5.11.1.3.3.4 Treatment – New Waste Processing Facility

The DOE would construct a new waste processing treatment facility in the 200 West Area to augment existing capabilities for treatment of contact-handled (CH) MLLW. DOE would provide onsite treatment for CH MLLW at this facility in addition to non-standard, remote-handled (RH) MLLW and TRU waste.

Radiological Consequences. Radiological consequences of accidents would be the same as those described for the modified T Plant Complex described under Alternative Group A (see Section 5.11.1.1.3.3).

Non-Radiological (Chemical) Consequences. Non-radiological consequences for the new waste processing facility have not been evaluated in detail. However, potential non-radiological impacts from accidents in the WRAP and the modified T Plant Complex are expected to be representative for potential impacts from the new waste processing facility. Potential impacts from accidents in the CWC and LLBGs would likely be bounding for accidents in the new waste processing facility.

Industrial Accidents-Construction. Direct employment for the new waste processing facility construction would total 278 worker-years. The estimated health and safety impacts would be 23 total recordable cases, 8 lost workday cases, and 150 lost workdays.

Industrial Accidents-Operations. Alternative Group B direct operations staffing in the new waste processing facility would be the same as described for the modified T Plant Complex under Alternative Group A (see Section 5.11.1.1.3.3).

5.11.1.3.3.5 Disposal – HSW Disposal Facilities

Potential radiological and non-radiological (chemical) accidents and impacts for the HSW disposal facilities under Alternative Group B would be the same as for Alternative Group A. Industrial accidents are discussed below.

Industrial Accidents-Construction. Slightly more impacts would be expected for LLBG construction under Alternative Group B than Alternative Group A and would require 54 to 83 worker-years. The estimated health and safety impacts would be 4 to 6 total recordable cases, 1 to 2 lost workday cases, and 24 to 41 lost workdays.

Industrial Accidents-Operations. Industrial accidents from LLBG operations would be the same as Alternative Group A (see Section 5.11.1.1.3.4).

ILAW Industrial Accidents. Industrial accidents form ILAW trench construction, operations, and closure would be the same as Alternative Group A (see Section 5.11.1.1.3.4).

5.11.1.4 Alternative Group C

Alternative Group C is similar to Alternative Group A except for the disposal location of some of the

waste streams. See Section 5.0 for a summary of the characteristics for this alternative.

5.11.1.4.1 Construction

Primary impacts from construction activities would be air quality and injuries to construction workers. The construction activities would result in the emission of criteria pollutants, as identified in (40 CFR 50) from the use of combustion engines and earthmoving activities. Impacts are measured by comparison of air concentrations with regulatory limits at the point of maximum potential public exposure. The air quality analysis (Section 5.2) indicates that maximum emissions of all criteria pollutants (including sulfur dioxide, carbon monoxide, nitrogen dioxide, and PM_{10}) from construction activities would result in air concentrations below the regulatory limits. As a consequence, no impacts on public health from emissions would be expected. Impacts from industrial accidents during construction are discussed in Section 5.11.1.3.3.

5.11.1.4.2 Normal Operations

Potential impacts to public health from normal operations include air quality impacts from atmospheric releases of radionuclides and chemicals from waste operations. Long-term impacts from releases to groundwater from LLBGs are discussed in Sections 5.11.2 and 5.3.

Alternative Group C involves operations that may result in routine releases of radionuclides and chemicals to the atmosphere and are the same operations as for Alternative Group A. These operations include waste package verification, treatment, and packaging at the WRAP; treatment and packaging of waste at the modified T Plant Complex; and treatment of leachate from MLLW trenches using pulse driers. The annual releases have been estimated for each year of operation for the facilities involved in this alternative. Details of the release calculations are presented in Appendix F, Section F.1.

5.11.1.4.2.1 Health Impacts from Routine Radionuclide Releases

The expected doses and health impacts to non-involved workers and public from routine atmospheric releases of radionuclides are presented in Table 5.54 for the Hanford Only waste volume, Table 5.55 for the Lower Bound waste volume, and in Table 5.56 for the Upper Bound waste volume. The tables present the maximum annual dose to the non-involved workers and the MEI, the collective dose to public along with the probability of developing an LCF for the individual, and the number of LCFs expected for the public. Given that the cancer risk estimates and doses are small in comparison to regulatory limits,[(a)] no adverse health impacts would be expected from radionuclide releases.

