level (MCL)[a]	Concentration as a percent of MCL	Time (years after closure) of peak concentration
Tank Farm - No Action				
Technetium-99	440	900	49	600
Iodine-129	0.19	1.0	19	700
Cadmium	5.2×10^{-4}	5.0×10^{-3}	10	3,200
Fluoride	1.2×10^{-4}	4.0	< 1	2,800
Nitrate	0.62	44 [b]	1.4	600
Bin Sets - No Action				
Technetium-99	2.6×10^{3}	900	290	600
Iodine-129	0.51	1.0	51	800
Cadmium	0.011	5.0×10^{-3}	210	6,500
Fluoride	5.1×10^{-3}	4.0	< 1	10,000
Nitrate	0.048	44	< 1	600
Tank Farm - Performance-Based Closure or Closure to Landfill Standards				
Technetium-99	15	900	1.7	700
Iodine-129	0.13	1.0	13	600
Cadmium	6.8×10^{-5}	5.0×10^{-3}	1.4	3,000
Fluoride	8.1×10^{-7}	4.0	< 1	3,000
Nitrate	2.6×10^{-3}	44	< 1	600
Bin Sets - Performance-Based Closure or Closure to Landfill Standards				
Technetium-99	7.1	900	0.79	900
Iodine-129	2.8×10^{-3}	1.0	0.28	700
Cadmium	7.9×10^{-5}	5.0×10^{-3}	1.6	4,700
Fluoride	4.3×10^{-5}	4.0	< 1	5,000
Nitrate	7.4×10^{-4}	44	< 1	600
New Waste Calcining Facility - Performance-Based Closure or Closure to Landfill Standards				
Technetium-99	0.18	900	< 1	900
Iodine-129	-[c]	1.0	-	-
Cadmium	-	5.0×10^{-3}	-	-
Fluoride	2.8×10^{-6}	4.0	< 1	5,400
Nitrate	1.2×10^{-5}	44	< 1	700
Process Equipment Waste Evaporator - Performance-Based Closure or Closure to Landfill Standards				
Technetium-99	0.19	900	< 1	900
Iodine-129	-	1.0	-	-
Cadmium	-	5.0×10^{-3}	-	-
Fluoride	8.1×10^{-6}	4.0	< 1	1,400
Nitrate	1.2×10^{-5}	44	< 1	700

Table 5.3-8. Projected long-term peak groundwater concentrations for contaminants associated with the facility disposition scenarios (continued).

Contaminant	Contaminant concentration (picocuries per liter or milligrams per liter): Calculated peak groundwater concentration	Contaminant concentration (picocuries per liter or milligrams per liter): Reference maximum contaminant level (MCL)[a]	Concentration as a percent of MCL	Time (years after closure) of peak concentration
Tank Farm - Performance-Based Closure with Class A Grout Disposal				
Technetium-99	15	900	< 1	700
Iodine-129	0.18	1.0	24	700
Cadmium	1.1×10^{-3}	5.0×10^{-3}	22	6,300
Fluoride	5.2×10^{-4}	4.0	< 1	10,000
Nitrate	0.092	44	< 1	600
Bin Sets - Performance-Based Closure with Class A Grout Disposal				
Technetium-99	7.2	900	< 1	800
Iodine-129	0.071	1.0	7.1	1,200
Cadmium	1.5×10^{-3}	5.0×10^{-3}	30	10,000
Fluoride	7.4×10^{-4}	4.0	< 1	10,000
Nitrate	0.47	44	1.1	600
Tank Farm - Performance-Based Closure with Class C Grout Disposal				
Technetium-99	15	900	< 1	700
Iodine-129	0.14	1.0	14	700
Cadmium	5.2×10^{-4}	5.0×10^{-3}	90	3,200
Fluoride	2.8×10^{-4}	4.0	< 1	3,500
Nitrate	0.013	44	< 1	600
Bin Sets - Performance-Based Closure with Class C Grout Disposal				
Technetium-99	7.7	900	< 1	800
Iodine-129	0.053	1.0	5.3	1,200
Cadmium	1.8×10^{-3}	5.0×10^{-3}	36	10,000
Fluoride	9.0×10^{-4}	4.0	< 1	10,000
Nitrate	0.37	44	< 1	600
Disposal of Class A Grout in a New Low-Activity Waste Disposal Facility[d]				
Technetium-99	0.90	900	< 1	1,000
Iodine-129	0.55	1.0	55	900
Cadmium	0.012	5.0×10^{-3}	250	6,500
Fluoride	6.5×10^{-3}	4.0	< 1	9,300
Nitrate	0.13	44	< 1	700
Disposal of Class C Grout in a New Low-Activity Waste Disposal Facility[d]				
Technetium-99	5.7	900	< 1	1,000
Iodine-129	0.39	1.0	39	900
Cadmium	0.014	5.0×10^{-3}	280	6,000
Fluoride	7.9×10^{-3}	4.0	< 1	8,000
Nitrate	0.037	44	< 1	700

a. Maximum contaminant levels are drinking water standards specified in 40 CFR 141.
b. The MCL for nitrate in 40 CFR 141 is 10 milligrams per liter for the nitrogen component, which equates to approximately 44 milligrams per liter of nitrate.
c. A dashed line indicates that there is no significant release.
d. The onsite Low-Activity Waste Disposal Facility is described in Section 3.1.3.1.

facility disposition option selected and the facility in question, they would be entombed and left standing, partially removed, completely removed, or returned to (restricted) industrial use. Potential impacts to ecological resources from facility disposition activities were evaluated by reviewing closure plans and project data sheets for disposition of HLW ***management*** facilities.

After closure, and during the institutional control period, ***until*** 2095, most areas within the INTEC boundaries will likely be designated restricted-use industrial areas. This use would be consistent with the long-term planning strategy outlined in DOE (1997), which encourages development in established facility areas such as INTEC and discourages the development of undisturbed areas. Following the period of institutional control, legal and administrative use restrictions may be placed on the land. However, for purposes of the analysis in this EIS, the loss of institutional control also means the loss of legal and administrative restrictions, such as deed restrictions. This being the case, any use may be made of the land, including residential or farming, though this is unlikely.

The methods used in this section are the same as those described in Section 5.2.8.

5.3.6.1 Short-Term Impacts

The facility disposition options being considered would primarily affect previously disturbed areas within the existing perimeter of INTEC. None of the closure options being considered would require construction of new facilities outside the existing secure INTEC perimeter. Therefore, no loss or alteration of habitat would occur.

Based on the number of employees required to disposition new facilities (see Section 5.3.2), the largest impacts to ecological resources would be for the Full Separations Option. Facility disposition activities under these options would expose wildlife to movement of personnel and vehicles, noise (from construction equipment, trucks, buses, and automobiles), and night lighting for as long as 4 years. Because the INTEC area provides poor-quality wildlife habitat, impacts would be limited to disturbance of wildlife in areas adjacent to INTEC. Representative impacts would include disruption of normal feeding, foraging, and nesting activities and, if the intensity of the disturbance is sufficient, displacement of less disturbance tolerant individuals. Other alternatives and options would require fewer employees and would produce generally lower levels of disturbance.

For disposition of existing facilities, the largest impacts would be expected under Clean Closure of the Tank Farm and under Performance-Based Closure of the bin sets. Impacts would be similar to those described in the previous paragraph but would be smaller because fewer employees would be required to disposition these existing facilities.

5.3.6.2 Long-Term Impacts

All newly constructed facilities necessary to implement the waste processing alternatives would be designed and constructed consistent with measures that facilitate clean closure. DOE has evaluated the potential for long-term impacts on the ecology surrounding the facilities after disposition decisions are enacted. Residual contamination at INTEC would occur in the soil or on buried facility surfaces either below grade or within above-grade engineered soil covers. Contaminants could be transported and spread by leaching into the aquifer or by erosion or penetration of contaminated soil by plant roots and vertebrate and invertebrate burrowing animals. This would result in a contaminant pathway to biological receptors. Contaminants brought to the surface may also be carried offsite by animals as plant material or prey or washed into the Big Lost River by erosion. DOE does not foresee that contaminants would concentrate in individuals of a certain species. There is no reason to anticipate long-term impacts to ecological resources within or near the INTEC boundaries.

5.3.7 TRAFFIC AND TRANSPORTATION

No waste or other materials would be shipped offsite from facility disposition activities, so DOE would not expect transportation impacts. This section analyzes impacts to traffic on Highway 20 (from Idaho Falls to the INEEL) from workers involved with facility disposition activities.

5.3.7.1 Methodology for Traffic Impact Analysis

DOE assessed potential traffic impacts based on the number of employees associated with the disposition of each facility or group of facilities (Section 5.3.2). The impacts associated with facility disposition activities were evaluated relative to baseline or historic traffic volumes on Highway 20. Changes in traffic were used to assess potential changes in level-of-service on the road.

Section 5.2.9 describes the methodology used in the determination of level of service on Highway 20. The level of service is a qualitative measure of operational conditions within a traffic stream as perceived by motorists and passengers. A level-of-service is defined for each roadway or section of roadway in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety (TRB 1985).

5.3.7.2 Traffic Impacts

As noted previously in Section 5.2.9, Highway 20 between Idaho Falls and the INEEL is designated Level-of-Service A, which represents free flow.

INEEL employment levels are expected to decrease during the period prior to initiation of facility dispositioning activities due to completion of INEEL missions and most waste processing activities. DOE would retrain and reassign its existing workforce to conduct disposition activities for both new and existing facilities.

Employment levels for facility disposition activities are presented in Table 5.3-1 (new facilities), Table 5.3-2 (Tank Farm and bin sets), and Table 5.3-3 (existing HLW ***management*** facility groups). Employment levels for disposition of new facilities would be similar to the levels estimated for construction associated with these facilities. With the exception of the Tank Farm facility, employment levels for dispositioning of existing facilities would be lower than for the waste processing alternatives discussed in Chapter 3.

Based on predicted levels of INEEL employment for facility disposition, DOE expects that traffic flows for Highway 20 would be virtually unaffected and the level of service would remain the same.

5.3.8 HEALTH AND SAFETY

This section describes potential health and safety impacts to INEEL workers and the offsite public from implementation of the facility disposition alternatives described in Chapter 3.

5.3.8.1 Short-Term Impacts

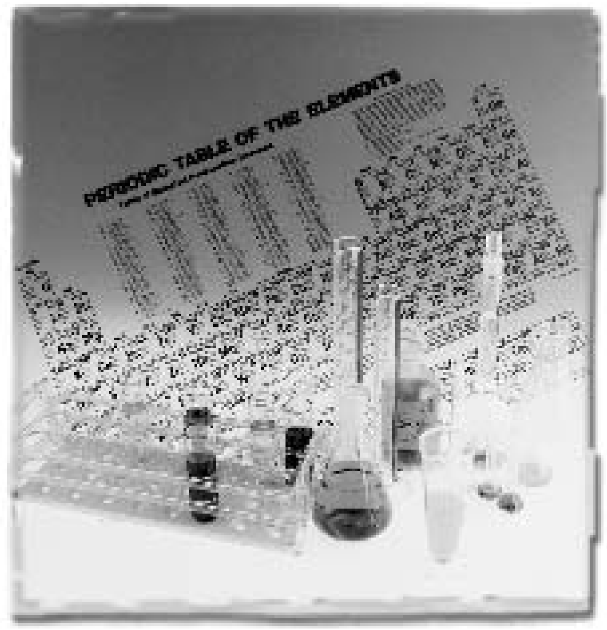
Short-term activities toward facility disposition could result in health impacts to INEEL workers and the public. DOE is considering two categories of disposition of HLW ***management*** facilities. The first involves disposition of new facilities required to support the waste processing alternatives. The second category involves the existing HLW ***management*** facilities as grouped in Table 3-***3*** in Chapter 3. The sections below provide DOE's estimates of radiological and nonradiological health and safety impacts for these facilities.

Impacts from Disposition of New Facilities Associated with Waste Processing Alternatives

Tables 5.3-***9*** through 5.3-1***1*** present potential health and safety impacts to involved workers from radiological and nonradiological sources by facility or group of facilities for new facilities associated with the waste processing alternatives.

Table 5.3-***9*** presents radiological impacts in terms of collective dose to workers and the resultant estimated number of latent cancer fatalities for the entire period of disposition. DOE bases dose estimates on the projected number of workers for each option and historic INEEL operations dose-per-worker data. No disposition activities would be associated with the No Action Alternative. ***The highest average collective dose would occur for the Hot Isostatic Pressed Waste Option and the Vitrification with Calcine Separations Option with 290 person-rem and would result in 0.12 latent cancer fatality under this option.***

Table 5.3-***10*** provides a summary of annual radiation dose and health impacts associated with airborne radionuclide emissions. These values



are based on the doses for closing each new facility presented in Section 5.3.4. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of ***INTEC***. The estimated increase in the number of latent cancer fatalities is presented for the collective population. ***The annual radiation doses to the maximally exposed individuals, noninvolved worker as well as to the population for all of the options are at very low levels. The maximum number of latent cancer fatalities is associated with the Vitrification with Calcine Separations Option and is much less than one (1.1×10^{-11}).***

Table 5.3-1***1*** provides estimates of occupational safety impacts for workers involved with disposition activities. Impacts are presented in terms of the number of lost workdays and total recordable cases on an annual and total disposition period basis. A lost workday is the number of lost workdays beyond the onset of injury or illness. A total recordable case is a recordable case that includes work-related death, illness, or injury that resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical attention beyond first aid. DOE estimated the lost workdays and total recordable cases for each option based on the projected number of workers and the five-year average lost workdays and total recordable cases rates from INEEL construction workforce data from ***1996*** to ***2000*** (***DOE 2001***).

Table 5.3-9. Estimated radiological impacts to involved workers during disposition activities for new facilities.[a,b,c]

Project Number	Description	***Radiation*** workers/ year	***Disposition*** time (years)	Total workers	***Collective*** dose (person-rem)	Estimated increase in latent cancer fatalities
	Continued Current Operations Alternative					
P1A	Calcine SBW including NWCF Upgrades[d]	37	2	74	19	***7.4×10^{-3}***
P1A	Calcine SBW including NWCF Upgrades[e]	31	2	62	16	***6.2×10^{-3}***
P1B	NGLW and Tank Farm Heel Waste Management	36	1	36	9	***3.6×10^{-3}***
Totals				***170***	***43***	***0.017***
	Full Separations Option					
P9A	Full Separations	100	3	***310***	77	***0.031***
P9B	Vitrification Plant	45	3	140	34	***0.014***
P9C	Class A Grout Plant	74	***2.5***	***190***	***46***	***0.019***
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P24	***Vitrified Product Interim Storage***	***3***	***1.8***	***5.4***	***1.4***	***5.4×10^{-4}***
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	88	2	180	44	***0.018***
P35D	Class A Grout Packaging and Shipping to a New Low-Activity Waste Disposal Facility	20	2	40	10	***4.0×10^{-3}***
P59A	Calcine Retrieval and Transport	100	***1***	100	26	0.010
P118	Separations Organic Incinerator	2	2	4	1.0	***4.0×10^{-4}***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***1.1×10^{3}***	***270***	***0.11***
	Planning Basis Option					
P1A	Calcine SBW including NWCF Upgrades[d]	37	2	74	19	***7.4×10^{-3}***
P1A	Calcine SBW including NWCF Upgrades[e]	31	2	62	16	***6.2×10^{-3}***
P1B	NGLW and Tank Farm Heel Waste Management	36	1	36	9	***3.6×10^{-3}***
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P23A	Full Separations	100	3	310	77	***0.031***
P23B	Vitrification Plant	49	2.8	***140***	34	***0.014***
P23C	Class A Grout Plant	67	2.8	***190***	***47***	***0.019***
P24	***Vitrified Product Interim Storage***	***3***	***1.8***	***5.4***	***1.4***	***5.4×10^{-4}***
P35E	***Class A Grout Packaging and Shipping for Offsite Disposal***	***20***	***2***	***40***	***10***	4.0×10^{-3}
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P118	Separations Organic Incinerator	2	2	4	1	***4.0×10^{-4}***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***1.1×10^{3}***	***270***	***0.11***

Table 5.3-9. Estimated radiological impacts to involved workers during disposition activities for new facilities [a,b,c] (continued).

Project Number	Descrition	***Radiation*** workers/ year	***Disposition*** time (years)	Total workers	***Collective*** dose (person-rem)	Estimated increase in latent cancer fatalities
	Transuranic Separations Option					
P18	New Analytical Laboratory	30	2	60	15	***6.0×10⁻³***
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	***49***	2	***98***	***25***	***9.8×10^{-3}***
P49A	Transuranic/Class C Separations	81	3	240	61	***0.024***
P49C	Class C Grout Plant	64	2	130	32	***0.013***
P49D	Class C Grout Packaging and Shipping to a New Low-Activity Waste Disposal Facility	41	2	82	21	***8.2×10^{-3}***
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P118	Separations Organic Incinerator	2	2	4	1	4.0×10^{-4}
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***770***	***190***	***0.077***
	Hot Isostatic Pressed Waste Option					
P1A	Calcine SBW including NWCF Upgrades[d]	37	2	74	*19*	***7.4×10^{-3}***
P1A	Calcine SBW including NWCF Upgrades[e]	31	2	62	*16*	***6.2×10^{-3}***
P1B	NGLW and Tank Farm Heel Waste Management	36	1	36	9	***3.6×10^{-3}***
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P71	Mixing and Hot Isostatic Pressing	150	5	730	***180***	***0.073***
P72	Interim Storage of Hot Isostatic Pressed Waste	16	3	48	12	***4.8×10^{-3}***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***1.2×10^{3}***	***290***	***0.12***
	Direct Cement Waste Option					
P1A	Calcine SBW including NWCF Upgrades[d]	37	2	74	19	***7.4×10^{-3}***
P1A	Calcine SBW including NWCF Upgrades[e]	31	2	62	16	***6.2×10^{-3}***
P1B	NGLW and Tank Farm Heel Waste Management	36	1	36	9	***3.6×10^{-3}***
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P80	Direct Cement Process	120	3	360	91	0.036
P81	Unseparated Cementitious HLW Interim Storage	***88***	***1***	***88***	***22***	***8.8×10^{-3}***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***840***	***210***	***0.084***

Table 5.3-9. Estimated radiological impacts to involved workers during disposition activities for new facilities [a,b,c] (continued).

Project Number	Descrition	***Radiation*** workers/ year	***Disposition*** time (years)	Total workers	***Collective*** dose (person-rem)	Estimated increase in latent cancer fatalities
			Early Vitrification Option			
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P61	***Vitrified Product Interim Storage***	25	***3***	***75***	19	***7.5×10^{-3}***
P88	Early Vitrification Facility	78	5	390	98	0.039
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***680***	***170***	0.068
			Steam Reforming Option			
P13	***New Storage Tanks***	***19***	***2***	***38***	***10***	***3.8×10^{-3}***
P35E	***Class A Grout Packaging and Loading for Offsite Disposal***	***20***	***2***	***40***	***10***	***4.0×10^{-3}***
P59A	***Calcine Retrieval and Transport***	***100***	***1***	***100***	***26***	***0.010***
P117A	***Calcine Packaging and Loading***	***33***	***3***	***99***	***25***	***9.9×10^{-3}***
P2001	***NGLW Grout Facility***	***9***	***1***	***9***	***2***	***9.0×10^{-4}***
P2002A	***Steam Reforming Facility***	***45***	***1***	***45***	***11***	***4.5×10^{-3}***
Totals				***330***	***83***	***0.033***
			Minimum INEEL Processing Alternative			
P18	New Analytical Laboratory	30	2	60	15	***6.0×10^{-3}***
P24	Vitrified Product Interim Storage	3	***1.8***	***5.4***	***1.4***	***5.4×10^{-4}***
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	88	2	180	44	0.018
P59A	Calcine Retrieval and Transport	100	1	100	26	0.010
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout & LLW Grout	59	1	59	15	***5.9×10^{-3}***
P117A	Calcine Packaging and Loading	33	3	99	25	***9.9×10^{-3}***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***550***	***140***	***0.055***
			Vitrification without Calcine Separations Option			
P13	***New Storage Tanks***	***15***	***2***	***30***	***7.5***	***3.0×10^{-3}***
P18	***New Analytical laboratory***	***30***	***2***	***60***	***15***	***6.0×10^{-3}***
P59A	***Calcine Retrieval and Transport***	***100***	***1***	***100***	***26***	***0.010***
P61	***Vitrified Product Interim Storage***	***25***	***3***	***75***	***19***	***7.5×10^{-3}***
P88	***Vitrification with MACT***	***78***	***5***	***390***	***98***	***0.039***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***710***	***180***	***0.071***

Table 5.3-*9*. Estimated radiological impacts to involved workers during disposition activities for new facilities[a,b,c] (continued).

Project number	Description	***Radiation*** workers/ year	***Disposition*** time (years)	Total workers	***Collective*** dose (person-rem)	Estimated increase in latent cancer fatalities
	Vitrification with Calcine Separations Option					
P9A	***Full Separations***	***100***	***3***	***310***	***77***	***0.031***
P9C	***Grout Plant***	***74***	***2.5***	***190***	***46***	***0.019***
P13	***New Storage Tanks***	***15***	***2***	***30***	***7.5***	***3.0×10^{-3}***
P18	***New Analytical Laboratory***	***30***	***2***	***60***	***15***	***6.0×10^{-3}***
P24	***Vitrified Product Interim Storage***	***3***	***1.8***	***5.4***	***1.4***	***5.4×10^{-4}***
P35E	***Grout Packaging and Loading for Offsite Disposal***	***20***	***2***	***40***	***10***	***4.0×10^{-3}***
P59A	***Calcine Retrieval and Transport***	***100***	***1***	***100***	***26***	***0.010***
P88	***Vitrification with MACT***	***78***	***5***	***390***	***98***	***0.039***
P133	***Waste Treatment Pilot Plant***	***25***	***2***	***50***	***13***	***5.0×10^{-3}***
Totals				***1.2×10^{3}***	***290***	***0.12***

a. Source: Data from Project Data Sheets in Appendix C.6.

b. Only includes projects with potential for radiation exposure during disposition.

c. ***The EIS analyzes treatment of post-2005 newly generated liquid waste as mixed transuranic waste/SBW for comparability of impacts between alternatives. The newly generated liquid waste could be treated in the same facility as the mixed transuranic waste/SBW or DOE could construct a separate facility to grout the newly generated liquid waste.***

d. For the New Waste Calcining Facility MACT Facility.

e. For the liquid waste storage tank.

CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; LLW = low-level waste; MACT = maximum achievable control technology; NGLW = newly generated liquid waste; TRU = transuranic.

As shown in Table 5.3-11, the highest number of lost workdays and total recordable cases over the entire disposition period would occur under the Hot Isostatic Pressed Waste and Vitrification with Calcine Separations Options. DOE estimates 610 lost workdays and 79 total recordable cases for these options. The ***Full Separations***, ***Planning Basis***, Early Vitrification, ***and Vitrification without Calcine Separations Options*** would have a similar number of lost workdays and total recordable cases occurrences with all other options resulting in lesser impacts for the entire disposition period of activity.

Impacts from Disposition of Existing Facilities Associated with HLW Management

Tables 5.3-1*2* through 5.3-1*5* present potential health and safety impacts from closure of existing HLW ***management*** facilities by alternative. These facilities would be closed as specified in Table 3-*3*.

Table 5.3-1*2* provides radiological impacts in terms of collective dose to workers and the resultant estimated number of LCFs for the entire disposition period of activity. As expected, the collective worker dose is highest for the Tank Farm Clean Closure Alternative due to the extensive decontamination efforts required for removing contaminated materials in order to reduce radioactivity to minimum detectable levels. Tank Farm Clean Closure would involve the largest number of workers and a longer duration of dispositioning activities for any of the Tank Farm options and therefore would result in a larger collective dose. DOE ***estimated*** the annual collective and total collective worker doses to be ***70*** and ***1,900*** person-rem, respectively. The total collective worker dose for the Clean Closure alternative would result in an estimated ***0.76*** latent cancer fatality. The estimated total collective worker doses for all other Tank Farm closure options, ***as well as closure of the*** bin sets and related facilities, and other new facilities associated with HLW management are much lower and would result in less than 1 latent cancer fatality for each option.

Table 5.3-*10*. Summary of radiation dose impacts associated with airborne radionuclide emissions from disposition of facilities associated with waste processing alternatives.

