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Table Q–280. Waste Management Alternative 2, Disposal Group 3, Base Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.03×10^{-7}	5.31×10^{-1}	1.82×10^{-5}	3.03×10^{-7}	1.36	5.99×10^{-5}	3.03×10^{-7}	2.78	1.31×10^{-4}
Iodine-129	3.64×10^{-10}	1.04×10^{-1}	1.18×10^{-6}	3.64×10^{-10}	1.20×10^{-1}	1.59×10^{-6}	3.64×10^{-10}	1.49×10^{-1}	2.29×10^{-6}
Total	3.03×10^{-7}	6.35×10^{-1}	1.94×10^{-5}	3.03×10^{-7}	1.48	6.15×10^{-5}	3.03×10^{-7}	2.93	1.33×10^{-4}
Year of Peak Impact	3987	3987	3987	3987	3987	3987	3987	3987	3987
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.07×10^{-6}	5.10×10^{-6}	0.00	1.07×10^{-6}	6.37×10^{-6}	0.00	1.07×10^{-6}	1.15×10^{-5}	0.00
Chromium	5.77×10^{-3}	5.50×10^{-2}	0.00	5.77×10^{-3}	5.50×10^{-2}	2.27×10^{-11}	5.77×10^{-3}	8.04×10^{-2}	1.04×10^{-6}
Nitrate	2.18×10^{-1}	3.89×10^{-3}	0.00	2.18×10^{-1}	5.12×10^{-3}	0.00	2.18×10^{-1}	1.01×10^{-2}	0.00
Total	2.24×10^{-1}	5.89×10^{-2}	0.00	2.24×10^{-1}	6.01×10^{-2}	2.27×10^{-11}	2.24×10^{-1}	9.04×10^{-2}	1.04×10^{-6}
Year of Peak Impact	4109	4109	N/A	4109	4109	4109	4109	4109	4109

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–281. Waste Management Alternative 2, Disposal Group 3, Base Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.75×10^{-7}	1.18	7.10×10^{-5}	1.18×10^{-6}	5.31	2.33×10^{-4}	1.18×10^{-6}	1.08×10^{1}	5.08×10^{-4}
Iodine-129	8.47×10^{-9}	2.41	6.70×10^{-6}	2.07×10^{-9}	6.83×10^{-1}	9.04×10^{-6}	2.07×10^{-9}	8.43×10^{-1}	1.30×10^{-5}
Total	6.83×10^{-7}	3.59	7.77×10^{-5}	1.18×10^{-6}	5.99	2.42×10^{-4}	1.18×10^{-6}	1.17×10^{1}	5.21×10^{-4}
Year of Peak Impact	8393	8393	8173	8173	8173	8173	8173	8173	8173
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	9.82×10^{-7}	1.40×10^{-7}	0.00	3.28×10^{-7}	4.74×10^{-8}	0.00	3.28×10^{-7}	5.03×10^{-8}	0.00
Chromium	9.62×10^{-3}	9.16×10^{-2}	0.00	2.14×10^{-4}	2.04×10^{-3}	4.31×10^{-11}	2.14×10^{-4}	2.98×10^{-3}	1.98×10^{-6}
Fluoride	4.84×10^{-5}	2.30×10^{-5}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrate	1.64	2.93×10^{-2}	0.00	6.55	1.54×10^{-1}	0.00	6.55	3.02×10^{-1}	0.00
Total	1.65	1.21×10^{-1}	0.00	6.55	1.56×10^{-1}	4.31×10^{-11}	6.55	3.05×10^{-1}	1.98×10^{-6}
Year of Peak Impact	9877	9877	N/A	6859	6859	6384	6859	6859	6384

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–282. Waste Management Alternative 2, Disposal Group 3, Base Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.41×10^{-7}	1.47	5.11×10^{-5}	8.48×10^{-7}	3.82	1.68×10^{-4}	8.48×10^{-7}	7.77	3.66×10^{-4}
Iodine-129	2.95×10^{-9}	8.40×10^{-1}	9.25×10^{-6}	2.85×10^{-9}	9.43×10^{-1}	1.25×10^{-5}	2.85×10^{-9}	1.16	1.80×10^{-5}
Total	8.44×10^{-7}	2.31	6.03×10^{-5}	8.51×10^{-7}	4.76	1.80×10^{-4}	8.51×10^{-7}	8.94	3.83×10^{-4}
Year of Peak Impact	9282	9282	9284	9284	9284	9284	9284	9284	9284

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.36×10^{-7}	6.48×10^{-7}	0.00	1.36×10^{-7}	8.09×10^{-7}	0.00	1.36×10^{-7}	1.46×10^{-6}	0.00
Boron and Compounds	3.27×10^{-7}	4.68×10^{-8}	0.00	3.27×10^{-7}	4.74×10^{-8}	0.00	3.27×10^{-7}	5.03×10^{-8}	0.00
Chromium	9.82×10^{-4}	9.35×10^{-3}	0.00	9.82×10^{-4}	9.36×10^{-3}	1.21×10^{-11}	9.82×10^{-4}	1.37×10^{-2}	5.54×10^{-7}
Fluoride	7.35×10^{-5}	3.50×10^{-5}	0.00	7.35×10^{-5}	3.60×10^{-5}	0.00	7.35×10^{-5}	3.88×10^{-5}	0.00
Nitrate	3.29	5.87×10^{-2}	0.00	3.29	7.73×10^{-2}	0.00	3.29	1.52×10^{-1}	0.00
Total	3.29	6.81×10^{-2}	0.00	3.29	8.67×10^{-2}	1.21×10^{-11}	3.29	1.65×10^{-1}	5.54×10^{-7}
Year of Peak Impact	7710	7710	N/A	7710	7710	4877	7710	7710	4877

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–283. Waste Management Alternative 2, Disposal Group 3, Base Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	9.40×10^{-12}	4.23×10^{-5}	1.86×10^{-9}	6.00×10^{-12}	6.23×10^{-5}	2.95×10^{-9}	8.48×10^{-7}	9.28×10^{-3}	5.09×10^{-7}
Iodine-129	6.08×10^{-14}	2.01×10^{-5}	2.67×10^{-10}	8.58×10^{-14}	4.63×10^{-4}	1.11×10^{-8}	2.85×10^{-9}	4.83×10^{-3}	1.18×10^{-7}
Total	9.46×10^{-12}	6.24×10^{-5}	2.12×10^{-9}	6.08×10^{-12}	5.26×10^{-4}	1.41×10^{-8}	8.51×10^{-7}	1.41×10^{-2}	6.28×10^{-7}
Year of Peak Impact	8962	8962	8962	9354	9354	9354	9284	9284	9284
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	7.21×10^{-13}	4.29×10^{-12}	0.00	7.21×10^{-13}	7.75×10^{-12}	0.00	1.36×10^{-7}	8.09×10^{-7}	0.00
Boron and Compounds	5.47×10^{-12}	7.92×10^{-13}	0.00	5.47×10^{-12}	8.69×10^{-13}	0.00	3.27×10^{-7}	3.27×10^{-9}	0.00
Chromium	6.45×10^{-9}	6.15×10^{-8}	1.23×10^{-16}	6.45×10^{-9}	9.85×10^{-8}	5.64×10^{-12}	5.93×10^{-4}	1.31×10^{-3}	2.77×10^{-7}
Fluoride	5.65×10^{-10}	2.77×10^{-10}	0.00	5.65×10^{-10}	3.92×10^{-10}	0.00	4.90×10^{-5}	7.17×10^{-6}	0.00
Nitrate	5.01×10^{-5}	1.73×10^{-6}	0.00	5.01×10^{-5}	4.71×10^{-3}	0.00	3.31	1.25×10^{-1}	0.00
Total	5.01×10^{-5}	1.79×10^{-6}	1.23×10^{-16}	5.01×10^{-5}	4.71×10^{-3}	5.64×10^{-12}	3.31	1.26×10^{-1}	2.77×10^{-7}
Year of Peak Impact	7991	7991	4468	7991	7991	4468	7714	7714	4877

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Table Q–284. Waste Management Alternative 2, Disposal Group 3, Option Case, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.64×10^{-6}	4.62	1.59×10^{-4}	2.64×10^{-6}	1.19×10^{1}	6.00×10^{-4}	2.64×10^{-6}	2.42×10^{1}	1.31×10^{-3}
Iodine-129	2.17×10^{-8}	6.17	7.02×10^{-5}	2.17×10^{-8}	7.16	4.77×10^{-5}	2.17×10^{-8}	8.84	6.86×10^{-5}
Total	2.66×10^{-6}	1.08×10^{1}	2.29×10^{-4}	2.66×10^{-6}	1.90×10^{1}	6.48×10^{-4}	2.66×10^{-6}	3.30×10^{1}	1.38×10^{-3}
Year of Peak Impact	8290	8290	8290	8290	8290	8646	8290	8290	8646
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.35×10^{-6}	1.93×10^{-7}	0.00	1.35×10^{-6}	1.95×10^{-7}	0.00	1.35×10^{-6}	2.07×10^{-7}	0.00
Chromium	1.05×10^{-3}	9.97×10^{-3}	0.00	1.05×10^{-3}	9.98×10^{-3}	1.21×10^{-11}	1.05×10^{-3}	1.46×10^{-2}	5.53×10^{-7}
Fluoride	1.77×10^{-4}	8.42×10^{-5}	0.00	1.77×10^{-4}	8.66×10^{-5}	0.00	1.77×10^{-4}	9.32×10^{-5}	0.00
Nitrate	1.66×10^{1}	2.97×10^{-1}	0.00	1.66×10^{1}	3.91×10^{-1}	0.00	1.66×10^{1}	7.68×10^{-1}	0.00
Total	1.66×10^{1}	3.07×10^{-1}	0.00	1.66×10^{1}	4.01×10^{-1}	1.21×10^{-11}	1.66×10^{1}	7.82×10^{-1}	5.53×10^{-7}
Year of Peak Impact	8236	8236	N/A	8236	8236	8561	8236	8236	8561

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–285. Waste Management Alternative 2, Disposal Group 3, Option Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.86×10^{-7}	6.76×10^{-1}	2.32×10^{-5}	3.86×10^{-7}	1.74	7.62×10^{-5}	3.86×10^{-7}	3.54	1.66×10^{-4}
Iodine-129	3.91×10^{-10}	1.11×10^{-1}	1.27×10^{-6}	3.91×10^{-10}	1.29×10^{-1}	1.71×10^{-6}	3.91×10^{-10}	1.59×10^{-1}	2.46×10^{-6}
Total	3.86×10^{-7}	7.87×10^{-1}	2.45×10^{-5}	3.86×10^{-7}	1.86	7.79×10^{-5}	3.86×10^{-7}	3.70	1.69×10^{-4}
Year of Peak Impact	4013	4013	4013	4013	4013	4013	4013	4013	4013
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	8.36×10^{-7}	3.98×10^{-6}	0.00	5.45×10^{-7}	3.24×10^{-6}	0.00	5.45×10^{-7}	5.85×10^{-6}	0.00
Chromium	3.37×10^{-2}	3.21×10^{-1}	0.00	2.94×10^{-2}	2.81×10^{-1}	1.43×10^{-10}	2.94×10^{-2}	4.10×10^{-1}	6.54×10^{-6}
Nitrate	6.07	1.08×10^{-1}	0.00	8.02	1.89×10^{-1}	0.00	8.02	3.70×10^{-1}	0.00
Total	6.10	4.29×10^{-1}	0.00	8.05	4.69×10^{-1}	1.43×10^{-10}	8.05	7.80×10^{-1}	6.54×10^{-6}
Year of Peak Impact	4387	4387	N/A	4196	4196	3878	4196	4196	3878

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–286. Waste Management Alternative 2, Disposal Group 3, Option Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	9.63×10^{-7}	1.69	5.80×10^{-5}	9.63×10^{-7}	4.33	2.33×10^{-4}	9.63×10^{-7}	8.83	5.08×10^{-4}
Iodine-129	8.47×10^{-9}	2.41	2.74×10^{-5}	8.47×10^{-9}	2.80	9.04×10^{-6}	8.47×10^{-9}	3.46	1.30×10^{-5}
Total	9.71×10^{-7}	4.10	8.54×10^{-5}	9.71×10^{-7}	7.13	2.42×10^{-4}	9.71×10^{-7}	1.23×10^{1}	5.21×10^{-4}
Year of Peak Impact	8393	8393	8393	8393	8393	8173	8393	8393	8173
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.63×10^{-7}	3.16×10^{-6}	0.00	6.63×10^{-7}	3.94×10^{-6}	0.00	6.63×10^{-7}	7.12×10^{-6}	0.00
Chromium	8.55×10^{-2}	8.15×10^{-1}	0.00	8.55×10^{-2}	8.15×10^{-1}	4.89×10^{-10}	8.55×10^{-2}	1.19	2.24×10^{-5}
Nitrate	3.02×10^{1}	5.40×10^{-1}	0.00	3.02×10^{1}	7.11×10^{-1}	0.00	3.02×10^{1}	1.39	0.00
Total	3.03×10^{1}	1.35	0.00	3.03×10^{1}	1.53	4.89×10^{-10}	3.03×10^{1}	2.59	2.24×10^{-5}
Year of Peak Impact	4628	4628	N/A	4628	4628	6610	4628	4628	6610

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–287. Waste Management Alternative 2, Disposal Group 3, Option Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.61×10^{-7}	1.51	5.19×10^{-5}	8.61×10^{-7}	3.87	1.70×10^{-4}	8.61×10^{-7}	7.89	3.71×10^{-4}
Iodine-129	2.91×10^{-9}	8.29×10^{-1}	9.44×10^{-6}	2.91×10^{-9}	9.63×10^{-1}	1.27×10^{-5}	2.91×10^{-9}	1.19	1.83×10^{-5}
Total	8.64×10^{-7}	2.34	6.13×10^{-5}	8.64×10^{-7}	4.84	1.83×10^{-4}	8.64×10^{-7}	9.08	3.89×10^{-4}
Year of Peak Impact	9284	9284	9284	9284	9284	9284	9284	9284	9284
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	2.69×10^{-7}	1.28×10^{-6}	0.00	2.69×10^{-7}	1.60×10^{-6}	0.00	2.69×10^{-7}	2.89×10^{-6}	0.00
Chromium	1.69×10^{-2}	1.61×10^{-1}	0.00	1.69×10^{-2}	1.61×10^{-1}	8.04×10^{-11}	1.69×10^{-2}	2.35×10^{-1}	3.69×10^{-6}
Nitrate	3.80	6.79×10^{-2}	0.00	3.80	8.94×10^{-2}	0.00	3.80	1.75×10^{-1}	0.00
Total	3.82	2.29×10^{-1}	0.00	3.82	2.51×10^{-1}	8.04×10^{-11}	3.82	4.11×10^{-1}	3.69×10^{-6}
Year of Peak Impact	4954	4954	N/A	4954	4954	6701	4954	4954	6701

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–288. Waste Management Alternative 2, Disposal Group 3, Option Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	9.41×10^{-12}	4.23×10^{-5}	1.86×10^{-9}	6.10×10^{-12}	6.34×10^{-5}	3.01×10^{-9}	8.61×10^{-7}	9.42×10^{-3}	5.17×10^{-7}
Iodine-129	6.10×10^{-14}	2.02×10^{-5}	2.68×10^{-10}	8.59×10^{-14}	4.64×10^{-4}	1.12×10^{-8}	2.91×10^{-9}	4.92×10^{-3}	1.21×10^{-7}
Total	9.47×10^{-12}	6.25×10^{-5}	2.13×10^{-9}	6.19×10^{-12}	5.28×10^{-4}	1.42×10^{-8}	8.64×10^{-7}	1.43×10^{-2}	6.38×10^{-7}
Year of Peak Impact	8962	8962	8962	9354	9354	9354	9284	9284	9284
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.41×10^{-12}	3.81×10^{-11}	0.00	4.49×10^{-12}	4.83×10^{-11}	0.00	4.07×10^{-7}	2.42×10^{-6}	0.00
Chromium	1.72×10^{-7}	1.64×10^{-6}	7.90×10^{-16}	1.15×10^{-7}	1.75×10^{-6}	3.62×10^{-11}	6.85×10^{-3}	1.51×10^{-2}	1.84×10^{-6}
Nitrate	4.49×10^{-5}	1.55×10^{-6}	0.00	5.65×10^{-5}	5.31×10^{-3}	0.00	5.62	2.02×10^{-1}	0.00
Total	4.50×10^{-5}	3.19×10^{-6}	7.90×10^{-16}	5.66×10^{-5}	5.31×10^{-3}	3.62×10^{-11}	5.62	2.17×10^{-1}	1.84×10^{-6}
Year of Peak Impact	4640	4640	4927	4843	4843	4927	6522	6522	6701

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–34 through Q–37 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary for the drinking-water well user over time. For the Base Case, the peak radiological risk occurs around the year 8200 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-East. For the Option Case, the peak radiological risk occurs around the year 8400 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-East. These are relatively mobile radionuclides that move at the same velocity as groundwater.

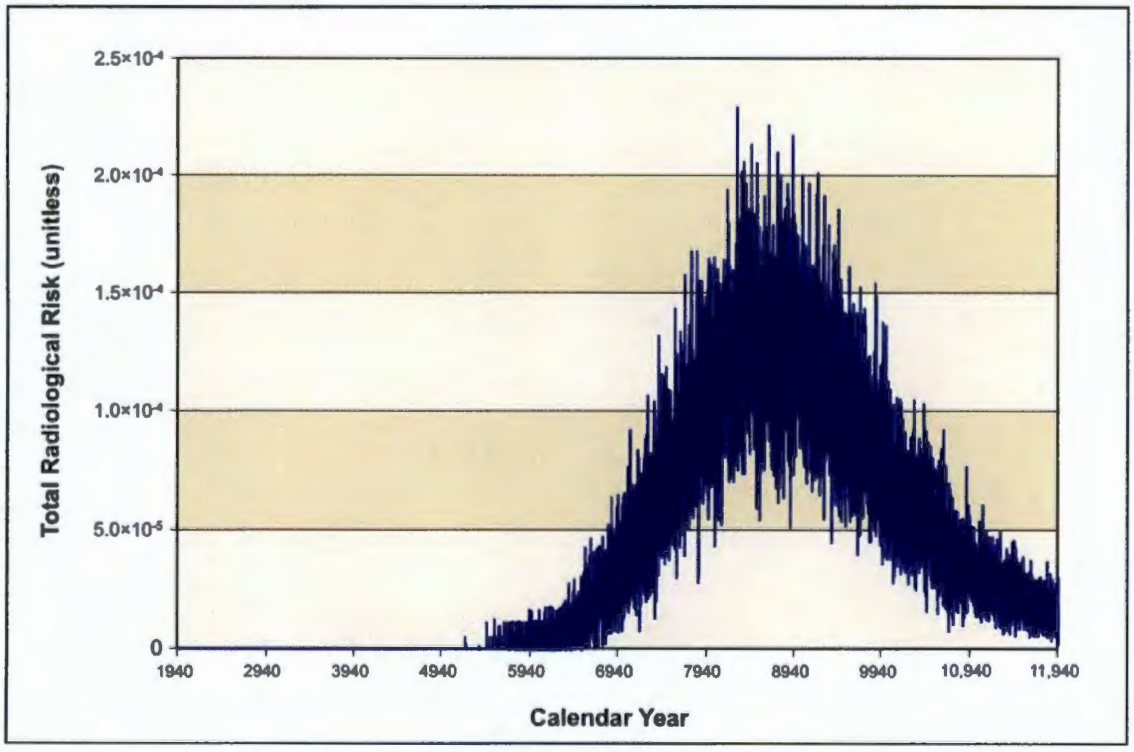


Figure Q–34. Waste Management Alternative 2, Disposal Group 3, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

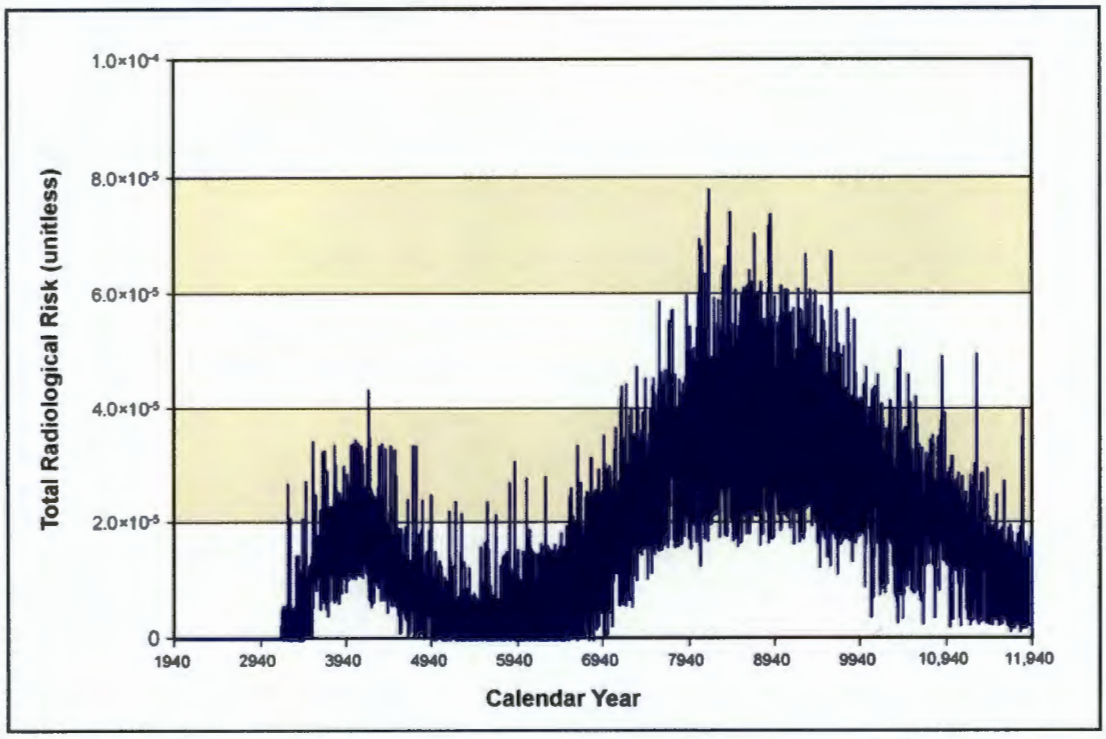


Figure Q–35. Waste Management Alternative 2, Disposal Group 3, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

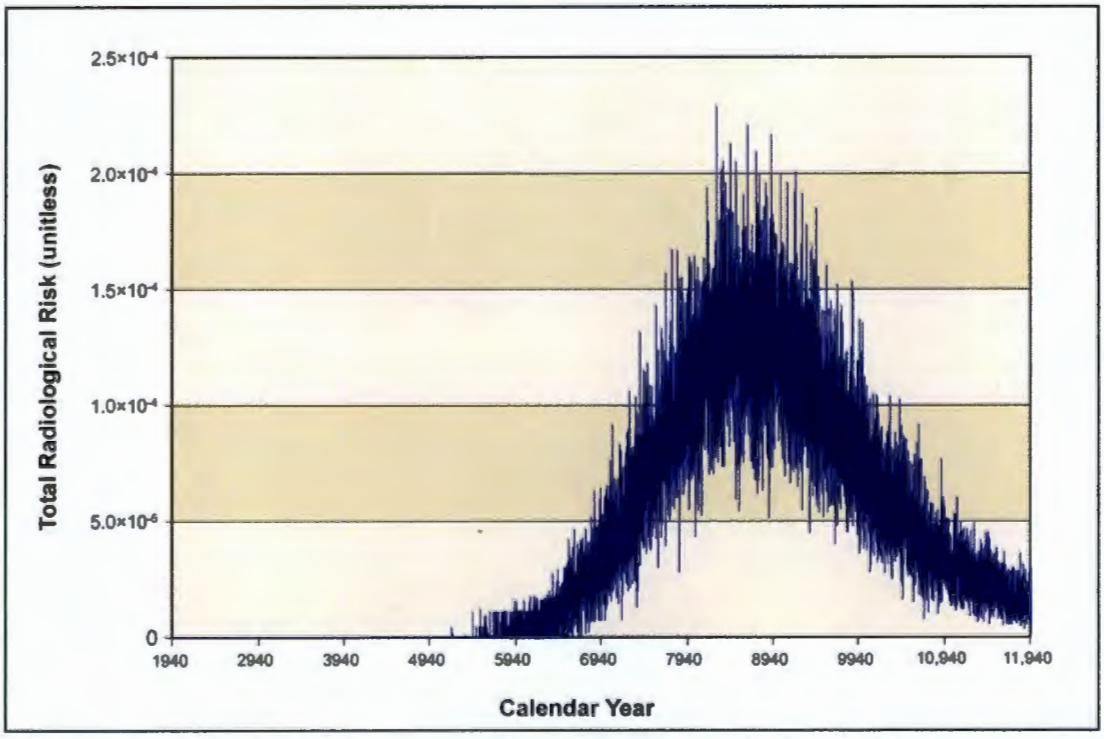


Figure Q–36. Waste Management Alternative 2, Disposal Group 3, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

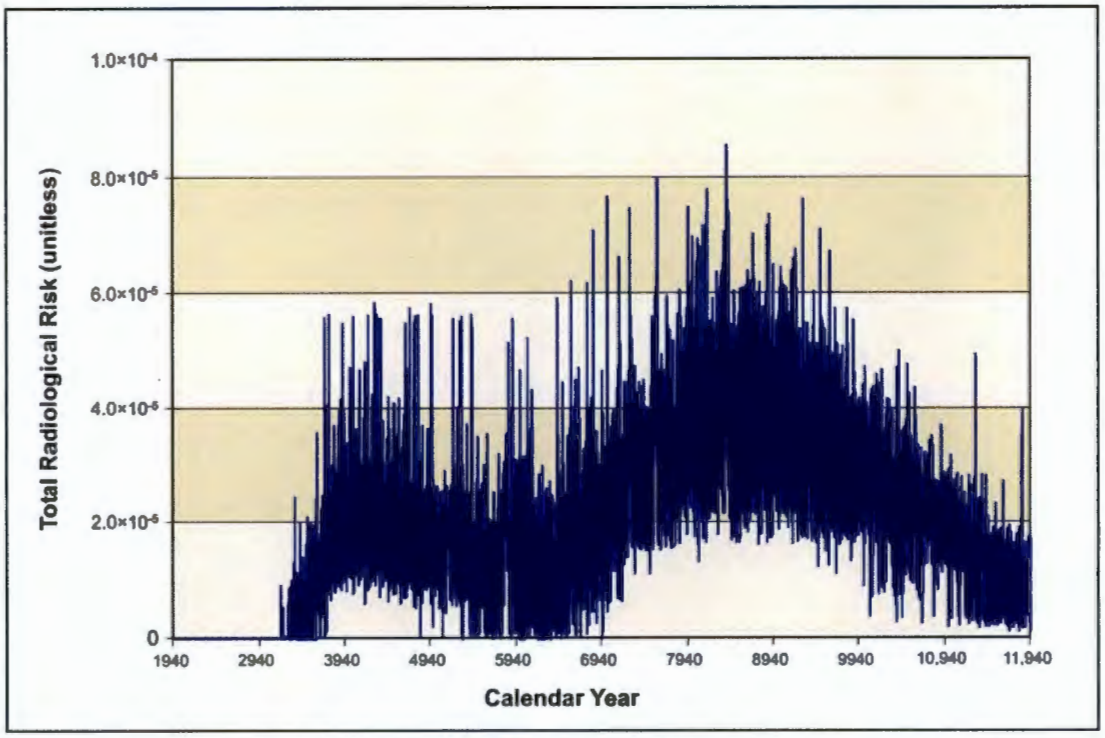


Figure Q–37. Waste Management Alternative 2, Disposal Group 3, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3 Waste Management Alternative 3: Disposal in IDF, 200-East and 200-West Areas

Under Waste Management Alternative 3, the waste from tank treatment operations would be disposed of in IDF-East, and onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites would be disposed of in IDF-West. Waste from tank farm cleanup operations would be disposed of in the RPPDF. As a result, the waste disposed of in these three facilities would become available for release to the environment. Because of the different waste types that result from the Tank Closure action alternatives, three disposal groups were considered to account for the different IDF-East sizes and operational time periods. In addition, within these three disposal groups, subgroups were identified to allow consideration of the different waste types resulting from the Tank Closure alternatives. Potential human health impacts of these subgroups under this alternative are discussed in the following sections.