(a) The maximum annual radiation dose presented in this section may be compared to the regulatory limit of 10 mrem/year (WAC 246-247; 40 CFR 61; DOE 1993).

Table 5.54. Non-Involved Worker and Public Health Impacts from Routine Atmospheric Releases of Radionuclides – Alternative Group C, Hanford Only Waste Volume

Exposed Group	Exposure Scenario[a]	Facility	Lifetime Dose[b] (mrem)	Probability of LCFs[c]	Maximum Annual Dose	
					Year	mrem
Worker Onsite (non-involved)	Industrial	WRAP	1.2E-03	7E-10	2004	1.3E-04
		Modified T Plant Complex	4.8E-01	3E-07	2003	3.9E-02
		Leachate Treatment[d, e]	5.8E-08	3E-14	2026	3.2E-09
MEI Offsite	Resident Gardener	WRAP	9.9E-05	6E-11	2004	1.1E-05
		Modified T Plant Complex	1.5E-03	9E-10	2003	1.1E-04
		Leachate Treatment	3.0E-11	2E-17	2026	1.6E-12
		Total	1.6E-03	1E-09	2003	1.2E-04
			(person-rem)	**Number of LCFs[g]**	**Year**	**(person-rem)**
Population[f]	Population within 80 km (50 mi)	WRAP	9.1E-03	0 (5E-06)	2004	7.4E-04
		Modified T Plant Complex	1.4E-01	0 (8E-05)	2003	7.4E-03
		Leachate Treatment	2.7E-09	0 (2E-12)	2026	1.1E-10
		Total	1.5E-01	0 (9E-05)	2003	8.1E-03

(a) The exposure duration for the industrial scenario is 20 years and for the resident gardener, 30 years. The exposure scenarios are described in Appendix F.
(b) The lifetime dose is the radiation dose received from intake during the exposure period and up to 50 years after exposure due to radionuclides deposited in the body during the exposure period.
(c) LCF = latent cancer fatality.
(d) Leachate treatment is a pulse drier operation.
(e) If LLW trenches were to be lined, the doses from leachate collection and treatment might be as much as three times the leachate treatment values shown in this table.
(f) The population lifetime impacts are based on exposure for the same exposure pathways impacting the resident gardener MEI.
(g) The value in parentheses is the calculated value based on the population dose and the appropriate health effects conversion factor. The actual number of LCFs must be a whole number (deaths).

Table 5.55. Non-Involved Worker and Public Health Impacts from Routine Atmospheric Releases of Radionuclides – Alternative Group C, Lower Bound Waste Volume

Exposed Group	Exposure Scenario[a]	Facility	Lifetime Dose[b] (mrem)	Probability of LCFs[c]	Maximum Annual Dose	
					Year	mrem
Worker Onsite (non-involved)	Industrial	WRAP	1.4E-03	9E-10	2004	1.6E-04
		Modified T Plant Complex	5.8E-01	3E-07	2003	4.8E-02
		Leachate Treatment[d, e]	6.0E-08	4E-14	2026	3.3E-09
MEI Offsite	Resident Gardener	WRAP	1.2E-04	7E-11	2004	1.3E-05
		Modified T Plant Complex	1.7E-03	1E-09	2003	1.2E-04
		Leachate Treatment	3.1E-11	2E-17	2026	1.6E-12
		Total	1.8E-03	1E-09	2003	1.3E-04
			(person-rem)	**Number of LCFs[g]**	**Year**	**(person-rem)**
Population[f]	Population within 80 km (50 mi)	WRAP	1.1E-02	0 (6E-06)	2004	8.8E-04
		Modified T Plant Complex	1.6E-01	0 (9E-05)	2003	8.5E-03
		Leachate Treatment	2.8E-09	0 (2E-12)	2026	1.2E-10
		Total	1.7E-01	0 (1E-04)	2003	9.4E-03