Receptor	No Action Alternative	Continued Current Operations Alternative	Separations Alternative			Non-Separations Alternative				Minimum INEEL Processing Alternative	***Direct Vitrification Alternative***	
			Full Separations Option[a]	Planning Basis Option	Transuranic Separations Option[b]	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***
Annual dose to maximally exposed offsite individual (millirem per year)[c]	-	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}
Integrated dose to maximally exposed offsite individual (millirem)[d]	-	2.2×10^{-10}	7.7×10^{-10}	9.9×10^{-10}	9.4×10^{-10}	5.4×10^{-10}	2.2×10^{-10}	4.0×10^{-10}	3.9×10^{-10}	1.3×10^{-9}	5.4×10^{-10}	7.8×10^{-10}
Estimated increase in probability of latent cancer fatality for the maximally exposed offsite individual	-	1.1×10^{-16}	3.9×10^{-16}	5.0×10^{-16}	4.7×10^{-16}	2.7×10^{-16}	1.1×10^{-16}	2.0×10^{-16}	2.0×10^{-16}	6.5×10^{-16}	2.7×10^{-16}	3.9×10^{-16}
Annual dose to noninvolved worker (millirem per year)[e]	-	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}
Integrated dose to noninvolved worker (millirem)[d]	-	4.0×10^{-11}	1.4×10^{-10}	1.8×10^{-10}	2.8×10^{-10}	1.1×10^{-10}	3.7×10^{-11}	8.1×10^{-11}	7.0×10^{-11}	3.8×10^{-10}	1.1×10^{-10}	1.6×10^{-10}
Estimated increase in probability of latent cancer fatality for the noninvolved worker	-	1.6×10^{-17}	5.6×10^{-17}	7.2×10^{-17}	1.1×10^{-16}	4.4×10^{-17}	1.5×10^{-17}	3.2×10^{-17}	2.8×10^{-17}	1.5×10^{-16}	4.4×10^{-17}	6.4×10^{-17}
Annual collective dose to population within 50 miles of INTEC (person-rem per year)[f]	-	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}
Integrated collective dose to population (person-rem)[d]	-	7.9×10^{-9}	2.8×10^{-8}	3.6×10^{-8}	2.6×10^{-8}	1.7×10^{-8}	7.7×10^{-9}	1.3×10^{-8}	1.4×10^{-8}	3.6×10^{-8}	1.8×10^{-8}	2.5×10^{-8}
Estimated increase in number of latent cancer fatalities in population	-	4.0×10^{-12}	1.4×10^{-11}	1.8×10^{-11}	1.3×10^{-11}	8.5×10^{-12}	3.9×10^{-12}	6.5×10^{-12}	7.0×10^{-12}	1.8×10^{-11}	9.0×10^{-12}	1.3×10^{-11}

a. Impacts do not include disposal of low-level waste Class A type Grout in Tank Farm and bin sets, which is presented in Section 5.3.4, Table 5.3-6.
b. Impacts do not include disposal of low-level waste Class C type Grout in Tank Farm and bin sets, which is presented in Section 5.3.4, Table 5.3-6.
c. Doses are maximum values over any single year in which facility disposition occurs.
d. The annual average project doses were multiplied by the project duration and summed for all projects to determine the integrated doses and health effects.
e. Location of highest onsite dose is Central Facilities Area.
f. Population dose assumes a growth rate of 6 percent per decade between 2000 and 2035.

Table 5.3-11. Estimated worker injury impacts during disposition activities of new facilities at INEEL by alternative.[a]

Project number	Description	Total number of workers per year	Disposition time (years)	Total number of workers	Total lost workdays[b]	Total recordable cases[c]
			Continued Current Operations Alternative			
P1A	Calcine SBW including NWCF Upgrades[d]	58	2	120	33	4.3
P1A	Calcine SBW including NWCF Upgrades[e]	42	2	84	24	3.1
P1B	NGLW and Tank Farm Heel Waste Management	48	1	48	14	1.8
Totals				250	70	9.2
			Full Separations Option			
P9A	Full Separations	220	3	670	190	25
P9B	Vitrification Plant	72	3	220	61	8.0
P9C	Class A Grout Plant	120	2.5	300	85	11
P18	New Analytical Laboratory	88	2	180	50	6.5
P24	Vitrified Product Interim Storage	31	1.8	56	16	2.1
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.25	0.53	0.15	0.019
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	140	2	270	77	10
P35D	Class A Grout Packaging and Shipping to a New Low-Activity Waste Disposal Facility	30	2	60	17	2.2
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P118	Separations Organic Incinerator	2	2	4	1.1	0.15
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				2.0×10^3	570	74
			Planning Basis Option			
P1A	Calcine SBW including NWCF Upgrades[d]	58	2	120	33	4.3
P1A	Calcine SBW including NWCF Upgrades[e]	42	2	84	24	3.1
P1B	NGLW and Tank Farm Heel Waste Management	48	1	48	14	1.8
P18	New Analytical Laboratory	88	2	180	50	6.5
P23A	Full Separations	220	3	660	190	24
P23B	Vitrification Plant	72	2.8	200	57	7.5
P23C	Class A Grout Plant	120	2.8	340	95	12
P24	Vitrified Product Interim Storage	31	1.8	56	16	2.1
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.25	0.53	0.15	0.019
P35E	Class A Grout Packaging and Loading for Offsite Disposal	30	2	60	17	2.2
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P118	Separations Organic Incinerator	2	2	4	1.1	0.15
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				2.0×10^3	570	74

Table 5.3-11. Estimated worker injury impacts during disposition activities of new facilities at INEEL by alternative [a] (continued).

Project number	Description	Total number of workers per year	Disposition time (years)	Total number of workers	Total lost workdays[b]	Total recordable cases[c]
	Transuranic Separations Option					
P18	New Analytical Laboratory	88	2	180	50	6.5
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	140	2	270	77	10
P39A	Packaging and Loading TRU at INTEC for Shipment to the Waste Isolation Pilot Plant	7	1.5	11	3.0	0.39
P49A	Transuranic/Class C Separations	150	3	450	130	17
P49C	Class C Grout Plant	93	2	190	53	6.9
P49D	Class C Grout Packaging and Shipping to a New Low-Activity Waste Disposal Facility	57	2	110	32	4.2
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P118	Separations Organic Incinerator	2	2	4	1.1	0.15
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				1.5×10^3	420	54
	Hot Isostatic Pressed Waste Option					
P1A	Calcine SBW including NWCF Upgrades[d]	58	2	120	33	4.3
P1A	Calcine SBW including NWCF Upgrades[e]	42	2	84	24	3.1
P1B	NGLW and Tank Farm Heel Waste Management	48	1	48	14	1.8
P18	New Analytical Laboratory	88	2	180	50	6.5
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P71	Mixing and Hot Isostatic Pressing	200	5	1.0×10^3	280	37
P72	Interim Storage of Hot Isostatic Pressed Waste	150	3	450	130	17
P73A	Packaging and Loading Hot Isostatic Pressed Waste at INTEC for Shipment to a Geologic Repository	7	1	7	2.0	0.26
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				2.1×10^3	610	79
	Direct Cement Waste Option					
P1A	Calcine SBW including NWCF Upgrades[d]	58	2	120	33	4.2
P1A	Calcine SBW including NWCF Upgrades[e]	42	2	84	24	3.1
P1B	NGLW and Tank Farm Heel Waste Management	48	1	48	14	1.8
P18	New Analytical Laboratory	88	2	180	50	6.5
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P80	Direct Cement Process	160	3	480	140	11
P81	Unseparated Cementitious HLW Interim Storage	290	1	290	82	11
P83A	Packaging and Loading Cementitious Waste at INTEC for Shipment to a Geologic Repository	7	1	7	2.0	0.26
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				1.4×10^3	410	54

Table 5.3-11. Estimated worker injury impacts during disposition activities of new facilities at INEEL by alternative [a] (continued).

Project number	Description	Total number of workers per year	Disposition time (years)	Total number of workers	Total lost workdays[b]	Total recordable cases[c]
	Early Vitrification Option					
P18	New Analytical Laboratory	88	2	180	50	6.5
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P61	Unseparated Vitrified Product Interim Storage	250	3	750	210	28
P62A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	10	3	30	8.5	1.1
P90A	Packaging and Loading Vitrified SBW at INTEC for Shipment to Waste Isolation Pilot Plant	7	1.5	11	3.0	0.39
P88	Early Vitrification Facility	120	5	590	170	22
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				1.8×10^3	510	67
	Steam Reforming Option					
P13	New Storage Tanks	19	2	38	11	1.4
P35E	Class A Grout Packaging and Loading for Offsite Disposal	30	2	60	17	2.2
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P117A	Calcine Packaging and Loading	52	3	160	44	5.8
P2001	NGLW Grout Facility	16	1	16	4.5	0.59
P2002A	Steam Reforming Facility	72	1	72	20	2.7
Totals				500	140	19
	Minimum INEEL Processing Alternative					
P18	New Analytical Laboratory	88	2	180	50	6.5
P24	Vitrified Product Interim Storage	31	1.8	56	16	2.1
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	2.1	0.25	0.53	0.15	0.19
P27	Class A Grout Disposal in a New Low-Activity Waste Disposal Facility	140	2	270	77	10
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout & LLW Grout	100	1	100	28	3.7
P112A	Packaging and Loading Contact Handled TRU for Shipment to WIPP	7	4.5	32	8.9	1.2
P117A	Calcine Packaging and Loading	110	3	330	94	12
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				1.2×10^3	350	45

Table 5.3-11. Estimated worker injury impacts during disposition activities of new facilities at INEEL by alternative [a] (continued).

Project number	Description	Total number of workers per year	Disposition time (years)	Total number of workers	Total lost workdays[b]	Total recordable cases[c]
Vitrification without Calcine Separations Option						
P13	New Storage Tanks	19	2	38	11	1.4
P18	New Analytical Laboratory	88	2	180	50	6.5
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P61	Vitrified HLW Interim Storage	250	3	750	210	28
P62A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	10	3	30	8.5	1.1
P88	Vitrification with MACT	120	5	590	170	22
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				1.8×10^3	520	68
Vitrification with Calcine Separations Option						
P9A	Full Separations	220	3	670	190	25
P9C	Grout Plant	120	2.5	300	85	11
P13	New Storage Tanks	19	2	38	11	1.4
P18	New Analytical Laboratory	88	2	180	50	6.5
P24	Vitrified Product Interim Storage	31	1.8	56	16	2.1
P25A	Packaging and Loading Vitrified HLW for Shipment to a Geologic Repository	2.1	0.25	0.53	0.15	0.019
P35E	Grout Packaging and Loading for Offsite Disposal	30	2	60	17	2.2
P59A	Calcine Retrieval and Transport	160	1	160	45	5.9
P88	Vitrification Facility with MACT	120	5	590	170	22
P133	Waste Treatment Pilot Plant	45	2	90	26	3.3
Totals				2.1×10^3	610	79

a. The EIS analyzes treatment of post-2005 newly generated liquid waste as mixed transuranic waste/SBW for comparability of impacts between alternatives. The newly generated liquid waste could be treated in the same facility as the mixed transuranic waste/SBW or DOE could construct a separate facility to grout the newly generated liquid waste.

b. The number of workdays beyond the day of injury or onset of illness the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

c. A recordable case includes work-related death, illness, or injury which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

d. For the New Waste Calcining Facility with Maximum Achievable Control Technology upgrades.

e. For the liquid waste storage tank.

CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; FUETAP = formed under elevated temperature and pressure; HLW = high-level waste; LLW = low-level waste; MACT = maximum achievable control technology; NGLW = newly generated liquid waste; TRU = transuranic waste; WIPP = Waste Isolation Pilot Plant.

Table 5.3-*12*. Estimated radiological health impacts from disposition activities for existing facilities (annual and total dose).[a]

Facility description	Annual average number of workers	Annual collective worker dose (person-rem)	Total collective dose for disposition period (person-rem)	Estimated LCFs from total collective dose (person-rem)
Tank Farm				
Clean Closure	280	***70***	***1,900***	***0.76***
Performance-Based Closure	***20***	***5.0***	***110***	***0.042***
Closure to Landfill Standards	***12***	***3.0***	***51***	***0.020***
Performance-Based Closure with Class A Grout Disposal	***11***	***2.8***	***66***	***0.026***
Performance-Based Closure with Class C Grout Disposal	***11***	***2.8***	***66***	***0.026***
Tank Farm related facilities	***1***	***0.25***	***1.5***	***6.0×10^{-4}***
Bin Sets				
Clean Closure	58	***15***	***380***	***0.15***
Performance-Based Closure	***55***	***14***	***290***	***0.12***
Closure to Landfill Standards	27	***6.8***	***140***	***0.057***
Performance-Based Closure with Class A Grout Disposal	***47***	***12***	***200***	***0.080***
Performance-Based Closure with Class C Grout Disposal	***47***	***12***	***200***	***0.080***
Bin Sets related facilities	***<1***	***<0.25***	***<1.5***	***$<6.0\times10^{-4}$***
PEWE and related facilities	***39***	***9.8***	***54***	***0.021***
Fuel Processing Building and related facilities				
Performance-Based Closure	25	6.3	63	0.025
Closure to Landfill Standards	20	5.0	50	0.020
FAST/FAST Stack	34	***8.5***	***51***	0.020
Transport Lines Group	***1***	***0.25***	***0. 25***	***1.0×10^{-4}***
New Waste Calcining Facility				
Performance-Based Closure	35	8.8	***26***	***0.011***
Closure to Landfill Standards	32	8.0	***24***	***9.6×10^{-3}***
Remote Analytical Laboratory	***4***	***1.0***	***3.0***	***1.2×10^{-3}***

a. Source: Data from Project Data Sheets in Appendix C.6.
FAST = Fluorinel and Storage Facility; LCF = latent cancer fatality; PEWE = Process Equipment Waste Evaporator.

Table 5.3-1***3*** provides a summary of annual radiation dose and health impacts associated with airborne radionuclide emissions from the Tank Farm and bin sets under alternative closure scenarios. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of ***INTEC***. The highest radiation dose impacts are associated with the Bin Set Closure to Landfill Standards Alternative. However, these doses are still significantly less than the applicable standard for annual exposure. The maximum collective population dose of ***6.1×10^{-8}*** person-rem for the Bin Set Closure to Landfill Standards Alternative results in an increase in the number of latent cancer fatalities of ***3.1×10^{-11}***. All other radiation dose impacts are lower.

Table 5.3-1***4*** provides a summary of annual radiation dose and health impacts from radionuclide emissions from the ***disposition of*** other existing facilities associated with HLW ***management***. Dose impacts are presented for the maximally exposed offsite and onsite individuals and the population within 50 miles of ***INTEC***. All of the dose impacts are negligible with the highest collective population dose and increase in number of latent cancer fatalities being estimated for the Fuel Processing Building and Related Facilities.

Table 5.3-*13*. Summary of radiation dose impacts associated with airborne radionuclide emissions from disposition of the Tank Farm and bin sets under alternative closure scenarios.

Case	Applicable standard	Maximum annual radiation dose[a]			
		Clean closure	Performance-based closure	Closure to landfill standards	Performance-based closure with Class A or C grout disposal [b]
Tank Farm					
Dose to maximally exposed offsite individual (millirem per year)	10[c]	1.2×10^{-9}	***1.5×10^{-10}***	***1.1×10^{-9}***	1.5×10^{-10}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA[d]	6.0×10^{-16}	***7.5×10^{-17}***	***5.5×10^{-16}***	7.5×10^{-17}
Dose to noninvolved worker (millirem per year)[e]	5.0×10^{3}[f]	1.2×10^{-9}	***1.5×10^{-10}***	***1.1×10^{-9}***	1.5×10^{-10}
Estimated annual increase in probability of LCF to the noninvolved work	NA	4.8×10^{-16}	***6.0×10^{-17}***	***4.4×10^{-16}***	6.0×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[g]	NA	***3.7×10^{-8}***	***4.6×10^{-9}***	***3.4×10^{-8}***	***4.7×10^{-9}***
Estimated annual increase in number of latent cancer fatalities to population	NA	***1.9×10^{-11}***	***2.3×10^{-12}***	***1.7×10^{-11}***	***2.4×10^{-12}***
Bin sets					
Dose to maximally exposed offsite individual (millirem per year)	10[c]	1.0×10^{-10}	1.3×10^{-10}	9.2×10^{-10}	1.3×10^{-10}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA	5.0×10^{-17}	6.5×10^{-17}	4.6×10^{-16}	6.5×10^{-17}
Dose to noninvolved worker (millirem per year)[e]	5.0×10^{3}[f]	2.3×10^{-11}	3.0×10^{-11}	2.2×10^{-10}	3.0×10^{-11}
Estimated annual increase in probability of LCF to the noninvolved work	NA	9.2×10^{-18}	1.2×10^{-17}	8.8×10^{-17}	1.2×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[g]	NA	***6.6×10^{-9}***	***8.6×10^{-9}***	***6.1×10^{-8}***	***8.6×10^{-9}***
Estimated annual increase in number of latent cancer fatalities to population	NA	***3.3×10^{-12}***	***4.3×10^{-12}***	***3.1×10^{-11}***	***4.3×10^{-12}***

a. Doses are maximum values over any single year during which decontamination and decommissioning occur.
b. Radiation dose impacts for Class A and Class C type grouting disposal techniques are the same since analyses indicate that the primary exposure results from the cleaning portion of the operation rather than the filling.
c. EPA dose limit specified in 40 CFR 61.92; applies to effective dose equivalent from air releases only.
d. NA = not applicable.
e. Location of highest onsite dose is Central Facilities Area.
f. Occupational dose limit per 10 CFR 835.202; applies to sum of doses from all exposure pathways.
g. Applies to future projected population of about ***242,000*** people.

Table 5.3-*14*. Summary of radiation dose impacts associated with airborne radionuclide emissions from disposition of other existing facilities associated with HLW management.

		Maximum annual radiation dose[a]						
Case	Applicable standard	Tank Farm related facilities	Bin set related facilities	Process Equipment Waste Evaporator & related facilities	Fuel processing building & related facilities	FAST and related facilities	New Waste Calcining Facility	Remote Analytical Laboratory
Dose to maximally exposed offsite individual (millirem per year)	10[b]	***8.1×10^{-11}***	***6.7×10^{-11}***	1.2×10^{-10}	2.4×10^{-10}	8.1×10^{-11}	4.5×10^{-11}	4.1×10^{-11}
Estimated annual increase in probability of LCF to the maximally exposed offsite individual	NA[c]	***4.1×10^{-17}***	***3.4×10^{-17}***	6.0×10^{-17}	1.2×10^{-16}	4.1×10^{-17}	2.3×10^{-17}	2.1×10^{-17}
Dose to noninvolved worker (millirem per year)[d]	5.0×10^{3}[e]	***8.1×10^{-11}***	***1.6×10^{-11}***	1.2×10^{-10}	2.4×10^{-10}	8.1×10^{-11}	1.0×10^{-11}	4.1×10^{-11}
Estimated annual increase in probability of LCF to the noninvolved worker	NA	***3.2×10^{-17}***	***6.4×10^{-18}***	4.8×10^{-17}	9.6×10^{-17}	3.2×10^{-17}	4.0×10^{-18}	1.6×10^{-17}
Collective dose to population within 50 miles of INTEC (person-rem per year)[f]	NA[f]	***2.5×10^{-9}***	***4.4×10^{-9}***	***3.7×10^{-9}***	***7.4×10^{-9}***	***2.5×10^{-9}***	***3.0×10^{-9}***	***1.2×10^{-9}***
Estimated annual increase in number of LCFs to population	NA	***1.3×10^{-12}***	***2.2×10^{-12}***	***1.9×10^{-12}***	***3.7×10^{-12}***	***1.3×10^{-12}***	***1.5×10^{-12}***	***6.0×10^{-13}***

a. Doses are maximum values over any single year during which decontamination and decommissioning occurs.

b. EPA dose limit specified in 40 CFR 61.92; applies to effective dose equivalent from air releases only.

c. NA = not applicable.

d. Location of highest onsite dose is Central Facilities Area.

e. Occupational dose limit per 10 CFR 835.202; applies to sum of doses from all exposure pathways.

f. Applies to future projected population of about ***242,000*** people.

FAST = Fluorinel and Storage Facility.

Source: Data from Project Data Sheets in Appendix C.6.

Table 5.3-1***5*** provides estimates of occupational safety impacts for workers involved with dispositioning activities. DOE estimated the lost workdays and total recordable cases for each option based on the projected number of workers and the 5-year average lost workdays and total recordable cases rates from INEEL construction ***and operations*** data from ***1996*** to ***2000*** (***DOE 2001***).

As shown in Table 5.3-1***5***, DOE expects the highest number of lost workdays and total recordable cases to occur for the Tank Farm Clean Closure Alternative due to the larger number of workers and duration of disposition activities associated with that option. DOE ***estimated*** the annual and total lost workdays to be ***80*** days and ***2,100*** days, respectively. The annual and total recordable cases are ***estimated*** to be ***10*** cases and ***280*** cases, respectively. As shown in Table 5.3-1***5***, worker occupational health and safety impacts for all other alternatives would be much lower.

Table 5.3-*15*. Estimated worker injury impacts from disposition activities for existing facilities.

Facility description	Annual average number of workers	Annual lost workdays[a]	Annual total recordable cases[b]	Total lost workdays	Total recordable cases
Tank Farm					
Clean Closure	280	***80***	***10***	***2.1×10^3***	***280***
Performance-Based Closure	***20***	***5.7***	***0.74***	***120***	***16***
Closure to Landfill Standards	***12***	***3.4***	***0.44***	***58***	***7.5***
Performance-Based Closure with Class A Grout Disposal	***11***	***3.1***	***0.41***	***75***	***9.8***
Performance-Based Closure with Class C Grout Disposal	***11***	***3.1***	***0.41***	***75***	***9.8***
Tank Farm related facilities	***1***	***0.28***	***0.037***	***1.7***	***0.22***
Bin Sets					
Clean Closure	58	***16***	***2.1***	***430***	***56***
Performance-Based Closure	55	***16***	2.0	***330***	***43***
Closure to Landfill Standards	27	***7.7***	1.0	***160***	***21***
Performance-Based Closure with Class A Grout Disposal	***47***	***13***	***1.7***	***230***	***30***
Performance-Based Closure with Class C Grout Disposal	***47***	***13***	***1.7***	***230***	***30***
Bin Sets related Facilities	***<1***	***<0. 28***	***<0.037***	***<1.7***	***<0.22***
PEWE and related facilities	***51***	***14***	***1.9***	***87***	***11***
Fuel Processing Building and related Facilities					
Performance-Based Closure	40	***11***	***1.5***	***110***	15
Closure to Landfill Standards	32	***9.1***	***1.2***	***91***	12
FAST/FAST Stack	54	***15***	2.0	***92***	12
Transport Lines Group	***3***	***0.85***	***0.11***	***0.85***	***0.11***
New Waste Calcining Facility					
Performance-Based Closure	47	***13***	***1.7***	***40***	***5.2***
Closure to Landfill Standards	44	***12***	***1.6***	***37***	***4.9***
Remote Analytical Laboratory	7	2.0	***0.26***	***6.0***	***0.78***

a. Lost workdays - the number of workdays beyond the onset of injury or illness.

b. Total recordable case - a recordable case includes work-related death, illness, or injury which resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical attention beyond first aid.

FAST = Fluorinel and Storage Facility; LCF = latent cancer fatalities; PEWE = Process Equipment Waste Evaporator.

Source: Data from Project Data Sheets in Appendix C.6.

5.3.8.2 Long-Term Impacts

In addition to the short term impacts evaluated in Section 5.3.8.1, DOE has also estimated the potential long-term impacts that may occur as a result of facility disposition activities. Because the residual contamination that could be released to the environment is underground, the primary means by which contamination could reach receptors is through leaching into the soil surrounding the facilities and eventually into ***the*** aquifer near the facilities.

DOE evaluated the potential for other ***dispersion mechanisms*** but has concluded that they are not likely except for the bin sets under the No Action Alternative, for which DOE has postulated a potential air release as discussed in Appendix C.9. For the No Action Alternative for other facilities, the residual contamination would be sufficiently far underground and enclosed within the facilities to preclude access by burrowing animals or weathering. The Performance-Based Closure, Closure to Landfill Standards, and variations of those alternatives involve placement of a cementitous grout material in the facilities, which would further preclude ***weathering or*** access by burrowing animals.

DOE evaluated the potential impacts over the 10,000-year period following facility disposition. This timeframe is consistent with the period of analysis for long-term impacts in other DOE EISs. It also represents the longest time period for the performance standards in applicable regulations and DOE Orders governing facility disposition activities. This analysis involved calculating the peak concentration of contaminants in the aquifer and then estimating the impact to an individual who drills a well into the contaminated material ***as well as calculating radiation dose to individuals who could be in proximity to radioactivity in closed HLW management facilities.***

For radiological constituents, DOE calculated the radiation dose and estimated the corresponding number of latent cancer fatalities that could result from the radiation exposure. For nonradiological constituents, the cancer risk (for carcinogens) or the hazard quotient (for noncarcinogens) was calculated. A summary of radiation dose is presented for each receptor and facility disposition scenario in Table 5.3-1***6. The results represent doses over the entire period of exposure for each receptor that would occur during peak years of exposure (peak groundwater concentration or highest external dose rates, depending on receptor).***

Doses to the maximally exposed resident are highest under the bin set - No Action scenario. For this receptor, doses from the groundwater pathway are primarily due to iodine-129 and technetium-99 intake via groundwater and food product ingestion. Intruder and ***future industrial*** worker doses result mainly from external exposure to radionuclides in closed facilities. For intruders, the dose would be highest under the alternative involving disposal of Class C-type grout in the Tank Farm, while for ***the future industrial*** worker it would be very low in all cases but highest under the ***bin set -*** No Action scenario. The magnitude of these external dose estimates is highly influenced by the proximity to the Tank Farm. Under the conditions assumed here, the maximum intruder dose is estimated at about ***2.5×10^5*** millirem ***under the Tank Farm - Performance-based Closure with Class C Grout Disposal scenario.***

Nonradiological risks are reported both for cancer and noncancer health effects. Cancer risk is reported in terms of probability of individual excess cancer resulting from lifetime exposure. In the cases assessed here, cancer risk results only from inhalation of cadmium entrained in fugitive dust. For all receptors and scenarios, cancer risk from cadmium exposure is very low (less than one in a trillion).