Q.3.3.1.3.1 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-A

Disposal Group 1, Subgroup 1-A, addresses the waste resulting from Tank Closure Alternative 2B, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 2B.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–289 through Q–294, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are boron and boron compounds, chromium, fluoride, and nitrate, however, the peak chemical hazard is negligible. For radionuclides, the dose standard would be exceeded at IDF-West boundary for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–289. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	4.61×10^{-7}	8.08×10^{-1}	2.84×10^{-5}	4.61×10^{-7}	2.08	9.30×10^{-5}	4.71×10^{-7}	4.32	2.03×10^{-4}
Iodine-129	8.24×10^{-10}	2.35×10^{-1}	2.12×10^{-6}	8.24×10^{-10}	2.72×10^{-1}	2.86×10^{-6}	6.53×10^{-10}	2.67×10^{-1}	4.12×10^{-6}
Total	4.62×10^{-7}	1.04	3.05×10^{-5}	4.62×10^{-7}	2.35	9.59×10^{-5}	4.72×10^{-7}	4.58	2.07×10^{-4}
Year of Peak Impact	11,257	11,257	8991	11,257	11,257	8991	8991	8991	8991
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	1.76×10^{-3}	1.68×10^{-2}	0.00	1.76×10^{-3}	1.68×10^{-2}	1.62×10^{-11}	1.76×10^{-3}	2.46×10^{-2}	7.41×10^{-7}
Nitrate	1.42×10^{1}	2.54×10^{-1}	0.00	1.42×10^{1}	3.35×10^{-1}	0.00	1.42×10^{1}	6.57×10^{-1}	0.00
Total	1.42×10^{1}	2.71×10^{-1}	0.00	1.42×10^{1}	3.52×10^{-1}	1.62×10^{-11}	1.42×10^{1}	6.82×10^{-1}	7.41×10^{-7}
Year of Peak Impact	8522	8522	N/A	8522	8522	8511	8522	8522	8511

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–290. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–291. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.18×10^{-8}	5.58×10^{-2}	1.98×10^{-6}	3.30×10^{-8}	1.48×10^{-1}	6.51×10^{-6}	3.30×10^{-8}	3.02×10^{-1}	1.42×10^{-5}
Iodine-129	4.71×10^{-11}	1.34×10^{-2}	1.26×10^{-7}	3.89×10^{-11}	1.29×10^{-2}	1.70×10^{-7}	3.89×10^{-11}	1.59×10^{-2}	2.45×10^{-7}
Total	3.19×10^{-8}	6.92×10^{-2}	2.11×10^{-6}	3.30×10^{-8}	1.61×10^{-1}	6.68×10^{-6}	3.30×10^{-8}	3.18×10^{-1}	1.44×10^{-5}
Year of Peak Impact	3804	3804	3825	3825	3825	3825	3825	3825	3825
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.13×10^{-3}	2.03×10^{-2}	0.00	2.13×10^{-3}	2.03×10^{-2}	8.36×10^{-12}	2.13×10^{-3}	2.96×10^{-2}	3.83×10^{-7}
Nitrate	9.37×10^{-2}	1.67×10^{-3}	0.00	9.37×10^{-2}	2.20×10^{-3}	0.00	9.37×10^{-2}	4.32×10^{-3}	0.00
Total	9.58×10^{-2}	2.19×10^{-2}	0.00	9.58×10^{-2}	2.25×10^{-2}	8.36×10^{-12}	9.58×10^{-2}	3.40×10^{-2}	3.83×10^{-7}
Year of Peak Impact	3856	3856	N/A	3856	3856	3856	3856	3856	3856

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–292. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.43×10^{-6}	1.13×10^{1}	4.55×10^{-4}	6.43×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.55×10^{-6}	6.92×10^{1}	3.26×10^{-3}
Iodine-129	5.62×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.62×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.84×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.49×10^{-6}	2.73×10^{1}	5.79×10^{-4}	6.49×10^{-6}	4.75×10^{1}	1.66×10^{-3}	7.59×10^{-6}	8.49×10^{1}	3.50×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	3.70×10^{-4}	3.52×10^{-3}	0.00	3.70×10^{-4}	3.53×10^{-3}	1.22×10^{-11}	3.70×10^{-4}	5.15×10^{-3}	5.58×10^{-7}
Nitrate	5.63	1.01×10^{-1}	0.00	5.63	1.32×10^{-1}	0.00	5.63	2.60×10^{-1}	0.00
Total	5.63	1.04×10^{-1}	0.00	5.63	1.36×10^{-1}	1.22×10^{-11}	5.63	2.65×10^{-1}	5.58×10^{-7}
Year of Peak Impact	9653	9653	N/A	9653	9653	3628	9653	9653	3628

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–293. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.06×10^{-7}	1.41	6.79×10^{-5}	1.13×10^{-6}	5.07	2.23×10^{-4}	1.13×10^{-6}	1.03×10^{1}	4.86×10^{-4}
Iodine-129	6.88×10^{-9}	1.96	1.34×10^{-5}	4.12×10^{-9}	1.36	1.80×10^{-5}	4.12×10^{-9}	1.68	2.60×10^{-5}
Total	8.12×10^{-7}	3.37	8.13×10^{-5}	1.13×10^{-6}	6.44	2.41×10^{-4}	1.13×10^{-6}	1.20×10^{1}	5.12×10^{-4}
Year of Peak Impact	4388	4388	4191	4191	4191	4191	4191	4191	4191

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.15×10^{-8}	0.00
Chromium	4.11×10^{-4}	3.91×10^{-3}	0.00	4.11×10^{-4}	3.92×10^{-3}	2.88×10^{-12}	4.11×10^{-4}	5.73×10^{-3}	1.32×10^{-7}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.32×10^{-5}	0.00
Nitrate	2.44	4.36×10^{-2}	0.00	2.44	5.74×10^{-2}	0.00	2.44	1.13×10^{-1}	0.00
Total	2.44	4.76×10^{-2}	0.00	2.44	6.14×10^{-2}	2.88×10^{-12}	2.44	1.18×10^{-1}	1.32×10^{-7}
Year of Peak Impact	8044	8044	N/A	8044	8044	8879	8044	8044	8879

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–294. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.58×10^{-11}	7.09×10^{-5}	3.29×10^{-9}	1.18×10^{-11}	1.23×10^{-4}	7.76×10^{-9}	8.05×10^{-7}	8.81×10^{-3}	6.77×10^{-7}
Iodine-129	1.34×10^{-13}	4.43×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.92×10^{-4}	1.74×10^{-8}	6.87×10^{-9}	1.12×10^{-2}	1.82×10^{-7}
Total	1.59×10^{-11}	1.15×10^{-4}	3.77×10^{-9}	1.20×10^{-11}	9.15×10^{-4}	2.51×10^{-8}	8.12×10^{-7}	2.00×10^{-2}	8.58×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	7.12×10^{-13}	1.03×10^{-13}	0.00	7.12×10^{-13}	1.13×10^{-13}	0.00	3.35×10^{-7}	3.34×10^{-9}	0.00
Chromium	6.50×10^{-9}	6.19×10^{-8}	3.91×10^{-17}	6.50×10^{-9}	9.92×10^{-8}	1.79×10^{-12}	2.54×10^{-4}	5.61×10^{-4}	6.61×10^{-8}
Nitrate	4.48×10^{-5}	1.55×10^{-6}	0.00	4.48×10^{-5}	4.21×10^{-3}	0.00	2.44	9.51×10^{-2}	0.00
Total	4.48×10^{-5}	1.61×10^{-6}	3.91×10^{-17}	4.48×10^{-5}	4.21×10^{-3}	1.79×10^{-12}	2.44	9.57×10^{-2}	6.61×10^{-8}
Year of Peak Impact	8016	8016	8736	8016	8016	8736	8085	8085	8879

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–38 through Q–40 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East, the radiological lifetime risk of incidence of cancer does not occur until around the year 11,300 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

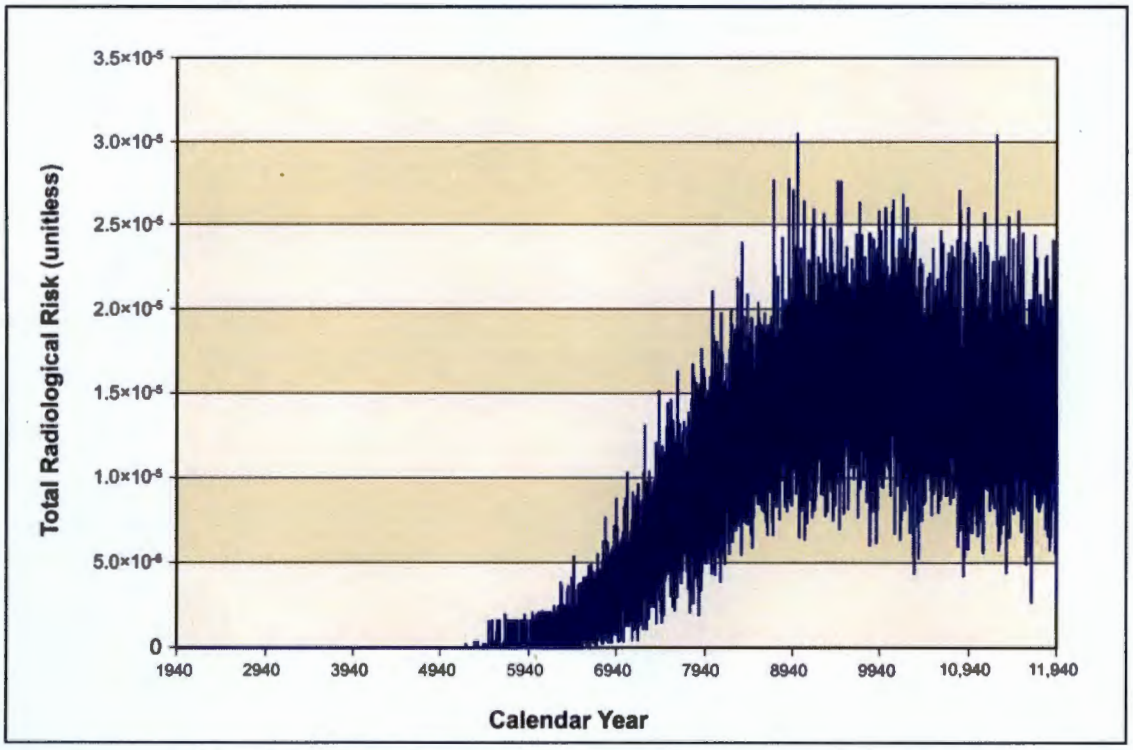


Figure Q–38. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

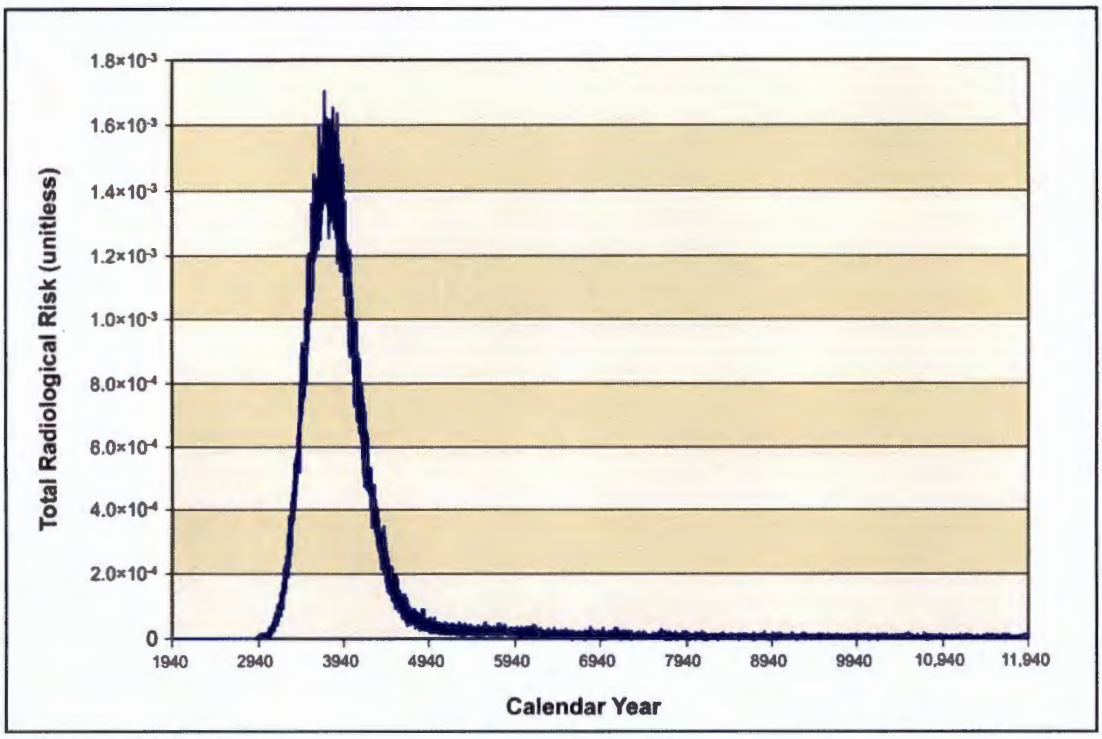


Figure Q–39. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

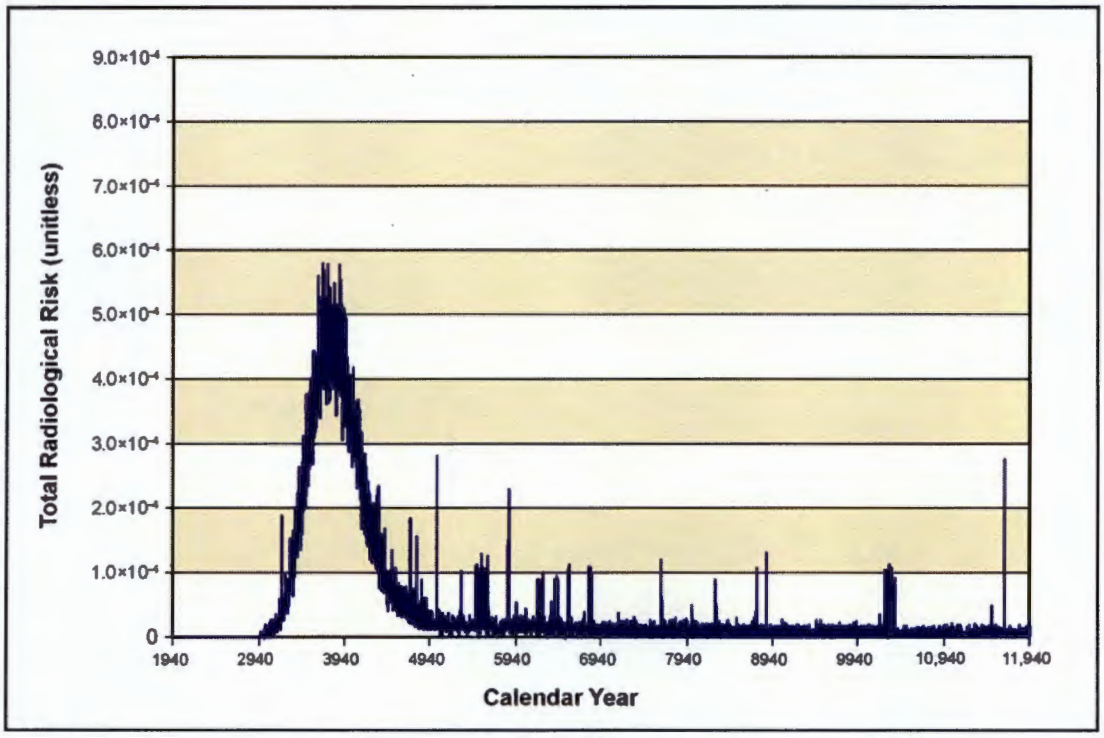


Figure Q–40. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.2 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-B

Disposal Group 1, Subgroup 1-B, addresses the waste resulting from Tank Closure Alternative 3A, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Bulk vitrification glass
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 3A.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–295 through Q–300, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are boron and boron compounds, chromium, fluoride, and nitrate, however, the peak chemical hazard is negligible. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–295. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.60×10^{-6}	2.81	9.66×10^{-5}	1.60×10^{-6}	7.22	3.17×10^{-4}	1.60×10^{-6}	1.47×10^{1}	6.91×10^{-4}
Iodine-129	6.64×10^{-10}	1.89×10^{-1}	2.15×10^{-6}	6.64×10^{-10}	2.19×10^{-1}	2.90×10^{-6}	6.64×10^{-10}	2.71×10^{-1}	4.18×10^{-6}
Total	1.60×10^{-6}	3.00	9.88×10^{-5}	1.60×10^{-6}	7.44	3.20×10^{-4}	1.60×10^{-6}	1.50×10^{1}	6.96×10^{-4}
Year of Peak Impact	8486	8486	8486	8486	8486	8486	8486	8486	8486
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	**Hazard Index at Year of Peak Hazard Index (unitless)**	**Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)**	**Concentration at Year of Peak Hazard Index (grams per cubic meter)**	**Hazard Index at Year of Peak Hazard Index (unitless)**	**Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)**	**Concentration at Year of Peak Hazard Index (grams per cubic meter)**	**Hazard Index at Year of Peak Hazard Index (unitless)**	**Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)**
Chromium	7.32×10^{-4}	6.97×10^{-3}	0.00	7.32×10^{-4}	6.98×10^{-3}	6.22×10^{-12}	7.32×10^{-4}	1.02×10^{-2}	2.85×10^{-7}
Nitrate	1.44×10^{1}	2.57×10^{-1}	0.00	1.44×10^{1}	3.38×10^{-1}	0.00	1.44×10^{1}	6.63×10^{-1}	0.00
Total	1.44×10^{1}	2.64×10^{-1}	0.00	1.44×10^{1}	3.45×10^{-1}	6.22×10^{-12}	1.44×10^{1}	6.74×10^{-1}	2.85×10^{-7}
Year of Peak Impact	7821	7821	N/A	7821	7821	8278	7821	7821	8278

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–296. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–297. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.18×10^{-8}	5.58×10^{-2}	1.98×10^{-6}	3.30×10^{-8}	1.48×10^{-1}	6.51×10^{-6}	3.30×10^{-8}	3.02×10^{-1}	1.42×10^{-5}
Iodine-129	4.71×10^{-11}	1.34×10^{-2}	1.26×10^{-7}	3.89×10^{-11}	1.29×10^{-2}	1.70×10^{-7}	3.89×10^{-11}	1.59×10^{-2}	2.45×10^{-7}
Total	3.19×10^{-8}	6.92×10^{-2}	2.11×10^{-6}	3.30×10^{-8}	1.61×10^{-1}	6.68×10^{-6}	3.30×10^{-8}	3.18×10^{-1}	1.44×10^{-5}
Year of Peak Impact	3804	3804	3825	3825	3825	3825	3825	3825	3825
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.13×10^{-3}	2.03×10^{-2}	0.00	2.13×10^{-3}	2.03×10^{-2}	8.36×10^{-12}	2.13×10^{-3}	2.96×10^{-2}	3.83×10^{-7}
Nitrate	9.37×10^{-2}	1.67×10^{-3}	0.00	9.37×10^{-2}	2.20×10^{-3}	0.00	9.37×10^{-2}	4.32×10^{-3}	0.00
Total	9.58×10^{-2}	2.19×10^{-2}	0.00	9.58×10^{-2}	2.25×10^{-2}	8.36×10^{-12}	9.58×10^{-2}	3.40×10^{-2}	3.83×10^{-7}
Year of Peak Impact	3856	3856	N/A	3856	3856	3856	3856	3856	3856

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–298. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.43×10^{-6}	1.13×10^{1}	4.55×10^{-4}	6.43×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.55×10^{-6}	6.92×10^{1}	3.26×10^{-3}
Iodine-129	5.62×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.62×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.84×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.49×10^{-6}	2.73×10^{1}	5.79×10^{-4}	6.49×10^{-6}	4.75×10^{1}	1.66×10^{-3}	7.59×10^{-6}	8.49×10^{1}	3.50×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	1.59×10^{-4}	1.52×10^{-3}	0.00	1.59×10^{-4}	1.52×10^{-3}	1.22×10^{-11}	1.59×10^{-4}	2.22×10^{-3}	5.58×10^{-7}
Nitrate	5.86	1.05×10^{-1}	0.00	5.86	1.38×10^{-1}	0.00	5.86	2.70×10^{-1}	0.00
Total	5.86	1.06×10^{-1}	0.00	5.86	1.39×10^{-1}	1.22×10^{-11}	5.86	2.72×10^{-1}	5.58×10^{-7}
Year of Peak Impact	8905	8905	N/A	8905	8905	3628	8905	8905	3628

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–299. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.06×10^{-7}	1.41	6.79×10^{-5}	1.13×10^{-6}	5.07	2.23×10^{-4}	1.13×10^{-6}	1.03×10^{1}	4.86×10^{-4}
Iodine-129	6.88×10^{-9}	1.96	1.34×10^{-5}	4.12×10^{-9}	1.36	1.80×10^{-5}	4.12×10^{-9}	1.68	2.60×10^{-5}
Total	8.12×10^{-7}	3.37	8.13×10^{-5}	1.13×10^{-6}	6.44	2.41×10^{-4}	1.13×10^{-6}	1.20×10^{1}	5.12×10^{-4}
Year of Peak Impact	4388	4388	4191	4191	4191	4191	4191	4191	4191

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.15×10^{-8}	0.00
Chromium	1.40×10^{-4}	1.33×10^{-3}	0.00	1.40×10^{-4}	1.33×10^{-3}	1.80×10^{-12}	1.40×10^{-4}	1.95×10^{-3}	8.28×10^{-8}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.32×10^{-5}	0.00
Nitrate	3.68	6.57×10^{-2}	0.00	3.68	8.65×10^{-2}	0.00	3.68	1.70×10^{-1}	0.00
Total	3.68	6.71×10^{-2}	0.00	3.68	8.79×10^{-2}	1.80×10^{-12}	3.68	1.72×10^{-1}	8.28×10^{-8}
Year of Peak Impact	8144	8144	N/A	8144	8144	4812	8144	8144	4812

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–300. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.58×10^{-11}	7.09×10^{-5}	3.29×10^{-9}	1.18×10^{-11}	1.23×10^{-4}	7.76×10^{-9}	8.05×10^{-7}	8.81×10^{-3}	6.77×10^{-7}
Iodine-129	1.34×10^{-13}	4.43×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.92×10^{-4}	1.74×10^{-8}	6.87×10^{-9}	1.12×10^{-2}	1.82×10^{-7}
Total	1.59×10^{-11}	1.15×10^{-4}	3.77×10^{-9}	1.20×10^{-11}	9.15×10^{-4}	2.51×10^{-8}	8.12×10^{-7}	2.00×10^{-2}	8.58×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	7.12×10^{-13}	1.03×10^{-13}	0.00	7.12×10^{-13}	1.13×10^{-13}	0.00	3.35×10^{-7}	3.34×10^{-9}	0.00
Chromium	2.91×10^{-9}	2.77×10^{-8}	3.00×10^{-17}	2.91×10^{-9}	4.44×10^{-8}	1.37×10^{-12}	1.40×10^{-4}	3.09×10^{-4}	4.14×10^{-8}
Fluoride	5.38×10^{-11}	2.64×10^{-11}	0.00	5.38×10^{-11}	3.74×10^{-11}	0.00	2.51×10^{-5}	3.67×10^{-6}	0.00
Nitrate	4.29×10^{-5}	1.48×10^{-6}	0.00	4.29×10^{-5}	4.03×10^{-3}	0.00	3.68	1.35×10^{-1}	0.00
Total	4.29×10^{-5}	1.51×10^{-6}	3.00×10^{-17}	4.29×10^{-5}	4.03×10^{-3}	1.37×10^{-12}	3.68	1.36×10^{-1}	4.14×10^{-8}
Year of Peak Impact	8558	8558	3934	8558	8558	3934	8144	8144	4812

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–41 through Q–43 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For IDF-East, the radiological lifetime risk of incidence of cancer does not occur until around the year 8500 as a result of slower movement through the vadose zone for waste forms disposed of in the IDF-East.

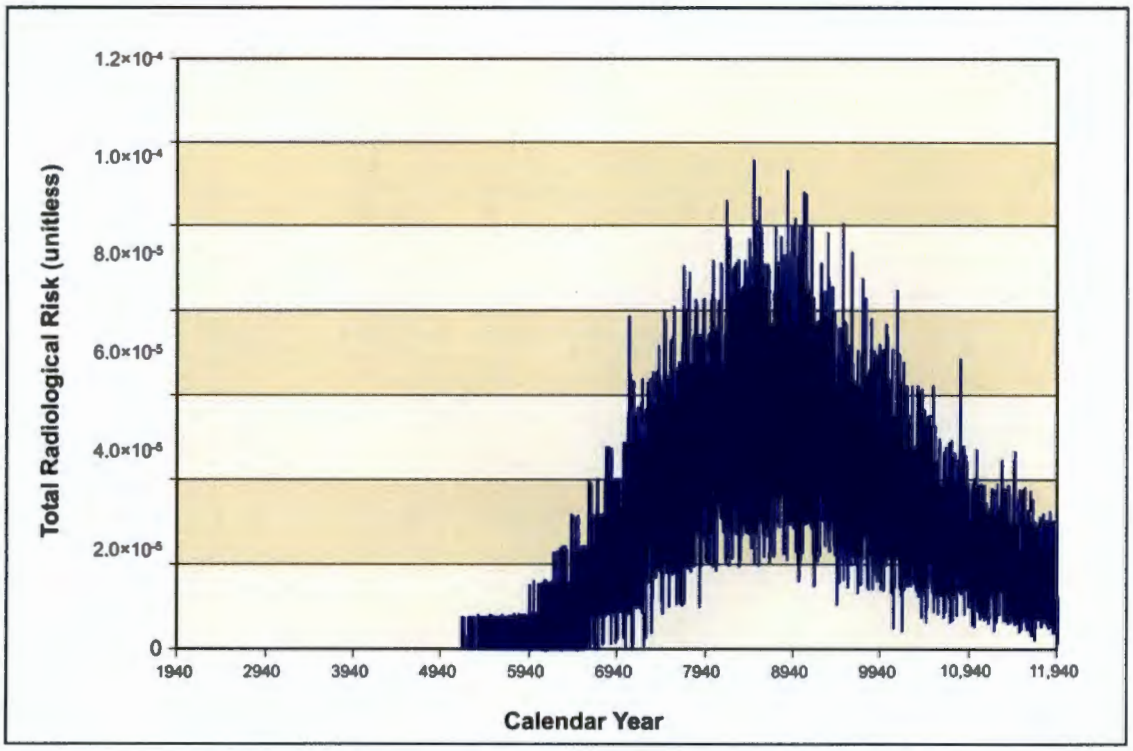


Figure Q–41. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

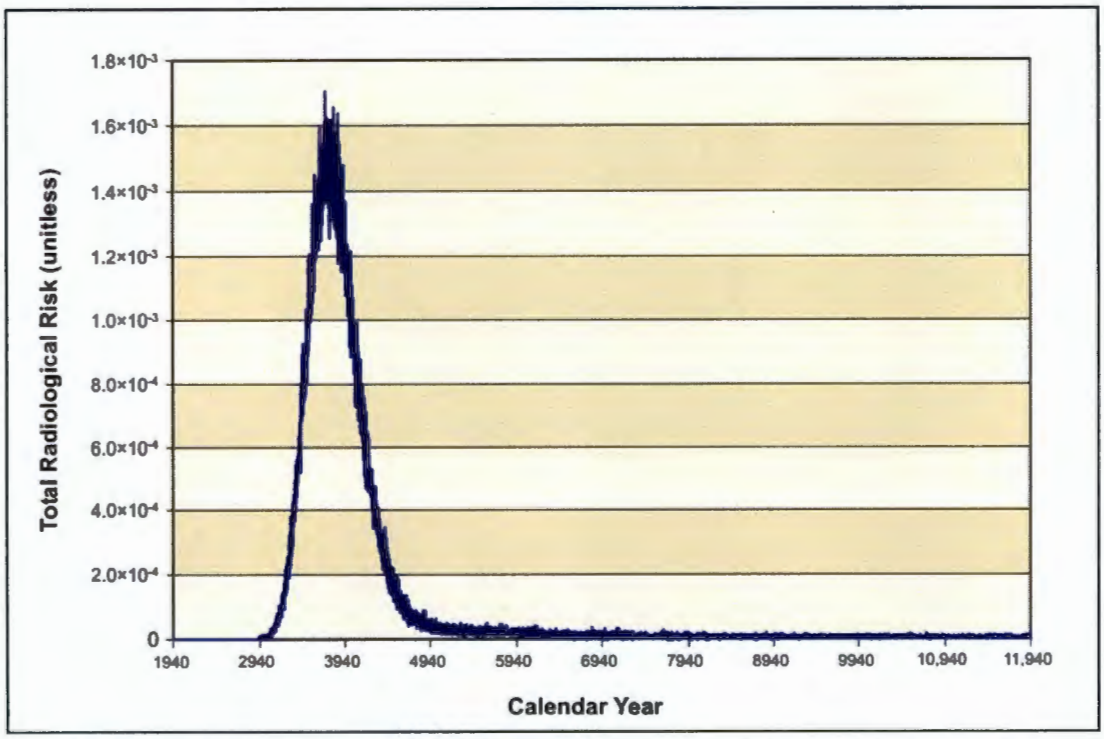


Figure Q–42. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

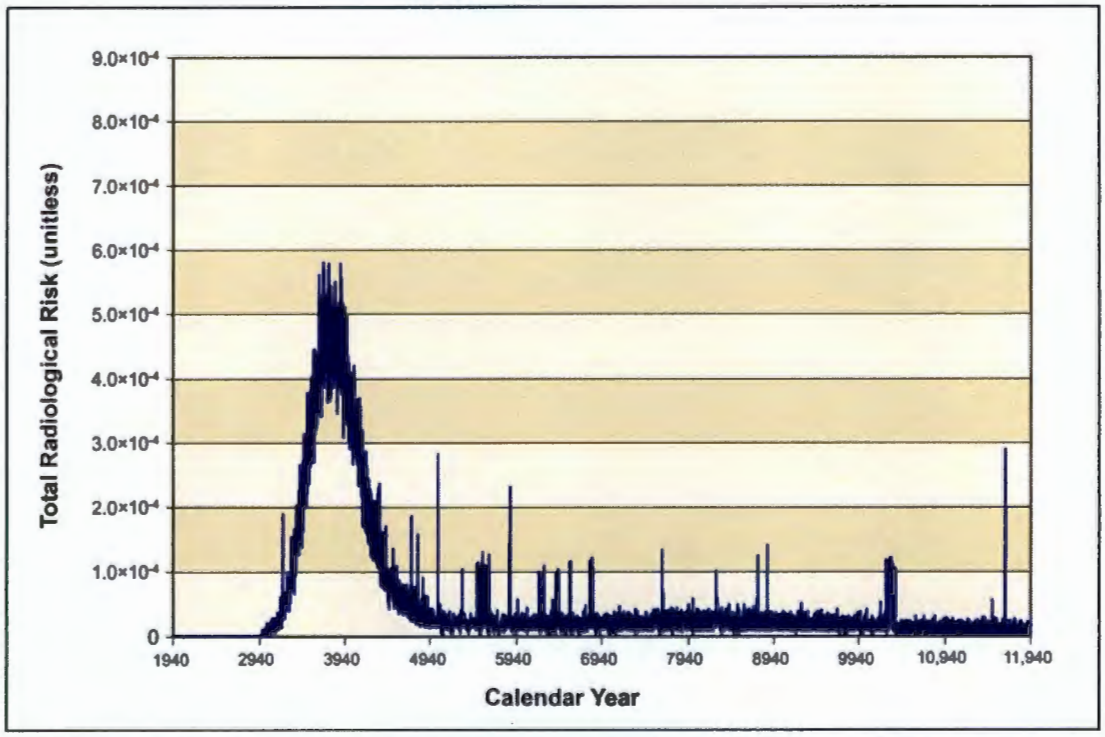


Figure Q–43. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-B, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.3 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-C