(a) The exposure duration for the industrial scenario is 20 years and for the resident gardener, 30 years. The exposure scenarios are described in Appendix F.
(b) The lifetime dose is the radiation dose received from intake during the exposure period and up to 50 years after exposure due to radionuclides deposited in the body during the exposure period.
(c) LCF = latent cancer fatality.
(d) Leachate treatment is a pulse drier operation.
(e) If LLW trenches were to be lined, the doses from leachate collection and treatment might be as much as three times the leachate treatment values shown in this table.
(f) The population lifetime impacts are based on exposure for the same exposure pathways impacting the resident gardener MEI.
(g) The value in parentheses is the calculated value based on the population dose and the appropriate health effects conversion factor. The actual number of LCFs must be a whole number (deaths).

Table 5.56. Non-Involved Worker and Public Health Impacts from Routine Atmospheric Releases of Radionuclides – Alternative Group C, Upper Bound Waste Volume

Exposed Group	Exposure Scenario[a]	Facility	Lifetime Dose[b] (mrem)	Probability of LCFs[c]	Maximum Annual Dose	
					Year	mrem
Worker Onsite (non-involved)	Industrial	WRAP	2.2E-03	1E-09	2004	1.9E-04
		Modified T Plant Complex	8.9E-01	5E-07	2006	7.2E-02
		Leachate Treatment[d, e]	1.2E-07	7E-14	2026	6.7E-09
MEI Offsite	Resident Gardener	WRAP	2.1E-04	1E-10	2004	1.6E-05
		Modified T Plant Complex	2.3E-03	1E-09	2006	1.7E-04
		Leachate Treatment	6.2E-11	4E-17	2026	3.3E-12
		Total	2.5E-03	1E-09	2006	1.9E-04
			(person-rem)	Number of LCFs[g]	Year	(person-rem)
Population[f]	Population within 80 km (50 mi)	WRAP	1.9E-02	0 (1E-05)	2004	1.1E-03
		Modified T Plant Complex	2.2E-01	0 (1E-04)	2006	1.5E-02
		Leachate Treatment	5.6E-09	0 (3E-12)	2026	2.3E-10
		Total	2.4E-01	0 (1E-04)	2006	1.6E-02

(a) The exposure duration for the industrial scenario is 20 years and for the resident gardener, 30 years. The exposure scenarios are described in Appendix F.
(b) The lifetime dose is the radiation dose received from intake during the exposure period and up to 50 years after exposure due to radionuclides deposited in the body during the exposure period.
(c) LCF = latent cancer fatality.
(d) Leachate treatment is a pulse drier operation.
(e) If LLW trenches were to be lined, the doses from leachate collection and treatment might be as much as three times the leachate treatment values shown in this table.
(f) The population lifetime impacts are based on exposure for the same exposure pathways impacting the resident gardener MEI.
(g) The value in parentheses is the calculated value based on the population dose and the appropriate health effects conversion factor. The actual number of LCFs must be a whole number (deaths).

5.11.1.4.2.2 Health Impacts from Chemical Releases

Releases of chemicals to the atmosphere could occur for the same processes involving release of radionuclides when wastes with hazardous chemicals are involved. The potential health impacts from chemical releases to the atmosphere for Alternative Group C are the same as for Alternative Group A, as presented in Table 5.29 for all waste volumes. The results are the same because the same processing and atmospheric releases occur for both alternative groups. Because all the peak hazard quotients are less than 1, and because the cancer risk estimates are small, no adverse health impacts would be expected from chemical releases.

5.11.1.4.2.3 Worker Occupational Radiation Exposure

The radiation dose received by workers involved with waste operations is estimated using historical exposure data for the facilities involved in the alternative, as provided in FH (2003). The potential radiation exposure to workers for Alternative Group C are summarized in Table 5.57 for the Hanford

Only waste volume, in Table 5.58 for the Lower Bound waste volume, and in Table 5.59 for the Upper Bound waste volume. The results are very similar to the Alternative Group A results except for pulse drier treatment of leachate. All estimated radiation doses to workers are well below regulatory limits.[(a)]

5.11.1.4.3 Accidents

Potential impacts of accidents under Alternative Group C would be identical to those described for Alternative Group A (see Section 5.11.1.1.3).