Noncancer effects are reported in terms of a health hazard quotient, which is the ratio of the contaminants of potential concern intake to the applicable inhalation or oral reference dose. A hazard quotient of greater than one indicates that the intake is higher than the reference value. Noncancer risk is incurred from intake of cadmium via ingestion, inhalation and dermal absorption, and fluorides and nitrates via ingestion and dermal absorption. Noncancer risk would be higher for some receptors and scenarios. ***The highest values result from cadmium intake by the maximally exposed resident under the bin sets - No Action scenario and the scenarios involving disposal of Class A or C-type***

Table 5.3-16. Lifetime radiation dose (millirem) 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.

grout in a Low-Activity Waste Disposal Facility. The health hazard quotient is slightly below one for the bin sets - No Action and Class A Grout Disposal in a new Low-Activity Waste Disposal Facility scenarios (0.81 and 0.96, respectively), and slightly above one (1.1) for the Class C Grout Disposal in a new Low-Activity Waste Disposal Facility scenario. The effect of concern for fluoride intake is objectionable dental fluorosis, which is considered more of a cosmetic effect than an adverse health effect (EPA 1998). Table 5.3-17 presents a summary of noncancer hazard quotients for intakes of fluoride, nitrate, and cadmium.

Additional details on the modeling methodology used by DOE is included in Appendix C.9 of this EIS.

5.3.9 ENVIRONMENTAL JUSTICE

As discussed in Section 5.2.11, Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs each Federal agency to "make…achieving environmental justice part of its mission" and to identify and address "…disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." The Council on Environmental Quality, which oversees the Federal government's compliance with Executive Order 12898 and the National Environmental Policy Act, subsequently developed guidelines to assist Federal agencies in incorporating the goals of Executive Order

Table 5.3-17. 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.

12898 in the NEPA process. This guidance, published in 1997, was intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed."

5.3.9.1 Methodology

The methods used to assess potential environmental justice impacts in Section 5.2.11 (Waste Processing) were also used to assess potential environmental justice impacts during facility disposition. The approach was based primarily on Council on Environmental Quality guidance (CEQ 1997).

Although no high and adverse impacts were predicted for the activities analyzed in this EIS, DOE nevertheless considered whether there were any means for minority or low-income populations to be disproportionately affected. The basis for making this determination would be a comparison of areas predicted to experience human health or environmental impacts with areas in the region of influence known to contain high percentages of minority or low-income populations as reported by the U.S. Bureau of the Census.

5.3.9.2 Facility Disposition Impacts

Relatively small numbers of workers would be required for facility disposition activities. DOE intends to retrain and reassign workers to conduct dispositioning activities to the extent practicable. Any socioeconomic impacts would be positive.

None of the facility disposition alternatives is expected to significantly affect land use, cultural resources, or ecological resources because no previously-undisturbed onsite land would be required and no offsite lands are affected.

DOE estimated emissions of radiological and nonradiological pollutants from dispositioning new and existing facilities required to support the various waste processing alternatives. These emissions would be temporary, lasting for a few (1 to 4) years following the shutdown of a facility. In general, radionuclide emission levels from dispositioning facilities would be lower than those resulting from operating the same facilities. In all cases, doses from dispositioning new facilities would be exceedingly low and a very small fraction of natural background levels and applicable standards. Criteria pollutant levels would remain well below applicable standards for all facility disposition alternatives. Toxic air pollutants would also be well below reference levels for all alternatives.

DOE also assessed the emissions from disposition of existing facilities including the Tank Farm and bin sets. In all cases, radiological doses from emissions would be low and nonradiological air impacts would be well below applicable standards.

DOE assessed short- and long-term impacts to groundwater that may occur as a result of facility disposition (closure) activities. Depending on the facility disposition alternative selected, small amounts of residual waste could reach into groundwater beneath INTEC. Based on computer modeling results, there are no instances where the peak groundwater concentration of a radiological or nonradiological contaminant would exceed its EPA drinking water standard.

The annual radiation doses to the maximally exposed onsite and offsite individuals and the offsite public (population within 50 miles of INTEC) from disposition of new facilities would be insignificant. The highest collective dose to the population within 50 miles of INTEC (***1.6×10^{-8}*** person-rem per year) would be associated with disposition of new facilities under the Minimum INEEL Processing Alternative. This collective dose would be associated with a very small increase (***1.8×10^{-11}***) in latent cancer fatalities in the population.

The annual radiation doses to the maximally exposed onsite and offsite individuals and the offsite public (population within 50 miles of INTEC) from disposition of existing waste management facilities would also be very small. The highest collective dose to the population with 50 miles of INTEC (***6.1×10^{-8}*** person-rem per year) would result from Closure to Landfill Standards of the bin sets. This collective dose would be associated with a very small increase (***3.1×10^{-11}***) in latent cancer fatalities in the population.

Impacts from other existing facility disposition alternatives would be lower.

Because facility disposition impacts would be small in all cases, and there is no means for minority or low-income populations to be diproportionately affected, no disproportionately high and adverse impacts would be expected for minority or low-income populations.

As noted in Section 5.3.8, public health impacts from facility disposition activities are based on projected airborne releases of radioactive and nonradioactive contaminants. Because prevailing winds are out of the southwest and northeast (see Section 4.7.1), contaminants released to the atmosphere from INTEC tend to be carried to the northeast (into the interior of the INEEL) or southwest (into the sparsely-populated area south and west of the INEEL). Minority populations tend to be concentrated south and east of INTEC, in urban areas like Pocatello and Idaho Falls and along the Interstate 15 corridor (see Figure 4-2***0***). The Fort Hall Indian Reservation is also some 40 miles southeast of INTEC (see Figure 4-2***1***). This suggests that minority and low-income populations would not experience higher exposure rates than the general population and that disproportionately high and adverse human health effects for minority or low-income populations would not occur as a result of facility disposition activities at INTEC.

5.3.10 UTILITIES AND ENERGY

Upon completion of waste processing operations, DOE would disposition surplus facilities. Disposition activities would result in the consumption of electricity, water, and fossil fuels, and the generation of wastewater.

Table 5.3-1***8*** presents the utility and energy requirements for disposition of new facilities that would be built to support the waste processing alternatives. These facilities would be clean-closed in accordance with applicable permits or regulations.

Table 5.3-1***9*** presents impacts for disposition of the Tank Farm and bin sets by closure alternative. Disposition of the Tank Farm and bin sets would be a long-term activity because facility closure and operation as a disposal facility could last 20 to 35 years depending on the facility, closure method, and low-level waste fraction disposal option chosen. Closure of the remaining existing HLW generation, treatment, and storage facilities ***would*** not ***be*** long-term compared to the Tank Farm and bin sets.

Table 5.3-***20*** presents impacts for disposition of other existing facilities associated with HLW management.

5.3.11 WASTE AND MATERIALS

Waste would be produced as a result of disposition of new waste processing facilities. Table 5.3-2***1*** summarizes total volumes of industrial, low-level, mixed low-level, and hazardous waste that would be generated from disposition of new facilities under each of the waste processing alternatives. As noted in Section 5.2.13, waste volumes have been conservatively estimated. Future regulatory changes could affect predicted waste volumes and, in the worst case, some reanalysis could be required to show that predicted impacts are bounding.

Generation of transuranic waste is not expected under disposition of any of these facilities. These facilities would be closed in accordance with the applicable permits or regulations, and closure activities would be typically between 1 to 5 years in duration. Although the No Action Alternative includes some minor construction actions, the evaluation of impacts presented here assumes it would involve no facility disposition activities.

Table 5.3-2***2*** shows volumes of industrial, low-level, mixed low-level, and hazardous waste that would be generated by disposition of existing HLW management facilities. As with disposition of new facilities, generation of transuranic waste is not anticipated for any of the facilities. Waste generation estimates are presented by facility (or facility grouping) and disposition alternative. Disposition of the Tank Farm and bin sets represents the more complex activities and would be long-term actions, lasting upwards of 30 years, depending on the alternative. Because of these complexities, the Tank Farm and bin sets are being evaluated under each of

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities.[a,b]

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Continued Current Operations Alternative				
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.14	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
Total			490	0.21	1.2	0.80	1.2
			Full Separations Option				
P9A	Full Separations	3	160	0.23	1.3	0.60	1.3
P9B	Vitrification Plant	3	160	0.12	0.41	0.20	0.41
P9C	Class A Grout Plant	2.5	160	0.12	0.67	0.60	0.67
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	***2.8***	160	***0.032***	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW at INTEC for Shipment to NGR	***0.25***	39	0	3.0×10^{-3}	0	3.0×10^{-3}
P27	Class A Grout Disposal in New INEEL Disposal Facility	2	1	0.06	0.76	0	0.76
P35D or P35E	Class A Grout Packaging & Shipping to INEEL Disposal Facility or to Offsite Disposal	2	160	0.02	0.17	0.05	0.17
P59A	Calcine Retrieval and Transport	***1***	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.01
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.3×10^{3}	0.84	5.2	1.8	5.2

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities [a,b] (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Planning Basis Option				
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P23A	Full Separations	***3***	160	0.23	1.3	0.60	1.3
P23B	Vitrification Plant	***2.8***	160	0.12	***0.43***	0.60	0.44
P23C	Class A Grout Plant	***2.8***	160	0.12	0.60	0.60	0.60
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	***2.8***	160	***0.032***	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW at INTEC for Shipment to NGR	***0.25***	***39***	0	3.0×10^{-3}	0	3.0×10^{-3}
P35E	Class A Grout Packaging & Shipping for Offsite Disposal	2	160	0.02	0.17	0.05	0.17
P59A	Calcine Retrieval and Transport	***1***	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.10
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.8×10^{3}	1.0	5.6	3.1	5.6

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities [a,b] (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Transuranic Separations Option				
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P27	Class A Grout Disposal in New INEEL Disposal Facility	2	1	0.060	0.76	0	0.76
P39A	Packaging and Loading TRU at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	140	0.05	0.04	0.04	0.04
P49A	TRU-C Separations	3	160	0.18	0.83	0.60	0.83
P49C	Class C Grout Plant	2	160	0.12	0.52	0.60	0.52
P49D	Class C Grout Packaging & Shipping to INEEL Disposal Facility	2	160	0.02	0.32	0.06	0.32
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P118	Separations Organic Incinerator	2	8	0.01	0.10	0.03	0.10
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^3	0.69	4.2	1.7	4.2
			Hot Isostatic Pressed Waste Option				
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P71	Mixing and HIPing	5	160	0.15	1.1	1.0	1.1
P72	HIP HLW Interim Storage	***3***	160	***0.071***	0.86	0	0.86
P73A	Packaging and Loading HIP Waste at INTEC for Shipment to NGR	***2.5***	140	***0.054***	***0.039***	0.080	***0.039***
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.4×10^3	0.79	4.9	2.6	4.9

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities [a,b] (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Direct Cement Waste Option				
P1A	Calcine SBW including NWCF Upgrades (MACT)	3	310	0.19	0.65	0.60	0.65
P1B	NGLW and Tank Farm Heel Waste	1	180	0.07	0.59	0.20	0.59
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P80	Direct Cement Process	3	160	0.14	0.92	0.60	0.92
P81	Unseparated Cementitious HLW Interim Storage	***3***	160	0.12	1.6	0	1.6
P83A	Packaging & Loading Cementitious Waste at INTEC for Ship. to NGR	***3.5***	140	***0.054***	***0.039***	0.080	0.04
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.4×10^3	0.82	5.5	1.8	5.5
			Early Vitrification Option				
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P61	Unseparated Vitrified HLW Interim Storage	***3***	160	0.10	1.4	0	1.4
P62A	Packaging/Loading Vitrified HLW at INTEC for Shipment to NGR	***3***	140	0.05	0.05	0.08	0.05
P88	Early Vitrification with MACT Upgrades	5	180	0.20	0.66	0.70	0.66
P90A	Packaging & Loading Vitrified SBW at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	140	0.05	0.04	0.04	0.04
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^3	0.65	3.8	1.2	3.8

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities [a,b] (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Steam Reforming Option				
P13	***New Storage Tanks***	***2***	***140***	***7.6×10^{-3}***	***0.11***	***0.11***	***0.11***
P35E	***Grout Packaging and Loading for Offsite Disposal***	***2***	***160***	***0.021***	***0.17***	***0.050***	***0.17***
P59A	***Calcine Retrieval and Transport***	***1***	***160***	***0.11***	***0.90***	***0.20***	***0.90***
P117A	***Calcine Packaging and Loading to Hanford***	***3***	***160***	***9.3×10^{-3}***	***0.29***	***0.80***	***0.29***
P2001	***NGLW Grout Facility***	***1***	***180***	***0.036***	***0.090***	***0.23***	***0.090***
P2002A	***Steam Reforming***	***1***	***96***	***0.12***	***0.41***	***0.18***	***0.41***
Total			***890***	***0.30***	***2.0***	***1.6***	***2.0***
			Minimum INEEL Processing Alternative				
P18	New Analytical Lab	2	160	0.08	0.49	0.11	0.49
P24	Vitrified Product Interim Storage at INEEL	***2.8***	160	***0.032***	0.17	0	0.17
P25A	Packaging & Loading Vitrified HLW and INTEC for Shipment to NGR	***0.25***	39	0	3.0×10^{-3}	0	3.0×10^{-3}
P27	Class A Grout Disposal in New INEEL Disposal Facility	***2***	1	0.060	0.76	0	0.76
P59A	Calcine Retrieval and Transport	1	160	0.11	0.90	0.20	0.90
P111	SBW & NGLW Treatment with CsIX to CH TRU Grout and LLW Grout	1	180	0.07	0.59	0.20	0.59
P112A	Packaging and Loading CH TRU for Shipment to the Waste Isolation Pilot Plant	4.5	140	0.05	0.04	0.04	0.04
P117A	Packaging and Loading Calcine for Transport to Hanford Site	3	160	***9.3×10^{-3}***	0.29	0.80	0.29
P133	Waste Treatment Pilot Plant	2	160	0.06	0.26	0.05	0.26
Total			1.1×10^{3}	0.47	3.5	1.4	3.5

Table 5.3-*18*. Utility and energy requirements for disposition of new facilities [a,b] (continued).

Project number	Description	Project duration (years)	Annual electricity use (megawatt-hours per year)	Annual fossil fuel use (million gallons per year)	Annual potable water use (million gallons per year)	Annual non-potable water use (million gallons per year)	Annual sanitary wastewater discharges (million gallons per year)
			Vitrification without Calcine Separations Option				
P13	***New Storage Tanks***	***2***	***140***	***7.6×10^{-3}***	***0.11***	***0.11***	***0.11***
P18	***New Analytical Lab***	***2***	***160***	***0.16***	***0.99***	***0.23***	***0.99***
P59A	***Calcine Retrieval and Transport***	***1***	***160***	***0.11***	***0.90***	***0.20***	***0.90***
P61	***Vitrified HLW Interim Storage***	***3***	***160***	***0.10***	***1.4***	***0***	***1.4***
P62A	***Packaging/Loading Vitrified HLW at INTEC for Shipment to NGR***	***3***	***140***	***0.054***	***0.052***	***0.080***	***0.052***
P88	***Vitrification with MACT Upgrades***	***5***	***180***	***0.20***	***0.66***	***0.70***	***0.66***
P133	***Waste Treatment Pilot Plant***	***2***	***160***	***0.059***	***0.26***	***0.045***	***0.26***
Total			***1.1×10^{3}***	***0.69***	***4.4***	***1.4***	***4.4***
			Vitrification with Calcine Separations Option				
P9A	***Full Separations***	***3***	***160***	***0.23***	***1.3***	***0.60***	***1.3***
P9C	***Grout Plant***	***2.5***	***160***	***0.12***	***0.67***	***0.60***	***0.67***
P13	***New Storage Tanks***	***2***	***140***	***7.6×10^{-3}***	***0.11***	***0.11***	***0.11***
P18	***New Analytical Lab***	***2***	***160***	***0.16***	***0.99***	***0.23***	***0.99***
P24	***Vitrified Product Interim Storage***	***2.8***	***160***	***0.032***	***0.17***	***0***	***0.17***
P25A	***Packaging & Loading Vitrified HLW at INTEC for Shipment to NGR***	***0.25***	***39***	***0***	***3.0×10^{-3}***	***0***	***3.0×10^{-3}***
P35E	***Grout Packaging and Loading for Offsite Disposal***	***2***	***160***	***0.021***	***0.17***	***0.050***	***0.17***
P59A	***Calcine Retrieval and Transport***	***1***	***160***	***0.11***	***0.90***	***0.20***	***0.90***
P88	***Vitrification with MACT Upgrades***	***5***	***180***	***0.20***	***0.66***	***0.70***	***0.66***
P133	***Waste Treatment Pilot Plant***	***2***	***160***	***0.059***	***0.26***	***0.045***	***0.26***
Total			***1.5×10^{3}***	***0.93***	***5.2***	***2.5***	***5.2***

a. Source: Data from Project Data Sheets in Appendix C.6.

b. The EIS analyzes treatment of post-2005 newly generated liquid waste as mixed transuranic waste/SBW for comparability of impacts between alternatives. The newly generated liquid waste could be treated in the same facility as the mixed transuranic waste/SBW or DOE could construct a separate facility to grout the newly generated liquid waste.

CH TRU = contact-handled transuranic waste; CsIX = cesium ion exchange; HIP = hot isostatic press; MACT = maximum achievable control technology; NGLW = newly generated liquid waste; NGR = national geologic repository; NWCF = New Waste Calcining Facility; SBW = sodium-bearing waste; TRU = transuranic waste; TRU-C = transuranic/Class C.

Table 5.3-19. Summary of annual resource impacts from disposition of existing facilities with multiple disposition alternatives.

Facility	Units	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
Tank Farm	Years (duration)	26	17	17	22	22
Wastewater discharges	Million gallons per year	2.0	0.13	0.10	0.14	0.15
Annual potable water use	Million gallons per year	2.0	0.11	0.06	0.13	0.14
Annual process water use	Million gallons per year	0.05	0.06	0.09	0.05	0.05
Annual fossil fuel use	Million gallons per year	0.08	0.02	0.011	0.010	0.010
Annual electricity use	Megawatt-hours per year	7.3×10^{3}	4.4×10^{3}	1.2×10^{3}	4.6×10^{3}	4.6×10^{3}
Bin sets	Years (duration)	27	21	21	22	22
Wastewater discharges	Million gallons per year	0.32	0.32	0.16	0.52	0.56
Annual potable water use	Million gallons per year	0.32	0.31	0.15	0.52	0.55
Annual process water use	Million gallons per year	3.9×10^{-3}	0.01	0.011	0.03	0.03
Annual fossil fuel use	Million gallons per year	3.9×10^{-3}	6.6×10^{-3}	5.2×10^{-3}	5.2×10^{-3}	5.0×10^{-3}
Annual electricity use	Megawatt-hours per year	3.2×10^{3}	6.0×10^{3}	990	1.5×10^{3}	1.5×10^{3}
Fuel Processing Building and Related Facilities	Years (duration)	NA[a]	10	10	NA	NA
Wastewater discharges	Million gallons per year	NA	6.0×10^{-3}	4.8×10^{-3}	NA	NA
Annual potable water use	Million gallons per year	NA	6.0×10^{-3}	4.8×10^{-3}	NA	NA
Annual process water use	Million gallons per year	NA	0	0	NA	NA
Annual fossil fuel use	Million gallons per year	NA	0.26	0.26	NA	NA
Annual electricity use	Megawatt-hours per year	NA	0	0	NA	NA
New Waste Calcining Facility	Years (duration)	NA	5	5	NA	NA
Wastewater discharges	Million gallons per year	NA	0.01	0.01	NA	NA
Annual potable water use	Million gallons per year	NA	0.01	0.01	NA	NA
Annual process water use	Million gallons per year	NA	0	0	NA	NA
Annual fossil fuel use	Million gallons per year	NA	0.09	0.09	NA	NA
Annual electricity use	Megawatt-hours per year	NA	300	300	NA	NA

a. NA = not applicable.

Table 5.3-20. Summary of resource impacts from disposition of other existing facilities associated with HLW management.

Facility Group	Duration of dispositioning activity[a] (years)	Annual wastewater discharges (million gallons per year)	Annual potable water use (million gallons per year)	Annual process water use (million gallons per year)	Annual fossil fuel use (million gallons per year)	Annual electricity use (megawatt-hours per year)
Tank Farm-Related Facilities	6	7.4×10^{-4}	7.4×10^{-4}	0	0.16	0
Bin Set-Related Facilities	6	5.0×10^{-5}	5.0×10^{-5}	0	0.13	0
Process Equipment Waste Evaporator and Related Facilities	6	0.02	0.02	0	0.17	0
Fluorinel and Storage Facility and Related Facilities	6	0.01	0.01	0	0.09	0
Remote Analytical Laboratory	5	2.1×10^{-3}	2.1×10^{-3}	0	0.06	0
Transport Lines Group	1	3.6×10^{-3}	3.6×10^{-3}	0	0.06	0

a. Duration refers to total number of calendar years during which dispositioning of facilities within the listed groups would occur.

Table 5.3-*21*. Summary of waste generated from the disposition of new waste processing facilities.[a,b]

Project Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters): Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Continued Current Operations Alternative					
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^3	620	0	200
P1B	Newly Generated Liquid Waste Management and Tank Farm Heel Waste	1	3.7×10^3	5.0×10^3	11	60
Total			4.8×10^3	5.6×10^3	11	260
	Full Separations Option					
P9A	Full Separations	3	2.4×10^4	3.1×10^4	350	11
P9B	Vitrification Plant	3	1.4×10^4	1.8×10^4	42	6
P9C	Class A Grout Plant	2.5	6.0×10^3	7.9×10^3	18	3
P118	Separations Organic Incinerator	2	0	0	15	0
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P24	Vitrified Product Interim Storage	***2.8***	9.4×10^3	0	0	2
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	***0.25***	10	0	0	3
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P133	Waste Treatment Pilot Plant	2	5.4×10^3	6.7×10^3	22	3
For onsite facility disposal of grout						
P27	Class A Grout Disposal in a new Low-Activity Waste Disposal Facility	2	130	0	0	0
P35D	Class A Grout Packaging and Shipping to a new Low-Activity Waste Disposal Facility	2	670	0	0	0
For tank farm and bin set disposal of grout						
P26	Class A Grout Disposal in Tank Farm and Bin Sets	4	3.7×10^3	0	350	20
For offsite disposal of grout						
P35E	Class A Grout Packaging and Loading for Offsite Disposal	2	670	0	0	0
Total	Base case – New INEEL disposal of Class A grout					
	Base case – New INEEL disposal of Class A grout		6.7×10^4	6.8×10^4	550	28
	Tank Farm and bin set disposal of Class A grout		7.0×10^4	6.8×10^4	900	48
	Offsite disposal of Class A grout		6.7×10^4	6.8×10^4	550	28

Table 5.3-21. Summary of waste generated from the disposition of new waste processing facilities [a,b] (continued).