Disposal Group 1, Subgroup 1-C, addresses the waste resulting from Tank Closure Alternative 3B, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Cast stone
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 3B.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–301 through Q–306, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would be exceeded primarily due to chromium and nitrate at the IDF-East barrier, the Core Zone Boundary, and the Columbia River nearshore for the drinking-water well user, resident farmer, and American Indian resident farmer. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–301. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	5.02×10^{-6}	8.80	3.02×10^{-4}	5.02×10^{-6}	2.26×10^{1}	9.92×10^{-4}	5.02×10^{-6}	4.60×10^{1}	2.16×10^{-3}
Iodine-129	2.97×10^{-10}	8.45×10^{-2}	9.62×10^{-7}	2.97×10^{-10}	9.81×10^{-2}	1.30×10^{-6}	2.97×10^{-10}	1.21×10^{-1}	1.87×10^{-6}
Total	5.02×10^{-6}	8.88	3.03×10^{-4}	5.02×10^{-6}	2.27×10^{1}	9.93×10^{-4}	5.02×10^{-6}	4.61×10^{1}	2.17×10^{-3}
Year of Peak Impact	9048	9048	9048	9048	9048	9048	9048	9048	9048
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.26×10^{-2}	6.02×10^{-2}	0.00	1.26×10^{-2}	7.51×10^{-2}	0.00	1.26×10^{-2}	1.36×10^{-1}	0.00
Chromium	4.36×10^{-1}	4.16	0.00	4.36×10^{-1}	4.16	1.71×10^{-9}	4.36×10^{-1}	6.08	7.86×10^{-5}
Nitrate	3.58×10^{1}	6.40×10^{-1}	0.00	3.58×10^{1}	8.43×10^{-1}	0.00	3.58×10^{1}	1.65	0.00
Total	3.63×10^{1}	4.86	0.00	3.63×10^{1}	5.08	1.71×10^{-9}	3.63×10^{1}	7.87	7.86×10^{-5}
Year of Peak Impact	8940	8940	N/A	8940	8940	8940	8940	8940	8940

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–302. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–303. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.18×10^{-8}	5.58×10^{-2}	1.98×10^{-6}	3.30×10^{-8}	1.48×10^{-1}	6.51×10^{-6}	3.30×10^{-8}	3.02×10^{-1}	1.42×10^{-5}
Iodine-129	4.71×10^{-11}	1.34×10^{-2}	1.26×10^{-7}	3.89×10^{-11}	1.29×10^{-2}	1.70×10^{-7}	3.89×10^{-11}	1.59×10^{-2}	2.45×10^{-7}
Total	3.19×10^{-8}	6.92×10^{-2}	2.11×10^{-6}	3.30×10^{-8}	1.61×10^{-1}	6.68×10^{-6}	3.30×10^{-8}	3.18×10^{-1}	1.44×10^{-5}
Year of Peak Impact	3804	3804	3825	3825	3825	3825	3825	3825	3825
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.13×10^{-3}	2.03×10^{-2}	0.00	2.13×10^{-3}	2.03×10^{-2}	8.36×10^{-12}	2.13×10^{-3}	2.96×10^{-2}	3.83×10^{-7}
Nitrate	9.37×10^{-2}	1.67×10^{-3}	0.00	9.37×10^{-2}	2.20×10^{-3}	0.00	9.37×10^{-2}	4.32×10^{-3}	0.00
Total	9.58×10^{-2}	2.19×10^{-2}	0.00	9.58×10^{-2}	2.25×10^{-2}	8.36×10^{-12}	9.58×10^{-2}	3.40×10^{-2}	3.83×10^{-7}
Year of Peak Impact	3856	3856	N/A	3856	3856	3856	3856	3856	3856

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–304. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.43×10^{-6}	1.13×10^{1}	4.55×10^{-4}	6.43×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.55×10^{-6}	6.92×10^{1}	3.26×10^{-3}
Iodine-129	5.62×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.62×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.84×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.49×10^{-6}	2.73×10^{1}	5.79×10^{-4}	6.49×10^{-6}	4.75×10^{1}	1.66×10^{-3}	7.59×10^{-6}	8.49×10^{1}	3.50×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	5.42×10^{-3}	2.58×10^{-2}	0.00	5.42×10^{-3}	3.22×10^{-2}	0.00	5.42×10^{-3}	5.82×10^{-2}	0.00
Chromium	2.65×10^{-1}	2.52	0.00	2.65×10^{-1}	2.52	1.04×10^{-9}	2.65×10^{-1}	3.69	4.77×10^{-5}
Nitrate	1.05×10^{1}	1.87×10^{-1}	0.00	1.05×10^{1}	2.47×10^{-1}	0.00	1.05×10^{1}	4.84×10^{-1}	0.00
Total	1.08×10^{1}	2.73	0.00	1.08×10^{1}	2.80	1.04×10^{-9}	1.08×10^{1}	4.23	4.77×10^{-5}
Year of Peak Impact	8760	8760	N/A	8760	8760	8760	8760	8760	8760

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–305. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.69×10^{-6}	2.96	1.02×10^{-4}	1.69×10^{-6}	7.60	3.34×10^{-4}	1.69×10^{-6}	1.55×10^{1}	7.28×10^{-4}
Iodine-129	1.45×10^{-9}	4.12×10^{-1}	4.69×10^{-6}	1.45×10^{-9}	4.79×10^{-1}	6.34×10^{-6}	1.45×10^{-9}	5.91×10^{-1}	9.12×10^{-6}
Total	1.69×10^{-6}	3.37	1.06×10^{-4}	1.69×10^{-6}	8.08	3.40×10^{-4}	1.69×10^{-6}	1.61×10^{1}	7.37×10^{-4}
Year of Peak Impact	8939	8939	8939	8939	8939	8939	8939	8939	8939
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.81×10^{-3}	8.60×10^{-3}	0.00	1.81×10^{-3}	1.07×10^{-2}	0.00	1.81×10^{-3}	1.94×10^{-2}	0.00
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.16×10^{-8}	0.00
Chromium	1.16×10^{-1}	1.11	0.00	1.16×10^{-1}	1.11	4.57×10^{-10}	1.16×10^{-1}	1.62	2.10×10^{-5}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.33×10^{-5}	0.00
Nitrate	7.07	1.26×10^{-1}	0.00	7.07	1.66×10^{-1}	0.00	7.07	3.26×10^{-1}	0.00
Total	7.19	1.24	0.00	7.19	1.29	4.57×10^{-10}	7.19	1.97	2.10×10^{-5}
Year of Peak Impact	9310	9310	N/A	9310	9310	9311	9310	9310	9311

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–306. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.58×10^{-11}	7.09×10^{-5}	3.29×10^{-9}	1.18×10^{-11}	1.23×10^{-4}	7.76×10^{-9}	1.69×10^{-6}	1.84×10^{-2}	1.01×10^{-6}
Iodine-129	1.34×10^{-13}	4.43×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.92×10^{-4}	1.74×10^{-8}	1.45×10^{-9}	2.16×10^{-3}	5.30×10^{-8}
Total	1.59×10^{-11}	1.15×10^{-4}	3.77×10^{-9}	1.20×10^{-11}	9.15×10^{-4}	2.51×10^{-8}	1.69×10^{-6}	2.06×10^{-2}	1.07×10^{-6}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	8939	8939	8939
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.80×10^{-8}	4.04×10^{-7}	0.00	7.98×10^{-8}	8.57×10^{-7}	0.00	1.81×10^{-3}	1.07×10^{-2}	0.00
Chromium	1.41×10^{-6}	1.34×10^{-5}	5.84×10^{-15}	1.01×10^{-6}	1.54×10^{-5}	2.68×10^{-10}	5.82×10^{-2}	1.28×10^{-1}	1.05×10^{-5}
Nitrate	1.53×10^{-4}	5.27×10^{-6}	0.00	1.91×10^{-4}	1.80×10^{-2}	0.00	1.39×10^{1}	5.20×10^{-1}	0.00
Total	1.54×10^{-4}	1.91×10^{-5}	5.84×10^{-15}	1.92×10^{-4}	1.80×10^{-2}	2.68×10^{-10}	1.40×10^{1}	6.59×10^{-1}	1.05×10^{-5}
Year of Peak Impact	9141	9141	9446	9138	9138	9446	9451	9451	9311

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–44 through Q–46 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For IDF-East, the radiological lifetime risk of incidence of cancer does not occur until around the year 9000 as a result of slower movement in the vadose zone for waste forms disposed of in IDF-East.

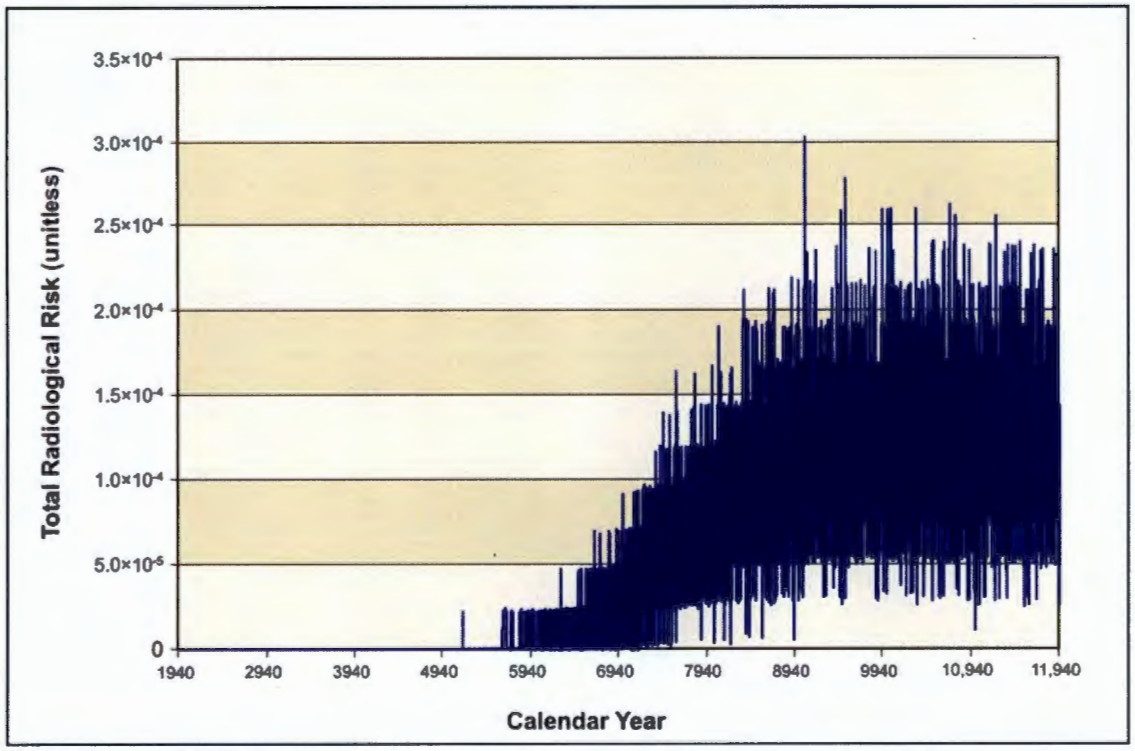


Figure Q–44. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

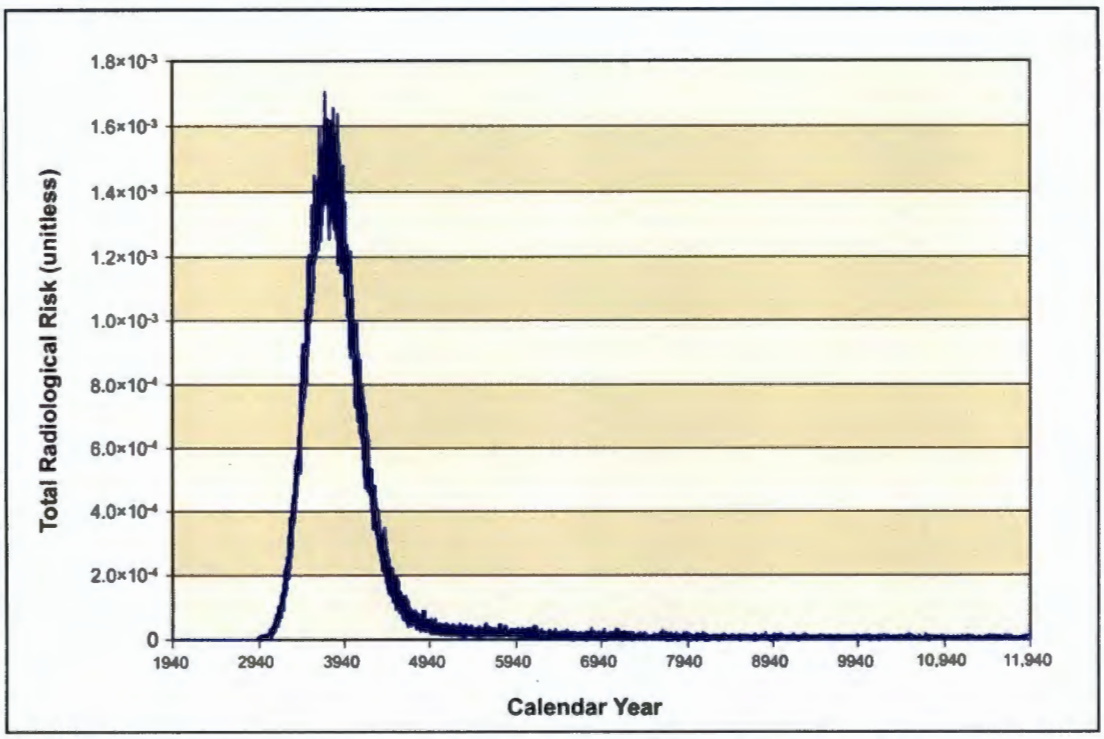


Figure Q–45. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

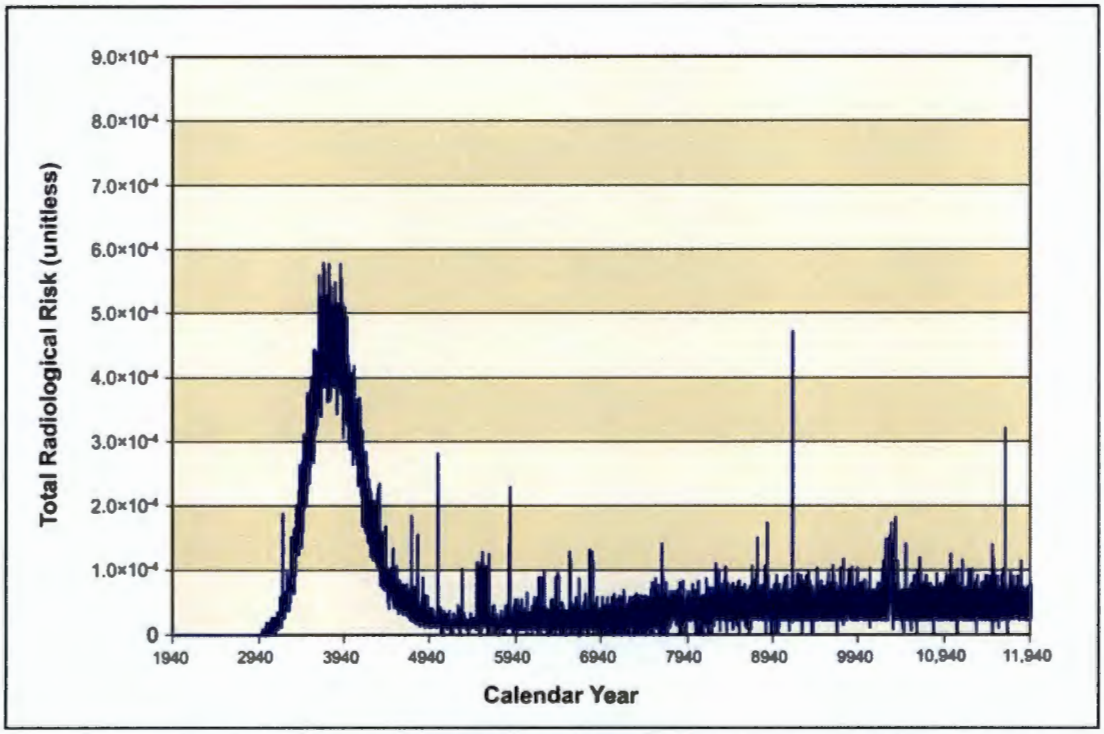


Figure Q–46. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-C, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.4 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-D

Disposal Group 1, Subgroup 1-D, addresses the waste resulting from Tank Closure Alternative 3C, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Steam reforming waste
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 3C.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–307 through Q–312, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-East barrier, the IDF-West barrier and the Core Zone Boundary for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would be exceeded primarily due to chromium at the IDF-East barrier, Core Zone Boundary, and Columbia River nearshore for the drinking-water well user, resident farmer, and American Indian resident farmer. Population dose was estimated as 2.24 person-rem per year for the year of maximum impact.

Table Q–307. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.92×10^{-5}	5.11×10^{1}	1.76×10^{-3}	2.92×10^{-5}	1.31×10^{2}	5.76×10^{-3}	2.92×10^{-5}	2.67×10^{2}	1.26×10^{-2}
Iodine-129	6.01×10^{-9}	1.71	1.95×10^{-5}	6.01×10^{-9}	1.99	2.63×10^{-5}	6.01×10^{-9}	2.45	3.79×10^{-5}
Total	2.92×10^{-5}	5.28×10^{1}	1.78×10^{-3}	2.92×10^{-5}	1.33×10^{2}	5.79×10^{-3}	2.92×10^{-5}	2.70×10^{2}	1.26×10^{-2}
Year of Peak Impact	9032	9032	9032	9032	9032	9032	9032	9032	9032
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	4.35×10^{-1}	4.14	0.00	4.35×10^{-1}	4.15	1.71×10^{-9}	4.35×10^{-1}	6.06	7.85×10^{-5}
Nitrate	8.54	1.52×10^{-1}	0.00	8.54	2.01×10^{-1}	0.00	8.54	3.94×10^{-1}	0.00
Total	8.97	4.30	0.00	8.97	4.35	1.71×10^{-9}	8.97	6.46	7.85×10^{-5}
Year of Peak Impact	8442	8442	N/A	8442	8442	9071	8442	8442	9071

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–308. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–309. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.18×10^{-8}	5.58×10^{-2}	1.98×10^{-6}	3.30×10^{-8}	1.48×10^{-1}	6.51×10^{-6}	3.30×10^{-8}	3.02×10^{-1}	1.42×10^{-5}
Iodine-129	4.71×10^{-11}	1.34×10^{-2}	1.26×10^{-7}	3.89×10^{-11}	1.29×10^{-2}	1.70×10^{-7}	3.89×10^{-11}	1.59×10^{-2}	2.45×10^{-7}
Total	3.19×10^{-8}	6.92×10^{-2}	2.11×10^{-6}	3.30×10^{-8}	1.61×10^{-1}	6.68×10^{-6}	3.30×10^{-8}	3.18×10^{-1}	1.44×10^{-5}
Year of Peak Impact	3804	3804	3825	3825	3825	3825	3825	3825	3825
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.13×10^{-3}	2.03×10^{-2}	0.00	2.13×10^{-3}	2.03×10^{-2}	8.36×10^{-12}	2.13×10^{-3}	2.96×10^{-2}	3.83×10^{-7}
Nitrate	9.37×10^{-2}	1.67×10^{-3}	0.00	9.37×10^{-2}	2.20×10^{-3}	0.00	9.37×10^{-2}	4.32×10^{-3}	0.00
Total	9.58×10^{-2}	2.19×10^{-2}	0.00	9.58×10^{-2}	2.25×10^{-2}	8.36×10^{-12}	9.58×10^{-2}	3.40×10^{-2}	3.83×10^{-7}
Year of Peak Impact	3856	3856	N/A	3856	3856	3856	3856	3856	3856

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–310. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.46×10^{-5}	4.31×10^{1}	1.48×10^{-3}	2.46×10^{-5}	1.11×10^{2}	4.87×10^{-3}	2.46×10^{-5}	2.26×10^{2}	1.06×10^{-2}
Iodine-129	2.71×10^{-9}	7.72×10^{-1}	8.79×10^{-6}	2.71×10^{-9}	8.97×10^{-1}	1.19×10^{-5}	2.71×10^{-9}	1.11	1.71×10^{-5}
Total	2.46×10^{-5}	4.39×10^{1}	1.49×10^{-3}	2.46×10^{-5}	1.12×10^{2}	4.88×10^{-3}	2.46×10^{-5}	2.27×10^{2}	1.06×10^{-2}
Year of Peak Impact	9067	9067	9067	9067	9067	9067	9067	9067	9067
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	1.74×10^{-1}	1.66	0.00	1.74×10^{-1}	1.66	6.84×10^{-10}	1.74×10^{-1}	2.43	3.14×10^{-5}
Nitrate	1.66	2.96×10^{-2}	0.00	1.66	3.90×10^{-2}	0.00	1.66	7.64×10^{-2}	0.00
Total	1.83	1.69	0.00	1.83	1.70	6.84×10^{-10}	1.83	2.50	3.14×10^{-5}
Year of Peak Impact	8397	8397	N/A	8397	8397	8397	8397	8397	8397

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–311. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	7.44×10^{-6}	1.30×10^{1}	4.48×10^{-4}	7.44×10^{-6}	3.35×10^{1}	1.47×10^{-3}	7.44×10^{-6}	6.82×10^{1}	3.21×10^{-3}
Iodine-129	3.49×10^{-9}	9.93×10^{-1}	1.13×10^{-5}	3.49×10^{-9}	1.15	1.53×10^{-5}	3.49×10^{-9}	1.42	2.20×10^{-5}
Total	7.45×10^{-6}	1.40×10^{1}	4.60×10^{-4}	7.45×10^{-6}	3.46×10^{1}	1.49×10^{-3}	7.45×10^{-6}	6.96×10^{1}	3.23×10^{-3}
Year of Peak Impact	7821	7821	7821	7821	7821	7821	7821	7821	7821
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	1.16×10^{-1}	1.11	0.00	1.16×10^{-1}	1.11	4.56×10^{-10}	1.16×10^{-1}	1.62	2.09×10^{-5}
Nitrate	8.28×10^{-1}	1.48×10^{-2}	0.00	8.28×10^{-1}	1.95×10^{-2}	0.00	8.28×10^{-1}	3.82×10^{-2}	0.00
Total	9.44×10^{-1}	1.12	0.00	9.44×10^{-1}	1.13	4.56×10^{-10}	9.44×10^{-1}	1.65	2.09×10^{-5}
Year of Peak Impact	9878	9878	N/A	9878	9878	9878	9878	9878	9878

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–312. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	9.78×10^{-11}	4.40×10^{-4}	1.93×10^{-8}	9.53×10^{-11}	9.91×10^{-4}	4.82×10^{-8}	7.44×10^{-6}	8.13×10^{-2}	4.46×10^{-6}
Iodine-129	2.28×10^{-14}	7.54×10^{-6}	9.99×10^{-11}	2.77×10^{-14}	1.49×10^{-4}	2.96×10^{-9}	3.49×10^{-9}	5.24×10^{-3}	1.29×10^{-7}
Total	9.78×10^{-11}	4.47×10^{-4}	1.94×10^{-8}	9.54×10^{-11}	1.14×10^{-3}	5.11×10^{-8}	7.45×10^{-6}	8.66×10^{-2}	4.59×10^{-6}
Year of Peak Impact	9193	9193	9193	9247	9247	9193	7821	7821	7821
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	1.66×10^{-6}	1.58×10^{-5}	6.52×10^{-15}	7.11×10^{-7}	1.08×10^{-5}	2.99×10^{-10}	1.16×10^{-1}	2.56×10^{-1}	1.05×10^{-5}
Nitrate	3.01×10^{-5}	1.04×10^{-6}	0.00	5.04×10^{-5}	4.73×10^{-3}	0.00	8.28×10^{-1}	3.16×10^{-2}	0.00
Total	3.18×10^{-5}	1.69×10^{-5}	6.52×10^{-15}	5.11×10^{-5}	4.74×10^{-3}	2.99×10^{-10}	9.44×10^{-1}	2.88×10^{-1}	1.05×10^{-5}
Year of Peak Impact	8877	8877	8877	8446	8446	8877	9878	9878	9878

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–47 through Q–49 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 9000 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-East. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-West barrier, the radiological lifetime risk of incidence of cancer occurs around the year 3700, and for the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 9000 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East. While the peak of the series of time average of lifetime radiological risk appears on the curve of Figure Q–49, the peak of the series of instantaneous lifetime radiological risk does not appear in the figure as the upper limit of the risk scale was reduced to facilitate comparison of the peaks attributed to RPPDF and IDF-East.