5.11.1.5 Alternative Group D

Alternative Group D is similar to Alternative Group A except for the disposal location of some of the waste streams. See Section 5 for a summary of the characteristics for the three subalternatives (D_1, D_2, and D_3) to this alternative group.

5.11.1.5.1 Construction

Primary impacts from construction activities would be air quality and injuries to construction workers. The construction activities would result in the emission of criteria pollutants (40 CFR 50) from the use of combustion engines and earthmoving activities. Impacts are measured by comparison of air concentrations with regulatory limits at the point of maximum potential public exposure. The air quality analysis (Section 5.2) indicates that maximum emissions of all criteria pollutants (including sulfur dioxide, carbon monoxide, nitrogen dioxide, and PM_{10}) from construction activities would result in air concentrations below the regulatory limits. As a consequence, no impacts on public health from emissions would be expected. Impacts from industrial accidents during construction are discussed in Section 5.11.1.4.3.

5.11.1.5.2 Normal Operations

Potential impacts to public health from normal operations include air quality impacts from atmospheric releases of radionuclides and chemicals from waste operations. Long-term impacts from releases to groundwater from LLBGs are discussed in Sections 5.11.2 and 5.3.

Alternative Group D involves operations that may result in routine releases of radionuclides and chemicals to the atmosphere and are the same as operations for Alternative Group A. These operations include waste package verification, treatment, and packaging at the WRAP; treatment and packaging of waste at the modified T Plant Complex; and treatment of leachate from MLLW trenches using pulse driers. The annual releases have been estimated for each year of operation for the facilities involved in this alternative. Details of the release calculations are presented in Appendix F, Section F.1.

(a) The annual limit for occupational exposures is 5000 mrem/year (10 CFR 835).

Table 5.57. Occupational Radiation Exposure – Alternative Group C, Hanford Only Waste Volume

Facility	Operating Period	Worker Category	Workers (FTE)[a]	Average Dose Rate (mrem/yr)	Workforce Dose (person-rem)	Workforce LCF[c]
LLW and MLLW Trenches	2002-2046	Operator	14	54	34	0 (2E-02)
		RCT[b]	4	45	8.5	0 (5E-03)
		Other	66	35	104	0 (6E-02)
ILAW	2008-2028	Workers	70	300[d]	443	0 (3E-01)
	2032-2046	Workers	20	14	4.1	0 (2E-03)
CWC	2002-2046	Operator	12	54	29	0 (1E-02)
		RCT	4	45	8.6	0 (5E-03)
		Other	55	17	42	0 (3E-02)
WRAP	2002-2032	Operator	13	18	7.3	0 (4E-03)
		RCT	9	36	10	0 (6E-03)
		Other	29	13	12	0 (7E-03)
	2033-2039	Operator	9	18	1.2	0 (7E-04)
		RCT	6	36	1.6	0 (1E-03)
		Other	21	13	1.9	0 (1E-03)
Modified T Plant Complex	2002-2032	Operator	20	9	5.6	0 (3E-03)
		RCT	18	13	7.3	0 (4E-03)
		Other	38	7	8.2	0 (5E-03)
	2033-2046	Operator	14	9	1.7	0 (1E-03)
		RCT	13	13	2.3	0 (1E-03)
		Other	27	7	2.6	0 (2E-03)
	2013-2031	Operator	10	13	2.6	0 (2E-03)
		RCT	10	13	2.4	0 (1E-03)
		Other	20	13	4.9	0 (3E-03)
Generator Staff[e]	2002-2019	Operator	15	34	9.2	0 (6E-03)
		RCT	12	35	8	0 (5E-03)
	2020-2026	Operator	5	34	1.2	0 (7E-04)
		RCT	3	35	0.7	0 (4E-04)
	2027-2044	Operator	1	34	0.6	0 (4E-04)
		RCT	1	35	0.6	0 (4E-04)
Pulse Driers	2026-2077	Operator	0.4	54	1.1	0 (7E-04)
Total					765	0 (5E-01)

(a) The number of workers is the average necessary for the facility during the indicated period.
(b) RCT = radiation control technician.
(c) LCF = latent cancer fatality. Workforce LCFs are the inferred number of cancer deaths in the exposed workforce, which must be a whole number (deaths). The value in parentheses is the calculated value based on the workforce dose and the appropriate health effects conversion factor.
(d) The dose rates for placement of ILAW into disposal facilities are higher than for other solid waste management operations because the material emits more radiation.
(e) Staff in the solid waste support services group that work as needed in various solid waste facilities.