Project Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters)			
			Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Planning Basis Option					
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^{3}	630	0	200
P1B	Treatment of Newly Generated Liquid Waste and Tank Farm Waste Heel Waste	1	3.7×10^{3}	5.0×10^{3}	11	60
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P23A	Full Separations	***3***	2.3×10^{4}	3.1×10^{4}	320	15
P23B	Vitrification Plant	***2.8***	1.4×10^{4}	1.8×10^{4}	8	6
P23C	Class A Grout Plant	***2.8***	6.0×10^{3}	7.9×10^{3}	12	3
P24	Vitrified Product Interim Storage	***2.8***	9.4×10^{3}	0	0	2
P25A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	***0.25***	12	0	0	3
P59A	Calcine Retrieval and Transport	*1*	3.6×10^{3}	0	0	0
P118	Separations Organic Incinerator	2	0	1	15	0
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
P35E	Class A Grout Packaging and Loading for Offsite Disposal	2	670	0	0	0
Total			7.2×10^{4}	7.3×10^{4}	480	290
	Transuranic Separations Option					
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P49A	Transuranic/Class C Separations	3	2.0×10^{4}	2.7×10^{4}	200	9
P49C	Class C Grout Plant	2	6.0×10^{3}	7.9×10^{3}	18	3
P118	Separations Organic Incinerator	2	0	0	15	0
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
P39A	Packaging and Loading Transuranic Waste at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	170	0	0	15
P59A	Calcine Retrieval and Transport	1	3.6×10^{3}	0	0	0
	For onsite facility disposal of grout					
P27	Class A Grout Disposal in a new Low-Activity Waste Disposal Facility	2	130	0	0	0
P49D	Class C Grout Packaging and Shipping to a new Low-Activity Waste Disposal Facility	2	700	0	0	0
	For tank farm and bin set disposal of grout					
P51	Class C Grout Placement in Tank Farm and Bin Sets	4	3.7×10^{3}	0	350	20
For offsite disposal of grout						
P49E	Class C Grout Packaging and Loading for Offsite Disposal	2	1.1×10^{3}	0	0	0
Total	Base case – New INEEL disposal of Class C grout		4.1×10^{4}	4.4×10^{4}	350	30
	Tank Farm and bin set disposal of Class C grout		4.4×10^{4}	4.4×10^{4}	710	50
	Offsite disposal of Class C grout		4.1×10^{4}	4.4×10^{4}	350	30

Table 5.3-*21*. Summary of waste generated from the disposition of new waste processing facilities [a,b] (continued).

Project Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters)			
			Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Hot Isostatic Pressed Waste Option					
P1A	Calcine SBW including New Waste Calcining Facility Maximum Achievable Control Technologies Upgrades	3	1.1×10^{3}	630	0	200
P1B	Newly Generated Liquid Waste Management (low-level waste grout) and Tank Farm Heel Waste	1	3.7×10^{3}	5.0×10^{3}	11	60
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^{3}	0	0	0
P71	Mixing and Hot Isostatic Pressing	5	2.6×10^{4}	3.5×10^{4}	210	12
P72	Interim Storage of Hot Isostatic Pressed Waste	3	2.3×10^{4}	0	0	4
P73A	Packaging and Loading of Hot Isostatic Pressed Waste at INTEC for Shipment to a Geologic Repository	*1*	580	0	0	68
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
Total			6.8×10^{4}	5.0×10^{4}	340	340
	Direct Cement Waste Option					
P1A	Calcine SBW including New Waste Calcining Facility Upgrades	3	1.1×10^{3}	620	0	200
P1B	Newly Generated Liquid Waste Management and Tank Farm Heel Waste	1	3.7×10^{3}	5.0×10^{3}	11	60
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^{3}	0	0	0
P80	Direct Cement Process	3	2.5×10^{4}	3.4×10^{4}	220	11
P81	Unseparated Cementious HLW Interim Storage	*1*	5.1×10^{4}	0	0	24
P83	Packaging and Loading of Cementitious Waste at INTEC for Shipment to a Geologic Repository	*1*	860	0	0	110
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
Total			9.5×10^{4}	4.9×10^{4}	350	410
	Early Vitrification Option					
P18	New Analytical Laboratory	2	4.6×10^{3}	3.1×10^{3}	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^{3}	0	0	0
P88	Early Vitrification with Maximum Achievable Control Technology	5	2.3×10^{4}	3.0×10^{4}	360	11
P61	Vitrified HLW Interim Storage	3	4.3×10^{4}	0	0	22
P62A	Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository	3	430	0	0	110
P90A	Packaging and Loading SBW at INTEC for Shipment to the Waste Isolation Pilot Plant	1.5	170	0	0	15
P133	Waste Treatment Pilot Plant	2	5.4×10^{3}	6.7×10^{3}	22	3
Total			8.0×10^{4}	4.1×10^{4}	480	160

Table 5.3-21. Summary of waste generated from the disposition of new waste processing facilities [a,b] (continued).

Project Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters): Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Steam Reforming Option					
P13	***New Storage Tanks***	***2***	***450***	***0.2***	***47***	***0***
P35E	***Grout Packaging and Loading for Offsite Disposal***	***2***	***670***	***0***	***0***	***1.3***
P59A	***Calcine Retrieval and Transport***	***1***	***3.6×10^3***	***0***	***0***	***0***
P117A	***Calcine Packaging and Loading***	***3***	***140***	***110***	***8***	***46***
P2001	***NGLW Grout Facility***	***1***	***1.9×10^3***	***0.2***	***14***	***2.5×10^3***
P2002A	***Steam Reforming***	***1***	***$\underline{1.1\times10^4}$***	***$\underline{1.5\times10^4}$***	***$\underline{0}$***	***$\underline{6.0}$***
Total			***1.8×10^4***	***1.5×10^4***	***69***	***2.5×10^3***
	Minimum INEEL Processing Alternative					
P111	SBW and Newly Generated Liquid Waste Treatment with Cesium Ion Exchange to Contact Handled Transuranic Grout and Low-Level Waste Grout	1	3.7×10^3	5.0×10^3	15	2
P18	New Analytical Laboratory	2	4.6×10^3	3.1×10^3	97	0
P59A	Calcine Retrieval and Transport	1	3.6×10^3	0	0	0
P27	Class A Grout Disposal in New INEEL Low-Activity Waste Disposal Facility (for vitrified low-level waste fraction)	2	130	0	0	0
P24	Interim Storage of Vitrified Waste at INEEL	***2.8***	9.4×10^3	0	0	2
P25A	Packaging and Loading of Vitrified HLW at INTEC for Shipment to a Geologic Repository	***0.25***	12	0	0	3
P112A	Packaging and Loading Contact Handled Transuranic Waste for Transport to the Waste Isolation Pilot Plant	4.5	880	0	0	0
P117A	Calcine Packaging and Loading	3	140	110	8	46
P133	Waste Treatment Pilot Plant	2	$\underline{5.4\times10^3}$	$\underline{6.7\times10^3}$	$\underline{22}$	$\underline{3}$
Total			2.8×10^4	1.5×10^4	140	56

Table 5.3-21. Summary of waste generated from the disposition of new waste processing facilities[a,b] (continued).

Project Number	Project description	Duration of activity (years)	Total waste generation per waste type (in cubic meters): Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
	Vitrification without Calcine Separations Option					
P13	*New Storage Tanks*	*2*	*450*	*0.20*	*47*	*0*
P18	*New Analytical Laboratory*	*2*	*4.6×10^3*	*3.1×10^3*	*97*	*4.9*
P59A	*Calcine Retrieval and Transport*	*1*	*3.6×10^3*	*0*	*0*	*0*
P61	*Vitrified HLW Interim Storage*	*3*	*4.3×10^4*	*0*	*0*	*32*
P62A	*Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository*	*3*	*430*	*0*	*0*	*110*
P88	*Vitrification with Maximum Achievable Control Technology*	*5*	*2.3×10^4*	*3.1×10^4*	*360*	*43*
P133	*Waste Treatment Pilot Plant*	*2*	*5.4×10^3*	*6.7×10^3*	*22*	*8.0*
Total			*8.1×10^4*	*4.1×10^4*	*530*	*200*
	Vitrification with Calcine Separations Option					
P9A	*Full Separations*	*3*	*2.4×10^4*	*3.1×10^4*	*350*	*32*
P9C	*Grout Plant*	*2.5*	*6.0×10^3*	*7.9×10^3*	*18*	*13*
P13	*New Storage Tanks*	*2*	*450*	*0.20*	*47*	*0*
P18	*New Analytical Laboratory*	*2*	*4.6×10^3*	*3.1×10^3*	*97*	*4.9*
P24	*Vitrified Product Interim Storage*	*2.8*	*9.4×10^3*	*0*	*0*	*4.9*
P25A	*Packaging and Loading Vitrified HLW at INTEC for Shipment to a Geologic Repository*	*0.25*	*12*	*0*	*0*	*3.4*
P35E	*Grout Packaging and Loading for Offsite Disposal*	*2*	*670*	*0*	*0*	*1.3*
P59A	*Calcine Retrieval and Transport*	*1*	*3.6×10^3*	*0*	*0*	*0*
P88	*Vitrification Facility with Maximum Achievable Control Technology*	*5*	*2.3×10^4*	*3.1×10^4*	*360*	*43*
P133	*Waste Treatment Pilot Plant*	*2*	*5.4×10^3*	*6.7×10^3*	*22*	*8.0*
Total			*7.7×10^4*	*8.0×10^4*	*900*	*110*

a. Source: Project Data Sheets in Appendix C.6.

b. The EIS analyzes treatment of post-2005 newly generated liquid waste as mixed transuranic waste/SBW for comparability of impacts between alternatives. The newly generated liquid waste could be treated in the same facility as the mixed transuranic waste/SBW or DOE could construct a separate facility to grout the newly generated liquid waste.

Table 5.3-*22*. Waste generated for existing HLW *management* facilities by facility and disposition alternative. [a]

	Total waste generation per waste type[b] (in cubic meters)			
	Industrial waste	Low-level waste	Mixed low-level waste	Hazardous waste
Tank Farm				
Clean Closure	1.6×10^5	1.1×10^3	1.1×10^4	0
Performance-Based Closure	1.9×10^3	0	120	79
Closure to Landfill Standards	1.7×10^3	0	480	0
Performance-Based Closure with Class A Grout Disposal	1.5×10^3	0	120	27
Performance-Based Closure with Class C Grout Disposal	1.5×10^3	0	120	27
Tank Farm Related Facilities	56	100	0	1
Bin Sets				
Clean Closure	2.4×10^4	4.6×10^3	180	130
Performance-Based Closure	3.6×10^3	150	85	100
Closure to Landfill Standards	3.6×10^3	150	33	100
Performance-Based Closure with Class A Grout Disposal	1.5×10^4	0	540	28
Performance-Based Closure with Class C Grout Disposal	1.5×10^4	0	540	28
Bin Set Related Facilities	0	10	0	0.2
Process Equipment Waste Evaporator and Related Facilities[c]	870	2.5×10^3	0	13
Fuel Processing Building and Related Facilities	0	920	0	18
FAST and Related Facilities	0	1.5×10^3	0	33
Remote Analytical Laboratory	0	100	0	2
New Waste Calcining Facility	0	2.4×10^3	460	250
Transport Line Group	0	9	43	0

a. Unless otherwise specified, the source of the data presented is the Project Data Sheets in Appendix C.6.

b. As presented here, the quantities of waste generated during dispositioning do not include building debris and other building material buried in place.

c. Source of data for Process Waste Equipment Evaporator, CPP-604, (combined with related facilities here): Haley (1998).

the five disposition alternatives. Other existing waste processing facilities are generally only being considered for a single disposition alternative as shown in Table 3-***3***. The ***exceptions*** to this ***are*** the facility groupings Fuel Processing Building and Related Facilities and the New Waste Calcining Facility. The Fuel Processing Building and Related Facilities were considered under two disposition alternatives: Performance-Based Closure and Closure to Landfill Standards. The group is shown with a single entry in Table 5.3-2*2* because the quantities of waste generated would be identical under either disposition alternative. The New Waste Calcining Facility was also evaluated for the same two disposition alternatives and, again, the quantities of waste generated under either alternative were projected to be the same. Disposition of these other facilities would not be long-term actions compared to the Tank Farm and bin sets.

Disposition of new and existing waste processing facilities would produce large quantities of industrial waste. Depending on the waste processing alternative and the facility disposition alternative considered for the Tank Farm and bin sets, projected volumes of industrial waste could exceed 2.5×10^5 cubic meters. This is greater than the quantities projected for construction and operation of the waste processing alternatives as described in Section 5.2.13. However, much of these materials would be construction debris and, as discussed in Section 5.2.13, should not present a serious problem for disposal within the INEEL.

The highest combined projections of low-level waste generated from facility disposition actions would be about 8.5×10^4 cubic meters. This is a significant volume in comparison to the DOE-wide projection of 1.5 million cubic meters over a 20-year period that was described in Section 5.2.13. However, the 8.5×10^4 cubic meter quantity would be generated over even a longer period of time and, also as discussed in Section 5.2.13, DOE assumes that new facilities would be constructed if additional treatment and disposal capacity is needed.

The projected quantities of mixed low-level waste vary greatly under the various facility disposition alternatives. The largest volume shown for either new or existing facilities is for clean closure of the Tank Farm, which is estimated to produce about 1.1×10^4 cubic meters of mixed low-level waste. As discussed in Section 5.2.13, DOE assumes that new facilities would be constructed if additional mixed low-level waste treatment and disposal capacity is needed. Planning documents for clean closure of the Tank Farm identify almost 134,000 cubic meters of CERCLA waste soil that may be associated with this disposition alternative. This waste, which would likely be contaminated with both hazardous and radiological constituents, is not included in Table 5.3-2***2*** under the assumption that it would be addressed and, as appropriate, remediated under INEEL's CERCLA program.

Quantities of hazardous waste produced under any of the facility disposition alternatives would be relatively small, particularly when spread over the number of years that it would take to implement the actions. The annual volumes would be similar to those discussed in Section 5.2.13 for construction and operation activities. Similarly, it is unlikely these additional wastes would adversely impact the ability of commercial facilities to manage hazardous waste.

5.3.12 FACILITY DISPOSITION ACCIDENTS

5.3.12.1 Introduction

Purpose

The purpose of this section is to analyze alternatives for the disposition of INTEC facilities based on their potential for facility accidents during the disposition process. Each waste processing alternative and facility disposition option requires an analysis of potential facility accidents as one of the environmental impacts, particularly to human health and safety, associated with its implementation. An accident analysis is performed to identify environmental impacts associated with accidents that would not necessarily occur but which are reasonably foreseeable and could result in significant impacts. Since the potential for accidents and their consequences varies among different facility disposition options, facility disposition accidents may provide a key discriminator among the Idaho HLW & FD EIS alternatives. Accidents are defined per the National Environmental Policy Act as undesired events that can occur during or as a result of implementing an alternative and that have the potential to result in human health impacts or indirect environmental impacts.

Potential facility disposition accidents pose ***risk of*** health impacts to several groups of candidate receptors, including workers at nearby INEEL facilities (noninvolved workers) and the offsite public who could be exposed to hazardous materials released during some accident scenarios. Potential facility disposition impacts to human health arise from the presence of radiological, chemical, and industrial (physical) hazards such as trauma, fire, spills, and falls.

Each waste processing alternative affects or includes several major INTEC facilities, such as the New Waste Calcining Facility, Tank Farm, and bin sets. Clean Closure, Performance-Based Closure, and Closure to Landfill Standards are the three major alternatives that are being considered by DOE for ***disposition of*** each HLW ***management*** facility. The facility disposition alternatives are evaluated below in the respective facility accident analyses.

Approach

The approach adopted by DOE is illustrated in Figure 5.3-1***0***. As shown, potential facility disposition impacts for noninvolved workers and members of the offsite public are analyzed differently than for involved workers. Only involved workers are subject to hazards of an industrial nature, such as trauma, fire, spills, and falls. However, all three groups could be exposed to radioactivity and/or hazardous chemicals released by a severe accident. For assessing impacts to noninvolved workers and the offsite public, the maximum plausible accident identified for disposition of each facility is compared to the maximum postulated accident during normal operation of that facility. Data sources include documented safety analyses for HLW processes at INTEC or EIS estimates for bounding facility events that are included in waste processing alternatives. The comparisons

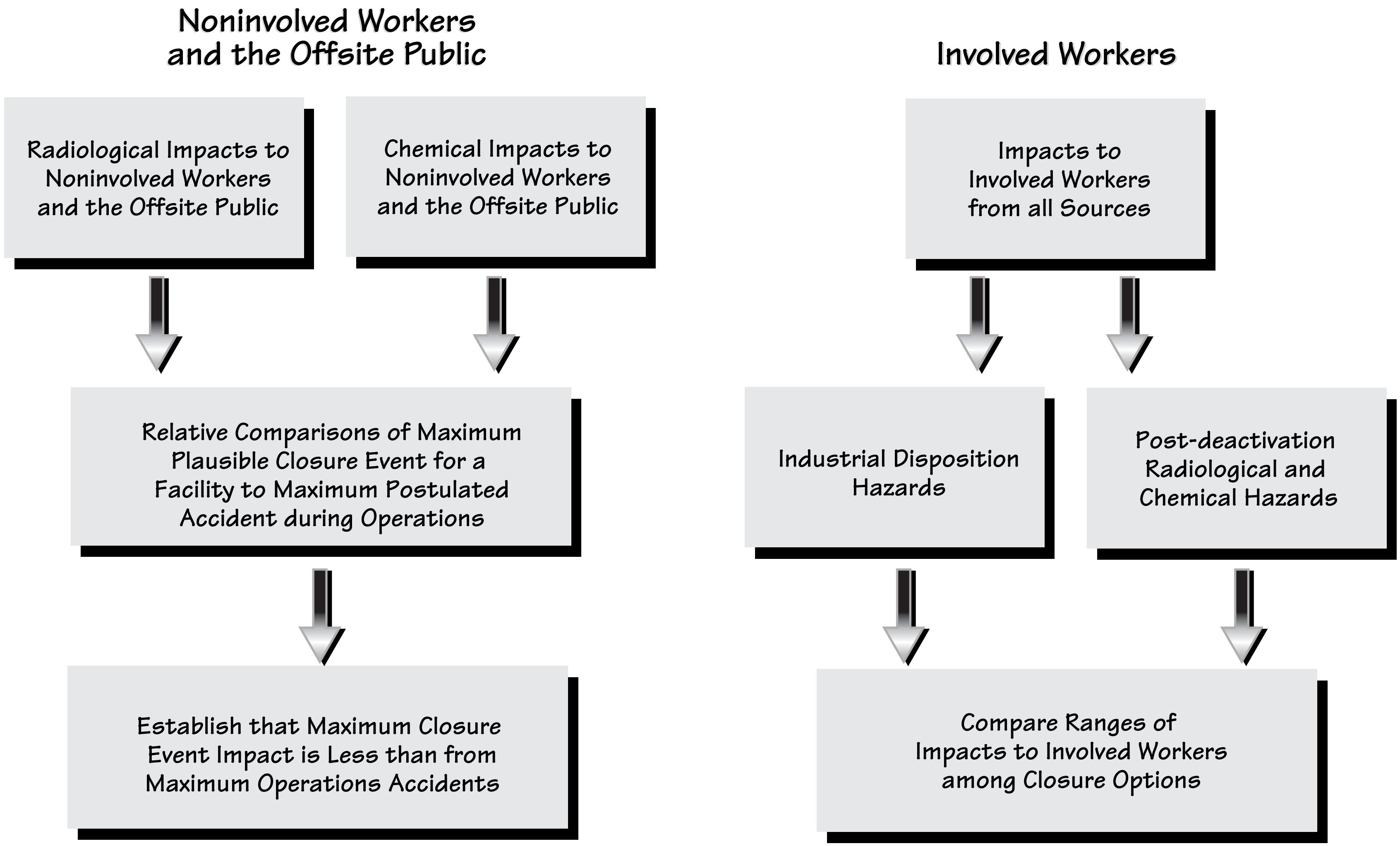


FIGURE 5.3-10.
Impact assessment methodology for hypothetical disposition accidents in INTEC facilities.

between disposition events and corresponding operations accidents use relative changes in inventories of radioactive materials and hazardous chemicals, changes in mobility of these substances, and changes in the energy available for accident initiation and propagation. These changes occur to some extent while a facility undergoes deactivation. As discussed below, the combination of inventory reductions, immobilization of residuals, and removal of energy sources produces potential disposition impacts that are less severe than those posed by acceptable hazards from current operations. This analysis indicates that a maximum plausible disposition event for a given facility has significantly less potential impact than a corresponding operations accident. Thus, an inference can be made that risks at each facility would not be increased by prospective actions taken to implement ***a facility disposition*** alternative.

Involved workers would be exposed to numerous industrial physical hazards during facility disposition activities, in addition to hazards from residual chemicals and radioactive materials following facility deactivation. The industrial hazards to involved workers likely would not diminish when inventories of chemicals and radioactive substances are removed or immobilized. Thus, accidents such as falls from scaffolding are assumed to be independent of the radioactive and chemical inventories, the mobility of these materials, and the energy available to release these inventories. DOE standards (DOE 1998) indicate the likelihood of industrial accidents may increase during facility disposition, relative to facility operations, because more industrial labor is required during active phases of disposition.

There is another reason why occupational impacts to involved facility workers cannot simply be bounded by the maximum postulated accident for operations in the same manner as for potential impacts to noninvolved workers and members of the offsite public. Many facility systems that mitigate consequences of operations accidents to involved workers, such as fire protection systems, may no longer be available during disposition, especially during latter phases such as demolition. It is also possible that involved workers may encounter unforeseen radiological or chemical hazards during disposition without the benefit of adequate protective equipment. For example, process tanks or lines that are declared empty in facility documentation may still contain enough radioactivity to require shielding or remote handling for disassembly.

For these reasons the strategy for involved workers reflected in Figure 5.3-1***0*** is to compare the potential impacts from disposition accidents with respect to the closure options under consideration. This assessment is relatively straightforward for industrial hazards, where potential impacts (injuries/illnesses and fatalities) are assumed proportional to disposition labor hours. As discussed below, a Clean Closure requires more disposition labor than a Performance-Based Closure, which requires more labor than Closure to Landfill Standards. Consequently, Clean Closure poses the largest total risk of industrial accidents to involved workers, while Closure to Landfill Standards poses the least total risk. Similarly, impacts from radiological hazards in terms of total rem exposure are calculated from the estimated duration (hours) of radiation worker labor. Facility-specific hazards from hazardous chemical residues are more difficult to quantify with available information. However, inferences can be drawn by assuming that impacts are related to amounts of disposition labor under hazardous conditions, because Clean Closure requires more disposition activity in close proximity to chemical hazards, followed by Performance-Based Closure and then Closure to Landfill Standards. Thus, potential impacts to involved workers from chemical residues should demonstrate the same trend among facility disposition alternatives as industrial and radiological accidents.

Scope

This analysis presents postulated facility disposition accidents that could occur during facility closure and have the potential to harm workers, the offsite public, and the environment. This analysis of facility disposition accidents was applied only to those existing INTEC facilities that are significant to the treatment, storage, or generation of HLW. New facilities required for the waste processing alternatives are not considered in the analysis because the design of these facilities has not been finalized and the designs would include features to facilitate decontamination and decommissioning (DOE 1989). Thus, new waste processing facilities would have minimal radioactive and hazardous material inventories remaining at the time of disposition and a low potential for significant accidents.

As described in Section 3.2.2 of this EIS, DOE used a systematic process to identify which existing INTEC facilities would be analyzed in detail for this EIS. These facilities selected for detailed analysis are assumed to have material inventories that require careful consideration of potential for accidental release into the environment at closure. The results of the DOE facility selection process are documented in Table 3-***3***. Table 5.3-2***3*** is derived from Table 3-***3*** and forms the basis for the analysis of potential disposition impacts to involved workers in Section 5.3.12.5. This section also is applicable to inter-facility transport lines that are not directly associated with individual INTEC facilities.

Because current facility data on the type and quantities of miscellaneous hazardous materials were not available, no definitive analysis was done with respect to the chemical content and potential impact of incidental, hazardous materials at the facilities. These hazardous materials may include kerosene, gasoline, nitric acid, decontamination fluids, paints, etc. The assumption was made that closure activities would include the disposal and cleanup of these hazardous materials to the maximum extent practicable in accordance with the current decommissioning manuals and regulations.

For occupational impacts to noninvolved workers and the offsite public, which are documented in Section C.4.2 of Appendix C.4 and summarized in Section 5.3.12.4, the facilities addressed were confined to those facilities where potential accidents could rapidly disperse radionuclides and/or hazardous chemicals beyond the immediate working area. Selection guidance was obtained from a prior study, the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL Part A, RI/BRA Report (*Rodriguez et al. 1997), which identified those facilities with airborne release and direct exposure pathways. Facilities that pose short-term radiological and/or chemical hazards to uninvolved workers and the offsite public are presented in Table 5.3-2***3***.

For purposes of this facility disposition accident analysis, HLW ***management*** facilities that have only "groundwater pathways" for hazardous material releases were not assessed for potential impacts to uninvolved workers and the offsite public. Groundwater is not considered a viable short-term pathway ***because*** accident releases to the groundwater pathway are remediable and would not be expected to produce a short-term health impact to the public. Groundwater impacts are presented in Section 5.2.14, Facility Accidents, only when the potential consequence of an accident is so great that the cost of remediation was intractable and had to be assessed. Also, due to limitations on hazardous material inventory, accessibility, and available energy for release, the possibility of such large events can be categorically eliminated or least assumed to be bounded by the facility accidents already considered. Any long-term impacts via groundwater exposure pathways are addressed in Section 5.3.8.