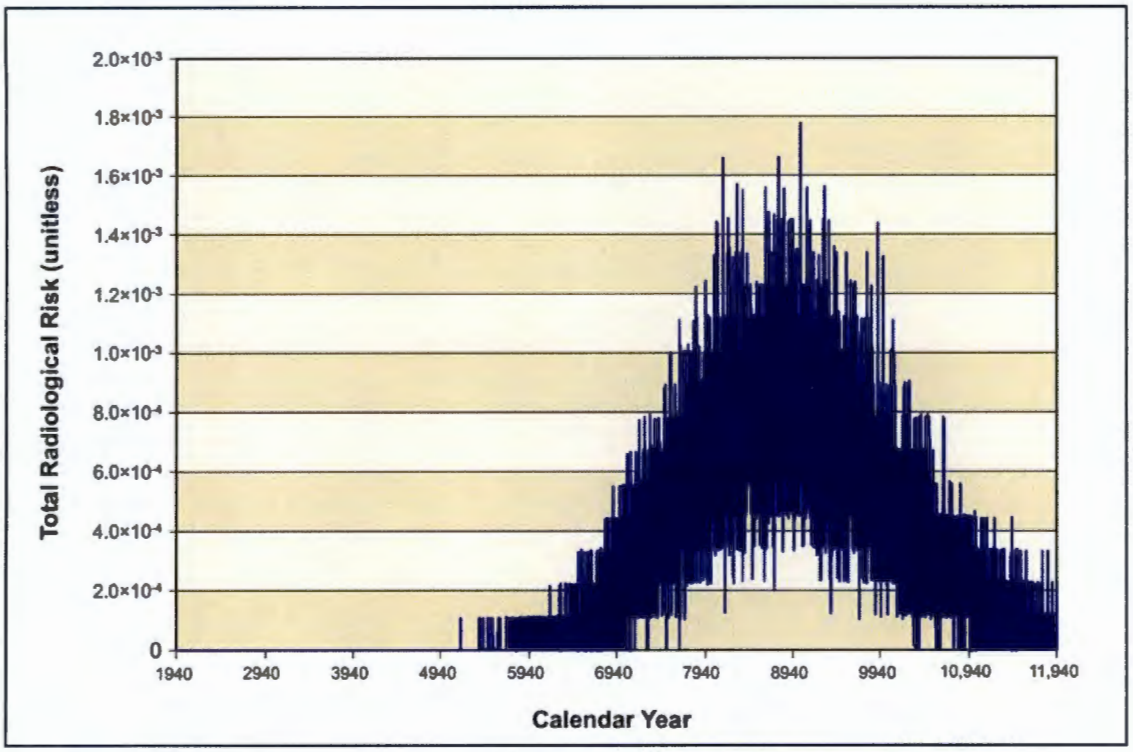


Figure Q–47. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

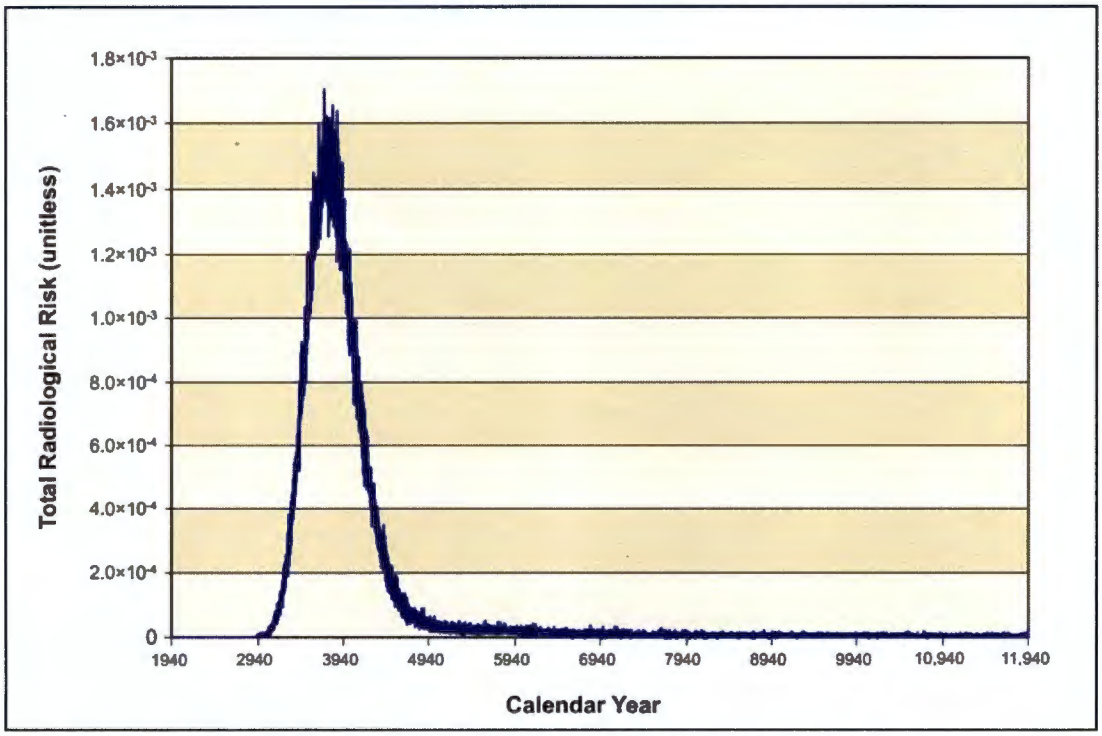


Figure Q–48. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

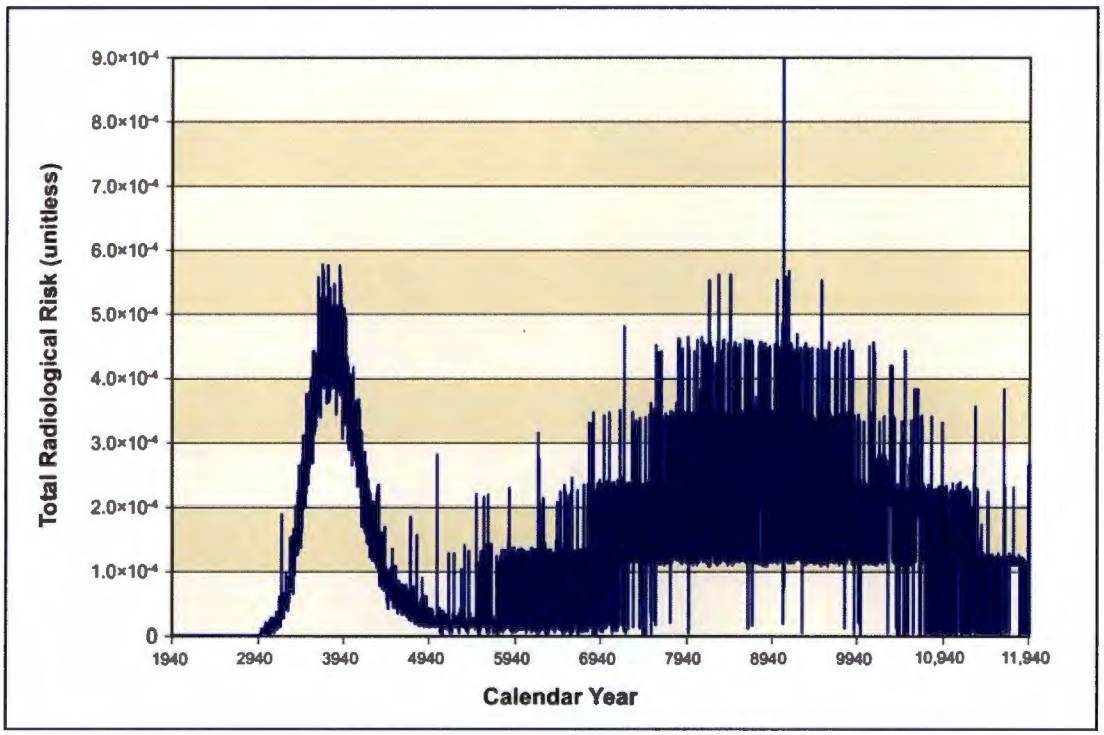


Figure Q–49. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.5 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-E

Disposal Group 1, Subgroup 1-E, addresses the waste resulting from Tank Closure Alternative 4, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Bulk vitrification glass
- Cast stone
- Sulfate grout
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 4.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–313 through Q–318, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would be exceeded primarily due to chromium at the IDF-East barrier and the Core Zone Boundary for the drinking-water well user, resident farmer, and American Indian resident farmer, and at the Columbia River nearshore for the American Indian resident farmer. Population dose was estimated as 5.80×10^{-1} person-rem per year for the year of maximum impact.

Table Q–313. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	5.64×10^{-6}	9.88	3.40×10^{-4}	5.64×10^{-6}	2.54×10^{1}	1.11×10^{-3}	5.64×10^{-6}	5.17×10^{1}	2.43×10^{-3}
Iodine-129	7.34×10^{-10}	2.09×10^{-1}	2.38×10^{-6}	7.34×10^{-10}	2.42×10^{-1}	3.21×10^{-6}	7.34×10^{-10}	2.99×10^{-1}	4.62×10^{-6}
Total	5.64×10^{-6}	1.01×10^{1}	3.42×10^{-4}	5.64×10^{-6}	2.56×10^{1}	1.12×10^{-3}	5.64×10^{-6}	5.20×10^{1}	2.43×10^{-3}
Year of Peak Impact	9826	9826	9826	9826	9826	9826	9826	9826	9826
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	7.01×10^{-3}	3.34×10^{-2}	0.00	7.01×10^{-3}	4.17×10^{-2}	0.00	7.01×10^{-3}	7.53×10^{-2}	0.00
Chromium	2.23×10^{-1}	2.13	0.00	2.23×10^{-1}	2.13	8.78×10^{-10}	2.23×10^{-1}	3.11	4.03×10^{-5}
Nitrate	1.77×10^{1}	3.16×10^{-1}	0.00	1.77×10^{1}	4.16×10^{-1}	0.00	1.77×10^{1}	8.16×10^{-1}	0.00
Total	1.79×10^{1}	2.48	0.00	1.79×10^{1}	2.59	8.78×10^{-10}	1.79×10^{1}	4.00	4.03×10^{-5}
Year of Peak Impact	9318	9318	N/A	9318	9318	9069	9318	9318	9069

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–314. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–315. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.03×10^{-7}	1.80×10^{-1}	6.19×10^{-6}	1.03×10^{-7}	4.63×10^{-1}	2.03×10^{-5}	1.03×10^{-7}	9.42×10^{-1}	4.43×10^{-5}
Iodine-129	1.22×10^{-10}	3.47×10^{-2}	3.95×10^{-7}	1.22×10^{-10}	4.02×10^{-2}	5.33×10^{-7}	1.22×10^{-10}	4.97×10^{-2}	7.67×10^{-7}
Total	1.03×10^{-7}	2.15×10^{-1}	6.59×10^{-6}	1.03×10^{-7}	5.03×10^{-1}	2.08×10^{-5}	1.03×10^{-7}	9.92×10^{-1}	4.51×10^{-5}
Year of Peak Impact	3822	3822	3822	3822	3822	3822	3822	3822	3822
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	5.86×10^{-3}	5.59×10^{-2}	0.00	5.86×10^{-3}	5.59×10^{-2}	2.30×10^{-11}	5.86×10^{-3}	8.17×10^{-2}	1.06×10^{-6}
Nitrate	1.53×10^{-1}	2.73×10^{-3}	0.00	1.53×10^{-1}	3.59×10^{-3}	0.00	1.53×10^{-1}	7.04×10^{-3}	0.00
Total	1.59×10^{-1}	5.86×10^{-2}	0.00	1.59×10^{-1}	5.95×10^{-2}	2.30×10^{-11}	1.59×10^{-1}	8.87×10^{-2}	1.06×10^{-6}
Year of Peak Impact	3804	3804	N/A	3804	3804	3804	3804	3804	3804

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–316. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.44×10^{-6}	1.13×10^{1}	4.57×10^{-4}	6.44×10^{-6}	2.90×10^{1}	1.50×10^{-3}	7.60×10^{-6}	6.96×10^{1}	3.27×10^{-3}
Iodine-129	5.62×10^{-8}	1.60×10^{1}	1.25×10^{-4}	5.62×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.84×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.49×10^{-6}	2.73×10^{1}	5.82×10^{-4}	6.49×10^{-6}	4.75×10^{1}	1.67×10^{-3}	7.63×10^{-6}	8.53×10^{1}	3.52×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.00×10^{-3}	4.77×10^{-3}	0.00	1.00×10^{-3}	5.95×10^{-3}	0.00	1.00×10^{-3}	1.08×10^{-2}	0.00
Chromium	9.56×10^{-2}	9.11×10^{-1}	0.00	9.56×10^{-2}	9.12×10^{-1}	3.76×10^{-10}	9.56×10^{-2}	1.33	1.72×10^{-5}
Nitrate	6.02	1.07×10^{-1}	0.00	6.02	1.41×10^{-1}	0.00	6.02	2.78×10^{-1}	0.00
Total Uranium	6.77×10^{-11}	6.45×10^{-10}	0.00	6.77×10^{-11}	6.52×10^{-10}	0.00	6.77×10^{-11}	6.75×10^{-10}	0.00
Total	6.11	1.02	0.00	6.11	1.06	3.76×10^{-10}	6.11	1.62	1.72×10^{-5}
Year of Peak Impact	9599	9599	N/A	9599	9599	8643	9599	9599	8643

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–317. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.03×10^{-6}	3.56	1.22×10^{-4}	2.03×10^{-6}	9.14	4.01×10^{-4}	2.03×10^{-6}	1.86×10^{1}	8.75×10^{-4}
Iodine-129	1.47×10^{-9}	4.18×10^{-1}	4.76×10^{-6}	1.47×10^{-9}	4.86×10^{-1}	6.43×10^{-6}	1.47×10^{-9}	6.00×10^{-1}	9.26×10^{-6}
Total	2.03×10^{-6}	3.98	1.27×10^{-4}	2.03×10^{-6}	9.62	4.08×10^{-4}	2.03×10^{-6}	1.92×10^{1}	8.85×10^{-4}
Year of Peak Impact	8117	8117	8117	8117	8117	8117	8117	8117	8117
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.00×10^{-3}	4.77×10^{-3}	0.00	1.00×10^{-3}	5.95×10^{-3}	0.00	1.00×10^{-3}	1.08×10^{-2}	0.00
Chromium	6.37×10^{-2}	6.07×10^{-1}	0.00	6.37×10^{-2}	6.08×10^{-1}	2.50×10^{-10}	6.37×10^{-2}	8.88×10^{-1}	1.15×10^{-5}
Nitrate	2.61	4.67×10^{-2}	0.00	2.61	6.14×10^{-2}	0.00	2.61	1.21×10^{-1}	0.00
Total	2.68	6.59×10^{-1}	0.00	2.68	6.75×10^{-1}	2.50×10^{-10}	2.68	1.02	1.15×10^{-5}
Year of Peak Impact	8069	8069	N/A	8069	8069	8079	8069	8069	8079

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–318. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.59×10^{-11}	7.14×10^{-5}	4.43×10^{-9}	1.15×10^{-11}	1.19×10^{-4}	7.81×10^{-9}	2.03×10^{-6}	2.21×10^{-2}	1.22×10^{-6}
Iodine-129	1.34×10^{-13}	4.43×10^{-5}	1.53×10^{-11}	1.48×10^{-13}	7.99×10^{-4}	1.74×10^{-8}	1.47×10^{-9}	2.20×10^{-3}	5.41×10^{-8}
Total	1.60×10^{-11}	1.16×10^{-4}	4.44×10^{-9}	1.16×10^{-11}	9.18×10^{-4}	2.52×10^{-8}	2.03×10^{-6}	2.44×10^{-2}	1.27×10^{-6}
Year of Peak Impact	4005	4005	9835	4075	4075	4005	8117	8117	8117
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	3.43×10^{-8}	2.04×10^{-7}	0.00	3.30×10^{-8}	3.54×10^{-7}	0.00	1.00×10^{-3}	5.96×10^{-3}	0.00
Chromium	9.28×10^{-7}	8.85×10^{-6}	3.65×10^{-15}	5.37×10^{-7}	8.19×10^{-6}	1.67×10^{-10}	4.80×10^{-2}	1.06×10^{-1}	5.74×10^{-6}
Fluoride	0.00	0.00	0.00	5.38×10^{-11}	3.74×10^{-11}	0.00	2.51×10^{-5}	3.68×10^{-6}	0.00
Nitrate	7.09×10^{-5}	2.45×10^{-6}	0.00	1.11×10^{-4}	1.05×10^{-2}	0.00	6.02	2.28×10^{-1}	0.00
Total	7.18×10^{-5}	1.15×10^{-5}	3.65×10^{-15}	1.12×10^{-4}	1.05×10^{-2}	1.67×10^{-10}	6.07	3.40×10^{-1}	5.74×10^{-6}
Year of Peak Impact	8553	8553	8553	8888	8888	8553	8691	8691	8079

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–50 through Q–52 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 9800 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

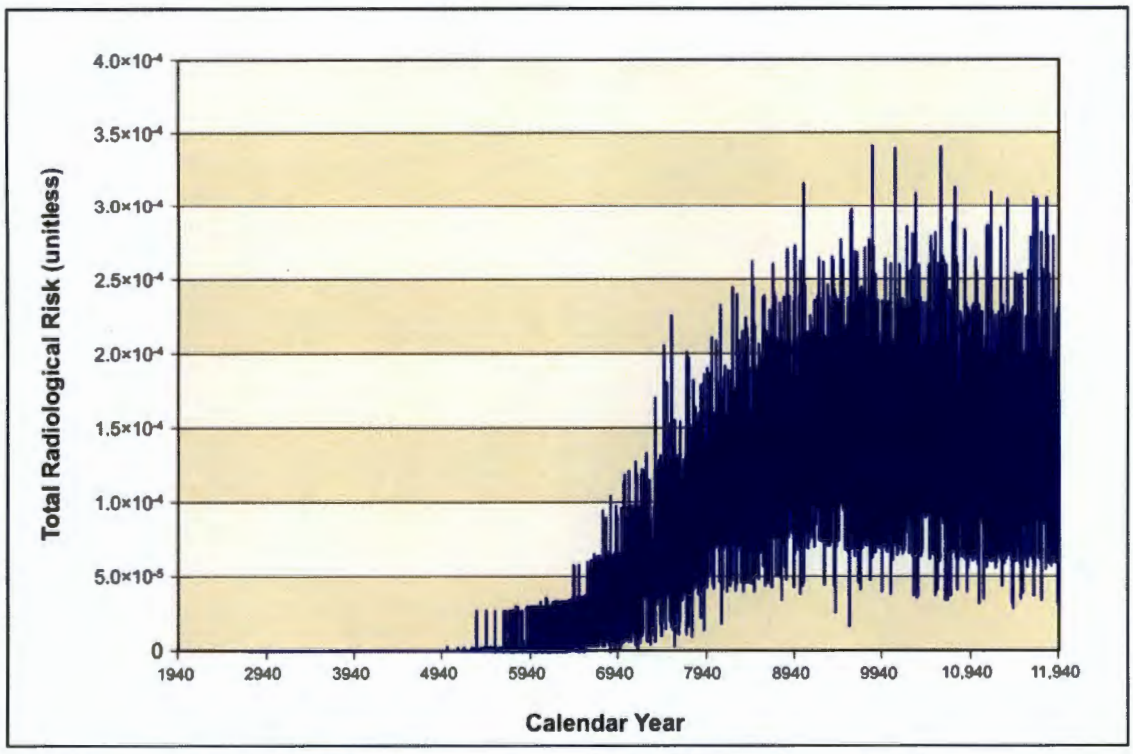


Figure Q–50. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

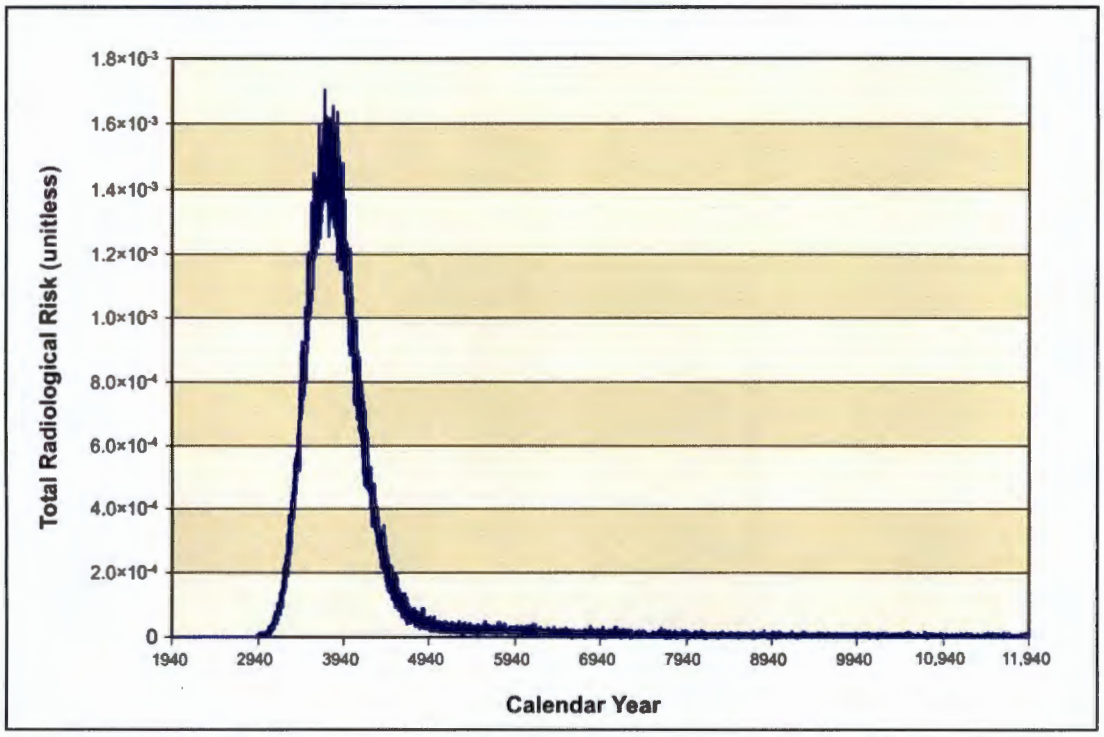


Figure Q–51. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

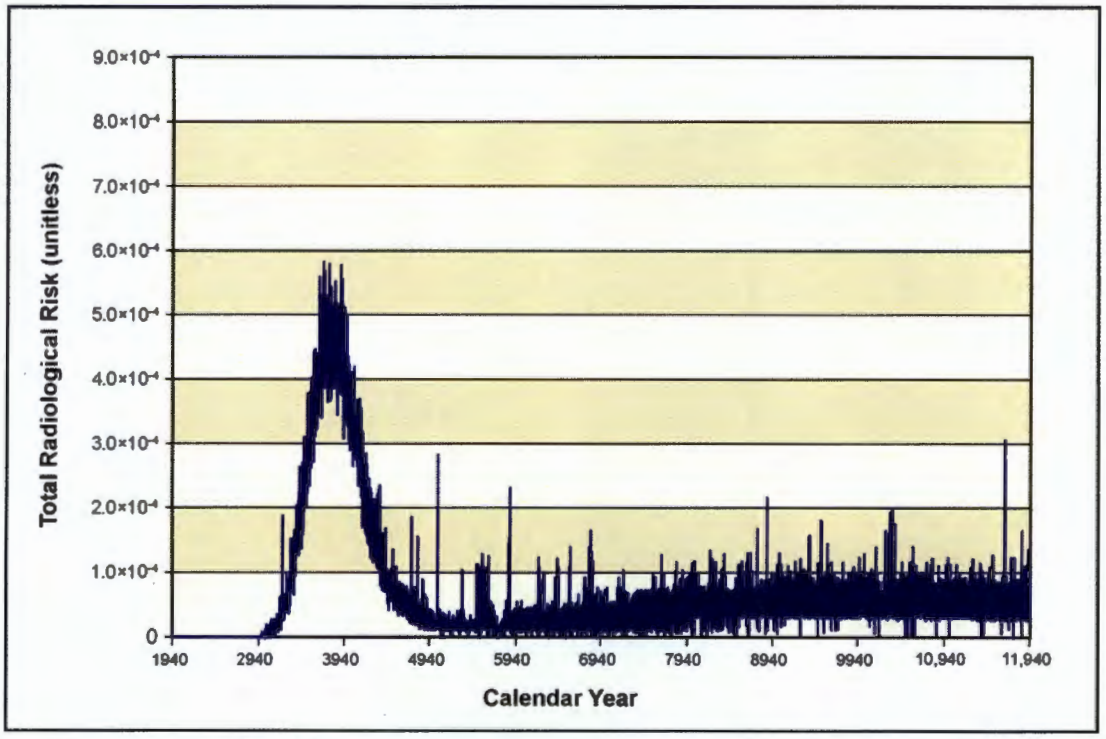


Figure Q–52. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-E, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.6 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-F

Disposal Group 1, Subgroup 1-F addresses the waste resulting from Tank Closure Alternative 5, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Bulk vitrification glass
- Cast stone
- Sulfate grout
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

The RPPDF would not be constructed or operated for Tank Closure Alternative 5 because tank closure cleanup activities would not be conducted.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–319 through Q–323, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would be exceeded primarily due to chromium at the IDF-East barrier, the Core Zone Boundary, and the Columbia River nearshore for the drinking-water well user, resident farmer, and American Indian resident farmer. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–319. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.39×10^{-6}	4.18	1.44×10^{-4}	2.39×10^{-6}	1.07×10^{1}	4.72×10^{-4}	2.39×10^{-6}	2.19×10^{1}	1.03×10^{-3}
Iodine-129	5.52×10^{-10}	1.57×10^{-1}	1.79×10^{-6}	5.52×10^{-10}	1.82×10^{-1}	2.42×10^{-6}	5.52×10^{-10}	2.25×10^{-1}	3.48×10^{-6}
Total	2.39×10^{-6}	4.34	1.46×10^{-4}	2.39×10^{-6}	1.09×10^{1}	4.74×10^{-4}	2.39×10^{-6}	2.21×10^{1}	1.03×10^{-3}
Year of Peak Impact	9701	9701	9701	9701	9701	9701	9701	9701	9701
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	2.65×10^{-3}	1.26×10^{-2}	0.00	2.65×10^{-3}	1.58×10^{-2}	0.00	2.65×10^{-3}	2.85×10^{-2}	0.00
Chromium	3.35×10^{-1}	3.19	0.00	3.35×10^{-1}	3.20	1.32×10^{-9}	3.35×10^{-1}	4.67	6.04×10^{-5}
Nitrate	1.73×10^{1}	3.08×10^{-1}	0.00	1.73×10^{1}	4.06×10^{-1}	0.00	1.73×10^{1}	7.96×10^{-1}	0.00
Total	1.76×10^{1}	3.51	0.00	1.76×10^{1}	3.62	1.32×10^{-9}	1.76×10^{1}	5.49	6.04×10^{-5}
Year of Peak Impact	8735	8735	N/A	8735	8735	8735	8735	8735	8735

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–320. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–321. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.42×10^{-6}	1.12×10^{1}	4.54×10^{-4}	6.42×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.54×10^{-6}	6.91×10^{1}	3.25×10^{-3}
Iodine-129	5.61×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.61×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.83×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.47×10^{-6}	2.72×10^{1}	5.78×10^{-4}	6.47×10^{-6}	4.74×10^{1}	1.66×10^{-3}	7.58×10^{-6}	8.47×10^{1}	3.49×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.33×10^{-3}	6.32×10^{-3}	0.00	1.33×10^{-3}	7.89×10^{-3}	0.00	1.33×10^{-3}	1.42×10^{-2}	0.00
Chromium	1.48×10^{-1}	1.41	0.00	1.48×10^{-1}	1.41	5.81×10^{-10}	1.48×10^{-1}	2.06	2.67×10^{-5}
Nitrate	3.27	5.84×10^{-2}	0.00	3.27	7.69×10^{-2}	0.00	3.27	1.51×10^{-1}	0.00
Total	3.42	1.47	0.00	3.42	1.50	5.81×10^{-10}	3.42	2.23	2.67×10^{-5}
Year of Peak Impact	8764	8764	N/A	8764	8764	8764	8764	8764	8764

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–322. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.04×10^{-7}	1.41	6.77×10^{-5}	1.12×10^{-6}	5.06	2.22×10^{-4}	1.12×10^{-6}	1.03×10^{1}	4.85×10^{-4}
Iodine-129	6.87×10^{-9}	1.96	1.33×10^{-5}	4.12×10^{-9}	1.36	1.80×10^{-5}	4.12×10^{-9}	1.68	2.59×10^{-5}
Total	8.11×10^{-7}	3.36	8.11×10^{-5}	1.13×10^{-6}	6.42	2.40×10^{-4}	1.13×10^{-6}	1.20×10^{1}	5.11×10^{-4}
Year of Peak Impact	4388	4388	4191	4191	4191	4191	4191	4191	4191
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	3.32×10^{-4}	1.58×10^{-3}	0.00	3.32×10^{-4}	1.97×10^{-3}	0.00	3.32×10^{-4}	3.56×10^{-3}	0.00
Chromium	1.10×10^{-1}	1.05	0.00	1.10×10^{-1}	1.05	4.32×10^{-10}	1.10×10^{-1}	1.53	1.98×10^{-5}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.33×10^{-5}	0.00
Nitrate	2.16	3.86×10^{-2}	0.00	2.16	5.09×10^{-2}	0.00	2.16	9.98×10^{-2}	0.00
Total	2.27	1.09	0.00	2.27	1.10	4.32×10^{-10}	2.27	1.63	1.98×10^{-5}
Year of Peak Impact	8819	8819	N/A	8819	8819	8819	8819	8819	8819

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–323. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.57×10^{-11}	7.06×10^{-5}	3.28×10^{-9}	1.18×10^{-11}	1.22×10^{-4}	7.73×10^{-9}	8.04×10^{-7}	8.79×10^{-3}	6.75×10^{-7}
Iodine-129	1.34×10^{-13}	4.42×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.91×10^{-4}	1.74×10^{-8}	6.87×10^{-9}	1.12×10^{-2}	1.82×10^{-7}
Total	1.58×10^{-11}	1.15×10^{-4}	3.75×10^{-9}	1.19×10^{-11}	9.13×10^{-4}	2.51×10^{-8}	8.11×10^{-7}	2.00×10^{-2}	8.57×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.04×10^{-8}	6.16×10^{-8}	0.00	8.56×10^{-9}	9.20×10^{-8}	0.00	3.32×10^{-4}	1.97×10^{-3}	0.00
Chromium	1.17×10^{-6}	1.11×10^{-5}	4.79×10^{-15}	9.44×10^{-7}	1.44×10^{-5}	2.20×10^{-10}	7.03×10^{-2}	1.55×10^{-1}	9.90×10^{-6}
Nitrate	5.79×10^{-5}	2.00×10^{-6}	0.00	7.39×10^{-5}	6.94×10^{-3}	0.00	4.56	1.74×10^{-1}	0.00
Total	5.90×10^{-5}	1.32×10^{-5}	4.79×10^{-15}	7.48×10^{-5}	6.96×10^{-3}	2.20×10^{-10}	4.63	3.31×10^{-1}	9.90×10^{-6}
Year of Peak Impact	9128	9128	8667	8316	8316	8667	8787	8787	8819

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–53 through Q–55 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 9700 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