Table 5.58. Occupational Radiation Exposure – Alternative Group C, Lower Bound Waste Volume

Facility	Operating Period	Worker Category	Workers (FTE)[a]	Average Dose Rate (mrem/yr)	Workforce Dose (person-rem)	Workforce LCF[c]
LLW and MLLW Trenches	2002-2046	Operator	14	54	34	0 (2E-02)
		RCT[b]	4	45	8.5	0 (5E-03)
		Other	66	35	104	0 (6E-02)
ILAW	2008-2028	Workers	70	300[d]	443	0 (3E-01)
	2032-2046	Workers	20	14	4.1	0 (2E-03)
CWC	2002-2046	Operator	12	54	29	0 (2E-02)
		RCT	4	45	8.6	0 (5E-03)
		Other	55	17	42	0 (3E-02)
WRAP	2002-2032	Operator	13	18	7.3	0 (4E-03)
		RCT	9	36	10	0 (6E-03)
		Other	29	13	12	0 (7E-03)
	2033-2039	Operator	9	18	1.2	0 (7E-04)
		RCT	6	36	1.6	0 (1E-03)
		Other	21	13	1.9	0 (1E-03)
Modified T Plant Complex	2002-2032	Operator	20	9	5.6	0 (3E-03)
		RCT	18	13	7.3	0 (4E-03)
		Other	38	7	8.2	0 (5E-03)
	2033-2046	Operator	14	9	1.7	0 (1E-03)
		RCT	13	13	2.3	0 (1E-03)
		Other	27	7	2.6	0 (2E-03)
	2013-2031	Operator	10	13	2.6	0 (2E-03)
		RCT	10	13	2.4	0 (1E-03)
		Other	20	13	4.9	0 (3E-03)
Generator Staff[e]	2002-2019	Operator	15	34	9.2	0 (6E-03)
		RCT	12	35	8	0 (5E-03)
	2020-2026	Operator	5	34	1.2	0 (7E-04)
		RCT	3	35	0.7	0 (4E-04)
	2027-2044	Operator	1	34	0.6	0 (4E-04)
		RCT	1	35	0.6	0 (4E-04)
Pulse Driers	2026-2077	Operator	0.4	54	1.1	0 (7E-04)
Total					765	0 (5E-01)

(a) The number of workers is the average necessary for the facility during the indicated period.
(b) RCT = radiation control technician.
(c) LCF = latent cancer fatality. Workforce LCFs are the inferred number of cancer deaths in the exposed workforce, which must be a whole number (deaths). The value in parentheses is the calculated value based on the workforce dose and the appropriate health effects conversion factor.
(d) The dose rates for placement of ILAW into disposal facilities are higher than for other solid waste management operations because the material emits more radiation.
(e) Staff in the solid waste support services group that work as needed in various solid waste facilities.

Table 5.59. Occupational Radiation Exposure – Alternative Group C, Upper Bound Waste Volume