During INTEC-wide operations, the bounding release scenario for hazardous chemicals with the greatest potential consequences to uninvolved workers and the offsite public is a catastrophic failure of a 3,000-gallon ammonia tank. (See accident ***under*** "Accidents with the Potential Release of Toxic Chemicals" in Appendix C.4). As discussed in Section 5.2.14, this scenario results in ammonia releases greater than ERPG-2 concentrations at 3,600 meters. Exposures to airborne concentrations greater than ERPG-2 values for a period greater than 1 hour results in an unacceptable likelihood that a person would experience or develop irreversible or other serious health effects or symptoms that could impact a person's ability to take protective action. This accident scenario also bounds potential chemical releases for the facility disposition analysis cases summarized in Section 5.3.12.4.

Table 5.3-*23*. Existing INTEC facilities with significant risk of accident impacts to noninvolved workers and to the offsite public.[a]

Tank Farm	
CPP-713	Vault containing Tanks VES-WM-187, 188, 189, and 190
CPP-780	Vault containing Tank VES-WM-180
CPP-781	Vault containing Tank VES-WM-181
CPP-782	Vault containing Tank VES-WM-182
CPP-783	Vault containing Tank VES-WM-183
CPP-784	Vault containing Tank VES-WM-184
CPP-785	Vault containing Tank VES-WM-185
CPP-786	Vault containing Tank VES-WM-186
Bin Sets	
CPP-729	Bin set 1
CPP-742	Bin set 2
CPP-746	Bin set 3
CPP-760	Bin set 4
CPP-765	Bin set 5
CPP-791	Bin set 6
CPP-795	Bin set 7
Process Equipment Waste Evaporator and Related Facilities	
CPP-604	Process Equipment Waste Evaporator
CPP-605	Blower Building
CPP-649	Atmospheric Protection Building
CPP-708	Main Exhaust Stack
CPP-756	Prefilter Vault
CPP-1618	Liquid Effluent Treatment and Disposal Facility
Fuel Processing Building and Related Facilities	
CPP-601	Fuel Processing Building
CPP-627	Remote Analytical Facility
CPP-640	Head End Process Plant
Other Facilities	
CPP-659	New Waste Calcining Facility
CPP-666/767	Fluorinel Dissolution Process and Fuel Storage Facility and Stack
CPP-684	Remote Analytical Laboratory

a. Derived from Table 3-*3* and Rodriguez et al. (1997).

5.3.12.2 Facility Disposition Alternatives

The three facility disposition alternatives considered by DOE ***are clean closure, performance-based closure, and closure to landfill standards.***

5.3.12.3 Analysis Methodology for Noninvolved Workers and the Offsite Public

Risks to uninvolved workers and the public from nuclear facility accidents are evaluated as part of an ongoing safety management process during nuclear facility operations. In the DOE safety management process, documents such as safety analysis reports are used to identify risks as well as risk mitigation measures that result in an acceptable level of safety assurance for facility operations. However, facility shutdown, decontamination, and disposition activities could pose additional risks to uninvolved workers and the public that do not exist during facility operations (for example by removing or compromising the integrity of barriers to the release of radioactive materials). The potential for such risks is identified as part of the EIS, and could present a basis for discriminating among facility disposition alternatives. A facility disposition accident analysis was performed to identify the potential for shutdown, decontamination and dispositioning activities to pose risks that are not enveloped by the standard safety assurance process.

The disposition accident analysis team performed a systematic review of available data from applicable INTEC safety analysis reports, safety reviews, HLW ***management*** facility closure studies, and EIS technical data that were generated for Section 5.2.14, Facility Accidents. The maximum plausible accident scenario selected for the HLW ***management*** facilities with airborne release and direct exposure pathways is compared to a bounding accident scenario that was postulated during normal facility operations in safety analysis reports or in Section 5.2.14 of this EIS.

Facility shutdown, decontamination, and disposition activities are not well defined at this time. The methodology used to evaluate facility disposition activities is intended to provide a comparison between bounding accident scenarios that could occur during facility disposition and those that could occur during facility operation. For each facility considered in the facility disposition alternatives, a maximum plausible accident scenario was identified using a systematic qualitative review process and compared with the maximum credible accident identified for facility operations from the safety assurance documents. The specific steps in this systematic evaluation process are described below, while the results of the qualitative accident scenario comparison are give in Table 5.3-2***4***.

Facility Description

The analysis team collected and reviewed facility descriptions that were obtained from current EIS alternative treatment studies, EIS facility closure studies, INTEC reports and studies, LMITCO feasibility studies, and previous DOE HLW studies. The facility description reviews focused on the facility's operational function; primary activities; location at INTEC; structural materials; type of equipment and process lines; shielding provisions; heating, ventilation, and air conditioning systems; material inventories; and other factors pertinent to potential facility disposition accidents. Particular attention was placed on structure design and materials that could impact the safe, efficient, and complete removal of radioactive and hazardous materials.

Facility Disposition Condition

The DOE process identified three types of facility closures appropriate for HLW ***management*** facility disposition: Clean Closure, Performance-Based Closure, and Closure to Landfill Standards. For the INTEC Tank Farm and bin sets, which would contain most of the residual radioactivity, all three facility disposition alternatives are under active consideration and were evaluated accordingly. A single facility disposition alternative was considered for the remaining INTEC facilities, except for the Fuel Processing Complex and the New Waste Calcining Facility where two facility disposition alternatives were evaluated. The material inventories associated with these facilities would be much less than that of the Tank Farm and bin sets. Therefore, the overall residual risk from closure of INTEC HLW ***management*** facilities would not change significantly due to the contribution of a potential accident for these facilities. Also, the type of closure is considered when the analyst is estimating the critical factors bearing on a bounding accident: material at risk, energy, and mobility.

Table 5.3-*24*. Summary of facility disposition accidents potentially impacting noninvolved workers or the offsite public.

Facility number	Facility title	Clean closure	Performance - ***based***	Landfill Stds	Material at risk at closure	Contaminant mobility at closure	Energy for accident at closure	Maximum plausible accident	Bounding operations accident
CPP-713	Vault for Tanks VES-WM-187, 188, 189, and 190	●	●	●	Low levels of radioactive and hazardous material	Low mobility ensured by pipe capping and filling the tanks with LLW Class C type grout or clean fill material	Low energy sources during MTRU waste (SBW) retrieval, removal of combustible materials, and routine decontamination	Rupture or break in the transfer lines during MTRU waste (SBW) retrieval operations	***An external event causing a release of radioactivity***
CPP-780 through CPP-786	Vaults for Tanks VES-WM-180-186	●	●	●	Low levels of radioactive and hazardous material	Low mobility ensured by pipe capping and filling the tanks with LLW Class C type grout or clean fill material	Low energy sources during MTRU waste (SBW) retrieval, removal of combustible materials, and routine decontamination	Rupture or break in the transfer lines during MTRU waste (SBW) retrieval operations	***An external event causing a release of radioactivity***
CPP-729, 742, 746, 760, 765, 791, and 795	Bin sets 1 through 7	●	●	●	Low levels of radioactive and hazardous material	Low mobility ensured by pipe capping and filling the bin sets with LLW Class C type grout or clean fill material	Low energy sources during Calcine Retrieval and Transport Project, removal of combustible materials, and routine decontamination	Rupture or break in the calcine transfer lines during Calcine Retrieval and Transport operations	***An external event causing a release of radioactivity***
CPP-604	Waste Treatment Building			●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Criticality event releasing significant radioactivity to the atmosphere
CPP-605	Blower Building			●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Chemical release due to ammonia gas explosion in the former NO_x Pilot Plant during New Waste Calcining Facility testing

Table 5.3-*24*. Summary of facility disposition accidents potentially impacting noninvolved workers or the offsite public (continued).

Facility number	Facility title	Clean closure	Performance *- based*	Landfill Stds	Material at risk at closure	Contaminant mobility at closure	Energy for accident at closure	Maximum plausible accident	Bounding operations accident
CPP-708	Main Stack			●	Low levels of radioactive and hazardous material	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to gradual disassembly of stack	Accidental drop of stack segment during disassembly	Main stack toppled westward by earthquake, crushing CPP-756 prefilters and CPP-604 off-gas filter
CPP-756 and 649	Prefilter Vault and Atmospheric Protection System Building			●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility ensured by pipe capping and installation of a site protective cover during closure activities	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Fire that begins in prefilters and spreads to all 104 final HEPA filters, releasing radioactivity to the atmosphere
CPP-1618	Liquid Effluent Treatment & Disposal Building	●			Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Explosion in fractionator releasing radioactivity to the atmosphere
CPP-601	Fuel Processing Building		●	●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Criticality event releasing significant radioactivity to the atmosphere
CPP-627	Remote Analytical Facility		●	●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Radionuclide spill in the CPP-627 cave; classified as an abnormal event
CPP-640	Head End Process Plant		●	●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Transfer cask criticality initiated by addition of water

Table 5.3-*24*. Summary of facility disposition accidents potentially impacting noninvolved workers or the offsite public (continued).

Facility number	Facility title	Clean closure	Performance *-based*	Landfill Stds	Material at risk at closure	Contaminant mobility at closure	Energy for accident at closure	Maximum plausible accident	Bounding operations accident
CPP-659	New Waste Calcining Facility		●	●	Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Crane drops or equipment malfunctions during decontamination or demolition activities	***An external event causing a release of radioactivity***
CPP-666 and 767	Fluorinel and Storage Facility and Stack	●	●		Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	Accidental fire during demolition activities could release contaminants beyond the working area	Criticality event in Spent Nuclear Fuel Storage Area
CPP-684	Remote Analytical Laboratory		●		Low levels of radioactive and hazardous material residue after cease-use removal activities	Low mobility potential for contaminants affixed to surfaces or trapped in inaccessible locations	Low energy sources due to routine closure activities and removal of combustible materials	High winds disperse residual contaminants freed during routine demolition activities	Failure of CPP-684 containment releasing entire contents of Analytical Cell

LLW = low-level waste; MTRU = mixed transuranic

Material at Risk at Closure

The severity or eventual consequences of any potential facility disposition accident is directly proportional to the type, quantity, and potential energy of material at risk and the resultant source term. For this analysis, it is assumed that most of the materials at risk would be removed during the facility cease-use period prior to closure activities. However, the estimated material at risk could be much greater if significant quantities of radioactive ***or*** hazardous materials were inadvertently "left behind" in areas that ***were*** assumed to be clean.

In the case of the bin sets, the Calcine Retrieval and Transport Project along with subsequent closure activities would reduce the quantities of material at risk by nearly two orders of magnitude below normal operation levels. This significant reduction in material inventory during facility closure activities is one of the primary assumptions that supports the selection of bounding accidents from operational scenarios to bound potential impacts of lesser closure accidents.

Contaminant Mobility at Closure

Contaminant mobility in the facility environment is a function of the type and construction of the facility, the location of the facility with respect to exposure pathways, the characterization and location of the contaminants, and the type of closure operations. These mobility factors and others were considered by the facility disposition accident analysis team in estimating the potential contaminant mobility for each type of HLW ***management*** facility. In facilities where most of the residual contamination was left in tanks or internal bins or otherwise inaccessible places, the contaminant materials were deemed relatively unavailable for release and not susceptible to natural or external phenomena accident initiators.

Available Energy for Accident at Closure

As was the case for determining bounding accident scenarios during the treatment alternative operations (documented in Section 5.2.14), the accident "initiating events" considered for the facility disposition alternatives include fires, explosions, spills, nuclear criticality, natural phenomena, and external events. Internal initiators such as human error and equipment failures occur during operations that trigger the fires, explosions, and spills. Natural phenomena initiators include floods, tornadoes, and seismic events. External initiators include human-caused events during decommissioning, decontamination, closure, or an unrelated aircraft crash. Generally, the external initiators are the most probable initiators for bounding facility accidents that cause major structure damages and materials releases to the environment.

Maximum Plausible Accident at Closure

The maximum plausible accident is the largest credible accident during facility closure that could be hypothesized using available information. Determination of the maximum plausible accident provides an "accident benchmark" to confirm that a "bounding accident for facility operations" results in greater consequences than the postulated maximum plausible facility disposition accident. Also, it is worthwhile to address any possible accident scenarios during closure because the review process may highlight the need for additional safety procedures or equipment to be considered in future safety analysis reports.

5.3.12.4 Facility Disposition Accident Summary for Noninvolved Workers and the Offsite Public

Table 5.3-2*4* summarizes the basis for identifying the maximum plausible accident scenarios during facility disposition and comparing them with the maximum credible accidents during facility operation. In each comparison, the potential for release is substantially smaller during facility disposition than it is during facility operation (typically several orders of magnitude smaller). The comparisons in Table 5.3-2*4* indicate that inventories of radioactive and chemically hazardous materials that would be available at the time facilities are turned over for disposition are typically a small percentage of those present during facility operation. In addition, materials present during facility disposition are typically not in a highly releasable form, and there are very limited energy sources such as elevated temperatures and pressures that would support release and dispersion of radioactive materials.

Conversely, normal mitigation systems (e.g. lighting, fire protection) may not be available during facility disposition activities, and there may be an increased potential for worker exposure to radiological and chemically hazardous materials (for example, during removal of piping and tanks in and around facilities). The data in Table 5.3-2*4* indicate that, while facility disposition activities may compromise designed safety features to control the release of radioactive materials, it is unlikely that facility disposition risks would exceed those that exist during facility operations. It can be concluded from the facilities disposition evaluation that facility disposition accidents do not pose a significant threat of health impacts to uninvolved workers or the public and do not provide a discriminator among facility disposition alternatives.

5.3.12.5 Impact of Facility Disposition Accidents on Involved Workers

During implementation of facility disposition alternatives, involved workers may incur health effects from several sources, particularly during physically intensive disposition phases, such as decontamination and demolition. Hazards to involved workers are posed by industrial accidents (e.g., falls from ladders) from increased occupational dosage as a result of accidental exposure to radiological and chemical contamination and from any radiological and chemical release accidents during disposition that impact involved workers but not uninvolved workers or the public. Specific hazards and their associated risks to involved workers will vary among facilities and the facility disposition alternatives selected for them. In general, Clean Closure requires more interaction between workers and hazards than Performance-Based Closure, while a Closure to Landfill Standards requires the least interaction.

Table 5.3-2*5* presents the analysis results for industrial impacts to involved workers based on facility closure alternative. The analysis methodology is detailed in Appendix C.4, but the basic assumption is that involved worker risk is directly proportional to the total worker hours for disposition of each facility. Estimated total worker hours were multiplied by average hazard incident rates from DOE and U.S. Government records described in Appendix C.4. These DOE rates are 6.2 injuries and illnesses and 0.011 fatalities per 200,000 hours; the private rates are 13.0 and 0.034, respectively. This methodology is generally in agreement with Section 5.3.8; however, this analysis distinguishes worker fatalities from injuries, rather than combining them as OSHA-recordable cases. This analysis further uses a construction injury rate that reflects historical incidents both to Management and Operating Contractor employees and to construction subcontractor employees.

Thus, to determine the total incidents by facility disposition alternative in Table 5.3-2*5*, the average DOE-Private Industry rates of 9.6 injuries/illnesses and 0.23 fatalities per 200,000 hours were used. Note that "Other Facilities" incidents consist of the sum of the incidents for all the facilities except the Tank Farm and the bin sets, i.e. Tank Farm Related Facilities, bin set Related Facilities, Process Equipment Waste Evaporator and Related Facilities, Fuel Processing Building and Related Facilities, FAST/FAST Stack, New Waste Calcining Facility, and Remote Analytical Laboratory. Since data for all three facility disposition alternatives were not available for all the Other Facilities, the total man-hours were assumed to

Table 5.3-*25*. Industrial hazards impacts during disposition of existing HLW *management* facility groups using "average DOE-private industry incident rates(per 200,000 hours)."

	Clean Closure		Performance-Based Closure		Closure to Landfill Standards	
Facility groups	Injuries/ illnesses	Fatalities	Injuries/ illnesses	Fatalities	Injuries/ illnesses	Fatalities
Tank Farm	***770***	1.8	30	0.07	16	0.04
Bin sets	130	0.32	100	0.24	48	0.11
Other facilities	150	0.33	150	0.33	150	0.33
Total incidents	***1,100***	2.4	280	0.64	210	0.48

be the same for all three facility disposition alternatives in the table. This assumption, that the incident data will be the same order of magnitude for all facility disposition alternatives, is considered conservative and will have no significant impact on the trend of the "Total Incidents" and the conclusion that Clean Closure has the most incidents.

Table 5.3-2***5 identifies*** significant differences among closure options for the Tank Farm and bin sets. (Labor estimates are not consistently available for all options being considered for the other facilities.) Clean Closure has by far the greatest number of injuries/illnesses and fatalities, while the Performance-Based Closure Alternative has fewer incidents, and the Closure to Landfill Standards Alternative has the least estimated incidents.

Appendix C.4 ***presents risk*** to involved workers using estimated radiation worker labor and exposure rates in facility closure studies and engineering design files. Results indicate that the greatest negative impacts to involved workers are predicted for Clean Closure, followed by Performance-Based Clean Closure, and then by Closure to Landfill Standards. As with industrial accidents, Clean Closure is estimated to result in significantly higher impacts than the other two disposition impacts.

5.4 Cumulative Impacts

Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what federal or nonfederal ***agency or entity*** undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time (40 CFR 1508.7). These actions include on- or off-site ***actions undertaken*** within the spatial and temporal boundaries of the actions considered in this EIS.

5.4.1 METHODOLOGY

This analysis considers ***direct and indirect*** impacts that could occur ***from*** 2000 to 2095 ***as well as the residual effects that may cause impacts over an indefinite period of time such as potential groundwater contamination***. The ***2000-2095*** period ***is the timeframe established*** for completion of activities evaluated in this EIS ***and the*** assumed period of institutional control, ***although DOE has no plans to ever relinquish institutional control of INEEL facilities or lands.*** The methodology used to analyze the potential for ***cumulative*** impacts from alternatives evaluated in this EIS involved the following process:

1. ***The*** Region of Influence for impacts associated with projects analyzed in this EIS was defined.

2. The affected environment ***and*** baseline conditions were identified.

3. Past, present, and reasonably foreseeable actions and the effects of those actions were identified.

4. Aggregate ***(additive)*** effects of past, present, and reasonably foreseeable actions were assessed.

The Idaho HLW & FD EIS ***tiers*** from the SNF & INEL EIS. Volume 2, Part A of the SNF & INEL EIS was concerned with the selection of facilities and technologies for the management of spent nuclear fuel and radioactive wastes at INEEL, including the mixed transuranic waste/SBW and HLW that are the focus of this EIS. Anticipated future INEEL projects, including remediation of contaminated sites at INEEL, were ***also*** previously analyzed in the SNF & INEL EIS. The Record of Decision for that EIS provided the ***general*** scope and ***timeframe*** for spent nuclear fuel management and environmental restoration activities to be included in the cumulative impact analysis of this EIS. ***In*** addition, actions undertaken or proposed subsequent to the issuance of that Record of Decision were identified and included in the cumulative impact analysis of this EIS.

Data ***used to establish the cumulative impacts baseline*** were extracted from the SNF & INEL EIS via the INEL Spent Nuclear Fuel and Waste Engineering Systems comprehensive model (Hendrickson 1995). This systems model included all spent nuclear fuel, HLW, transuranic waste, low-level waste, mixed low-level waste, hazardous waste, and industrial waste activities. The model was based on planned treatment, storage, and disposal activities at the INEEL, EIS project summaries, and operating parameters of existing facilities, ***and*** was updated to reflect projects included in the SNF & INEL EIS Record of Decision and other projects that occurred subsequent to ***that*** EIS (Jason 1998). In ***the cumulative impacts*** analysis ***for this EIS***, data extracted from the updated model were used to project a baseline for impacts to air resources and generation of low-level waste, mixed low-level waste, hazardous waste, and industrial waste over a timeframe encompassing the time required for completion of the alternatives analyzed in this EIS. Anticipated projects included in the baseline are identified in Table 5.4-1. The contribution of each Idaho HLW & FD EIS alternative and option to these INEEL waste streams was obtained from project data sheets. Anticipated quantities of these waste streams from the INEEL baseline and Idaho HLW & FD EIS were combined and depicted graphically to provide a visual representation of cumulative waste quantities over time (see Section 5.4.3.*7*).

Section 5.4.2 identifies past, present, and reasonably foreseeable actions included in the cumulative impact analysis. Actions not included in the analysis because of the speculative nature of the action are also identified in Section 5.4.2. Subsequent sections present cumulative impact analysis by resource ***or pathway***.

Table 5.4-1. Projects included in the environmental baseline for analyses of cumulative impacts.

Borrow Source Silt Clay	Partnership Natural Disaster Reduction Test Station
Calcine Transfer Project	Pit 9 Retrieval
Central Liquid Waste Processing Facility D&D	Private Sector Alpha-MLLW Treatment
Dry Fuels Storage Facility	Radioactive Scrap/Waste Facility
EA Determination for CPP-627	Remediation of Groundwater Facilities
EBR-II Blanket Treatment	Remote Mixed Waste Treatment Facility
EBR-II Plant Closure	RESL Replacement
ECF Dry Cell Project	RWMC Modifications for Private Sector Treatment of Alpha-MLLW
Engineering Test Reactor D&D	Sodium Processing Plant
Fuel Processing Complex (CPP-601) D&D	TAN Pool Fuel Transfer
Fuel Receiving, Canning, Characterization & Shipping	Tank Farm Heel Removal Project
Gravel Pit Expansions (New Borrow Source)	Treatment of Alpha-MLLW
GTCC Dedicated Storage	TSA Enclosure and Storage Project
Headend Processing Plant (CPP-640) D&D	Vadose Zone Remediation
Health Physics Instrument Lab	Waste Calcine Facility (CPP-633) D&D
High Level Tank Farm Replacement (upgrade phase)	Waste Characterization Facility
Increased Rack Capacity for CPP-666	Waste Handling Facility
Industrial/Commercial Landfill Expansion	Waste Immobilization Facility
Material Test Reactor D&D	WERF Incineration
Mixed/LLW Disposal Facility	
Non Incinerable Mixed Waste Treatment	

5.4.2 IDENTIFICATION OF PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

The project impact zones of past, present, and reasonably foreseeable on- and off-site actions that could result in cumulative impacts were identified by reviewing DOE proposed and anticipated future actions on the INEEL and by contacting other Federal and state agencies. Actions determined to have environmental impacts that would ***add to or*** overlap in time and space with potential impacts from the actions evaluated in this EIS were included in the analysis. The City of Idaho Falls, the State of Idaho Department of Environmental Quality, and the Bureau of Land Management were contacted for information regarding anticipated future activities that could contribute to a cumulative impact on a particular resource ***or through a particular pathway*** within the Region of Influence. Past, present, and reasonably foreseeable onsite actions included in the cumulative impact analysis are presented in Table 5.4-2.

Onsite actions that could potentially have overlapping or connected impacts with waste processing activities include the Advanced Mixed Waste Treatment Project, ***and*** remedial activities at INTEC Waste Area Group 3 (WAG 3), ***including construction and operation of the INEEL CERCLA Disposal Facility***, excavation of silt/clay borrow sources, deactivation of obsolete nuclear facilities, and replacement of INTEC percolation ponds. Impacts associated with the Advanced Mixed Waste Treatment Project have been analyzed in detail and are presented in the *U.S. Department of Energy Idaho National Engineering and Environmental Laboratory Advanced Mixed Waste Treatment Project Draft Environmental Impact Statement* (AMWTP EIS) (DOE 1999a). The SNF & INEL EIS analyzed potential environmental impacts associated with remediation of contaminated sites at the INEEL, including INTEC, which are included in the analysis ***in*** this EIS. Excavation of silt ***and*** clay for use in INEEL operations and remedial activities was evaluated in this ***analysis*** because these materials may be required to support facility disposition activities at INTEC. Furthermore, residual contamination left in place from WAG 3 activities would contribute to the source for long-term risks associated with INTEC. DOE has chosen to remediate contaminated perched water at WAG 3 using institutional controls with aquifer recharge control (DOE 1999b). This will entail (1) restricting future use of contaminated perched water and

Table 5.4-2. Onsite actions included in the assessment of cumulative impacts.