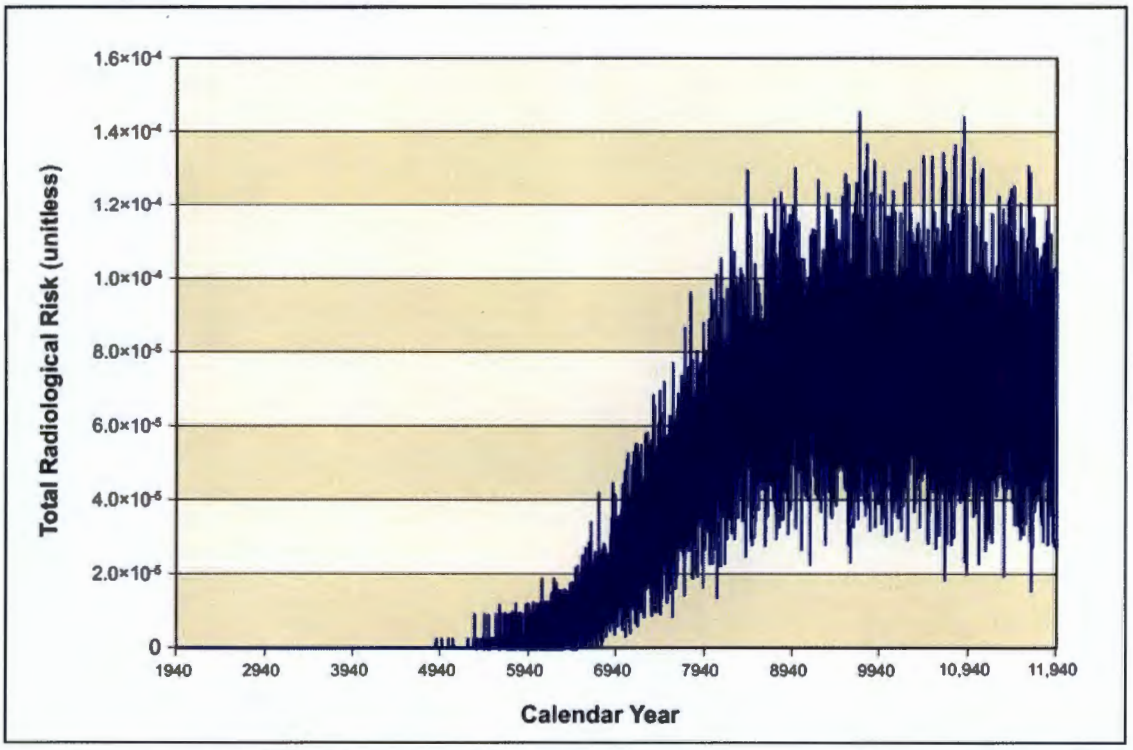


Figure Q–53. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

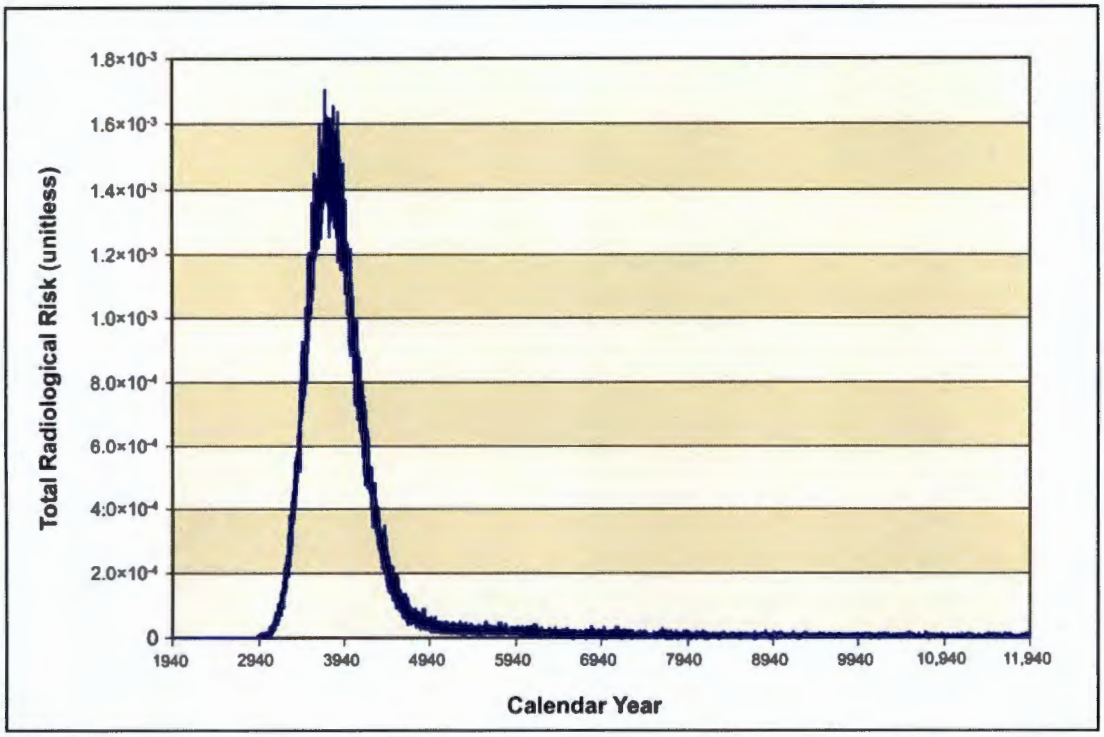


Figure Q–54. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

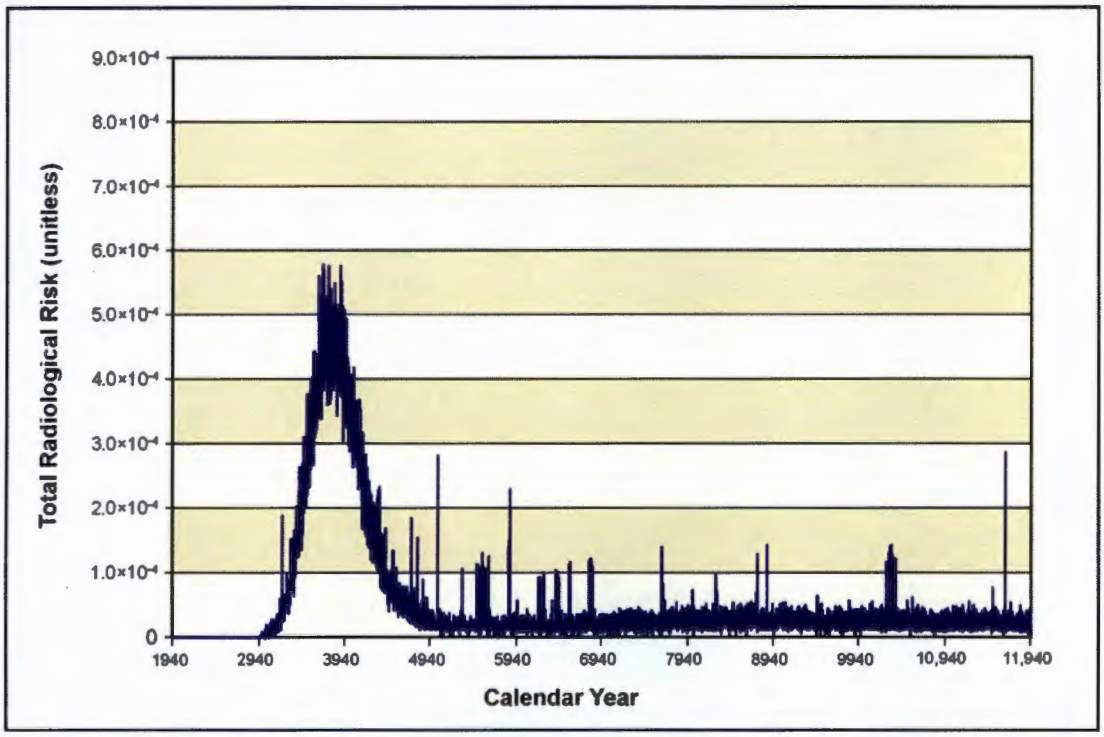


Figure Q–55. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-F, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.7 Waste Management Alternative 3; Disposal Group 1, Subgroup 1-G

Disposal Group 1, Subgroup 1-G, addresses the waste resulting from Tank Closure Alternative 6C, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 6C.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–324 through Q–329, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–324. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	4.14×10^{-7}	7.25×10^{-1}	2.49×10^{-5}	4.14×10^{-7}	1.86	8.17×10^{-5}	4.14×10^{-7}	3.79	1.78×10^{-4}
Iodine-129	6.40×10^{-10}	1.82×10^{-1}	2.07×10^{-6}	6.40×10^{-10}	2.11×10^{-1}	2.80×10^{-6}	6.40×10^{-10}	2.61×10^{-1}	4.03×10^{-6}
Total	4.14×10^{-7}	9.07×10^{-1}	2.70×10^{-5}	4.14×10^{-7}	2.07	8.45×10^{-5}	4.14×10^{-7}	4.05	1.82×10^{-4}
Year of Peak Impact	10,032	10,032	10,032	10,032	10,032	10,032	10,032	10,032	10,032
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.82×10^{-3}	2.69×10^{-2}	0.00	8.63×10^{-4}	8.23×10^{-3}	1.44×10^{-11}	8.63×10^{-4}	1.20×10^{-2}	6.61×10^{-7}
Nitrate	1.34×10^{1}	2.39×10^{-1}	0.00	1.42×10^{1}	3.35×10^{-1}	0.00	1.42×10^{1}	6.57×10^{-1}	0.00
Total	1.34×10^{1}	2.66×10^{-1}	0.00	1.42×10^{1}	3.43×10^{-1}	1.44×10^{-11}	1.42×10^{1}	6.69×10^{-1}	6.61×10^{-7}
Year of Peak Impact	8168	8168	N/A	8522	8522	8618	8522	8522	8618

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–325. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–326. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.18×10^{-8}	5.58×10^{-2}	1.98×10^{-6}	3.30×10^{-8}	1.48×10^{-1}	6.51×10^{-6}	3.30×10^{-8}	3.02×10^{-1}	1.42×10^{-5}
Iodine-129	4.71×10^{-11}	1.34×10^{-2}	1.26×10^{-7}	3.89×10^{-11}	1.29×10^{-2}	1.70×10^{-7}	3.89×10^{-11}	1.59×10^{-2}	2.45×10^{-7}
Total	3.19×10^{-8}	6.92×10^{-2}	2.11×10^{-6}	3.30×10^{-8}	1.61×10^{-1}	6.68×10^{-6}	3.30×10^{-8}	3.18×10^{-1}	1.44×10^{-5}
Year of Peak Impact	3804	3804	3825	3825	3825	3825	3825	3825	3825
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.13×10^{-3}	2.03×10^{-2}	0.00	2.13×10^{-3}	2.03×10^{-2}	8.36×10^{-12}	2.13×10^{-3}	2.96×10^{-2}	3.83×10^{-7}
Nitrate	9.37×10^{-2}	1.67×10^{-3}	0.00	9.37×10^{-2}	2.20×10^{-3}	0.00	9.37×10^{-2}	4.32×10^{-3}	0.00
Total	9.58×10^{-2}	2.19×10^{-2}	0.00	9.58×10^{-2}	2.25×10^{-2}	8.36×10^{-12}	9.58×10^{-2}	3.40×10^{-2}	3.83×10^{-7}
Year of Peak Impact	3856	3856	N/A	3856	3856	3856	3856	3856	3856

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–327. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.43×10^{-6}	1.13×10^{1}	4.55×10^{-4}	6.43×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.55×10^{-6}	6.92×10^{1}	3.26×10^{-3}
Iodine-129	5.62×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.62×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.84×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.49×10^{-6}	2.73×10^{1}	5.79×10^{-4}	6.49×10^{-6}	4.75×10^{1}	1.66×10^{-3}	7.59×10^{-6}	8.49×10^{1}	3.50×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	3.60×10^{-4}	3.43×10^{-3}	0.00	3.60×10^{-4}	3.44×10^{-3}	1.22×10^{-11}	3.60×10^{-4}	5.02×10^{-3}	5.58×10^{-7}
Nitrate	5.63	1.01×10^{-1}	0.00	5.63	1.32×10^{-1}	0.00	5.63	2.60×10^{-1}	0.00
Total	5.63	1.04×10^{-1}	0.00	5.63	1.36×10^{-1}	1.22×10^{-11}	5.63	2.65×10^{-1}	5.58×10^{-7}
Year of Peak Impact	9653	9653	N/A	9653	9653	3628	9653	9653	3628

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–328. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.06×10^{-7}	1.41	6.79×10^{-5}	1.13×10^{-6}	5.07	2.23×10^{-4}	1.13×10^{-6}	1.03×10^{1}	4.86×10^{-4}
Iodine-129	6.88×10^{-9}	1.96	1.34×10^{-5}	4.12×10^{-9}	1.36	1.80×10^{-5}	4.12×10^{-9}	1.68	2.60×10^{-5}
Total	8.12×10^{-7}	3.37	8.13×10^{-5}	1.13×10^{-6}	6.44	2.41×10^{-4}	1.13×10^{-6}	1.20×10^{1}	5.12×10^{-4}
Year of Peak Impact	4388	4388	4191	4191	4191	4191	4191	4191	4191
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.15×10^{-8}	0.00
Chromium	4.32×10^{-4}	4.11×10^{-3}	0.00	4.32×10^{-4}	4.12×10^{-3}	3.08×10^{-12}	4.32×10^{-4}	6.02×10^{-3}	1.41×10^{-7}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.33×10^{-5}	0.00
Nitrate	2.44	4.36×10^{-2}	0.00	2.44	5.74×10^{-2}	0.00	2.44	1.13×10^{-1}	0.00
Total	2.44	4.78×10^{-2}	0.00	2.44	6.16×10^{-2}	3.08×10^{-12}	2.44	1.19×10^{-1}	1.41×10^{-7}
Year of Peak Impact	8821	8821	N/A	8821	8821	8204	8821	8821	8204

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–329. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.58×10^{-11}	7.09×10^{-5}	3.29×10^{-9}	1.18×10^{-11}	1.23×10^{-4}	7.76×10^{-9}	8.05×10^{-7}	8.81×10^{-3}	6.77×10^{-7}
Iodine-129	1.34×10^{-13}	4.43×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.92×10^{-4}	1.74×10^{-8}	6.87×10^{-9}	1.12×10^{-2}	1.82×10^{-7}
Total	1.59×10^{-11}	1.15×10^{-4}	3.77×10^{-9}	1.20×10^{-11}	9.15×10^{-4}	2.51×10^{-8}	8.12×10^{-7}	2.00×10^{-2}	8.58×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	6.39×10^{-9}	6.09×10^{-8}	3.70×10^{-17}	6.39×10^{-9}	9.75×10^{-8}	1.70×10^{-12}	4.23×10^{-4}	9.34×10^{-4}	7.06×10^{-8}
Nitrate	4.48×10^{-5}	1.55×10^{-6}	0.00	4.48×10^{-5}	4.21×10^{-3}	0.00	2.44	9.51×10^{-2}	0.00
Total	4.48×10^{-5}	1.61×10^{-6}	3.70×10^{-17}	4.48×10^{-5}	4.21×10^{-3}	1.70×10^{-12}	2.44	9.61×10^{-2}	7.06×10^{-8}
Year of Peak Impact	8016	8016	8400	8016	8016	8400	8085	8085	8204

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–56 through Q–58 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 10,000 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

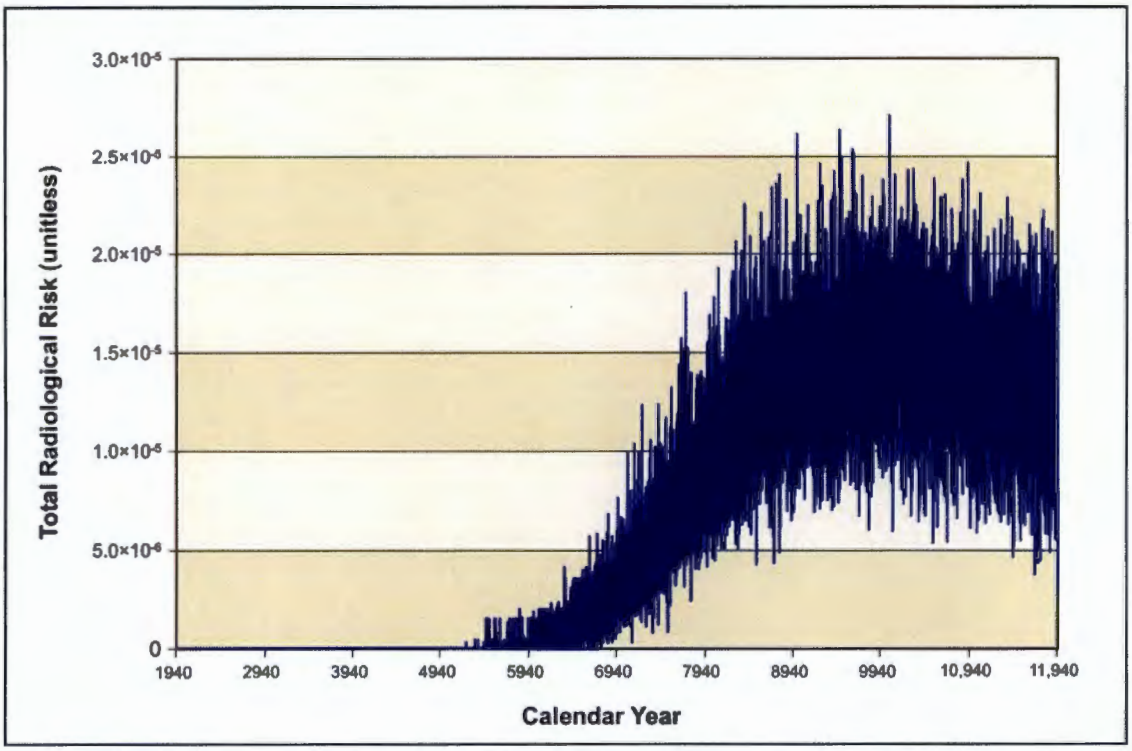


Figure Q–56. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

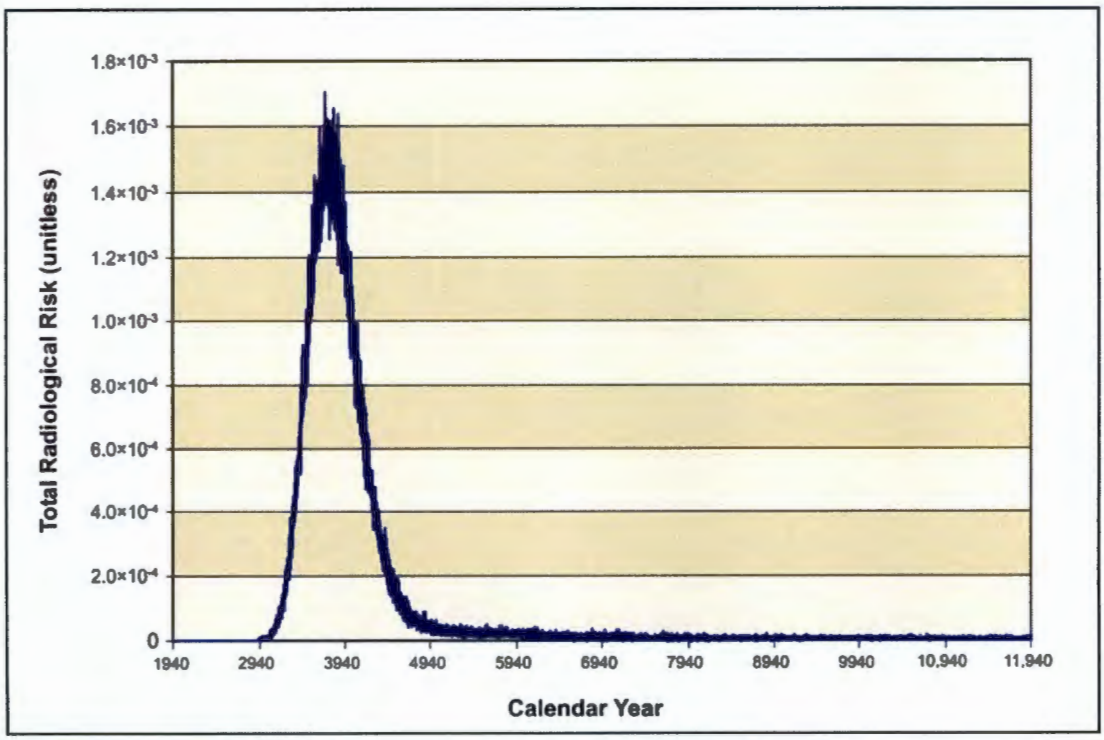


Figure Q–57. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

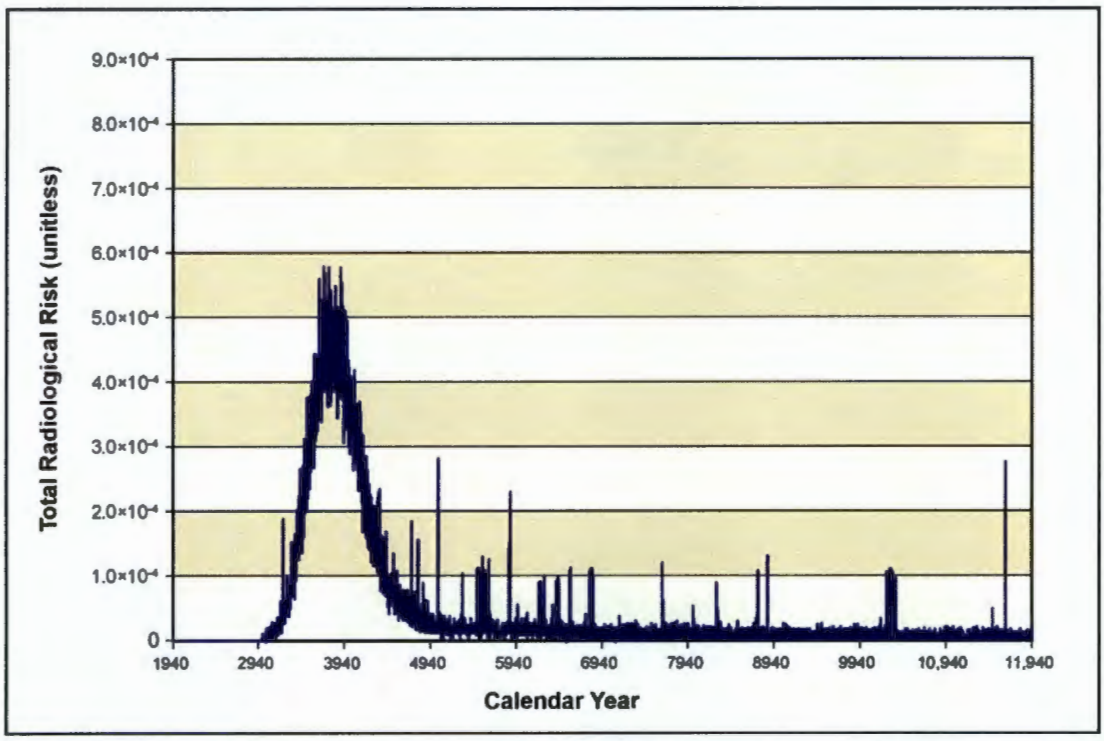


Figure Q–58. Waste Management Alternative 3, Disposal Group 1, Subgroup 1-G, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.8 Waste Management Alternative 3; Disposal Group 2, Subgroup 2-A

Disposal Group 2, Subgroup 2-A, addresses the waste resulting from Tank Closure Alternative 2A, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- ILAW glass
- LAW melters
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

The RPPDF would not be constructed or operated for Tank Closure Alternative 2A because tank closure cleanup activities would not be conducted.

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–330 through Q–334, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides. For chemicals, the key constituents are boron and boron compounds, chromium, fluoride, and nitrate. For radionuclides, the dose standard would be exceeded at the IDF-West barrier for the resident farmer and the American Indian resident farmer. The Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 5.75×10^{-1} person-rem per year for the year of maximum impact.

Table Q–330. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.45×10^{-7}	4.29×10^{-1}	2.01×10^{-5}	3.34×10^{-7}	1.50	6.59×10^{-5}	3.34×10^{-7}	3.06	1.44×10^{-4}
Iodine-129	1.53×10^{-9}	4.35×10^{-1}	2.38×10^{-6}	7.34×10^{-10}	2.42×10^{-1}	3.21×10^{-6}	7.34×10^{-10}	2.99×10^{-1}	4.62×10^{-6}
Total	2.46×10^{-7}	8.64×10^{-1}	2.25×10^{-5}	3.34×10^{-7}	1.74	6.91×10^{-5}	3.34×10^{-7}	3.36	1.48×10^{-4}
Year of Peak Impact	9988	9988	9823	9823	9823	9823	9823	9823	9823
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.00×10^{-3}	1.90×10^{-2}	0.00	2.00×10^{-3}	1.90×10^{-2}	1.20×10^{-11}	2.00×10^{-3}	2.78×10^{-2}	5.49×10^{-7}
Nitrate	1.55×10^{1}	2.77×10^{-1}	0.00	1.55×10^{1}	3.65×10^{-1}	0.00	1.55×10^{1}	7.15×10^{-1}	0.00
Total	1.55×10^{1}	2.96×10^{-1}	0.00	1.55×10^{1}	3.84×10^{-1}	1.20×10^{-11}	1.55×10^{1}	7.43×10^{-1}	5.49×10^{-7}
Year of Peak Impact	8216	8216	N/A	8216	8216	9308	8216	8216	9308

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–331. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–332. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.42×10^{-6}	1.12×10^{1}	4.54×10^{-4}	6.42×10^{-6}	2.89×10^{1}	1.49×10^{-3}	7.54×10^{-6}	6.91×10^{1}	3.25×10^{-3}
Iodine-129	5.61×10^{-8}	1.60×10^{1}	1.24×10^{-4}	5.61×10^{-8}	1.86×10^{1}	1.68×10^{-4}	3.83×10^{-8}	1.57×10^{1}	2.42×10^{-4}
Total	6.47×10^{-6}	2.72×10^{1}	5.78×10^{-4}	6.47×10^{-6}	4.74×10^{1}	1.66×10^{-3}	7.58×10^{-6}	8.47×10^{1}	3.49×10^{-3}
Year of Peak Impact	3709	3709	3690	3709	3709	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	3.65×10^{-4}	3.48×10^{-3}	0.00	3.65×10^{-4}	3.48×10^{-3}	6.29×10^{-12}	3.65×10^{-4}	5.08×10^{-3}	2.88×10^{-7}
Nitrate	5.69	1.02×10^{-1}	0.00	5.69	1.34×10^{-1}	0.00	5.69	2.63×10^{-1}	0.00
Total	5.69	1.05×10^{-1}	0.00	5.69	1.37×10^{-1}	6.29×10^{-12}	5.69	2.68×10^{-1}	2.88×10^{-7}
Year of Peak Impact	7905	7905	N/A	7905	7905	8982	7905	7905	8982

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–333. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.04×10^{-7}	1.41	6.77×10^{-5}	1.12×10^{-6}	5.06	2.22×10^{-4}	1.12×10^{-6}	1.03×10^{1}	4.85×10^{-4}
Iodine-129	6.87×10^{-9}	1.96	1.33×10^{-5}	4.12×10^{-9}	1.36	1.80×10^{-5}	4.12×10^{-9}	1.68	2.59×10^{-5}
Total	8.11×10^{-7}	3.36	8.11×10^{-5}	1.13×10^{-6}	6.42	2.40×10^{-4}	1.13×10^{-6}	1.20×10^{1}	5.11×10^{-4}
Year of Peak Impact	4388	4388	4191	4191	4191	4191	4191	4191	4191

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.15×10^{-8}	0.00
Chromium	1.91×10^{-4}	1.82×10^{-3}	0.00	1.91×10^{-4}	1.82×10^{-3}	2.81×10^{-12}	1.91×10^{-4}	2.66×10^{-3}	1.29×10^{-7}
Nitrate	4.07	7.26×10^{-2}	0.00	4.07	9.56×10^{-2}	0.00	4.07	1.88×10^{-1}	0.00
Total	4.07	7.45×10^{-2}	0.00	4.07	9.75×10^{-2}	2.81×10^{-12}	4.07	1.90×10^{-1}	1.29×10^{-7}
Year of Peak Impact	8055	8055	N/A	8055	8055	8353	8055	8055	8353

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–334. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.57×10^{-11}	7.06×10^{-5}	3.28×10^{-9}	1.18×10^{-11}	1.22×10^{-4}	7.73×10^{-9}	8.04×10^{-7}	8.79×10^{-3}	6.75×10^{-7}
Iodine-129	1.34×10^{-13}	4.42×10^{-5}	4.72×10^{-10}	1.47×10^{-13}	7.91×10^{-4}	1.74×10^{-8}	6.87×10^{-9}	1.12×10^{-2}	1.82×10^{-7}
Total	1.58×10^{-11}	1.15×10^{-4}	3.75×10^{-9}	1.19×10^{-11}	9.13×10^{-4}	2.51×10^{-8}	8.11×10^{-7}	2.00×10^{-2}	8.57×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	5.12×10^{-9}	4.88×10^{-8}	3.77×10^{-17}	5.12×10^{-9}	7.82×10^{-8}	1.73×10^{-12}	8.49×10^{-6}	1.89×10^{-5}	6.46×10^{-8}
Fluoride	2.69×10^{-11}	1.32×10^{-11}	0.00	2.69×10^{-11}	1.87×10^{-11}	0.00	2.51×10^{-5}	3.67×10^{-6}	0.00
Nitrate	4.58×10^{-5}	1.58×10^{-6}	0.00	4.58×10^{-5}	4.31×10^{-3}	0.00	4.07	1.52×10^{-1}	0.00
Total	4.58×10^{-5}	1.63×10^{-6}	3.77×10^{-17}	4.58×10^{-5}	4.31×10^{-3}	1.73×10^{-12}	4.07	1.52×10^{-1}	6.46×10^{-8}
Year of Peak Impact	8326	8326	8489	8326	8326	8489	8056	8056	8353