Facility	Operating Period	Worker Category	Workers (FTE)[a]	Average Dose Rate (mrem/yr)	Workforce Dose (person-rem)	Workforce LCF[c]
LLW and MLLW Trenches	2002-2046	Operator	14	54	34	0 (2E-02)
		RCT[b]	4	45	8.5	0 (5E-03)
		Other	66	35	104	0 (6E-02)
ILAW	2008-2028	Workers	70	300[d]	443	0 (3E-01)
	2032-2046	Workers	20	14	4.1	0 (2E-03)
CWC	2002-2046	Operator	12	54	29	0 (2E-02)
		RCT	4	45	8.6	0 (5E-03)
		Other	55	17	42	0 (3E-02)
WRAP	2002-2032	Operator	13	18	7.3	0 (4E-03)
		RCT	9	36	10	0 (6E-03)
		Other	29	13	12	0 (7E-03)
	2033-2039	Operator	9	18	1.2	0 (7E-04)
		RCT	6	36	1.6	0 (1E-03)
		Other	32	13	1.9	0 (1E-03)
Modified T Plant Complex	2002-2032	Operator	20	9	5.5	0 (3E-03)
		RCT	18	13	7.4	0 (4E-03)
		Other	38	7	8.2	0 (5E-03)
	2033-2046	Operator	14	9	1.7	0 (1E-03)
		RCT	13	13	2.3	0 (1E-03)
		Other	27	7	2.6	0 (2E-03)
	2013-2031	Operator	10	13	2.6	0 (2E-03)
		RCT	10	13	2.4	0 (1E-03)
		Other	20	13	4.9	0 (3E-03)
Generator Staff[e]	2002-2019	Operator	20	34	12	0 (7E-03)
		RCT	13	35	8.2	0 (5E-03)
	2020-2026	Operator	7	34	1.7	0 (1E-03)
		RCT	5	35	1.2	0 (7E-04)
	2027-2044	Operator	3	34	1.8	0 (1E-03)
		RCT	2	35	1.3	0 (8E-04)
Pulse Driers	2026-2077	Operators	0.8	54	2.2	0 (1E-03)
Total					773	0 (5E-01)

(a) The number of workers is the average necessary for the facility during the indicated period.
(b) RCT = radiation control technician.
(c) LCF = latent cancer fatality. Workforce LCFs are the inferred number of cancer deaths in the exposed workforce, which must be a whole number (deaths). The value in parentheses is the calculated value based on the workforce dose and the appropriate health effects conversion factor.
(d) The dose rates for placement of ILAW into disposal facilities are higher than for other solid waste management operations because the material emits more radiation.
(e) Staff in the solid waste support services group that work as needed in various solid waste facilities.

5.11.1.5.2.1 Health Impacts from Routine Radionuclide Releases

The expected doses and health impacts to non-involved workers and public from routine atmospheric releases of radionuclides are presented in Table 5.60 for the Hanford Only waste volume, Table 5.61 for the Lower Bound waste volume, and in Table 5.62 for the Upper Bound waste volume. The tables present the maximum annual dose to the non-involved workers and the MEI, and the collective dose to public along with the probability of developing an LCF for the individual and the number of LCFs expected for the public. Given that the cancer risk estimates and doses are small in comparison to regulatory limits,[(a)] no adverse health impacts would be expected from radionuclide releases.

5.11.1.5.2.2 Health Impacts from Chemical Releases

Releases of chemicals to the atmosphere could occur for the same processes involving release of radionuclides when wastes with hazardous chemicals are involved. The potential health impacts from chemical releases to the atmosphere for Alternative Group D are the same as for Alternative Group A, as presented in Table 5.21 for all waste volumes. The results are the same because the same processing and atmospheric releases occur for both alternative groups. Because all the peak hazard quotients are less than 1, and because the cancer risk estimates are small, no adverse health impacts would be expected from chemical releases.

5.11.1.5.2.3 Worker Occupational Radiation Exposure

The radiation dose received by workers involved with waste operations is estimated using historical exposure data for the facilities involved in the alternative, as provided in FH (2003). The potential radiation exposure to workers for Alternative Group D are summarized in Table 5.63 for the Hanford Only waste volume, in Table 5.64 for the Lower Bound waste volume, and in Table 5.65 for the Upper Bound waste volume. The results are very similar to the Alternative Group A results except for pulse drier treatment of leachate. All estimated radiation doses to workers are well below regulatory limits.[(b)]

5.11.1.5.3 Accidents

Potential impacts of accidents under Alternative Group D would be identical to those described for Alternative Group A (see section 5.11.1.1.3).

5.11.1.6 Alternative Group E

Alternative Group E is similar to Alternative Groups A and D except for the disposal location of some of the waste streams. See Section 5 for a summary of the characteristics for the three subalternatives (E_1, E_2, and E_3) to this alternative group.

(a) The maximum annual radiation dose presented in this section may be compared to the regulatory limit of 10 mrem/year (WAC 246-247; 40 CFR 61; DOE 1993).

(b) The annual limit for occupational exposures is 5000 mrem/year (10 CFR 835).