Project	Description
SNF & INEL EIS	The SNF & INEL EIS provided the scope and timetable for spent nuclear fuel and environmental restoration activities to be included in the cumulative impact analysis of this EIS.
Advanced Mixed Waste Treatment Project[a]	Retrieve, sort, characterize, and treat mixed low-level waste and approximately 65,000 cubic meters of alpha-contaminated mixed low-level waste and transuranic waste currently stored at the INEEL Radioactive Waste Management Complex. Package the treated waste for shipment offsite for disposal.
WAG 3 Remediation[a]	Ongoing activities addressing remediation of past releases of contaminants at INTEC.
New silt/clay source development and use at the INEEL.	INEEL activities require silt/clay for construction of soil caps over contaminated sites, research sites, and landfills; replacement of radioactivity contaminated soil with topsoil for revegetation and backfill; sealing of sewage lagoons; and other uses. Silt/clay will be mined from three onsite sources (ryegrass flats, spreading area A, and WRRTF) (DOE 1997a).
Closure of various INTEC facilities unrelated to Idaho HLW&FD EIS Alternatives	Reduce the risk of radioactive exposure and release of hazardous constituents and eliminate the need for extensive long-term surveillance and maintenance for obsolete facilities at INTEC. Facilities included in the cumulative impact analysis are identified in Table 5.4-***5***.
Percolation Pond Replacement	DOE intends to replace the existing percolation ponds at the INTEC with replacement ponds located approximately 10,200 feet southwest of the existing percolation ponds (DOE 1999***c***).
EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel (DOE/EIS-0306)	This EIS analyzes alternatives for the treatment and management of sodium bonded spent nuclear fuel at Argonne National Laboratory-West (ANL-W) located on the INEEL. Under some alternatives the sodium bonded SNF would be treated at ANL-W using an electrometallurgical process. This process was addressed in the SNF & INEL EIS (Experimental Breeder Reactor-II Blanket Treatment at Appendix C-4.1.7, and Electrometallurgical Process Demonstration at Appendix C-4.1.8). These actions are included in the projects that make up the environmental baseline for this EIS.

a. Included in the baseline conditions identified in the SNF & INEL EIS.

future recharge to contaminated perched water and (2) taking the existing INTEC percolation ponds out of service and replacing them with new ponds built outside of the zone influencing perched water contaminant transport. As a consequence, development of new percolation ponds is included in this cumulative impact assessment.

A potential future project identified but not considered in the cumulative impact analysis because of its speculative nature involves the INTEC coal fired steam heating plant. The plant could potentially be converted to a small commercial power generating facility. The potential for such a conversion is being considered by the Eastern Idaho Community Reuse Organization.

Since the Draft EIS was issued, updated information concerning the treatment of sodium-bonded fuel and irradiation of neptunium-237 targets at the Advanced Test Reactor (ATR) has been evaluated. Impacts associated with the treatment of sodium-bonded spent nuclear fuel have been analyzed in detail and are presented in the U.S. Department of Energy Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel (DOE 2000a).

Impacts from irradiation of neptunium-237 targets at ATR as well as ATR operations were evaluated in the Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States (Nuclear Infrastructure PEIS) (DOE 2000b).

Table 5.4-3 presents waste processing impacts for each Idaho HLW & FD EIS alternative. The maximum impact from the Idaho HLW & FD EIS waste processing and facility disposition alternatives, and other past, present, and reasonably foreseeable projects evaluated in this EIS are presented in Table 5.4-4. Although potential incremental impacts of actions analyzed in the Nuclear Infrastructure PEIS were considered in the cumulative analysis, they were small in every instance and would not contribute substantially to cumulative impacts. For this reason, they were not included in Table 5.4-4. Table 5.4-5 lists INTEC facilities unrelated to Idaho HLW alternatives planned for closure over approximately the same timeframe as the waste processing and facility disposition activities ***analyzed*** in this EIS. The impacts from these unrelated facility closures are included in the cumulative evaluation in Table 5.4-4.

Additional INTEC facilities have been determined through the CERCLA process to require "no action" (no contaminant source) or "no further action" (no exposure route for a potential source under current site conditions). A list of these facilities is provided in the Record of Decision for WAG 3 (DOE 1999b). As a result, these facilities were not included in the cumulative impact analysis ***because they possess no additive value***.

Impacts associated with the Hanford alternative are discussed in Appendix C.8. Actions at the Hanford Site that could result in cumulative impacts with the Minimum INEEL Processing Alternative include the Hanford Site waste management and environmental restoration programs, operation of the Environmental Restoration and Disposal Facility, the management of spent nuclear fuel, and activities at the U.S. Ecology Site. The level of activity associated with many of the Hanford Site cleanup functions would be declining by the time treatment of the INEEL waste would begin. Among the cumulative impacts that would occur are impacts to land use and biological resources, human health, transportation, and socioeconomics.

5.4.3 RESOURCES ***AND PATHWAYS*** INCLUDED IN THE CUMULATIVE IMPACT ANALYSIS

Implementation of alternatives evaluated in this EIS would contribute to cumulative impacts on lands, ***including ecology, cultural resources, and borrow materials,*** air, water, ***socioeconomics***, traffic and transportation, health and safety, long-term health risk, and waste management. No cumulative impacts were identified that would affect noise, aesthetic and scenic resources, or environmental justice.

5.4.3.1 Land ***Based Impacts Including Ecology, Cultural Resources, and Geology and Soils***

Land Use - Existing industrial development at the INEEL occupies approximately 11,400 acres of the total INEEL area (569,600 acres) (DOE 1995). Cumulatively, implementation of all ***anticipated*** activities ***sitewide*** would lead to converting ***an additional 1,600*** acres of land to industrial use, ***which would increase*** the total disturbance to approximately 13,000 acres, less than 3 percent of the total INEEL land area.

A majority of the potential land disturbance would be associated with environmental restoration activities identified in the SNF & INEL EIS (DOE 1995). This disturbance would be associated with remediation of contaminated areas and would largely involve previously disturbed ***areas*** contiguous with or adjacent to existing industrial facilities. Potential impacts to INEEL land resources from Idaho HLW & FD EIS activities would account for less than 2 percent of the total potential new development of INEEL land. Therefore, the contribution of the alternatives evaluated in this EIS to land use impacts would be small.

Land disturbance associated with the facility disposition alternatives analyzed in this EIS, including closure of those identified in Table 5.4-5, would occur within the previously disturbed industrial area of INTEC. Certain land uses (such as residential or future industrial development) within this area would be precluded indefinitely into the future.

Ecology - Cumulative impacts to the ecology of the INEEL from habitat loss as a result of any alternative analyzed in this EIS would be small. Radionuclides released from treatment operations could be deposited on vegetation surrounding INTEC. Exposure of individual plants and animals to radionuclides in areas adjacent to INTEC could increase slightly due to waste processing operations. Residual radionuclides and hazardous constituents in soils surrounding INTEC could be absorbed by plants and consumed by animals. Although exposure to these materials may affect individual animals or plants, measurable impacts to populations on or off the INEEL have not occurred and are not expected as a result of the incremental increase in exposure that could result from alternatives analyzed in this EIS. Additional deposition resulting from any of the alternatives analyzed in this EIS would not be expected to lead to levels of contaminants that would exceed the historically reported range of concentrations or ecologically based screening levels (See Section 5.2.8). Therefore, DOE does not anticipate cumulative impacts to the ecology of the INEEL or plant or animal populations as a result of any alternative analyzed in this EIS.

Cultural and Historic Resources - As stated above, the majority of reasonably foreseeable INEEL actions and waste processing activities would occur within previously disturbed areas contained within or adjacent to INTEC facility areas. The likelihood that these areas contain cultural materials in-tact or in their original context, is small. Nevertheless, there is the potential to unearth or expose cultural materials during excavation. Standard measures to avoid or minimize the impacts to cultural materials discovered during site development are in place. Cultural resource surveys would be conducted prior to construction or surface disturbance outside the INTEC fence and appropriate standard measures, such as avoidance or scientific documentation and tribal consultation, would be implemented prior to development of the site. Implementation of these measures would minimize the potential for impacts, including cumulative impacts, to cultural resources.

The types of cumulative impacts on historic resources are the same for each alternative analyzed in this EIS. All undertakings within developed facility areas on the INEEL have the potential to impact properties eligible for nomination to the National Register of Historic Places. Appropriate standard measures, including archival documentation of historic structures, would be implemented in accordance with an agreement with the State Historic Preservation Officer. Contribution of activities evaluated in this EIS to cumulative impacts on cultural and historic resources on the INEEL or in southeastern Idaho would be small.

Geology and Soils - Disposition of facilities and remediation of contaminated sites at INTEC and other INEEL facility areas would require the use of borrow materials such as gravel, silt and clay. Anticipated requirements for these materials in support of remediation of contaminated sites at the INEEL were identified in the SNF & INEL EIS and in an environmental assessment (EA) addressing impacts of developing new sources of silt and clay to support INEEL actions (DOE 1997a). The EA identified a need for 2,300,000 cubic yards of silt/clay material over a period of 10 years. To account for compaction, reject material not suitable for construction, and other uncertainties associated with construction activities, the volume of material analyzed in the EA was doubled to 4,600,000 cubic yards. Silt and clay required for construction activities associated with waste processing alternatives and facilities disposition at INTEC, as well as material for all other INEEL activities, including ongoing operations and remediation of contaminated sites, would be obtained from sources analyzed in the EA. Sources of sand, gravel, aggregate, etc. in support of remedial activities and INEEL operations were evaluated in the SNF & INEL EIS. The estimated need for gravel is estimated to be 1,772,000 cubic yards (DOE 1995). The development or expansion of borrow material sources would be within the boundaries of the

Table 5.4-3. Waste processing impacts from each Idaho HLW & FD EIS alternative.

Resource area	No Action Alternative	Continued Current Operations	Separations Alternative: Full Separations Option	Separations Alternative: Planning Basis Option	Separations Alternative: Transuranic Separations Options
Land resources	None	None	Conversion of 22 acres to industrial use	None	Conversion of 22 acres to industrial use
Cultural resources	None	***Minimal visual degradation through 2016***	Minimal visual degradation through 2035	Minimal visual degradation through 2035	Minimal visual degradation through 2035
Air resources Maximum consumption of PSD increment	39 percent	***39*** percent	***39*** percent	***40*** percent	***39*** percent
Water resources[a]					
Construction	***0.16***	***0.88***	***7.0***	7.2	4.9
Operations	15	65	9.0	75	56
Ecological resources	None	None	Loss of 22 acres of habitat	None	Loss of 22 acres of habitat
Waste management[b]					
Industrial					
Construction	1.4×10^3	6.8×10^3	5.5×10^4	6.0×10^4	3.9×10^4
Operations	1.4×10^4	1.9×10^4	5.3×10^4	5.2×10^4	4.3×10^4
Hazardous					
Construction	0	30	790	880	280
Operations	0	0	1.6×10^3	1.2×10^3	960
Mixed low-level waste					
Construction	220	240	1.1×10^3	1.1×10^3	1.1×10^3
Operations	1.3×10^3	3.2×10^3	5.9×10^3	7.9×10^3	5.3×10^3
Low-level waste					
Construction	0	20	330	210	210
Operations	190	9.5×10^3	1.2×10^3	1.0×10^4	960
Socioeconomics[c]					
Construction					
Direct	20	90	850	870	680
Indirect	20	90	***830***	***840***	***650***
Year of peak	2005	2008	2013	2013	2012
Operations					
Direct	***73***	280	440	480	320
Indirect	***140***	***550***	***870***	***950***	***630***
Year of peak	***2007***	2015	2018	***2020***	2015

a. Million gallons per year.
b. Total waste volumes in cubic meters.
c. Peak employment.

Table 5.4-3. Waste processing impacts from each Idaho HLW & FD EIS alternative (continued).

Non-Separations Alternative					***Direct Vitrification Alternative***	
Hot Isostatic Pressed Waste Option	Direct Cement Waste Option	Early Vitrification Option	***Steam Reforming Option***	Minimal INEEL Processing at INEEL	***Vitrification Without Calcine Separations Option***	***Vitrification With Calcine Separations Option***
None	None	None	***None***	Conversion of 22 acres to industrial use	***None***	***None***
Minimal visual degradation ***through 2035***	***Minimal*** visual degradation ***through 2035***	***Minimal*** visual degradation ***through 2035***	***Minimal visual degradation through 2035***	***Minimal*** visual degradation ***through 2035***	***Minimal visual degradation through 2035***	***Minimal visual degradation through 2035***
39 percent	***39*** percent	***39*** percent	***39 percent***	39 percent	***39 percent***	***39 percent***
3.3	3.7	2.8	***4.3***	3.2	***2.7***	***5.0***
93	67	9.2	***8.1***	9.1	***9.1***	***15***
None	None	None	***None***	Loss of 22 acres of habitat	***None***	***None***
2.6×10^4	3.0×10^4	2.3×10^4	***2.4×10^4***	2.6×10^4	***2.3×10^4***	***4.3×10^4***
4.3×10^4	5.0×10^4	4.2×10^4	***2.5×10^4***	3.5×10^4	***3.0×10^4***	***4.2×10^4***
790	560	640	***200***	340	***570***	***840***
4	4	4	***58***	40	***4.0***	***1.4×10^3***
1.1×10^3	1.1×10^3	1.1×10^3	***1.1×10^3***	1.1×10^3	***1.1×10^3***	***1.1×10^3***
6.4×10^3	8.6×10^3	6.0×10^3	***4.1×10^3***	5.7×10^3	***6.0×10^3***	***7.5×10^3***
260	340	310	***0***	110	***1.6×10^3***	***1.7×10^3***
1.0×10^4	1.0×10^4	750	***560***	700	***700***	***1.3×10^3***
360	400	330	***550***	200	***350***	***670***
350	***390***	***320***	***530***	***190***	***340***	***650***
2008	2008	2008	***2010***	2008	***2011***	***2019***
460	530	330	***170***	330	***310***	***440***
910	***1,000***	***650***	***340***	***650***	***600***	***880***
2015	2015	2015	***2012***	2018	***2015***	***2023***

a. Million gallons per year.

b. Total waste volumes in cubic meters.

c. Peak employment.

Table 5.4-4. Maximum impact from Idaho HLW & FD EIS alternatives and other past, present, and reasonably foreseeable projects evaluated in this EIS. (Health & Safety and Transportation impacts are addressed in applicable sections.)

Resource area	Idaho HLW & FD EIS		SNF & INEL EIS (inclusive of WAG 3 and AMWTP) (DOE 1995)	New silt/clay source development and use at the INEEL	Disposition of unrelated INTEC facilities	Percolation pond replacement
	Waste Processing	Facility Disposition				
Land resources/acres disturbed	22 acres	None	1,346 acres[a]	21 acres and 24 acres per year[b]	None	***17*** acres
Socioeconomics	Direct employment of 870 during construction and 530 during operations	Direct peak year employment of ***790***	Overall decrease in employment	None/use of existing workforce	Small numbers of workers drawn from existing labor pool	None/use of existing workforce
Air resources	Consumption of up to ***40*** percent of PSD increment/no health based standards exceeded	No health based standards exceeded	Below applicable standards	Short-term elevated levels of fugitive dust and exhaust emissions	Emissions of fugitive dust/vehicle exhaust during demolition activities	Temporary emissions of fugitive dust and vehicular exhaust during construction activities
Water resources groundwater withdrawal and contamination	93 million gallons per year; negligible latent cancer fatality risk	Increase of ***11*** million gallons per year; latent cancer fatality risk of $\boldsymbol{2.9\times10^{-4}}$[c] from facility disposition.	Increase of 83 million gallons per year[d]; latent cancer fatality risk of 5×10^{-5}	Negligible	Within existing water use; latent cancer fatality risk of 2×10^{-6} from closure of CPP-633	Relocation of ponds reduces potential for contaminant migration
Ecological resources/ acreage loss	22 acres	None	1,346 acres[a]	21 acres and 24 acres per year[b]	None	***6.2*** acres
Geology and soils	Negligible (use of existing onsite sources)	Negligible (use of existing onsite sources)	1,772,000 ***yd***^{3}	4,600,000 ***yd***^{3} as a silt/clay source	Materials obtained from existing INEEL sources	Soil disturbance on ***17*** acres
Cultural resources	Negligible	Potential for loss of historic data on nuclear facilities	70 structures and 23 sites impacted[e]	No significant resources identified in surveys of 40-acre plots at each onsite location	Potential for loss of historic data on nuclear facilities	Surveys will be conducted/resources avoided

a. SNF & INEL EIS involves 1,339 acres, plus 7 acres impacted as a result of AMWTP.
b. Represents temporary disturbance; rehabilitation of disturbed acres will occur annually.
c. Represents the total for all existing HLW management facilities.
d. SNF & INEL EIS activities use 79 million gallons per year and AMWTP involves use of 4.2 million gallons per year.
e. SNF & INEL EIS impacts plus 1 additional site impacted from AMWTP.
AMWTP = Advanced Mixed Waste Treatment Project; PSD = Prevention of Significant Deterioration.

Table 5.4-5. List of INTEC facilities subject to closure and anticipated closure action and time of closure activity.

Building	Name	Closure Action	Deactivation Activity Period	Demolition Activity Period
		Service Waste Group A		
CPP-709	Service Waste Monitoring System (Completed)	Closure to Landfill Standards	1999	1999-2000
CPP-734	Service Waste Monitoring Station for West Side (Completed)	Closure to Landfill Standards	1999	1999-2000
CPP-750	Service Waste Diversion Pump Station	Clean Closure	2035-2037	2038-2043
CPP-796	West Side Service Waste Building	Clean Closure	2035-2037	2038-2043
CPP-797	East Side Service Waste Building	Clean Closure	2035-2037	2038-2043
CPP-631	RALA Process "L" Off-Gas Blower Room (Completed)	Closure to Landfill Standards	1998-1999	2000
		Service Waste Group B		
CPP-642	Hot Waste Pump House and Pit	Clean Closure	1999	1999-2000
CPP-648	Basin Sludge Tank Control House	Clean Closure	1999-2000	2000-2002
CPP-740	Settling Basin and Dry Well (Near CPP-603)	Clean Closure	2035-2037	2038-2043
CPP-751	Service Waste Monitoring Station for CPP-601	Clean Closure	2035-2037	2038-2043
CPP-752	Service Waste Diversion Station for CPP-601	Clean Closure	2035-2037	2038-2043
CPP-753	Service Waste Monitoring Station for CPP-633	Clean Closure	2035-2037	2038-2043
CPP-754	Service Waste Diversion Station for CPP-633	Clean Closure	2035-2037	2038-2043
CPP-763	Waste Diversion Tank Vault	Clean Closure	2030-2032	2033-2037
CPP-764	SFE Hold Tank Vault	Performance-Based	1999	1999-2000
		Laboratory and Office Buildings		
CPP-602	Laboratory and Office Building	Closure to Landfill Standards	2010-2012	2015-2025
CPP-608	Storage-Butler Building (Contains Rover ash under concrete)	Clean Closure	2014-2015	2015-2025
CPP-620	Chemical Engineering High Bay Facility & HCWHNF	Clean Closure	2010-2012	2015-2025
CPP-630	Safety and Spectrometry Building	Clean Closure	2014-2015	2015-2025
CPP-663	Maintenance Building	Clean Closure	2038	2043
CPP-637	Process Improvement Facilities	Clean Closure	2038	2043
		Ponds and Service Waste Lines		
NA	Service Waste Lines (Low-Level Liquid Waste)	Clean Closure	2035-2037	2038-2043
		Miscellaneous		
NA	Overhead Pneumatic Transfer Lines	Clean Closure		
CPP-1776	Utility Tunnel System throughout Chem Plant	Clean Closure		
CPP-618	Measurement and Control Building/Tank Farm	Clean Closure	2030-2034	2034-2035
		Waste Storage Building		
CPP-1617	Waste Staging Building	Clean Closure	2037	2038-2043
CPP-1619	Hazardous Chemical/Radioactive Waste Facility	Clean Closure	2037	2038-2043
		Waste Calcining Facility		
CPP-633	Waste Calcining Facility	Closure to Landfill Standards		
		CPP 603		
CPP-603	Fuel Receiving and Storage Building	Performance-Based		

INEEL, the acreage used would be small and subject to standard cultural resources protection measures and site restoration including revegetation with native plant species. Therefore, cumulative impacts to lands based resources including site geology and soils are anticipated to be small.

5.4.3.2 Socioeconomics

Table 5.4-4 presents employment impacts for each project evaluated in this EIS. Over the timeframe ***analyzed in this EIS***, waste processing activities would sustain a maximum of 870 direct jobs during the peak year (2013) of the construction phase and a maximum of 530 direct jobs during the peak year (2015) of the operations phase. However, the timing of peak employment and the number of workers, both direct and indirect, is highly variable across all alternatives. Facility disposition activities would require direct employment of up to ***790*** workers. DOE anticipates these workers would be drawn from the existing workforce through retraining and reassignment. DOE anticipates total employment would decline and the net change in jobs associated with alternatives ***analyzed in this EIS*** would represent a continuation of current site employment that may otherwise cease. Considering that direct employment at the INEEL was approximately 11,000 workers in 1990 (DOE 1995) and that ***2001*** INEEL employment was approximately 8,100 workers (see Section 4.3.2), future changes in employment as a result of activities described in this EIS would be within normal INEEL workforce fluctuations.

5.4.3.3 Air Resources

Cumulative impacts of radiological and nonradiological air emissions have been assessed for each alternative in this EIS. Since issuance of the Draft EIS, DOE has updated estimated impacts to the noninvolved worker resulting from baseline conditions. Radiological emission impacts at on- and off-site locations are well below applicable standards (see Table 5.4-6). The highest dose to an offsite individual from waste processing activities would be less than 1.8×10^{-3} millirem per year (under the Continued Current Operations Alternative, Planning Basis Option, Hot Isostatic Pressed Waste Option, and Direct Cement Waste Option). The cumulative dose to the maximally exposed offsite individual would be about 0.16 millirem per year. This dose, which is predominantly caused by baseline sources, is less than 2 percent of the 10 millirem per year dose limit specified in the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61.92) and is a small addition to the 360 millirem dose received from natural background and man-made sources. Cumulative doses to noninvolved INEEL workers and the total population within 50 miles of INTEC would also be very low under each of the waste processing alternatives, and would be due mainly to baseline emissions.

Summing maximum impacts from sources located in different areas (e.g., Radioactive Waste Management Complex, INTEC) and with different release parameters (e.g., stack heights) is inherently conservative since the maximum impacts from each source are likely to occur at different offsite locations.

Cumulative nonradiological air quality impacts are expressed in terms of concentrations of criteria and toxic air pollutants in ambient air and general deterioration of current air quality. Table 5.4-7 presents a comparison of recent criteria pollutant emission estimates. Analyses of SNF & INEL EIS maximum baseline concentrations are presented in Table 5.7-5 of the SNF & INEL EIS and are well within the National Ambient Air Quality Standards (DOE 1995). The highest predicted concentrations of criteria pollutants from Idaho HLW & FD EIS activities remain well below the SNF & INEL EIS maximum baseline case. Since maximum baseline concentrations are much greater than actual sitewide emissions and the total emissions from other activities evaluated in this EIS remain substantially lower, these results likely overstate the consequences that would actually occur.

Toxic air pollutants were assumed to be emitted at the maximum levels allowed under the maximum achievable control technology rule. ***Toxic air pollutant incremental impacts at offsite and onsite locations are well below applicable standards in all cases. The highest offsite impact from any waste processing alternative would be for nickel, which could reach about 10 percent of the standard under the Planning Basis***

Table 5.4-6. Summary of radiation dose impacts associated with airborne radionuclide emissions.

	Maximally exposed offsite individual (millirem per year)	Noninvolved worker (millirem per year)	Population (person-rem per year)
Baseline conditions[a]	0.16	***0.35***	***1.1***
Idaho HLW & FD EIS[b]	***1.8×10^{-3}***	1.0×10^{-4}[c]	***0.11***
Total	0.16	***0.35***	***1.2***
Standard	10[d]	5,000	NA[e]

a. Includes contributions from foreseeable sources including Advanced Mixed Waste Treatment Project (see Table C.2-8).
b. Maximum dose for any alternative.
c. Location of highest onsite dose is Central Facilities Area.
d. EPA dose limit specified in 40 CFR 61.92; applies to effective dose equivalent from air releases only.
e. NA = Not available. No standard has been established.

Table 5.4-7. Comparison of recent criteria pollutant emissions estimates with the levels assessed under the maximum emissions case in the SNF & INEL EIS.

Pollutant	SNF & INEL EIS maximum baseline case (kilograms per year)[a]	Advanced Mixed Waste Treatment Project (kilograms per year)[b]	Idaho HLW&FD EIS (kilograms per year)	Actual sitewide emissions (1996) (kilograms per year)[c]	Total (kilograms per year)	Percent of baseline case
Carbon monoxide	2,200,000	2,100	***24,000***	155,000	183,100	***8.2***
Nitrogen dioxide	3,000,000	25,000	***85,000***	220,000	338,000	11
Particulate matter[d]	900,000	290	***5,400***	180,000	186,000	21
Sulfur dioxide	1,700,000	700	***170,000***	120,000	380,700	***17***
Lead components	68	1.9×10^{-5}	***3.6***	1.5	5.6	***7.5***
VOCs	not specified	480	***2,700***	16,000	19,000	-

a. Source: DOE (1995).
b. Source: DOE (1999a).
c. Source: DOE (1997b).
d. Particle size of particulate matter emissions is assumed to be in the respirable range (less than 10 microns).
VOCs = volatile organic compounds.

Option at, or just beyond, the INEEL boundary. The highest onsite nickel concentrations are not expected to exceed one percent of the occupational exposure limit for that substance.