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–59 through Q–61 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 10,000 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

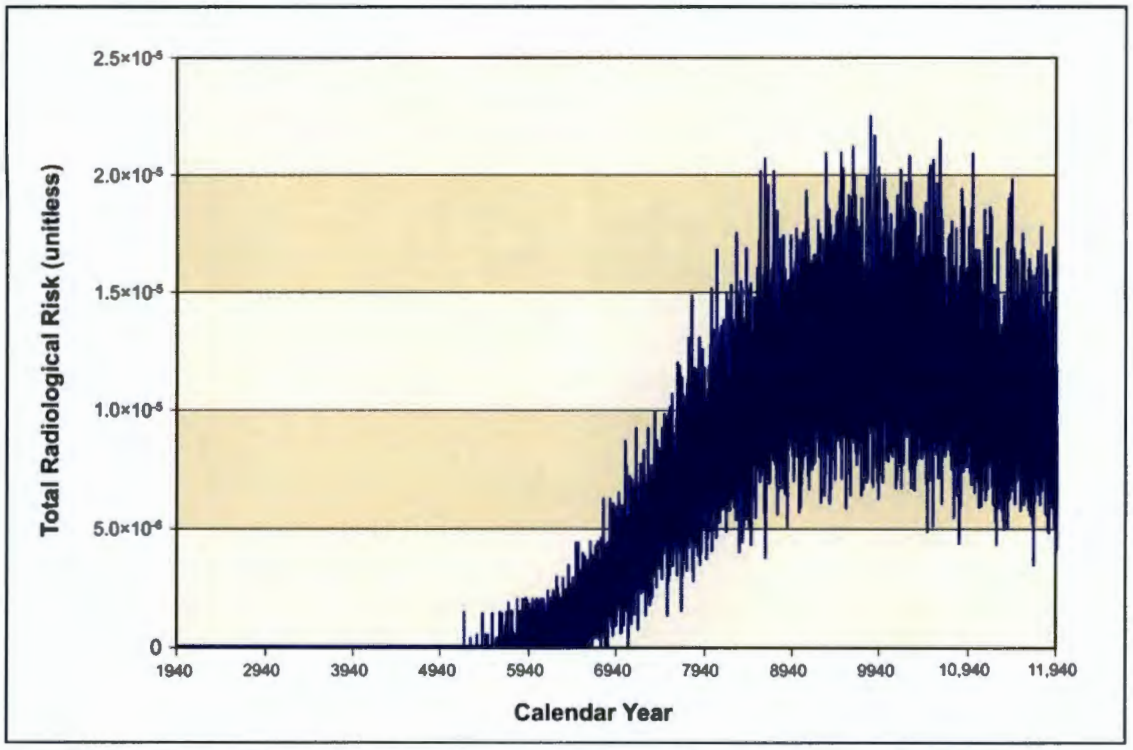


Figure Q–59. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

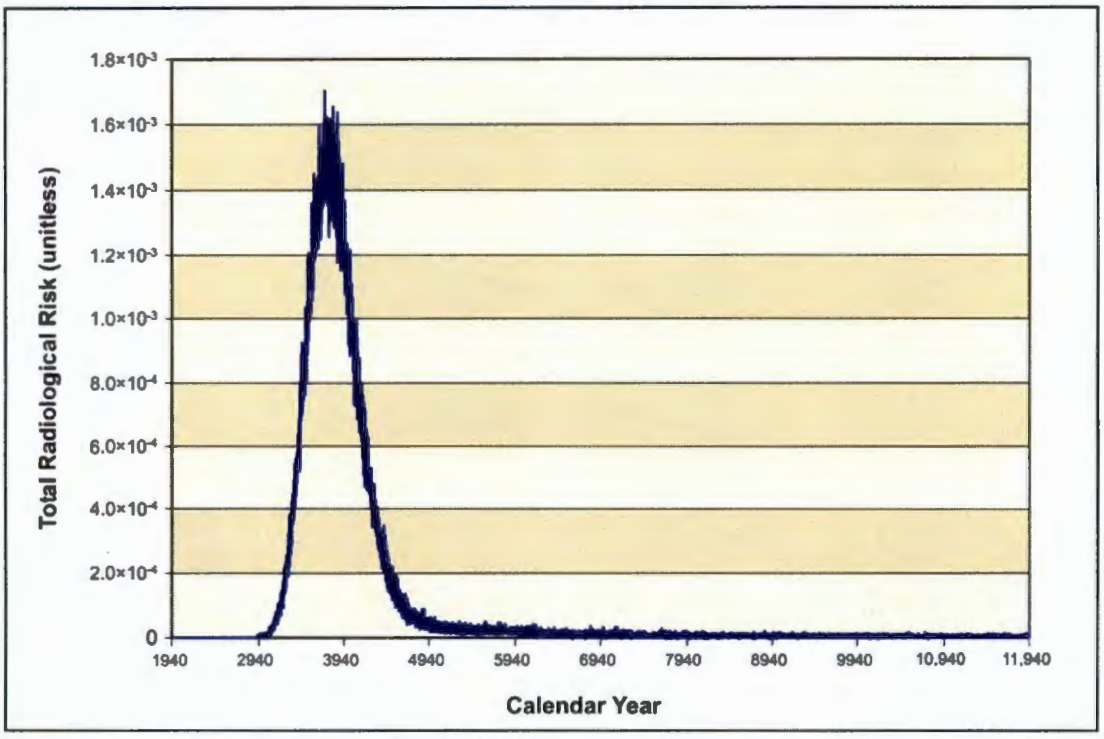


Figure Q–60. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

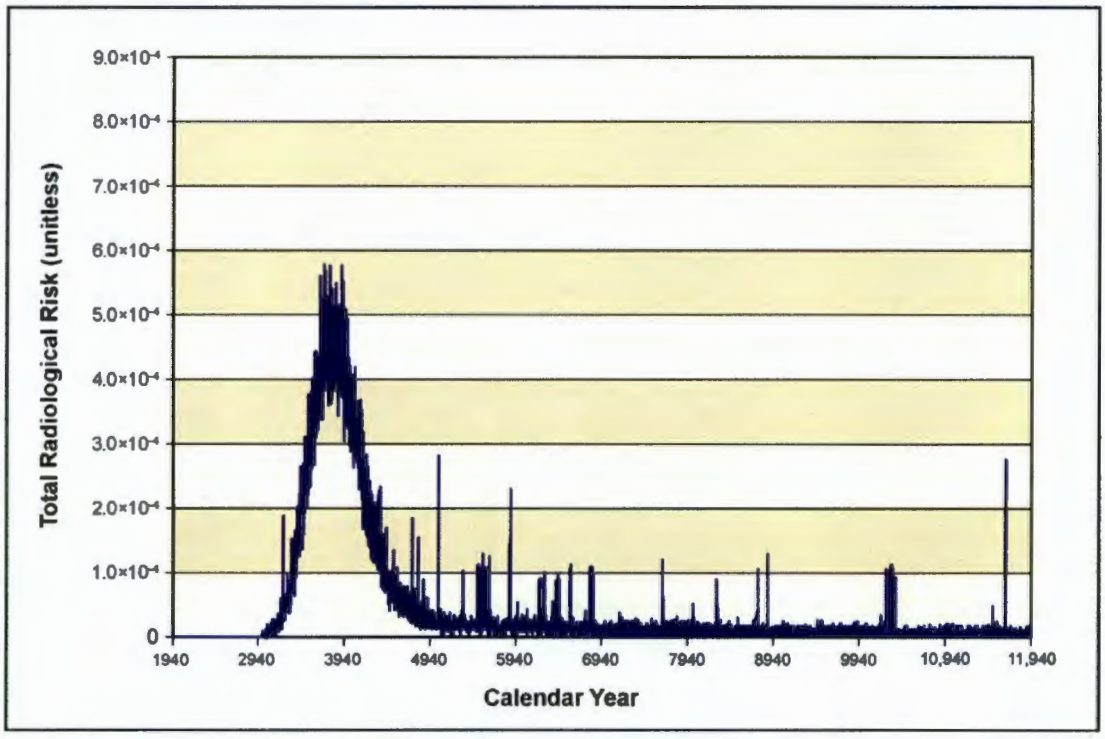


Figure Q–61. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.9 Waste Management Alternative 3; Disposal Group 2, Subgroup 2-B

Disposal Group 2, Subgroup 2-B addresses the waste resulting from Tank Closure Alternative 6B (Base and Option Cases), onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- PPF glass
- PPF melters
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 6B (Base and Option Cases).

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–335 through Q–346. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides; and acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would be exceeded at IDF-West for the resident farmer and the American Indian resident farmer for both the Base and Option Cases. The Hazard Index guideline would be exceeded for the Option Case only at the Core Zone Boundary for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose for the Base Case was estimated as 6.00×10^{-1} person-rem per year for the year of maximum impact and for the Option Case was estimated as 5.90×10^{-1} person-rem per year for the year of maximum impact.

Table Q–335. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.37×10^{-7}	5.90×10^{-1}	2.03×10^{-5}	3.37×10^{-7}	1.51	6.85×10^{-5}	3.37×10^{-7}	3.09	1.50×10^{-4}
Iodine-129	1.08×10^{-9}	3.08×10^{-1}	3.50×10^{-6}	1.08×10^{-9}	3.57×10^{-1}	3.70×10^{-6}	1.08×10^{-9}	4.41×10^{-1}	5.32×10^{-6}
Total	3.38×10^{-7}	8.97×10^{-1}	2.38×10^{-5}	3.38×10^{-7}	1.87	7.22×10^{-5}	3.38×10^{-7}	3.53	1.55×10^{-4}
Year of Peak Impact	11,141	11,141	11,141	11,141	11,141	10,643	11,141	11,141	10,643
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.20×10^{-3}	2.10×10^{-2}	0.00	2.20×10^{-3}	2.10×10^{-2}	1.20×10^{-11}	2.20×10^{-3}	3.07×10^{-2}	5.49×10^{-7}
Nitrate	1.66×10^{1}	2.97×10^{-1}	0.00	1.66×10^{1}	3.91×10^{-1}	0.00	1.66×10^{1}	7.68×10^{-1}	0.00
Total	1.66×10^{1}	3.18×10^{-1}	0.00	1.66×10^{1}	4.12×10^{-1}	1.20×10^{-11}	1.66×10^{1}	7.98×10^{-1}	5.49×10^{-7}
Year of Peak Impact	8414	8414	N/A	8414	8414	8281	8414	8414	8281

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–336. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–337. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.83×10^{-7}	4.97×10^{-1}	1.71×10^{-5}	2.83×10^{-7}	1.28	5.60×10^{-5}	2.83×10^{-7}	2.60	1.22×10^{-4}
Iodine-129	3.34×10^{-10}	9.51×10^{-2}	1.08×10^{-6}	3.34×10^{-10}	1.10×10^{-1}	1.46×10^{-6}	3.34×10^{-10}	1.36×10^{-1}	2.10×10^{-6}
Total	2.84×10^{-7}	5.92×10^{-1}	1.82×10^{-5}	2.84×10^{-7}	1.39	5.75×10^{-5}	2.84×10^{-7}	2.73	1.24×10^{-4}
Year of Peak Impact	3889	3889	3889	3889	3889	3889	3889	3889	3889
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.80×10^{-7}	3.24×10^{-6}	0.00	6.80×10^{-7}	4.04×10^{-6}	0.00	6.80×10^{-7}	7.30×10^{-6}	0.00
Chromium	5.77×10^{-3}	5.49×10^{-2}	0.00	5.77×10^{-3}	5.50×10^{-2}	2.27×10^{-11}	5.77×10^{-3}	8.03×10^{-2}	1.04×10^{-6}
Nitrate	2.62×10^{-1}	4.67×10^{-3}	0.00	2.62×10^{-1}	6.16×10^{-3}	0.00	2.62×10^{-1}	1.21×10^{-2}	0.00
Total	2.68×10^{-1}	5.96×10^{-2}	0.00	2.68×10^{-1}	6.11×10^{-2}	2.27×10^{-11}	2.68×10^{-1}	9.24×10^{-2}	1.04×10^{-6}
Year of Peak Impact	3868	3868	N/A	3868	3868	3868	3868	3868	3868

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–338. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.62×10^{-6}	1.16×10^{1}	4.49×10^{-4}	6.62×10^{-6}	2.98×10^{1}	1.53×10^{-3}	7.75×10^{-6}	7.10×10^{1}	3.34×10^{-3}
Iodine-129	5.63×10^{-8}	1.60×10^{1}	1.43×10^{-4}	5.63×10^{-8}	1.86×10^{1}	1.69×10^{-4}	3.87×10^{-8}	1.58×10^{1}	2.44×10^{-4}
Total	6.67×10^{-6}	2.76×10^{1}	5.92×10^{-4}	6.67×10^{-6}	4.84×10^{1}	1.70×10^{-3}	7.79×10^{-6}	8.68×10^{1}	3.58×10^{-3}
Year of Peak Impact	3709	3709	3751	3709	3709	3690	3690	3690	3690

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.84×10^{-6}	8.77×10^{-6}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron and Compounds	9.63×10^{-6}	1.38×10^{-6}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	1.20×10^{-2}	1.15×10^{-1}	0.00	4.30×10^{-4}	4.10×10^{-3}	4.72×10^{-11}	4.30×10^{-4}	5.98×10^{-3}	2.17×10^{-6}
Fluoride	7.21×10^{-4}	3.43×10^{-4}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrate	5.52×10^{-1}	9.86×10^{-3}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.65×10^{-1}	1.25×10^{-1}	0.00	5.75	1.39×10^{-1}	4.72×10^{-11}	5.75	2.71×10^{-1}	2.17×10^{-6}
Year of Peak Impact	4042	4042	N/A	8245	8245	4042	8245	8245	4042

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–339. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.79×10^{-7}	1.54	7.00×10^{-5}	1.16×10^{-6}	5.22	2.30×10^{-4}	1.16×10^{-6}	1.07×10^{1}	5.01×10^{-4}
Iodine-129	6.98×10^{-9}	1.99	1.35×10^{-5}	4.18×10^{-9}	1.38	1.82×10^{-5}	4.15×10^{-9}	1.70	2.62×10^{-5}
Total	8.86×10^{-7}	3.53	8.35×10^{-5}	1.16×10^{-6}	6.60	2.48×10^{-4}	1.17×10^{-6}	1.23×10^{1}	5.27×10^{-4}
Year of Peak Impact	4389	4389	4191	3882	3882	4191	4191	4191	4191

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.36×10^{-7}	6.49×10^{-7}	0.00	1.36×10^{-7}	8.10×10^{-7}	0.00	1.36×10^{-7}	1.46×10^{-6}	0.00
Boron and Compounds	3.35×10^{-7}	4.79×10^{-8}	0.00	3.35×10^{-7}	4.85×10^{-8}	0.00	3.35×10^{-7}	5.15×10^{-8}	0.00
Chromium	5.86×10^{-4}	5.58×10^{-3}	0.00	5.86×10^{-4}	5.59×10^{-3}	9.42×10^{-12}	5.86×10^{-4}	8.16×10^{-3}	4.32×10^{-7}
Fluoride	2.51×10^{-5}	1.20×10^{-5}	0.00	2.51×10^{-5}	1.23×10^{-5}	0.00	2.51×10^{-5}	1.32×10^{-5}	0.00
Nitrate	3.31	5.92×10^{-2}	0.00	3.31	7.79×10^{-2}	0.00	3.31	1.53×10^{-1}	0.00
Total	3.31	6.48×10^{-2}	0.00	3.31	8.35×10^{-2}	9.42×10^{-12}	3.31	1.61×10^{-1}	4.32×10^{-7}
Year of Peak Impact	7831	7831	N/A	7831	7831	4714	7831	7831	4714

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–340. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.68×10^{-11}	7.55×10^{-5}	3.49×10^{-9}	1.32×10^{-11}	1.37×10^{-4}	8.26×10^{-9}	8.79×10^{-7}	9.62×10^{-3}	6.98×10^{-7}
Iodine-129	1.36×10^{-13}	4.49×10^{-5}	4.84×10^{-10}	1.49×10^{-13}	8.05×10^{-4}	1.76×10^{-8}	6.98×10^{-9}	1.14×10^{-2}	1.85×10^{-7}
Total	1.69×10^{-11}	1.20×10^{-4}	3.97×10^{-9}	1.33×10^{-11}	9.42×10^{-4}	2.59×10^{-8}	8.86×10^{-7}	2.10×10^{-2}	8.82×10^{-7}
Year of Peak Impact	4005	4005	4042	4076	4076	4005	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	2.88×10^{-13}	1.72×10^{-12}	0.00	2.88×10^{-13}	3.10×10^{-12}	0.00	1.36×10^{-7}	8.10×10^{-7}	0.00
Boron and Compounds	1.07×10^{-12}	1.54×10^{-13}	0.00	1.07×10^{-12}	1.69×10^{-13}	0.00	3.35×10^{-7}	3.34×10^{-9}	0.00
Chromium	7.12×10^{-9}	6.79×10^{-8}	1.30×10^{-16}	7.12×10^{-9}	1.09×10^{-7}	5.94×10^{-12}	5.86×10^{-4}	1.29×10^{-3}	2.16×10^{-7}
Fluoride	0.00	0.00	0.00	0.00	0.00	0.00	2.51×10^{-5}	3.67×10^{-6}	0.00
Nitrate	4.78×10^{-5}	1.65×10^{-6}	0.00	4.78×10^{-5}	4.50×10^{-3}	0.00	3.31	1.24×10^{-1}	0.00
Total	4.79×10^{-5}	1.72×10^{-6}	1.30×10^{-16}	4.79×10^{-5}	4.50×10^{-3}	5.94×10^{-12}	3.31	1.26×10^{-1}	2.16×10^{-7}
Year of Peak Impact	8304	8304	4172	8304	8304	4172	7837	7837	4714

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Table Q–341. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.37×10^{-7}	5.90×10^{-1}	2.03×10^{-5}	3.37×10^{-7}	1.51	6.85×10^{-5}	3.37×10^{-7}	3.09	1.50×10^{-4}
Iodine-129	1.08×10^{-9}	3.08×10^{-1}	3.50×10^{-6}	1.08×10^{-9}	3.57×10^{-1}	3.70×10^{-6}	1.08×10^{-9}	4.41×10^{-1}	5.32×10^{-6}
Total	3.38×10^{-7}	8.97×10^{-1}	2.38×10^{-5}	3.38×10^{-7}	1.87	7.22×10^{-5}	3.38×10^{-7}	3.53	1.55×10^{-4}
Year of Peak Impact	11,141	11,141	11,141	11,141	11,141	10,643	11,141	11,141	10,643
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	2.21×10^{-3}	2.10×10^{-2}	0.00	2.21×10^{-3}	2.11×10^{-2}	1.20×10^{-11}	2.21×10^{-3}	3.08×10^{-2}	5.50×10^{-7}
Nitrate	1.66×10^{1}	2.97×10^{-1}	0.00	1.66×10^{1}	3.91×10^{-1}	0.00	1.66×10^{1}	7.68×10^{-1}	0.00
Total	1.66×10^{1}	3.18×10^{-1}	0.00	1.66×10^{1}	4.12×10^{-1}	1.20×10^{-11}	1.66×10^{1}	7.98×10^{-1}	5.50×10^{-7}
Year of Peak Impact	8414	8414	N/A	8414	8414	8281	8414	8414	8281

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–342. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–343. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.40×10^{-7}	5.95×10^{-1}	2.05×10^{-5}	3.40×10^{-7}	1.53	6.71×10^{-5}	3.40×10^{-7}	3.11	1.46×10^{-4}
Iodine-129	3.54×10^{-10}	1.01×10^{-1}	1.15×10^{-6}	3.54×10^{-10}	1.17×10^{-1}	1.55×10^{-6}	3.54×10^{-10}	1.45×10^{-1}	2.23×10^{-6}
Total	3.40×10^{-7}	6.96×10^{-1}	2.16×10^{-5}	3.40×10^{-7}	1.65	6.87×10^{-5}	3.40×10^{-7}	3.26	1.49×10^{-4}
Year of Peak Impact	4213	4213	4213	4213	4213	4213	4213	4213	4213
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	4.34×10^{-7}	2.06×10^{-6}	0.00	4.34×10^{-7}	2.58×10^{-6}	0.00	4.34×10^{-7}	4.66×10^{-6}	0.00
Chromium	2.55×10^{-2}	2.43×10^{-1}	0.00	2.55×10^{-2}	2.43×10^{-1}	1.28×10^{-10}	2.55×10^{-2}	3.55×10^{-1}	5.87×10^{-6}
Nitrate	8.28	1.48×10^{-1}	0.00	8.28	1.95×10^{-1}	0.00	8.28	3.82×10^{-1}	0.00
Total	8.31	3.91×10^{-1}	0.00	8.31	4.38×10^{-1}	1.28×10^{-10}	8.31	7.37×10^{-1}	5.87×10^{-6}
Year of Peak Impact	4260	4260	N/A	4260	4260	4118	4260	4260	4118

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–344. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.63×10^{-6}	1.16×10^{1}	4.44×10^{-4}	6.63×10^{-6}	2.98×10^{1}	1.50×10^{-3}	7.38×10^{-6}	6.76×10^{1}	3.27×10^{-3}
Iodine-129	5.64×10^{-8}	1.61×10^{1}	1.44×10^{-4}	5.64×10^{-8}	1.86×10^{1}	1.70×10^{-4}	4.43×10^{-8}	1.81×10^{1}	2.44×10^{-4}
Total	6.69×10^{-6}	2.77×10^{1}	5.88×10^{-4}	6.69×10^{-6}	4.85×10^{1}	1.67×10^{-3}	7.42×10^{-6}	8.57×10^{1}	3.51×10^{-3}
Year of Peak Impact	3709	3709	3895	3709	3709	3690	3895	3895	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.08×10^{-7}	2.89×10^{-6}	0.00	6.08×10^{-7}	3.61×10^{-6}	0.00	6.08×10^{-7}	6.53×10^{-6}	0.00
Boron and Compounds	9.99×10^{-7}	1.43×10^{-7}	0.00	9.99×10^{-7}	1.45×10^{-7}	0.00	9.99×10^{-7}	1.53×10^{-7}	0.00
Chromium	9.52×10^{-2}	9.07×10^{-1}	0.00	9.52×10^{-2}	9.08×10^{-1}	3.81×10^{-10}	9.52×10^{-2}	1.33	1.75×10^{-5}
Fluoride	1.50×10^{-4}	7.12×10^{-5}	0.00	1.50×10^{-4}	7.33×10^{-5}	0.00	1.50×10^{-4}	7.89×10^{-5}	0.00
Nitrate	2.68×10^{1}	4.78×10^{-1}	0.00	2.68×10^{1}	6.29×10^{-1}	0.00	2.68×10^{1}	1.23	0.00
Total	2.69×10^{1}	1.38	0.00	2.69×10^{1}	1.54	3.81×10^{-10}	2.69×10^{1}	2.56	1.75×10^{-5}
Year of Peak Impact	4564	4564	N/A	4564	4564	10,533	4564	4564	10,533

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.
Key: N/A=not applicable.

Table Q–345. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.67×10^{-7}	1.52	7.15×10^{-5}	1.19×10^{-6}	5.34	2.35×10^{-4}	1.19×10^{-6}	1.09×10^{1}	5.12×10^{-4}
Iodine-129	6.93×10^{-9}	1.97	1.37×10^{-5}	4.23×10^{-9}	1.40	1.85×10^{-5}	4.23×10^{-9}	1.73	2.67×10^{-5}
Total	8.74×10^{-7}	3.49	8.53×10^{-5}	1.19×10^{-6}	6.74	2.53×10^{-4}	1.19×10^{-6}	1.26×10^{1}	5.39×10^{-4}
Year of Peak Impact	4388	4388	4189	4189	4189	4189	4189	4189	4189
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	2.69×10^{-7}	1.28×10^{-6}	0.00	2.69×10^{-7}	1.60×10^{-6}	0.00	2.69×10^{-7}	2.89×10^{-6}	0.00
Boron and Compounds	6.68×10^{-7}	9.54×10^{-8}	0.00	6.68×10^{-7}	9.66×10^{-8}	0.00	6.68×10^{-7}	1.03×10^{-7}	0.00
Chromium	1.70×10^{-2}	1.62×10^{-1}	0.00	1.70×10^{-2}	1.62×10^{-1}	6.69×10^{-11}	1.70×10^{-2}	2.37×10^{-1}	3.07×10^{-6}
Fluoride	5.00×10^{-5}	2.38×10^{-5}	0.00	5.00×10^{-5}	2.45×10^{-5}	0.00	5.00×10^{-5}	2.64×10^{-5}	0.00
Nitrate	3.81	6.81×10^{-2}	0.00	3.81	8.97×10^{-2}	0.00	3.81	1.76×10^{-1}	0.00
Total	3.83	2.30×10^{-1}	0.00	3.83	2.52×10^{-1}	6.69×10^{-11}	3.83	4.13×10^{-1}	3.07×10^{-6}
Year of Peak Impact	5180	5180	N/A	5180	5180	5522	5180	5180	5522

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–346. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.63×10^{-11}	7.35×10^{-5}	3.45×10^{-9}	1.22×10^{-11}	1.27×10^{-4}	6.96×10^{-9}	1.03×10^{-6}	1.13×10^{-2}	7.13×10^{-7}
Iodine-129	1.35×10^{-13}	4.47×10^{-5}	5.13×10^{-10}	1.49×10^{-13}	8.05×10^{-4}	1.87×10^{-8}	5.54×10^{-9}	9.49×10^{-3}	1.79×10^{-7}
Total	1.65×10^{-11}	1.18×10^{-4}	3.96×10^{-9}	1.23×10^{-11}	9.32×10^{-4}	2.57×10^{-8}	1.03×10^{-6}	2.08×10^{-2}	8.93×10^{-7}
Year of Peak Impact	4005	4005	4036	4075	4075	4006	4059	4059	4189

Chemical Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	5.64×10^{-12}	3.35×10^{-11}	0.00	5.69×10^{-12}	6.11×10^{-11}	0.00	1.34×10^{-7}	7.97×10^{-7}	0.00
Boron and Compounds	1.14×10^{-11}	1.64×10^{-12}	0.00	4.40×10^{-12}	6.99×10^{-13}	0.00	9.99×10^{-7}	9.97×10^{-9}	0.00
Chromium	1.76×10^{-7}	1.68×10^{-6}	8.34×10^{-16}	8.83×10^{-8}	1.35×10^{-6}	3.82×10^{-11}	6.83×10^{-3}	1.51×10^{-2}	1.53×10^{-6}
Fluoride	1.01×10^{-9}	4.95×10^{-10}	0.00	3.97×10^{-10}	2.76×10^{-10}	0.00	7.48×10^{-5}	1.09×10^{-5}	0.00
Nitrate	5.13×10^{-5}	1.77×10^{-6}	0.00	5.40×10^{-5}	5.08×10^{-3}	0.00	5.70	2.06×10^{-1}	0.00
Total	5.15×10^{-5}	3.45×10^{-6}	8.34×10^{-16}	5.41×10^{-5}	5.08×10^{-3}	3.82×10^{-11}	5.70	2.22×10^{-1}	1.53×10^{-6}
Year of Peak Impact	4576	4576	4805	4839	4839	4805	4618	4618	5522

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q–62 through Q–67 depicts the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary for the Base and Option Cases and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 11,000 for the Base and Option Cases as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