The maximum consumption of Prevention of Significant Deterioration increment would occur under the Planning Basis Option. The combined effects of baseline sources, waste processing alternatives, and other planned future projects would consume ***40*** percent of increment at Craters of the Moon ***Wilderness Area*** (Class I area) and ***38*** percent of increment at the INEEL boundary (Class II area) for sulfur dioxide, averaged over 24 hours. All other waste processing options would result in a smaller cumulative consumption of Prevention of Significant Deterioration increment (see Table 5.2-9).

5.4.3.4 Water Resources

Potential impacts to water would include withdrawal of water from the aquifer in support of INEEL activities and potential long-term impacts on water quality from migration of residual contaminants to the aquifer.

Water Use - Current INEEL activities use an average of 1.6 billion gallons of water from the ***Snake River Plain*** Aquifer each year (DOE 1997c). Total water consumption from reasonably foreseeable activities, including waste processing activities ***analyzed*** in this EIS, could account for an additional ***187*** million gallons per year, of which ***104*** million gallons would be associated with activities from ***this*** EIS (see Table 5.4-4). This would have a small effect on the quantity of water in the aquifer, given that 470 billion gallons of water pass under the INEEL annually (Robertson et al. 1974).

Groundwater - Past waste disposal practices have ***contaminated groundwater***, primarily in isolated areas within the INEEL site boundaries, including the groundwater underlying INTEC. Tritium, strontium-90, iodine-129, americium-241, cesium-137, chloride, chromium, cobalt-60, nitrate, sodium, and plutonium isotopes have been detected in ***groundwater*** near INTEC. Some contaminant plumes, most notably tritium, strontium-90, and iodine-129, have concentrations in excess of EPA drinking water standards. Previous modeling of the vadose zone and saturated contaminant transport predicted no contaminants would migrate past the present INEEL site boundaries in concentrations exceeding maximum contaminant levels (DOE 1995). A more recent study (Rodriguez et al. 1997) predicts that without remediation, mercury, tritium, iodine-129, neptunium-237, and strontium-90 have already or will reach or exceed drinking water standards beneath INTEC before the year 2095. Iodine-129 was predicted to migrate to the INEEL southern ***boundary*** at a concentration near the drinking water standard (Rodriquez et al. 1997).

Relocation of the percolation ponds used for disposal of service waste to a location 10,200 feet southwest of INTEC would move the region of influence of the ponds far enough that infiltration of water discharged to the ponds (which in the past has exceeded drinking water standards) ***would*** not hydrologically interact with contaminated perched water bodies beneath INTEC ***(DOE 1999c)***. Contaminant ***plumes*** are known to occur in perched water zones and the Snake River Plain Aquifer in areas underlying and downgradient from other INEEL facilities. The potential for interaction between ***these*** plumes ***is not well understood*** at this time. However, the concentration of contaminants is greatest close to the INEEL facilities that are, ***or were,*** the source of the plume. Closure of facilities and residual contamination left in place after remediation of INTEC facilities could contribute to the concentration of contaminants in the aquifer over the long term. A discussion of long-term cumulative impacts from exposure to contaminants in groundwater can be found in Section 5.4.3.***6***.

5.4.3.*5* Traffic and Transportation

Transportation impacts analyzed in the SNF & INEL EIS are summarized in this section as well as cumulative impacts from the AMWTP EIS and WAG 3 remediation activities.

Traffic Volume - As noted in Section 5.2.9, DOE does not expect any change in the Level-of-Service on U.S. Highway 20 as a result of anticipated future activities at the INEEL.

Transportation Radiological Impacts - Radiological collective doses to workers and the general population were used to quantify cumulative transportation impacts. The analysis of cumulative transportation impacts focuses on offsite transportation because this method yields a larger dose to the general population in comparison to onsite transportation or occupational dose. Due to the difficulty in identifying a maximally exposed individual for historical and anticipated shipments that would occur all over the U.S. over an extended period of time (i.e., from 1953 through completion of transportation related activities evaluated in this EIS), this measure of impact was evaluated by estimating cancer fatalities using cancer risk coefficients. The collective dose for waste shipments associated with all alternatives in this EIS ***is*** summarized in Section 5.2.9, Traffic and Transportation. Total collective occupational and general population doses from past, present, and reasonably foreseeable actions are summarized in Table 5.4-8.

There are also general transportation activities unrelated to alternatives evaluated in the SNF & INEL EIS, this EIS, or to reasonably foreseeable actions. Examples of these activities are shipments of radiopharmaceuticals to nuclear medicine laboratories and shipment of commercial low-level radioactive waste to commercial

Table 5.4-8. Cumulative transportation-related radiological collective doses and cancer fatalities.

Category	Collective occupational dose (person-rem)	Latent cancer fatalities[a]	Collective general population dose (person-rem)	Latent cancer fatalities[a]
Historical				
Waste (1954 - 1995)	47	0.02	28	0.01
DOE Spent Nuclear Fuel (1953 - 1995)	56	0.02	30	0.02
Naval Spent Nuclear Fuel (1957 - 1995)	6.2	3.0×10^{-3}	1.6	8.0×10^{-4}
Alternative B (10-year plan)[b]				
Waste shipments				
Truck (100 percent)	870	0.35	460	0.23
Rail (100 percent)	20	***8.0×10^{-3}***	29	***0.015***
Spent Nuclear Fuel Shipments				
Truck (100 percent)	***350***	***0.14***	***810***	***0.41***
Rail (100 percent)	***67***	***0.027***	***100***	***0.050***
Maximum Waste Processing Alternative				
Direct Cement Waste Option (Truck)	***520***	0.21	2.9×10^{3}	1.4
Reasonably Foreseeable Actions				
Geological Repository				
Truck	8.6×10^{3}	3.4	4.8×10^{4}	24
Rail	750	0.3	740	0.37
Waste Isolation Pilot Plant				
Test Phase	110	0.043	48	0.03
Disposal Phase				
Truck	1.9×10^{3}	0.76	1.5×10^{3}	0.75
Rail	180	0.07	990	0.5
General Transportation				
Truck				
1953 - 1982	1.7×10^{5}	68	1.3×10^{5}	65
1983 - 2037	9.6×10^{4}	38	1.0×10^{5}	52
Summary				
Historical	109	0.043	60	0.030
Alternatives B (10-year plan)[b] ***and Spent Nuclear Fuel Shipments***				
Truck (100 percent)	***1.2×10^{3}***	***0.49***	***1.3×10^{3}***	***0.64***
Rail (100 percent)	***87***	***0.04***	***130***	***0.07***
Maximum Waste Processing Alternative	***520***	0.21	2.9×10^{3}	1.4
Reasonably Foreseeable Actions				
Truck (100 percent)	1.1×10^{4}	4.2	5.0×10^{4}	25
Rail (100 percent)	1.0×10^{3}	0.37	1.8×10^{3}	0.87
General Transportation (1953 - 2037)	2.7×10^{5}	110	2.3×10^{5}	120
Total collective dose[c]	2.8×10^{5}	110	2.8×10^{5}	140
Percent of total collective dose from Maximum Waste Processing Alternative	***0.19***	***0.19***	***1.0***	***1.0***

a. Dose conversion factors were 4.0×10^{-4} latent cancer fatality per person-rem for workers and 5.0×10^{-4} latent cancer fatality per person-rem for the general population.

b. Dose reported in SNF & INEL EIS (DOE 1995); includes Advanced Mixed Waste Treatment Project.

c. Assumes truck transport.

disposal facilities. The U.S. Nuclear Regulatory Commission evaluated these types of shipments based on a survey of radioactive materials transportation published in 1975 (NRC 1977). Categories of radioactive material evaluated by the Nuclear Regulatory Commission included limited quantity shipments, medical, industrial, fuel cycle, and waste. The Nuclear Regulatory Commission estimated the annual collective worker dose for these shipments was 5,600 person-rem, which would result in 2.2 cancer fatalities. The annual collective general population dose for these shipments was estimated to be 4,200 person-rem, which would result in 2.1 cancer fatalities. Because comprehensive transportation doses were not available, these collective dose estimates were used to estimate transportation collective doses for 1953 through 1982 (30 years). These dose estimates included shipments of spent nuclear fuel and radioactive waste shipments.

Weiner et al. (1991a,b) estimated doses to workers and the general public from land (truck) and air shipments of radioactive material and estimated the annual collective radiation dose to workers and the general population was 1,690 and 1,850 person-rem per year, respectively. Assuming similar exposure rates over the 1983 to 2037 period, the total collective doses to workers and the general public would be 96,000 person-rem and 103,000 person-rem, respectively.

The total number of cancer fatalities resulting from shipments of radioactive materials from 1953 through 2037 was estimated to be 255. Based on 300,000 cancer deaths/year (NRC 1977) over this same period (84 years), approximately 24,000,000 people will die from cancer. The transportation-related cancer deaths are less than 0.001 percent of this total. The maximum number of transportation-related cancer deaths that would occur as a result of the projects analyzed in this EIS would be less than 1 percent of the total number of cancer deaths resulting from transportation of radioactive materials and less than 0.00001 percent of the conservatively estimated total number of fatal cancers from all causes.

Like the historical transportation dose assessments, the estimates of collective doses due to general transportation exhibit considerable uncertainty. For example, data from 1975 were applied to all general transportation activities from 1953 through 1982. This approach may have overestimated doses because the amount of radioactive material transported and the number of shipments in the 1950s and 1960s was less than the amount shipped in the 1970s.

Comprehensive data that would enable a more accurate transportation dose assessment are not available so the dose estimates developed by the Nuclear Regulatory Commission were used. In addition, the collective doses identified in Weiner et al. (1991a,b) were assumed to be representative of the dose that would occur over the life of the project and are likely to understate the health effects that would occur as a result of unrelated shipments of radioactive material.

The estimate of the total number of fatal cancers from all causes that would occur over the life of the project is conservative, which tends to overstate the impacts of the project relative to the number of cancers that would occur from all causes. The number of cancer fatalities over time is influenced by numerous factors, including the population size and the age structure of the population. Although the estimate of 300,000 fatal cancers per year is probably too high for the 1950s and 1960s, the estimate is also too low for the 1980s, 1990s, ***and 2000s***. For example, there were more than ***553,000*** cancer fatalities in ***2001*** (American Cancer Society ***2001***).

Vehicular Accident Impacts - Facilities that involve the shipment of radioactive materials were surveyed for 1971 through 1993 using accident data from the U.S. Department of Transportation, the Nuclear Regulatory Commission, DOE and state radiation control offices. During this period, there were 21 vehicular accidents involving 36 fatalities. These fatalities resulted from the vehicular accidents and were not associated with the radioactive nature of the cargo; no radiological fatalities due to transportation accidents have ever occurred in the U.S. For the Transuranic Separations Option, it is estimated there would be approximately ***25*** vehicular accidents, which would be expected to result in approximately one (***0.98***) fatality over the shipment campaign. All other alternatives would involve fewer vehicular accidents and fatalities. During 1997, approximately 42,000 people were killed in all vehicle accidents (DOT 1997).

5.4.3.6 Health and Safety

Although there are a number of pathways through which radioactive materials at INTEC and INEEL operations could affect onsite workers or an offsite member of the public, air is the principal exposure pathway. Radiation doses ***and nonradiological impacts*** to public receptors in the vicinity of INEEL due to atmospheric releases have been analyzed in the SNF & INEL EIS and in Sections 5.2.6 and 5.2.10 of this EIS. Actual emissions of radionuclides are continuously monitored and the potential radiation dose to offsite members of the public is reported in INEEL annual site environmental reports (ESRF 1996, 1997).

The potential health effects from radiation exposure are presented as the estimated number of fatal cancers in the affected population. The potential health effects resulting from exposure to chemical carcinogens are presented as the number of lifetime cancers in the affected population. For exposure to noncarcinogenic chemicals, health effects are presented as estimated fatalities.

Historic radiation releases and subsequent offsite doses associated with INEEL operations have been evaluated and summarized in the SNF & INEL EIS (DOE 1995) and the Idaho National Engineering Laboratory Historical Dose Evaluation (DOE 1991). Airborne releases over the operating history of INEEL have always been within the radiation protection standards applicable at the time and the doses from those releases have been small in comparison to doses from sources of natural background radiation in the vicinity of INEEL (DOE 1991). Liquid-borne radioactive effluents from the INEEL have not, to this time, produced measurable exposure to offsite members of the public. Some potential biotic pathways ***such as*** animals and vegetation also exist, ***including*** game animals that assimilate radioactivity on the INEEL and are subsequently harvested. DOE has estimated that the potential radiation dose to individuals through ingestion of game animals, although unlikely, could be as high as 10 millirem per hunting season (DOE 1991). More recent analyses (ESRF 1998) of duck sampling data indicate the potential dose to be approximately 1 millirem.

Public exposure to residual radioactive materials left in place at INTEC after the completion of all remedial activities and implementation of a waste processing alternative would be small because of institutional controls. Materials left in place would potentially provide a source of contamination that could migrate to the Snake River Plain Aquifer. Public exposure to these contaminants could occur if the ***contaminant*** plumes within the aquifer migrated off the INEEL or to a point outside the institutionally controlled area. ***Since the Draft EIS, DOE has updated health and safety information specific to the long-term groundwater impacts (see Appendix C.9).***

Occupational Health - Activities to be performed by workers under each of the alternatives ***analyzed*** in this EIS are similar to activities currently performed at INTEC. Therefore, the potential hazards encountered in the workplace would be similar to existing hazards. For these reasons, the average measured radiation dose and the number of reportable cases of injury and illness are anticipated to be proportional to the number of workers employed under each alternative. The airborne pathway, through which materials released on the INEEL could affect workers, was modeled in the SNF & INEL EIS and was found to add negligible amounts to actual measured data.

As used in the SNF & INEL EIS, the average reportable radiation dose to an INEEL worker, including both INTEC and non-INTEC workers, was about 27 millirem per year. The value was based on 1991 occupational radiation monitoring results, but was projected to be representative over the 10-year period of the SNF & INEL EIS analysis. In addition, there is a potential for a small additional radiation dose due to atmospheric releases from INEEL facilities. The occupational dose received by the entire INEEL workforce would result in about one fatal cancer for ten years of operations (DOE 1995). For comparison, the natural lifetime incidence of fatal cancers in the same population from all other causes would be about 2,000. The greatest increase in the collective worker dose would occur under the Direct Cement Waste Option. This option would have a total campaign collective worker dose of ***1,100*** person-rem. The combined additional radiation dose to workers from this option would result in less than one (***0.43***) additional latent cancer fatality over the life of the project. All other options would result in a lower contribution to the cumulative collective worker dose.

For the evaluation of occupational health effects from chemical emissions, the modeled chemical concentrations were compared with applicable occupational standards (see Sections 5.2.6 and 5.2.10). Modeled concentrations below occupational standards were considered acceptable. Based on the analysis, no adverse health effects for onsite workers are projected to occur as a result of normal chemical emissions under any alternative.

Routine workplace safety hazards can result in injury or fatality. Projected injury rates were calculated based on INEEL historic injury rates for construction workers and for INEEL operations. The number of additional recordable cases and lost workdays that would be anticipated for each alternative are reported in Section 5.2.10.4.

Facility disposition at INTEC would also result in worker exposure to radiation. Clean Closure of the Tank Farm and bin sets would result in the greatest dose to workers at ***0.91*** latent cancer fatality. Disposition of other facilities and remedial activities undertaken at INTEC would also lead to worker exposure, but those doses were calculated to be much lower than for Clean Closure of the Tank Farm.

These analyses indicate that the cumulative radiological health effects, nonradiological health effects, and workplace safety hazards to the INEEL workforce would be small. The combined occupational risks are less than those encountered by the average worker in private industry.

Public Health - Air is the principal pathway through which radioactive materials released on the INEEL can reach offsite members of the public. The project-specific analysis of the potential radiation dose to the public in the vicinity of the INEEL indicates the potential radiation dose (to the maximally exposed individual and collectively) would be highest under the Continued Current Operations Alternative, Planning Basis Option, Hot Isostatic Pressed Waste Option, or Direct Cement Waste Option. These options would result in a potential annual radiological dose to the maximally exposed individual of approximately 0.002 millirem. This potential dose would be in addition to the dose from existing and proposed INEEL operations. Monitoring of existing operations indicated that the maximally exposed individual received a dose of 0.018 millirem and 0.031 millirem in 1995 and 1996, respectively (ESRF 1996, 1997). For comparison, the radiation dose to individuals residing in the vicinity of INEEL from natural background radiation ***and manmade sources*** averages approximately 360 millirem per year (ESRF 1997).

Waste processing options would add a maximum of ***0.11*** person-rem per year to the collective radiation dose received by the affected population. The collective radiological dose to the population within 50 miles of the INEEL in 1996 was ***0.24*** person-rem. Using the standard risk factors for estimating fatal ***cancers*** from a given calculated exposure, a ***maximum*** value of ***0.001*** fatal cancers would be obtained as a result of the cumulative radiation dose received by the population within 50 miles of the INEEL from existing INEEL operations, treatment of HLW, and other reasonably foreseeable actions at the INEEL. In essence, no fatalities would be expected. The natural lifetime incidence of cancer in the same population from all other causes would be about 24,000 cancers in a population of about 120,000 people (DOE 1995).

Other regional sources of atmospheric radioactivity have the potential to contribute to the radiation dose received by the public near the INEEL. The primary non-INEEL source of airborne radioactivity is emissions from phosphate processing operations in Pocatello, Idaho. EPA evaluated health effects in the exposed population from these emissions (EPA 1989). The number of fatal cancers in the population within 50 miles of Pocatello would be about one over a ten-year period. INEEL and the Pocatello phosphate plants are separated by enough distance that the population evaluated by EPA does not completely overlap the population evaluated in this EIS. The population exposed to the cumulative impact of both facilities would be small.

In addition to radiation dose from atmospheric emissions, there is a potential for impacts to the public from exposure to carcinogenic chemicals released to the air. No emissions of toxic air pollutants would exceed applicable standards ***under*** any alternative ***or option***, although emissions of ***nickel*** at the Maximum Achievable Control Technology limit, which is much higher than actual emissions are likely to be, could potentially reach ***10*** percent of the standard. Nevertheless, INEEL operations are not anticipated to exceed any applicable standards when emissions from the alternatives analyzed in this EIS are considered in conjunction with existing and anticipated emissions. The highest risks calculated for any alternative imply less than one fatal cancer in the exposed population. Therefore, no health effects are anticipated from releases of chemical carcinogens. No basis for use in evaluating risks from chemical exposure due to other regional commercial, industrial, and agricultural sources, such as combustion of diesel or gasoline fuels and agricultural use of pesticides, herbicides, and fertilizers, is available. Therefore, the ***cumulative*** potential health effects in the general population from INEEL activities combined with other sources of chemical exposure cannot be reliably estimated.

The volume of surface water ***flowing*** from the INEEL to offsite areas is negligible and there are no liquid discharges from operations to the intermittent streams on the INEEL. In the event storm water runoff from INTEC were to reach the Big Lost River channel, the flow would not leave the INEEL. Therefore, INEEL operations, including existing and proposed activities at INTEC, have a negligible contribution to cumulative impacts on public health resulting from the surface water pathway.

Long-term impacts from exposure to residual contamination - Long-term impacts to public health could potentially occur as a result of contaminants left in place after completion of closure activities and WAG 3 remedial action. Over time, these contaminants could migrate to the groundwater and ultimately be ingested by humans residing near the location of the INTEC and using the Snake River Plain Aquifer as a drinking water source.

Table 5.4-9 shows the unmitigated results of the baseline risk assessment for Operable Unit 3-13 and the results from the analyses of the facility disposition alternatives in this EIS. (Note the CERCLA Record of Decision for the Operable Unit 3-13 portion of WAG 3 committed DOE to meet the drinking water standards in the Snake River Plain Aquifer outside of the INTEC security fence by 2095.) For each evaluation, the dose is presented, along with the corresponding risks reported in the respective documents. Also included in the table are estimates of the annual dose to the maximally exposed individual and the time periods at which the presented doses and risks are applicable.

As shown in Table 5.4-9, the risk and dose ***shown in*** the WAG 3 risk assessment are both low but are not expected to overlap in time to any great extent with the doses and risks calculated for this EIS. The table presents the highest radiation dose for the maximally exposed resident farmer for facility disposition alternatives in this EIS, including the No Action Alternative. The table also contains estimates of annual doses due to groundwater consumption. The values in the table are below the drinking water standard of 4 millirem for beta/gamma-emitting radionuclides. Groundwater concentration limits for ***any of*** the radionuclides are also not exceeded.

In addition to the activities listed in Table 5.4-9, the total estimated cancer risk due to groundwater ingestion from closure in place of building CPP-633 would be 2.0×10^{-6} (DOE 1996). This value is small compared to the WAG 3 risk assessment. ***The potential for long-term cumulative impacts is discussed in Section 5.3.8.2. Section 5.2.14.6 provides a discussion of potential impacts to the groundwater from a postulated failure of five below grade storage tanks full of mixed transuranic waste/SBW.***

Additional health risk could occur as a result of nonradiological contaminants ***through the*** groundwater and fugitive dust pathways. However, in the cases assessed here, cancer risk ***would*** result only from inhalation of cadmium entrained in fugitive dust, as discussed in Appendix C.9. For all receptors and exposure scenarios, cancer risk from cadmium would be

Table 5.4-9. Comparison of groundwater impacts.

Evaluation Document	Total individual dose[a] over evaluation period (millirem)	Excess latent cancer fatality risk due to total individual dose	Annual individual dose due to drinking water during evaluation period [b] (millirem per year)	Time of evaluation (year)
Assessment derived from the Operable Unit 3-13 Baseline Risk Assessment ***(unmitigated)***	56[c] (beta/gamma emitting radionuclides) 250[c] (total radiation dose)	5.0×10^{-5}[d]	1.9 (beta/gamma-emitting radionuclides) 8.33 (total radiation dose)	2095
Idaho High-Level Waste and Facilities Disposition EIS				
Tank Farm	***4.4***[e]	$\boldsymbol{2.2\times10^{-6}}$[f]	***0.040***	***2800***
Bin Sets	***1.3***[e]	$\boldsymbol{6.5\times10^{-7}}$[f]	$\boldsymbol{7.8\times10^{-3}}$	***3000***
New Waste Calcining Facility	***0.034***[e]	$\boldsymbol{1.7\times10^{-8}}$[f]	$\boldsymbol{1.9\times10^{-4}}$	***3000***
Process Equipment Waste Evaporator	***0.036***[e]	$\boldsymbol{1.8\times10^{-8}}$[f]	$\boldsymbol{2.0\times10^{-4}}$	***3000***

a. The total radiation dose is presented for the duration reported in the respective documents.
b. The annual dose was estimated by dividing the total dose by the evaluation period duration.
c. The radiation dose for this receptor was calculated by using the groundwater concentrations reported by Rodriguez et al. (1997) and applying DOE dose conversion factors (DOE 1988).
d. The risk for this evaluation was calculated based on EPA methodology for risk assessment.
e. ***Values represent results for the maximally exposed resident for Performance-Based Closure.***
f. The risk for this evaluation was calculated based on National Council on Radiation Protection and Measurements and DOE guidance on risk assessment.

less than 1×10^{-9} and would not contribute substantially to the cumulative risk. Noncancer risk would be higher than for some receptors and scenarios, most notably those cases involving fluoride releases from onsite disposal of low-level Class A or C type grout.

5.4.3.7 Waste Management

Table 5.4-3 presents, by waste stream for each alternative, the total volumes of waste that would be generated under each alternative. Existing disposal of waste stored or buried on the INEEL includes approximately 145,000 cubic meters of low-level waste and about 62,000 cubic meters of transuranic waste. Although the volume of INEEL industrial waste previously ***disposed of*** in the INEEL Landfill Complex is unknown, it is estimated that the Landfill Complex would provide adequate capacity for the next 30 to 50 years, which would accommodate wastes generated over the life of the ***actions*** evaluated in this EIS.

Figures depicting the cumulative volume of specific waste streams that may be generated by INEEL activities over the projected life of the Idaho HLW & FD EIS alternatives have been developed using the INEEL baseline (Jason 1998) and LMITCO Project Data Sheets. Figures 5.4-1, 5.4-2, 5.4-3, and 5.4-4 project cumulative INEEL generation of low-level waste, mixed low-level waste, hazardous waste, and industrial waste, respectively.