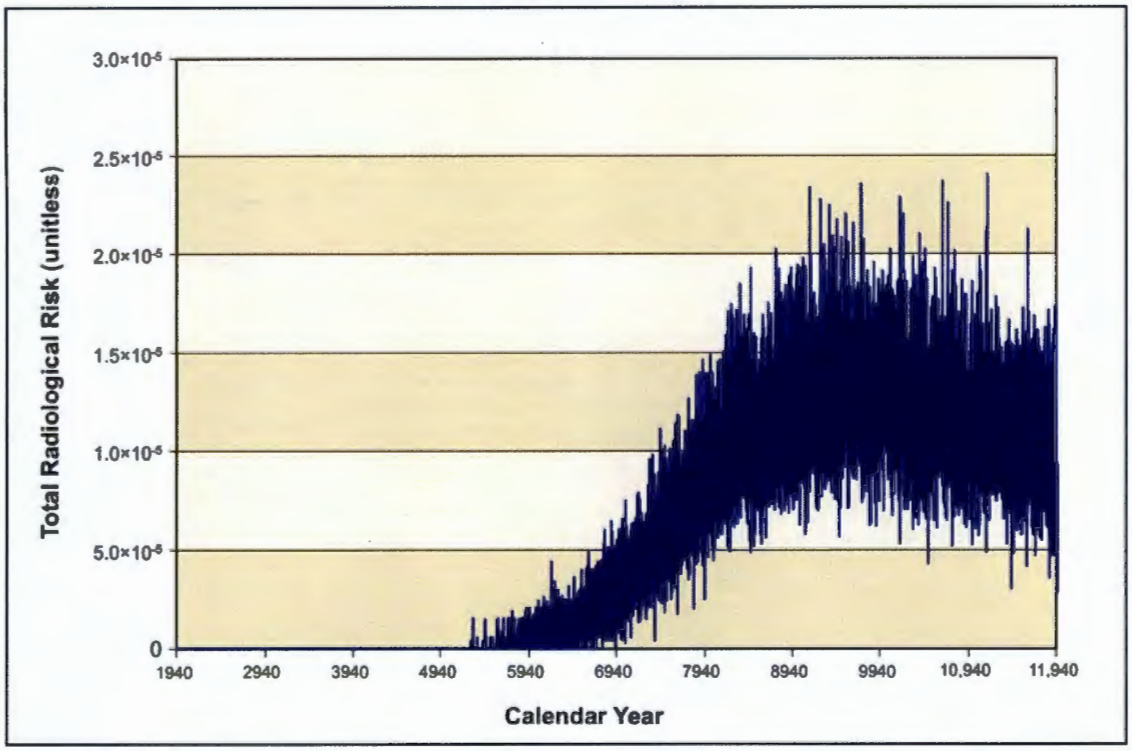


Figure Q–62. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

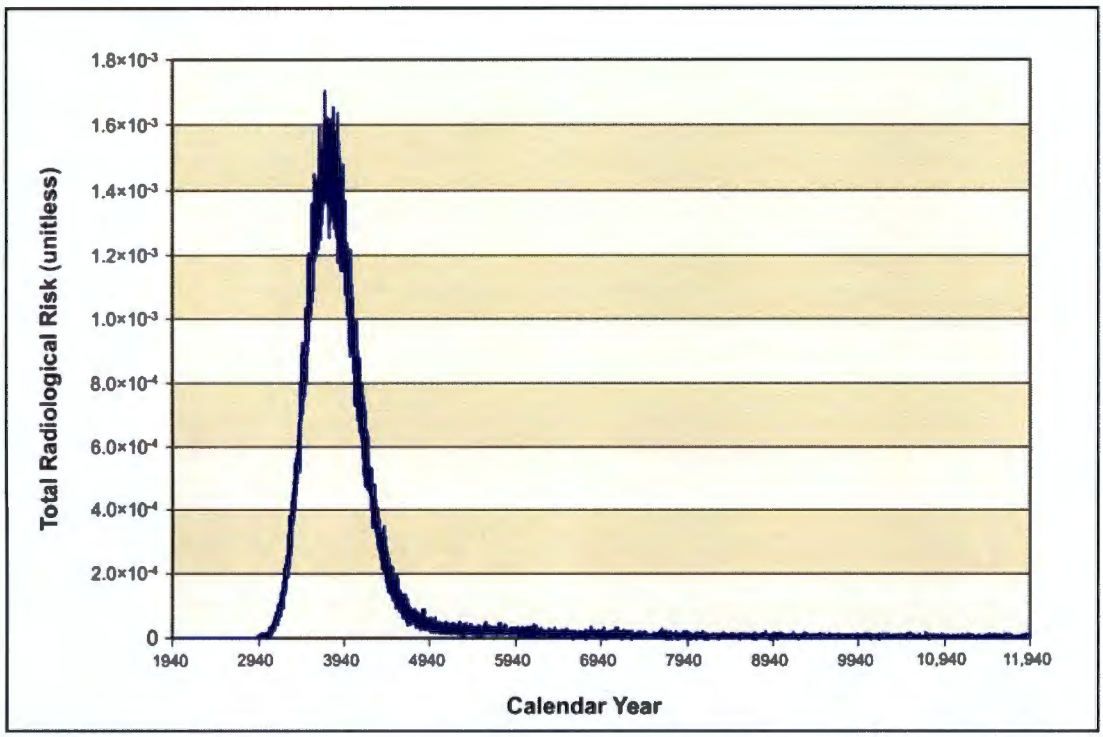


Figure Q–63. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

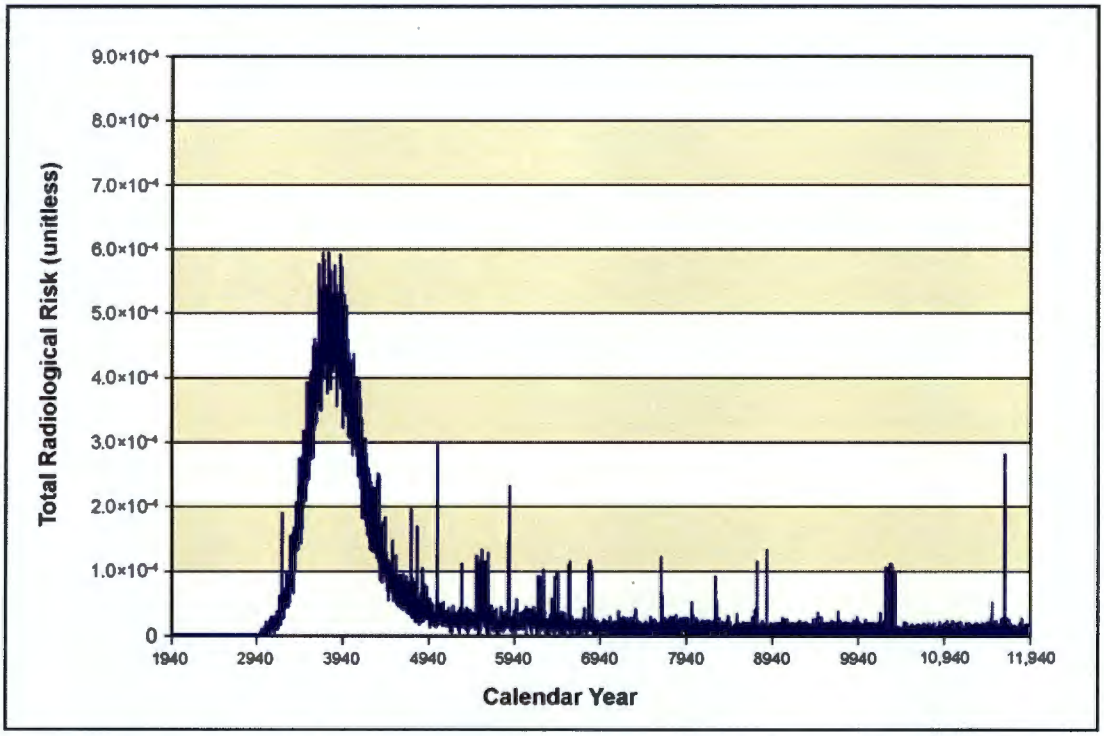


Figure Q–64. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

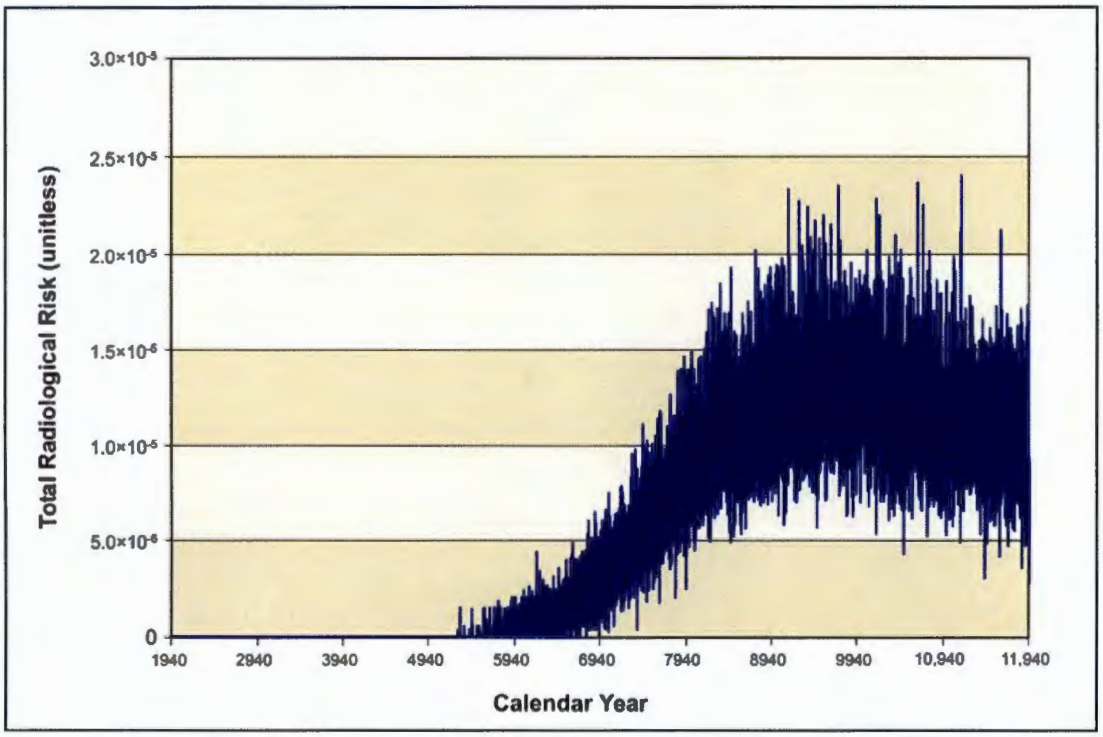


Figure Q–65. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

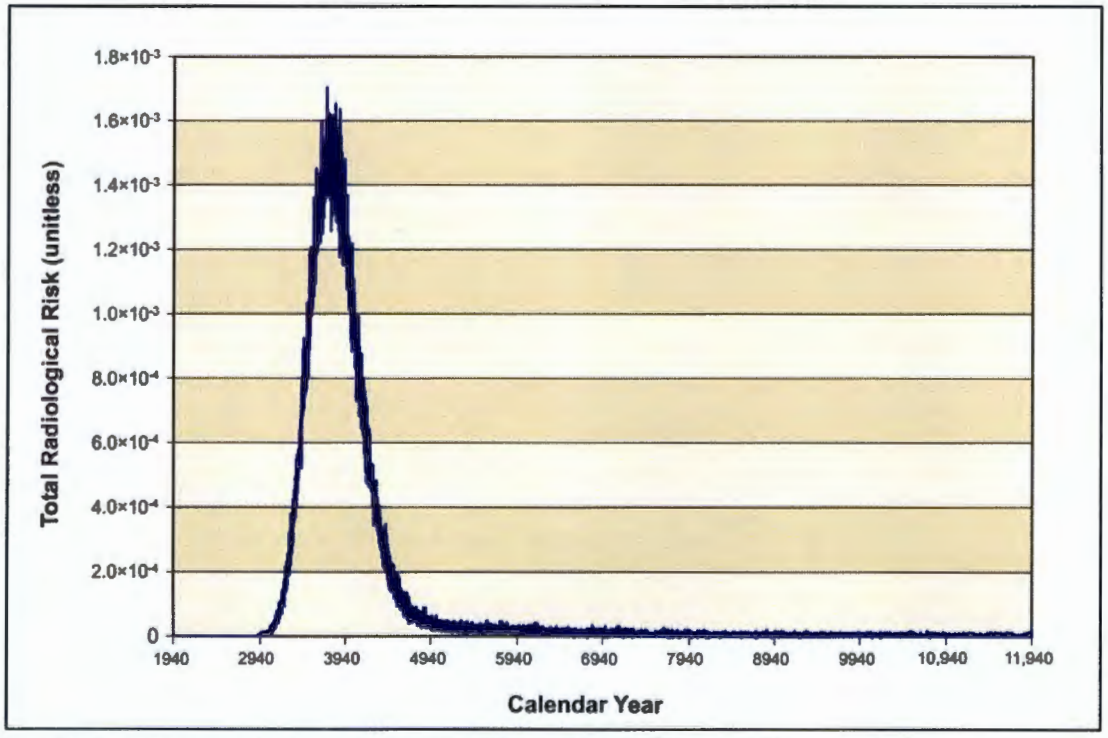


Figure Q–66. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

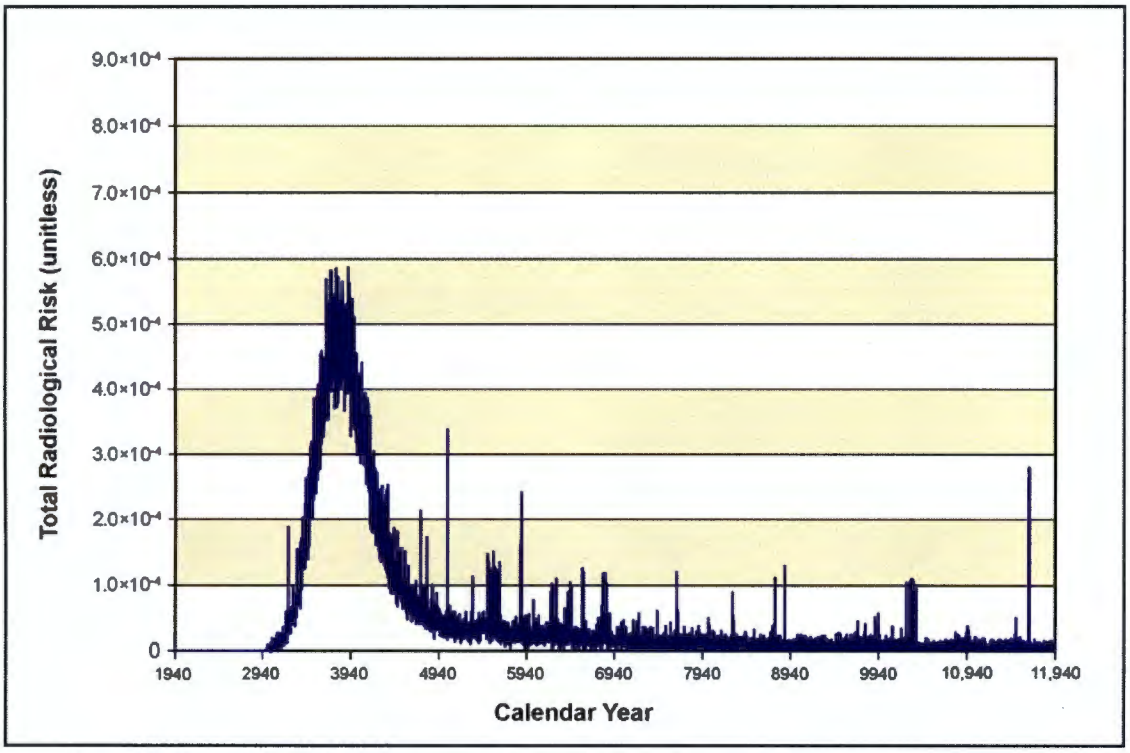


Figure Q–67. Waste Management Alternative 3, Disposal Group 2, Subgroup 2-B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.3.10 Waste Management Alternative 3; Disposal Group 3

Disposal Group 3 addresses the waste resulting from Tank Closure Alternative 6A (Base and Option Cases), onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites. Waste forms for IDF-East include the following:

- PPF glass
- PPF melters
- Tank closure secondary waste

Waste forms for IDF-West include the following:

- FFTF decommissioning secondary waste
- Waste management secondary waste
- Offsite waste
- Onsite non-CERCLA waste

Waste forms for the RPPDF include those resulting from tank closure cleanup activities for Tank Closure Alternative 6A (Base and Option Cases).

Potential human health impacts at the IDF-East barrier, the IDF-West barrier, the RPPDF barrier, the Core Zone Boundary and the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–347 through Q–358, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides; and acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would be

exceeded at IDF-West for the resident farmer and the American Indian resident farmer under the Base and Option Cases. The Hazard Index guideline would be exceeded only for the Option Case at the Core Zone Boundary for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose for the Base Case was estimated as 5.95×10^{-1} person-rem per year for the year of maximum impact and for the Option Case as 5.95×10^{-1} person-rem per year for the year of maximum impact.

Table Q–347. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.61×10^{-7}	4.57×10^{-1}	2.34×10^{-5}	3.89×10^{-7}	1.75	7.68×10^{-5}	3.89×10^{-7}	3.56	1.68×10^{-4}
Iodine-129	1.42×10^{-9}	4.06×10^{-1}	1.59×10^{-6}	4.91×10^{-10}	1.62×10^{-1}	2.15×10^{-6}	4.91×10^{-10}	2.00×10^{-1}	3.09×10^{-6}
Total	2.62×10^{-7}	8.62×10^{-1}	2.50×10^{-5}	3.89×10^{-7}	1.91	7.89×10^{-5}	3.89×10^{-7}	3.76	1.71×10^{-4}
Year of Peak Impact	11,896	11,896	9324	9324	9324	9324	9324	9324	9324
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	9.10×10^{-4}	8.67×10^{-3}	0.00	9.10×10^{-4}	8.68×10^{-3}	1.13×10^{-11}	9.10×10^{-4}	1.27×10^{-2}	5.16×10^{-7}
Nitrate	1.66×10^{1}	2.97×10^{-1}	0.00	1.66×10^{1}	3.91×10^{-1}	0.00	1.66×10^{1}	7.67×10^{-1}	0.00
Total	1.66×10^{1}	3.06×10^{-1}	0.00	1.66×10^{1}	4.00×10^{-1}	1.13×10^{-11}	1.66×10^{1}	7.80×10^{-1}	5.16×10^{-7}
Year of Peak Impact	8236	8236	N/A	8236	8236	8037	8236	8236	8037

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–348. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.
Key: N/A=not applicable.

Table Q–349. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.03×10^{-7}	5.31×10^{-1}	1.82×10^{-5}	3.03×10^{-7}	1.36	5.99×10^{-5}	3.03×10^{-7}	2.78	1.31×10^{-4}
Iodine-129	3.64×10^{-10}	1.04×10^{-1}	1.18×10^{-6}	3.64×10^{-10}	1.20×10^{-1}	1.59×10^{-6}	3.64×10^{-10}	1.49×10^{-1}	2.29×10^{-6}
Total	3.03×10^{-7}	6.35×10^{-1}	1.94×10^{-5}	3.03×10^{-7}	1.48	6.15×10^{-5}	3.03×10^{-7}	2.93	1.33×10^{-4}
Year of Peak Impact	3987	3987	3987	3987	3987	3987	3987	3987	3987
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.07×10^{-6}	5.10×10^{-6}	0.00	1.07×10^{-6}	6.37×10^{-6}	0.00	1.07×10^{-6}	1.15×10^{-5}	0.00
Chromium	5.77×10^{-3}	5.50×10^{-2}	0.00	5.77×10^{-3}	5.50×10^{-2}	2.27×10^{-11}	5.77×10^{-3}	8.04×10^{-2}	1.04×10^{-6}
Nitrate	2.18×10^{-1}	3.89×10^{-3}	0.00	2.18×10^{-1}	5.12×10^{-3}	0.00	2.18×10^{-1}	1.01×10^{-2}	0.00
Total	2.24×10^{-1}	5.89×10^{-2}	0.00	2.24×10^{-1}	6.01×10^{-2}	2.27×10^{-11}	2.24×10^{-1}	9.04×10^{-2}	1.04×10^{-6}
Year of Peak Impact	4109	4109	N/A	4109	4109	4109	4109	4109	4109

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–350. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.51×10^{-6}	1.14×10^{1}	4.58×10^{-4}	7.60×10^{-6}	3.42×10^{1}	1.53×10^{-3}	7.60×10^{-6}	6.97×10^{1}	3.35×10^{-3}
Iodine-129	5.67×10^{-8}	1.61×10^{1}	1.43×10^{-4}	4.42×10^{-8}	1.46×10^{1}	1.69×10^{-4}	4.42×10^{-8}	1.80×10^{1}	2.43×10^{-4}
Total	6.57×10^{-6}	2.75×10^{1}	6.01×10^{-4}	7.65×10^{-6}	4.88×10^{1}	1.70×10^{-3}	7.65×10^{-6}	8.77×10^{1}	3.59×10^{-3}
Year of Peak Impact	3709	3709	3895	3895	3895	3690	3895	3895	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	9.55×10^{-3}	9.09×10^{-2}	0.00	1.80×10^{-4}	1.71×10^{-3}	4.57×10^{-11}	1.80×10^{-4}	2.50×10^{-3}	2.10×10^{-6}
Nitrate	1.64	2.93×10^{-2}	0.00	6.55	1.54×10^{-1}	0.00	6.55	3.02×10^{-1}	0.00
Total	1.65	1.20×10^{-1}	0.00	6.55	1.56×10^{-1}	4.57×10^{-11}	6.55	3.05×10^{-1}	2.10×10^{-6}
Year of Peak Impact	9877	9877	N/A	6859	6859	4035	6859	6859	4035

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–351. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.42×10^{-7}	1.47	7.00×10^{-5}	1.16×10^{-6}	5.23	2.30×10^{-4}	1.16×10^{-6}	1.07×10^{1}	5.01×10^{-4}
Iodine-129	6.94×10^{-9}	1.98	1.36×10^{-5}	4.19×10^{-9}	1.38	1.83×10^{-5}	4.19×10^{-9}	1.71	2.64×10^{-5}
Total	8.48×10^{-7}	3.45	8.36×10^{-5}	1.17×10^{-6}	6.61	2.48×10^{-4}	1.17×10^{-6}	1.24×10^{1}	5.27×10^{-4}
Year of Peak Impact	4389	4389	4191	4191	4191	4191	4191	4191	4191
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	1.36×10^{-7}	6.48×10^{-7}	0.00	1.36×10^{-7}	8.09×10^{-7}	0.00	1.36×10^{-7}	1.46×10^{-6}	0.00
Chromium	9.83×10^{-4}	9.36×10^{-3}	0.00	9.83×10^{-4}	9.37×10^{-3}	1.25×10^{-11}	9.83×10^{-4}	1.37×10^{-2}	5.72×10^{-7}
Nitrate	3.29	5.87×10^{-2}	0.00	3.29	7.73×10^{-2}	0.00	3.29	1.52×10^{-1}	0.00
Total	3.29	6.80×10^{-2}	0.00	3.29	8.66×10^{-2}	1.25×10^{-11}	3.29	1.65×10^{-1}	5.72×10^{-7}
Year of Peak Impact	7710	7710	N/A	7710	7710	4877	7710	7710	4877

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–352. Waste Management Alternative 3, Disposal Group 3, Base Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.70×10^{-11}	7.65×10^{-5}	3.49×10^{-9}	1.28×10^{-11}	1.33×10^{-4}	6.28×10^{-9}	8.42×10^{-7}	9.20×10^{-3}	6.98×10^{-7}
Iodine-129	1.29×10^{-13}	4.28×10^{-5}	4.82×10^{-10}	1.49×10^{-13}	8.05×10^{-4}	1.94×10^{-8}	6.94×10^{-9}	1.13×10^{-2}	1.83×10^{-7}
Total	1.71×10^{-11}	1.19×10^{-4}	3.98×10^{-9}	1.29×10^{-11}	9.37×10^{-4}	2.56×10^{-8}	8.48×10^{-7}	2.05×10^{-2}	8.81×10^{-7}
Year of Peak Impact	4019	4019	4042	4076	4076	4076	4389	4389	3882
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	7.21×10^{-13}	4.29×10^{-12}	0.00	7.21×10^{-13}	7.75×10^{-12}	0.00	1.36×10^{-7}	8.09×10^{-7}	0.00
Boron and Compounds	0.00	0.00	0.00	0.00	0.00	0.00	3.35×10^{-7}	3.34×10^{-9}	0.00
Chromium	5.90×10^{-9}	5.62×10^{-8}	1.27×10^{-16}	5.90×10^{-9}	9.00×10^{-8}	5.84×10^{-12}	5.94×10^{-4}	1.31×10^{-3}	2.86×10^{-7}
Nitrate	5.01×10^{-5}	1.73×10^{-6}	0.00	5.01×10^{-5}	4.71×10^{-3}	0.00	3.31	1.25×10^{-1}	0.00
Total	5.01×10^{-5}	1.79×10^{-6}	1.27×10^{-16}	5.01×10^{-5}	4.71×10^{-3}	5.84×10^{-12}	3.31	1.26×10^{-1}	2.86×10^{-7}
Year of Peak Impact	7991	7991	4468	7991	7991	4468	7714	7714	4877

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Table Q–353. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the 200-East Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	2.61×10^{-7}	4.57×10^{-1}	2.34×10^{-5}	3.89×10^{-7}	1.75	7.68×10^{-5}	3.89×10^{-7}	3.56	1.68×10^{-4}
Iodine-129	1.42×10^{-9}	4.06×10^{-1}	1.59×10^{-6}	4.91×10^{-10}	1.62×10^{-1}	2.15×10^{-6}	4.91×10^{-10}	2.00×10^{-1}	3.09×10^{-6}
Total	2.62×10^{-7}	8.62×10^{-1}	2.50×10^{-5}	3.89×10^{-7}	1.91	7.90×10^{-5}	3.89×10^{-7}	3.76	1.71×10^{-4}
Year of Peak Impact	11896	11896	9324	9324	9324	9324	9324	9324	9324

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Chromium	9.13×10^{-4}	8.69×10^{-3}	0.00	9.13×10^{-4}	8.70×10^{-3}	1.13×10^{-11}	9.13×10^{-4}	1.27×10^{-2}	5.17×10^{-7}
Nitrate	1.66×10^{1}	2.97×10^{-1}	0.00	1.66×10^{1}	3.91×10^{-1}	0.00	1.66×10^{1}	7.67×10^{-1}	0.00
Total	1.66×10^{1}	3.06×10^{-1}	0.00	1.66×10^{1}	4.00×10^{-1}	1.13×10^{-11}	1.66×10^{1}	7.80×10^{-1}	5.17×10^{-7}
Year of Peak Impact	8236	8236	N/A	8236	8236	8037	8236	8236	8037

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–354. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the 200-West Area Integrated Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.83×10^{-5}	3.20×10^{1}	1.22×10^{-3}	2.02×10^{-5}	9.09×10^{1}	3.99×10^{-3}	2.02×10^{-5}	1.85×10^{2}	8.71×10^{-3}
Iodine-129	1.71×10^{-7}	4.87×10^{1}	4.84×10^{-4}	1.49×10^{-7}	4.93×10^{1}	6.53×10^{-4}	1.49×10^{-7}	6.09×10^{1}	9.40×10^{-4}
Total	1.85×10^{-5}	8.08×10^{1}	1.70×10^{-3}	2.04×10^{-5}	1.40×10^{2}	4.65×10^{-3}	2.04×10^{-5}	2.46×10^{2}	9.65×10^{-3}
Year of Peak Impact	3723	3723	3713	3713	3713	3713	3713	3713	3713

Chemical Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Boron and Compounds	1.59×10^{-5}	2.27×10^{-6}	0.00	1.59×10^{-5}	2.30×10^{-6}	0.00	1.59×10^{-5}	2.45×10^{-6}	0.00
Chromium	1.95×10^{-3}	1.86×10^{-2}	0.00	1.95×10^{-3}	1.86×10^{-2}	7.67×10^{-12}	1.95×10^{-3}	2.72×10^{-2}	3.52×10^{-7}
Fluoride	1.37×10^{-3}	6.50×10^{-4}	0.00	1.37×10^{-3}	6.69×10^{-4}	0.00	1.37×10^{-3}	7.20×10^{-4}	0.00
Nitrate	1.37×10^{-2}	2.45×10^{-4}	0.00	1.37×10^{-2}	3.23×10^{-4}	0.00	1.37×10^{-2}	6.33×10^{-4}	0.00
Total	1.71×10^{-2}	1.95×10^{-2}	0.00	1.71×10^{-2}	1.96×10^{-2}	7.67×10^{-12}	1.71×10^{-2}	2.85×10^{-2}	3.52×10^{-7}
Year of Peak Impact	3756	3756	N/A	3756	3756	3696	3756	3756	3696

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–355. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the River Protection Project Disposal Facility

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	3.86×10^{-7}	6.76×10^{-1}	2.32×10^{-5}	3.86×10^{-7}	1.74	7.62×10^{-5}	3.86×10^{-7}	3.54	1.66×10^{-4}
Iodine-129	3.91×10^{-10}	1.11×10^{-1}	1.27×10^{-6}	3.91×10^{-10}	1.29×10^{-1}	1.71×10^{-6}	3.91×10^{-10}	1.59×10^{-1}	2.46×10^{-6}
Total	3.86×10^{-7}	7.87×10^{-1}	2.45×10^{-5}	3.86×10^{-7}	1.86	7.79×10^{-5}	3.86×10^{-7}	3.70	1.69×10^{-4}
Year of Peak Impact	4013	4013	4013	4013	4013	4013	4013	4013	4013
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	8.36×10^{-7}	3.98×10^{-6}	0.00	5.45×10^{-7}	3.24×10^{-6}	0.00	5.45×10^{-7}	5.85×10^{-6}	0.00
Chromium	3.37×10^{-2}	3.21×10^{-1}	0.00	2.94×10^{-2}	2.81×10^{-1}	1.43×10^{-10}	2.94×10^{-2}	4.10×10^{-1}	6.54×10^{-6}
Nitrate	6.07	1.08×10^{-1}	0.00	8.02	1.89×10^{-1}	0.00	8.02	3.70×10^{-1}	0.00
Total	6.10	4.29×10^{-1}	0.00	8.05	4.69×10^{-1}	1.43×10^{-10}	8.05	7.80×10^{-1}	6.54×10^{-6}
Year of Peak Impact	4387	4387	N/A	4196	4196	3878	4196	4196	3878