Since issuance of the Draft EIS, more detailed information has become available on two INEEL projects, treatment of sodium-bonded spent nuclear fuel at Argonne National Laboratory-West (ANL-W) and irradiation of neptunium-237 targets at ATR. As discussed in

Cumulative Impacts (LLW)

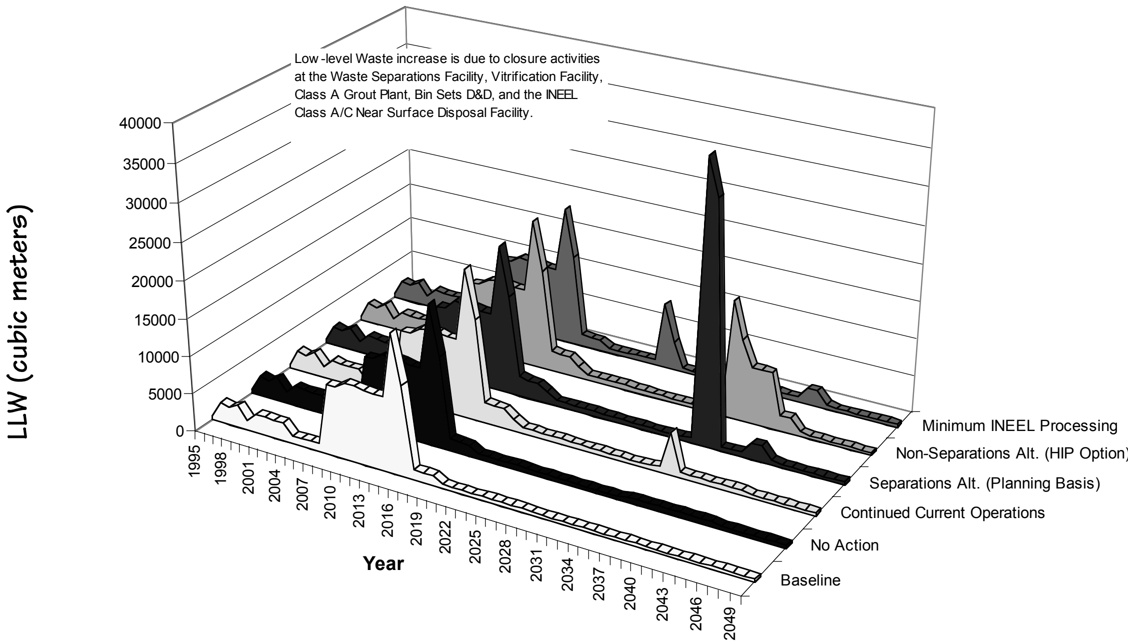


Figure 5.4-1. Cumulative generation of low-level waste at INEEL, 1995-2050.

Cumulative Impacts (MLLW)

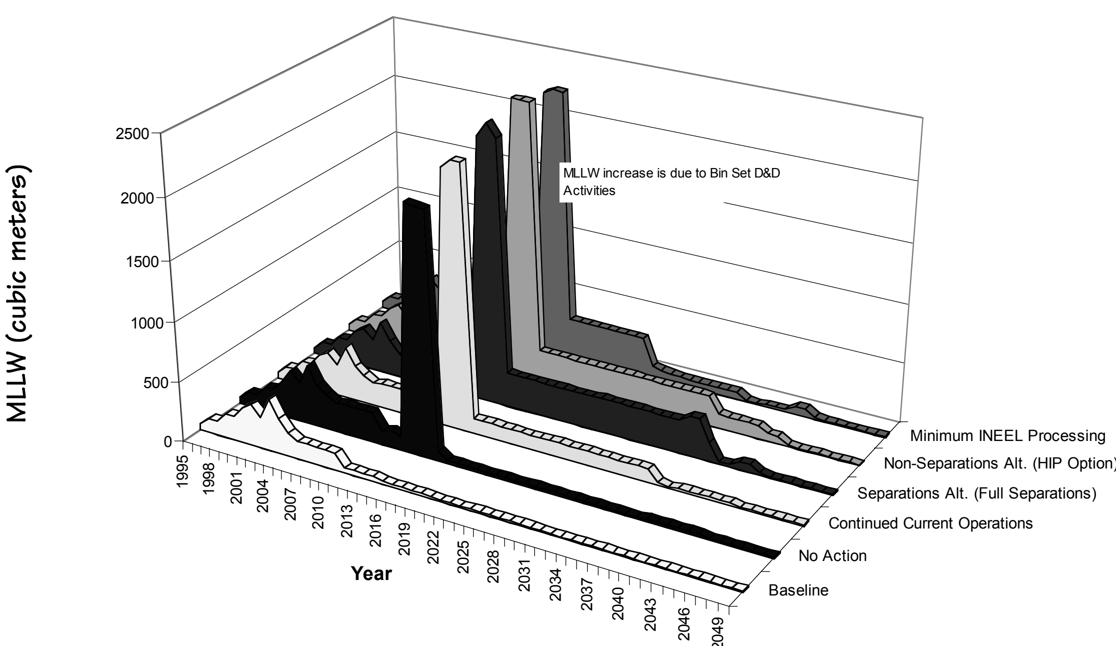


Figure 5.4-2. Cumulative generation of mixed low-level waste at INEEL, 1995-2050.

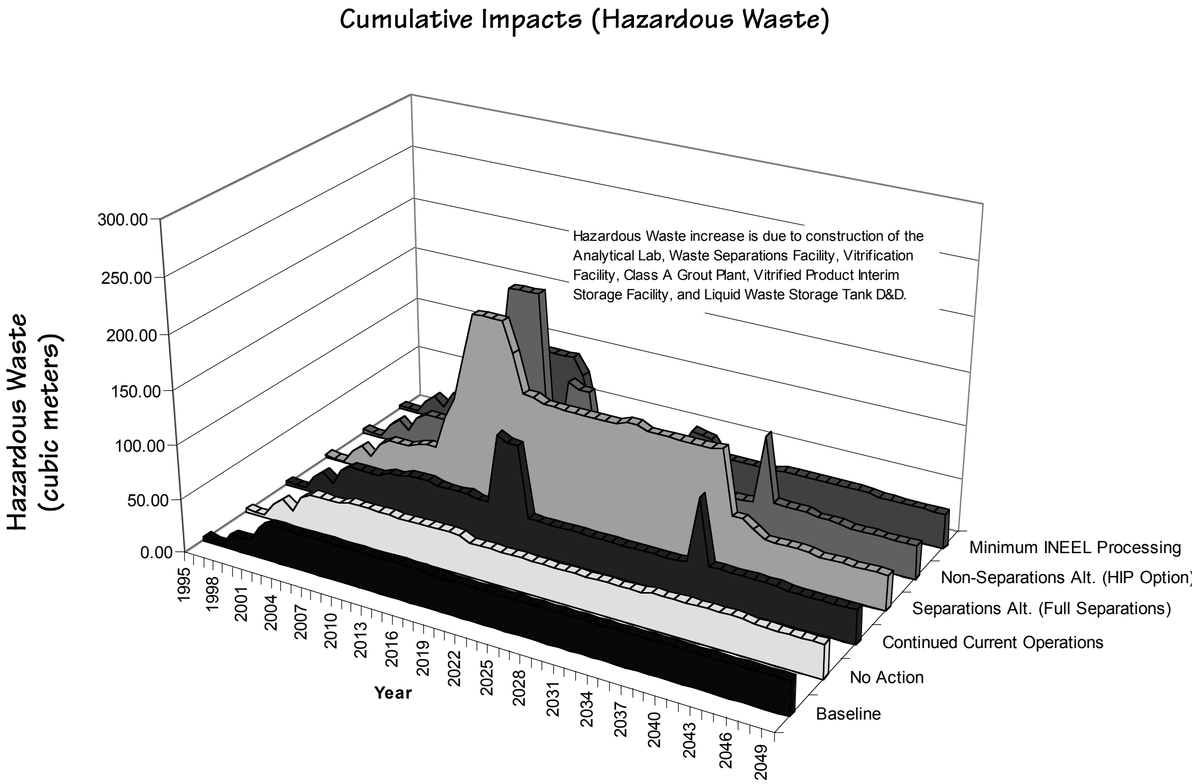


Figure 5.4-3. Cumulative generation of hazardous waste at INEEL, 1995-2050.

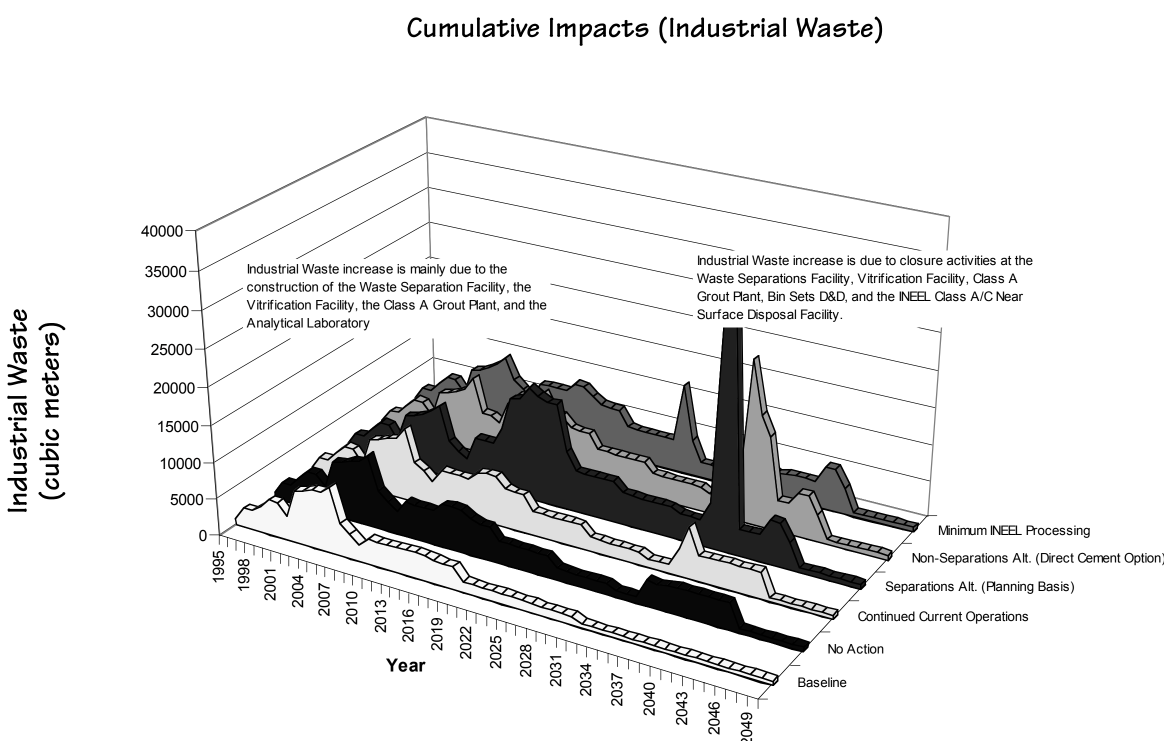


Figure 5.4-4. Cumulative generation of industrial waste at INEEL, 1995-2050.

Section 5.2.13 of this EIS, process waste volumes generated under the waste processing alternatives would be small relative to the volumes generated site-wide and complex-wide. Adding the modest volumes of process wastes likely to be produced by several other reasonably foreseeable projects listed in Table 5.4-2 would not substantially increase the volumes of waste generated at the INEEL and would not strain existing infrastructure or capacity. For example, HLW management activities are expected to generate a total of 9.7×10^3 cubic meters of mixed low-level waste over the 2000-2035 processing period (see Table 5.4-3). The electrometallurgical treatment of sodium-bonded fuel at ANL-W over the 2000-2015 timeframe would contribute another 40 cubic meters of mixed low-level waste to this total (DOE 2000a). Very small amounts of waste are expected to be generated by the irradiation of neptunium-237 targets at ATR and would not contribute to the mixed low-level waste total (DOE 2000b). DOE has plans to manage 1.4×10^5 cubic meters of mixed low-level waste over the next 20 years and is prepared to build additional treatment capacity should it be necessary.

HLW management activities are expected to generate as much as 1.0×10^4 cubic meters of low-level waste over the 2000-2035 processing period. Treatment of sodium-bonded fuel at ANL-W is expected to contribute another 850 cubic meters of low-level waste over a 15-year period, while irradiation of neptunium-237 targets at ATR is expected to produce 1 cubic meter of low-level waste. This compares to an average annual generation rate of 2.9×10^3 cubic meters for the INEEL site as a whole. DOE has plans to generate and safely manage approximately 1.5 million cubic meters of low-level waste over the next 20 years. The quantities of low-level waste that would be produced by the proposed action and other reasonably foreseeable activities are minor compared to the amount that would be produced by other DOE activities (complex-wide) and should have very little impact on the ability of existing DOE disposal facilities to manage this waste.

The waste processing alternatives would result in the generation of as much as 6.0×10^4 cubic meters per year of industrial (nonhazardous and nonradiological) waste during construction and 5.3×10^4 cubic meters per year during operations. The peak annual production of industrial waste (8.5×10^3 cubic meters, during construction) represents a 10 to 18 percent increase in the volumes currently disposed of at the INEEL Landfill Complex (in the Central Facilities Area), which in recent years have ranged between 4.6×10^4 and 8.5×10^4 cubic meters. Little or no additional industrial waste is expected to be generated by the treatment of sodium-bonded fuel at ANL-W or the irradiation of neptunium-237 targets at ATR. Although the volume of industrial waste previously disposed of in the Landfill Complex is unknown, it is estimated that the INEEL Landfill Complex would provide adequate capacity for the next 30 to 50 years, which would accommodate industrial wastes generated over the life of the projects analyzed in this EIS and other reasonably foreseeable projects.

Consistent with the Draft EIS, this discussion emphasizes process wastes, because ultimate disposition of these wastes is largely the responsibility of INEEL, whereas product wastes are generally intended for two national repositories, the Waste Isolation Pilot Plant and the national geologic repository. The potential cumulative impacts of managing product wastes result from the need to provide interim storage and ultimately transport the material to a repository for disposal.

DOE's decision (65 FR 56565; September 19, 2000) to select electrometallurgical treatment at ANL-W as the preferred alternative for treatment and management of INEEL sodium-bonded spent nuclear fuel will produce treated HLW forms in addition to those evaluated in this EIS, with potential cumulative impacts with respect to waste management and transportation. Electrometallurgical treatment of accumulated sodium-bonded fuel at the INEEL would produce approximately 80 cubic meters of high-level (ceramic and metallic) waste, the equivalent of approximately 130 HLW canisters (DOE 2000a). This added volume of treated HLW could require an expansion of interim storage facilities planned under the waste processing alternatives.

Based on the waste processing option and transportation mode selected, the waste processing alternatives would require between 650 and 18,000 truck shipments or between 130 and

3,600 rail shipments to transport treated HLW canisters from INTEC to a national geologic repository. An additional 130 truck shipments or 26 rail shipments would be needed to transport the HLW canisters produced from electrometallurgical treatment of accumulated sodium-bonded fuel at ANL-W.

5.5 Mitigation Measures

As required by the Council on Environmental Quality, ***DOE*** considered mitigation measures that could reduce or offset the potential environmental consequences of waste management activities that are not integral to the alternatives analyzed in this EIS. ***Under any of the alternatives analyzed in this EIS standard management controls, engineering, safety and health practices, cultural and biological surveys and site restoration requirements would be uniformly implemented. No impact resulting from normal operations under any of the alternatives or options analyzed in this EIS would require a specifically designed mitigation measure. If future connected actions have the potential to lead to impacts beyond those described in Chapter 5 of this EIS, mitigation action planning would begin concurrent with consideration of the need for appropriate National Environmental Policy Act documentation.*** Appendix C.8 discusses mitigation measures that could reduce or offset potential impacts at Hanford under the Minimum INEEL Processing Alternative.

5.6 Unavoidable Adverse Environmental Impacts

This section summarizes potential unavoidable adverse environmental impacts associated with the alternatives analyzed in this EIS. Unavoidable impacts are ***those*** that would occur after implementation of all ***standard management controls, engineering, safety and health practices, cultural and biological surveys and site restoration requirements and*** feasible mitigation measures. ***Appendix*** C.8 contains a discussion of potential unavoidable adverse impacts at Hanford associated with the Minimum INEEL Processing Alternative.

5.6.1 CULTURAL RESOURCES

Existing facilities or facilities constructed under the alternatives analyzed in this EIS as well as the institutional controls that would be necessary following facilities disposition could occupy INEC and adjacent areas for an indefinite period of time. Even after remediation, the appearance and presence of institutional controls would likely preclude the INTEC area from ever being returned to its natural cultural setting or to a condition where the effects of industrial activities were not the most evident feature of the landscape.

5.6.2 AESTHETIC AND SCENIC RESOURCES

INTEC is distant from points along U.S. Highways 20 and 26 where the facility is visible to the public. Changes in the specific configuration of facilities within the INTEC ***under the alternatives analyzed in this EIS*** would change the viewscape to some degree, but those changes would ***not*** likely be noticed ***by*** the casual observer.

Emission rates for pollutants under the waste processing alternatives are not expected to exceed levels currently or previously ***emitted*** by INEEL sources; therefore, the "visual impact" of these alternatives is already reflected in existing baseline conditions. Nevertheless, conservative visibility screening analysis has been performed to evaluate the relative potential for visibility impacts between alternatives. The views analyzed were at Craters of the Moon Wilderness Area and Fort Hall Indian Reservation. The results of the visibility analysis indicate that emissions ***under*** the waste processing alternatives ***analyzed in this EIS*** would not result in deleterious impacts on scenic views at Craters of the Moon Wilderness Area or Fort Hall Indian Reservation (including the view to Middle Butte, an important cultural resource to the Shoshone-Bannock Tribes). Generators and night lighting associated with facilities at INTEC would increase the visible and audible intrusion to the aesthetic environment in the vicinity of the INTEC but would have little or no impact at the nearest points of public access along public highways.

5.6.3 AIR RESOURCES

Construction or demolition activities would result in short-term increases of particulate emissions in localized areas. Emissions of criteria pollutants, toxic air pollutants, and radionuclides may result in some degradation of air quality ***during the period of waste treatment*** under ***any of the action*** alternatives ***analyzed in this EIS***.

5.6.4 WATER RESOURCES

Water consumption would increase as a result of construction activities, operational activities, facility disposition, and the increased workforce at INTEC. An unavoidable adverse impact of all alternatives would be the risk of migration of ***residual*** contaminants from contaminated media and areas at INTEC to the Snake River Plain Aquifer. Based on the quantity of untreated material that would be left in place (approximately ***1,000,000*** gallons of mixed transuranic waste/SBW and ***4,400*** cubic meters of mixed HLW calcine), the greatest potential for migration of contaminants would occur under the No Action Alternative.

5.6.5 ECOLOGICAL RESOURCES

The entire area ***within and adjacent to the INTEC fence line has been cleared of natural vegetation and the habitat it provides is poor compared to the surrounding sagebrush steppe. This condition would exist during the operating period under any of the alternatives analyzed in this EIS. After facility disposition most of the area would likely return to near natural conditions of habitat diversity and productivity.***

Radionuclide exposure of plant and animal species in the areas adjacent to INTEC could increase slightly due to operations ***that would occur under the action alternatives***. Residual radionuclides in soils surrounding INTEC, not related to the proposed action, would still potentially be absorbed by plants and consumed by animals. Although exposure to these materials could theoretically result in injury to individual animals or plants, measurable impacts to populations on or off the INEEL have not occurred and are not expected to occur as a result of ***implementing any alternative analyzed in this EIS***.

5.6.6 HEALTH AND SAFETY

The workforce and offsite population would be exposed to low levels of radionuclides under any of the alternatives analyzed in this EIS. Exposure would be highest under the Direct Cement Waste Option of the Non-Separations Alternative. This exposure could potentially lead to less than 1 (***0.43***) latent cancer fatality within the exposed workforce. The highest collective worker dose during disposition of new facilities associated with the waste processing alternatives ***could*** result in less than one (***0.12***) latent cancer fatality. The highest collective worker dose from disposition of existing facilities associated with HLW management would occur as a result of Clean Closure of the Tank Farm and ***could*** result in an estimated ***0.76*** latent cancer fatality. The highest total collective dose to the offsite population from any alternative described in this EIS would occur under the Early Vitrification Option and ***could*** lead to less than one (8.5×10^{-4}) latent cancer fatality within the population residing within 50 miles of the INTEC. As described in Section 5.2.6, DOE does not expect exposure to noncarcinogenic and carcinogenic toxic air pollutants to result in health impacts.

5.7 Short-term Use Versus Long-term Productivity of the Environment

This section compares ***the*** potential short-term ***effects*** of ***the alternatives analyzed in this EIS*** on the ***use of the*** environment ***with*** the ***potential*** effects on ***its*** long-term productivity. ***Appendix*** C.8 contains a discussion of the relationship between short-term uses of the environment and long-term productivity at Hanford under the Minimum INEEL Processing Alternative.

5.7.1 *NO ACTION ALTERNATIVE*

Short-term use of the existing environment would not change from that described in Chapter 4 of this EIS. Long-term productivity could be impaired through the risk associated with the indefinite storage of mixed transuranic waste/SBW and calcine in the tank farm and bin sets at INTEC. The radioactivity in the mixed transuranic waste/SBW and calcine would decay over thousands of years but the potential for release to the aquifer and surrounding environment would increase as the tank farm and bin sets aged and the level of uncertainty of maintaining institutional controls increased.

5.7.2 CONTINUED CURRENT OPERATIONS ALTERNATIVE

As with the No Action Alternative, short term use of the environment would not change from that described in Chapter 4 of this EIS. There would be some small short-term worker risk and small short term impairment of air quality associated with calcining the remaining mixed transuranic waste/SBW but this would contribute to reducing long term risk and preserving the long term productivity of the environment. The long-long term productivity of the environment could be impaired through the presence and risk associated with the indefinite storage of calcine but the risk associated with the indefinite storage of mixed transuranic waste/SBW would not exist. Thus, the risk to the long term productivity of the aquifer would be less than the No Action Alternative. Radioactivity in the calcine would decay over thousands of years but the potential for release to the surrounding environment would increase as the bin sets aged and the level of uncertainty of maintaining institutional controls increased.

5.7.3 ACTION ALTERNATIVES

In the context of their affects on short-term use versus long-term productivity of the environment the action alternatives are indistinguishable. Each of the action alternatives involves a period of treating mixed transuranic waste/SBW and treating or containerizing calcine during which there would be a small temporary increase in worker risk and impairment to air quality. The short-term use of the environment would not change from that described in Chapter 4 of this EIS. Each of the action alternatives would place the mixed transuranic waste/SBW and calcine in a form suitable for disposal and place the treated waste forms in a disposal facility or repository designed to preserve the long term productivity of the environment and reduce dependence on the effectiveness of institutional controls.

5.8 Irreversible and Irretrievable Commitments of Resources

The irreversible ***or*** irretrievable commitment ***of resources is*** the permanent loss ***of a resource for future uses or alternative purposes. These kinds of*** commitments occur as a result of destruction ***or use*** of a resource (e.g., fossil fuels) that cannot be replaced ***or recovered***. Irreversible and irretrievable commitments of resources ***could*** potentially include land, groundwater, construction materials, and energy resources. Some resources and materials that would be used under each alternative could be recycled and do not represent an irreversible ***or***

irretrievable commitment, ***for example,*** structural and stainless steel used in construction could be recovered and recycled after the completion of project related activities.

Activities at the INEEL ***and at INTEC*** have resulted in the ***chemical and radioactive contamination of*** the Snake River Plain Aquifer ***in localized areas***. ***This has resulted in an irreversible and irretrievable commitment of the groundwater that is actually contaminated.*** Services lost ***due to the contaminants*** include ***possible*** limits on the ***future*** location of wells, ***and use of water for drinking and agricultural production***. Risk of future contamination of groundwater underlying the INTEC, and hence commitment of the groundwater resource, ***would be*** highest under the No Action Alternative.

Borrow materials extracted on the INEEL would be ***used but not actually*** irreversibly and irretrievably committed ***to*** support activities associated with waste processing, facility disposition, ***and environmental restoration***. Materials ***required*** for facility construction, such as structural steel, could ultimately be recycled depending on market conditions. All of these materials are plentiful ***and their*** consumption ***under any alternative analyzed in this EIS*** would not lead to shortages in ***their*** availability. ***Chemicals and other materials, such as nitric acid and titanium or aluminum powder, would be used up or permanently converted to other forms under any of the alternatives involving waste treatment. These materials and chemicals could not be recycled in any volume but none are of strategic importance nor are any in short supply.***

Consumption of fossil fuel during the construction phase would be highest under the Vitrification with Calcine Separations Option, which would require an estimated 0.81 million gallons of fuel per year. The peak annual fossil fuel usage for operations is also highest under this option at 5.0 million gallons per year. Other options would consume substantially less fossil fuel during both construction and operations phases.

The Planning Basis Option has the highest requirement for electrical energy during the construction phase. This option would require up to 6,500 megawatt-hours per year during construction. All other alternatives have lower requirements for electrical energy. ***The Vitrification with Calcine Separations Option has the highest operations-phase energy requirement, 5.2×10^4 megawatt hours per year.*** All other alternatives would require ***less*** electrical energy. Annual energy requirements for facility disposition, including decontamination and decommissioning of new waste processing facilities and closure of existing facilities, would be much lower than peak energy demands identified for waste processing.