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–356. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the Core Zone Boundary

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	6.60×10^{-6}	1.16×10^{1}	4.78×10^{-4}	7.94×10^{-6}	3.57×10^{1}	1.57×10^{-3}	7.94×10^{-6}	7.27×10^{1}	3.42×10^{-3}
Iodine-129	5.64×10^{-8}	1.61×10^{1}	1.25×10^{-4}	3.86×10^{-8}	1.28×10^{1}	1.69×10^{-4}	3.86×10^{-8}	1.58×10^{1}	2.43×10^{-4}
Total	6.66×10^{-6}	2.76×10^{1}	6.03×10^{-4}	7.97×10^{-6}	4.85×10^{1}	1.74×10^{-3}	7.97×10^{-6}	8.85×10^{1}	3.66×10^{-3}
Year of Peak Impact	3709	3709	3690	3690	3690	3690	3690	3690	3690
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.63×10^{-7}	3.16×10^{-6}	0.00	6.63×10^{-7}	3.94×10^{-6}	0.00	6.63×10^{-7}	7.12×10^{-6}	0.00
Boron and Compounds	7.00×10^{-7}	9.99×10^{-8}	0.00	7.00×10^{-7}	1.01×10^{-7}	0.00	7.00×10^{-7}	1.08×10^{-7}	0.00
Chromium	8.56×10^{-2}	8.16×10^{-1}	0.00	8.56×10^{-2}	8.16×10^{-1}	4.89×10^{-10}	8.56×10^{-2}	1.19	2.24×10^{-5}
Fluoride	9.98×10^{-5}	4.75×10^{-5}	0.00	9.98×10^{-5}	4.89×10^{-5}	0.00	9.98×10^{-5}	5.26×10^{-5}	0.00
Nitrate	3.02×10^{1}	5.40×10^{-1}	0.00	3.02×10^{1}	7.11×10^{-1}	0.00	3.02×10^{1}	1.39	0.00
Total	3.03×10^{1}	1.36	0.00	3.03×10^{1}	1.53	4.89×10^{-10}	3.03×10^{1}	2.59	2.24×10^{-5}
Year of Peak Impact	4628	4628	N/A	4628	4628	6610	4628	4628	6610

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–357. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the Columbia River Nearshore

Radiological Constituent	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	8.99×10^{-7}	1.58	7.34×10^{-5}	1.22×10^{-6}	5.48	2.41×10^{-4}	1.22×10^{-6}	1.12×10^{1}	5.25×10^{-4}
Iodine-129	7.04×10^{-9}	2.01	1.35×10^{-5}	4.17×10^{-9}	1.38	1.83×10^{-5}	4.17×10^{-9}	1.70	2.63×10^{-5}
Total	9.06×10^{-7}	3.58	8.69×10^{-5}	1.22×10^{-6}	6.86	2.59×10^{-4}	1.22×10^{-6}	1.29×10^{1}	5.52×10^{-4}
Year of Peak Impact	4388	4388	4066	4066	4066	4066	4066	4066	4066
Chemical Constituent	**Drinking-Water Well User**			**Resident Farmer**			**American Indian Resident Farmer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	2.69×10^{-7}	1.28×10^{-6}	0.00	2.69×10^{-7}	1.60×10^{-6}	0.00	2.69×10^{-7}	2.89×10^{-6}	0.00
Boron and Compounds	3.34×10^{-7}	4.77×10^{-8}	0.00	3.34×10^{-7}	4.83×10^{-8}	0.00	3.34×10^{-7}	5.13×10^{-8}	0.00
Chromium	1.70×10^{-2}	1.62×10^{-1}	0.00	1.70×10^{-2}	1.62×10^{-1}	8.05×10^{-11}	1.70×10^{-2}	2.36×10^{-1}	3.69×10^{-6}
Fluoride	1.00×10^{-4}	4.76×10^{-5}	0.00	1.00×10^{-4}	4.90×10^{-5}	0.00	1.00×10^{-4}	5.27×10^{-5}	0.00
Nitrate	3.80	6.79×10^{-2}	0.00	3.80	8.95×10^{-2}	0.00	3.80	1.75×10^{-1}	0.00
Total	3.82	2.30×10^{-1}	0.00	3.82	2.51×10^{-1}	8.05×10^{-11}	3.82	4.12×10^{-1}	3.69×10^{-6}
Year of Peak Impact	4954	4954	N/A	4954	4954	6701	4954	4954	6701

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Key: N/A=not applicable.

Table Q–358. Waste Management Alternative 3, Disposal Group 3, Option Case, Human Health Impacts at the Columbia River Surface Water

Radiological Constituent	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Concentration at Year of Peak Dose (curies per cubic meter)	Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Technetium-99	1.65×10^{-11}	7.42×10^{-5}	3.42×10^{-9}	1.24×10^{-11}	1.29×10^{-4}	8.13×10^{-9}	8.99×10^{-7}	9.84×10^{-3}	7.33×10^{-7}
Iodine-129	1.35×10^{-13}	4.48×10^{-5}	4.82×10^{-10}	1.48×10^{-13}	8.01×10^{-4}	1.76×10^{-8}	7.04×10^{-9}	1.12×10^{-2}	1.83×10^{-7}
Total	1.66×10^{-11}	1.19×10^{-4}	3.90×10^{-9}	1.26×10^{-11}	9.30×10^{-4}	2.57×10^{-8}	9.06×10^{-7}	2.10×10^{-2}	9.16×10^{-7}
Year of Peak Impact	4005	4005	3986	4076	4076	4005	4388	4388	4066
Chemical Constituent	**Resident Farmer**			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Concentration at Year of Peak Hazard Index (grams per cubic meter)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Acetonitrile	6.41×10^{-12}	3.81×10^{-11}	0.00	4.49×10^{-12}	4.83×10^{-11}	0.00	4.07×10^{-7}	2.42×10^{-6}	0.00
Boron and Compounds	1.15×10^{-11}	1.66×10^{-12}	0.00	6.26×10^{-12}	9.93×10^{-13}	0.00	3.35×10^{-7}	3.34×10^{-9}	0.00
Chromium	1.73×10^{-7}	1.65×10^{-6}	7.92×10^{-16}	1.15×10^{-7}	1.76×10^{-6}	3.63×10^{-11}	6.85×10^{-3}	1.51×10^{-2}	1.85×10^{-6}
Fluoride	7.28×10^{-10}	3.57×10^{-10}	0.00	5.42×10^{-10}	3.76×10^{-10}	0.00	2.51×10^{-5}	3.67×10^{-6}	0.00
Nitrate	4.49×10^{-5}	1.55×10^{-6}	0.00	5.65×10^{-5}	5.31×10^{-3}	0.00	5.62	2.02×10^{-1}	0.00
Total	4.50×10^{-5}	3.20×10^{-6}	7.92×10^{-16}	5.66×10^{-5}	5.31×10^{-3}	3.63×10^{-11}	5.62	2.17×10^{-1}	1.85×10^{-6}
Year of Peak Impact	4640	4640	4927	4843	4843	4927	6522	6522	6701

Note: Concentrations are those reported for groundwater at the specified location. Total concentrations, although reported, are not used in the analysis.

Figures Q-68 through Q–73 depicts the cumulative radiological lifetime risk of the incidence of cancer at the IDF-East barrier, the IDF-West barrier, and the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3700 for the Core Zone Boundary for the Base and Option Cases and is dominated by technetium-99 and iodine-129 from naturally occurring release mechanisms and degradation of waste forms disposed of in IDF-West and the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater. For the IDF-East barrier, the radiological lifetime risk of incidence of cancer occurs around the year 11,900 as a result of slower movement through the vadose zone for waste forms disposed of in IDF-East.

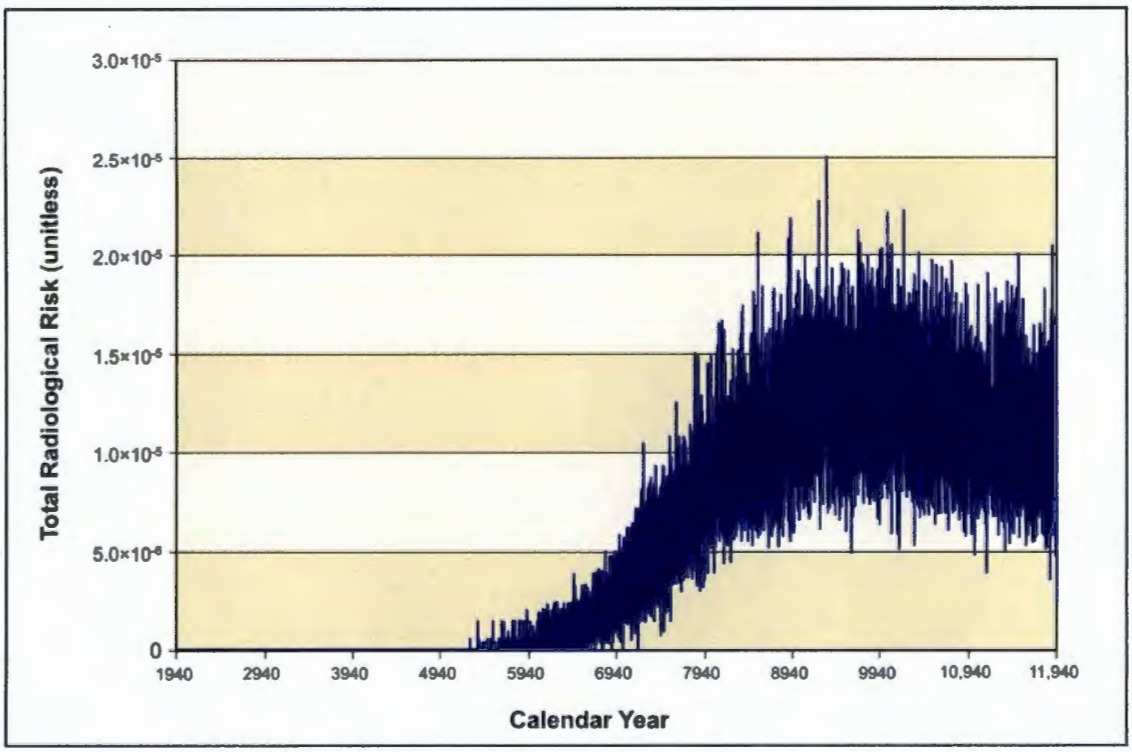


Figure Q–68. Waste Management Alternative 3, Disposal Group 3, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

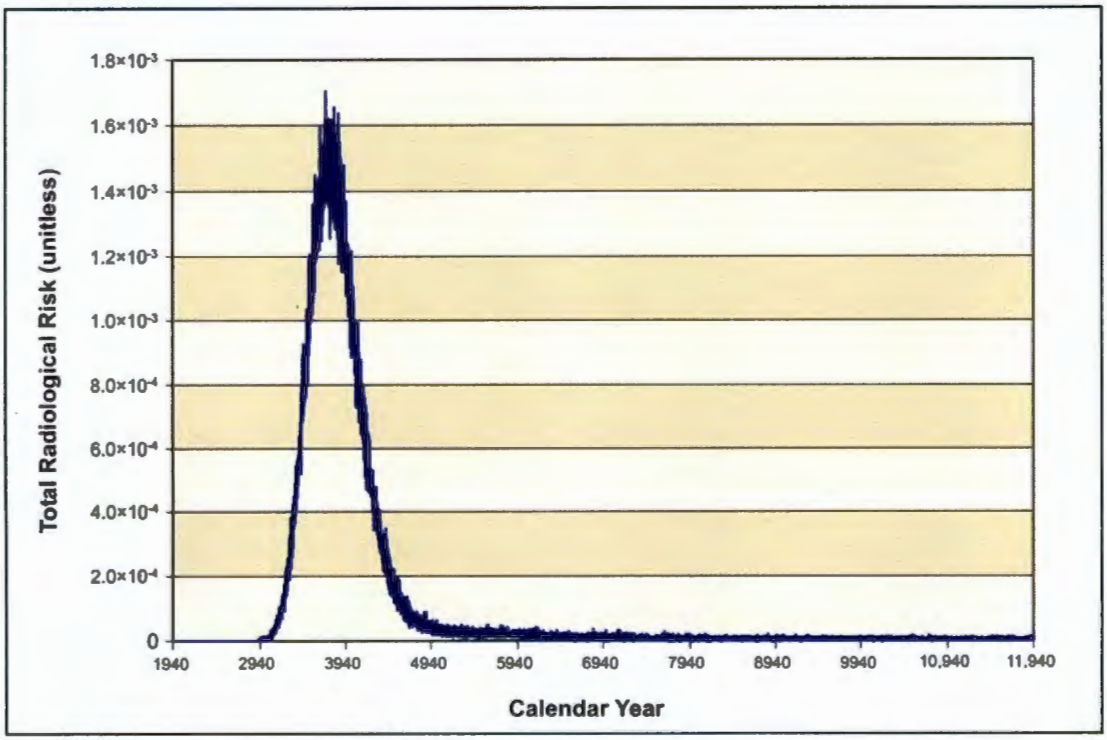


Figure Q–69. Waste Management Alternative 3, Disposal Group 3, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

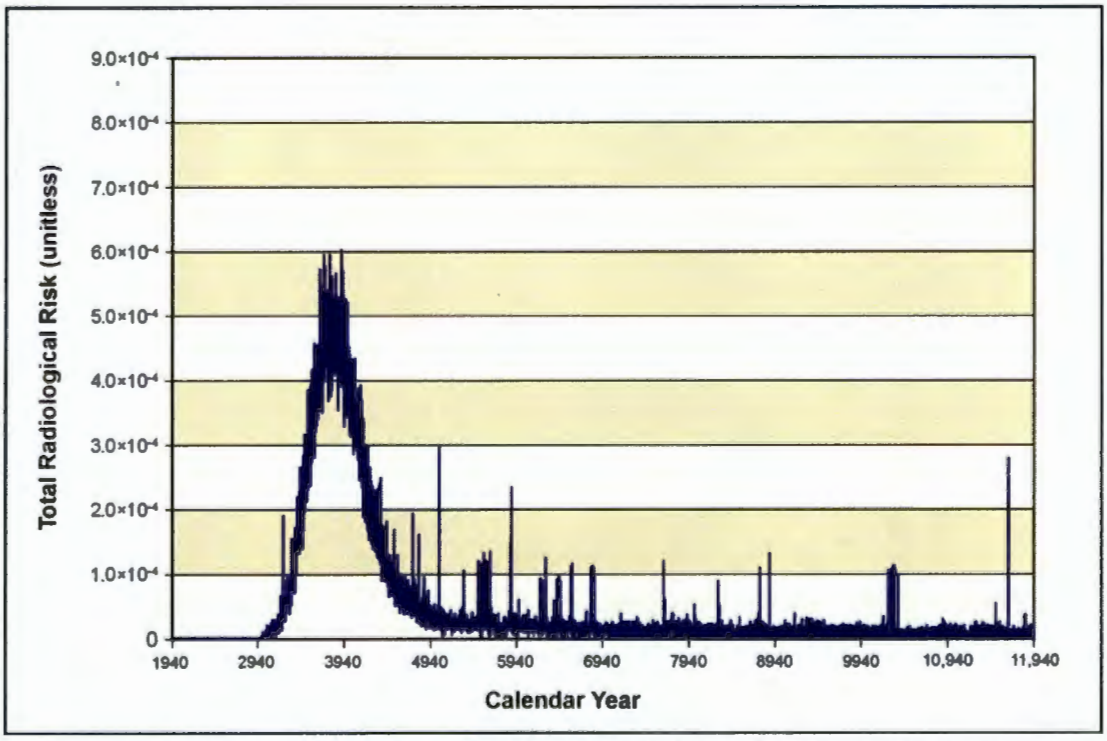


Figure Q–70. Waste Management Alternative 3, Disposal Group 3, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

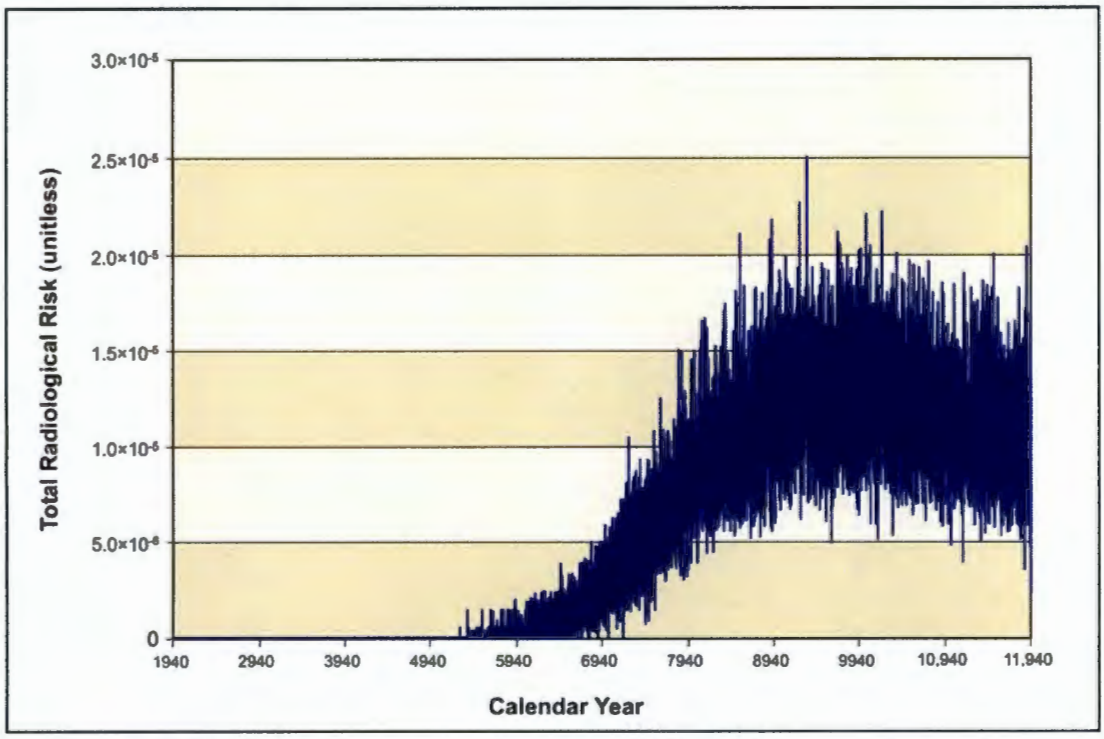


Figure Q–71. Waste Management Alternative 3, Disposal Group 3, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

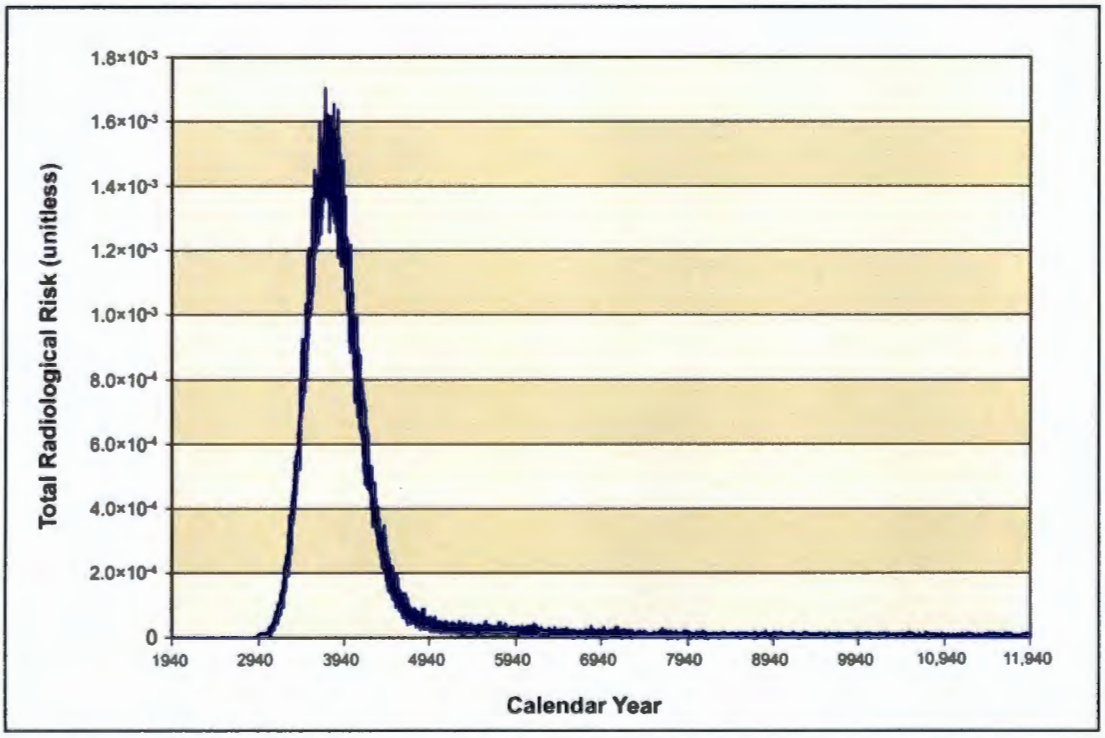


Figure Q–72. Waste Management Alternative 3, Disposal Group 3, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-West Area Integrated Disposal Facility

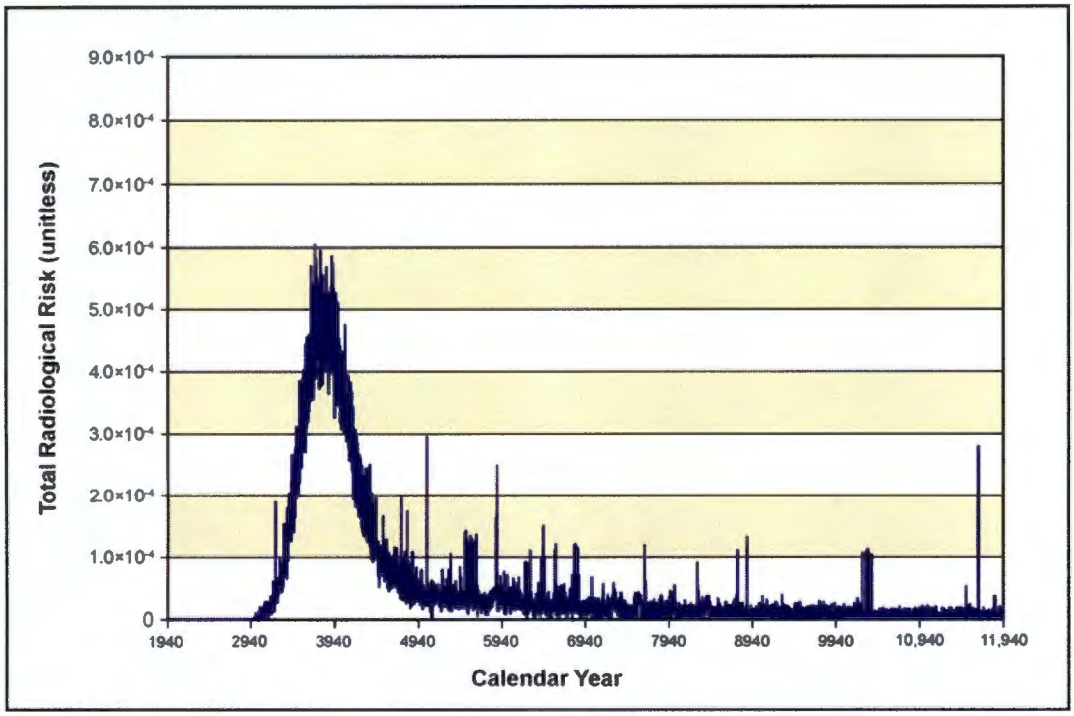


Figure Q–73. Waste Management Alternative 3, Disposal Group 3, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.4 Waste Management Intruder Scenario

Intruders are individuals who enter IDF-East, IDF-West, or the RPPDF and engage in activity that could cause direct contact with residual contamination in the stabilized, below-grade waste. Waste types that would be disposed of in IDF-East and IDF-West include waste generated in activities related to tank closure and activities not related to tank closure. Waste types related to tank closure that would be disposed of in IDF-East include:

- ILAW glass
- Bulk vitrification glass
- Cast stone
- Steam reforming solids
- PPF glass
- Effluent Treatment Facility (ETF) Secondary
- Sulfate grout
- Tank closure secondary
- Discarded melters

In addition, rubble, soil and equipment generated during tank closure activities would be disposed of in the RPPDF under some Tank Closure alternatives. Waste types not related to tank closure that would be disposed of in either the IDF-East or IDF-West include:

- Onsite non-CERCLA waste
- Waste management secondary waste
- Offsite waste
- FFTF decommissioning secondary waste

As in the case of Tank Closure alternatives, two types of receptors and two types of scenarios were considered. The receptor types were the resident farmer and American Indian resident farmer, and the scenario types were home construction and well drilling. Because the waste at the disposal areas is at a depth greater than that of the foundation for a home, the home construction scenario was screened from the analysis. Also, sensitivity analysis determined that in all cases for residential agriculture, impacts on the American Indian resident farmer exceeded impacts on the resident farmer. Because inhalation and external exposure are the only exposure modes for the well-drilling worker, impacts on the worker involved in well drilling would be the same for the resident farmer and American Indian resident farmer. Screening analysis also determined that impacts of intrusion were dominated by contact with short-lived radionuclides, strontium-90 and cesium-137 for all waste types except ETF Secondary waste. Consequently, impacts of intrusion at the disposal areas are represented by the well-drilling scenario in which a worker inhales dust and receives external radiation while drilling the well, and an American Indian resident farmer contacting residual contamination brought to the surface during development of the well. For both the resident farmer and drilling worker, impacts are presented as dose for the year of peak dose and the year of peak dose occurs immediately after loss of institutional control.

The impacts under this intrusion scenario at IDF-East or IDF-West for waste types related to tank closure are summarized in Tables Q–359 and Q–360 for the American Indian resident farmer and worker intruders, respectively. For all waste types and alternatives except ETF Secondary waste, resident farmer impacts are dominated by exposure to strontium-90 and cesium-137. Estimates of impact on the drilling worker are dominated by external exposure due to cesium-137. For both the American Indian resident farmer and drilling worker, impacts related to ETF Secondary waste are dominated by exposure to iodine-129. Due to high waste loadings of cesium-137, the DOE intruder dose guideline of 500 millirem is exceeded for both primary and secondary waste forms. The estimated impacts of intrusion into the rubble, soil and equipment related to tank closure that is disposed of in the RPPDF are presented in Table Q–361. As for other tank closure waste types, doses are dominated by exposure to cesium-137. The DOE intruder dose guideline is exceeded only for Tank Closure Alternatives 6A and 6B that involve complete removal of below grade tanks and soil. The estimated impacts of intrusion into waste types not related to tank closure that are disposed of in either IDF-East or IDF-West are presented in Table Q–362 for an American Indian resident farmer and a drilling worker. The DOE intruder dose guideline of 500 millirem is exceeded for the Offsite waste type due to high loading of cesium-137.

Table Q–359. Doses by Tank Closure Waste Type to an American Indian Engaged in Residential Agriculture Following Well Drilling at an Integrated Disposal Facility

	Dose (rem per year)								
	Waste Type								
Alternative	ILAW Glass	Bulk Vitrification Glass	Cast Stone	Steam Reforming Solids	PPF Glass	ETF Secondary	Sulfate Grout	Tank Closure Secondary	Discarded Melters
2A	0.74	N/A[a]	N/A	N/A	N/A	0.29	N/A	1.22	0.026
2B	0.74	N/A	N/A	N/A	N/A	0.29	N/A	1.29	0.025
3A	0.93	7.7	N/A	N/A	N/A	0.51	N/A	1.63	0.034
3B	0.93	N/A	5.9	N/A	N/A	0.22	N/A	2.19	0.034
3C	0.93	N/A	N/A	7.6	N/A	0.51	N/A	2.19	0.034
4	1.36	18.6	0.47	N/A	N/A	0.58	N/A	1.84	0.044
5	1.24	20.5	0.46	N/A	N/A	0.49	0.47	1.50	0.049
6A, Base Case	N/A	N/A	N/A	N/A	64.2	0.29	N/A	1.38	0.969
6A, Option Case	N/A	N/A	N/A	N/A	2.37	0.29	N/A	1.38	0.033
6B, Base Case	N/A	N/A	N/A	N/A	62.8	0.29	N/A	1.36	1.48
6B, Option Case	N/A	N/A	N/A	N/A	2.36	0.29	N/A	1.36	0.05
6C	N/A	N/A	N/A	N/A	N/A	0.29	N/A	1.29	N/A

[a] N/A=not applicable, this waste type is not generated for this alternative.

Key: ETF=Effluent Treatment Facility; ILAW=immobilized low-activity waste; PPF=Preprocessing Facility.

Table Q–360. Doses by Tank Closure Waste Type to a Well-Drilling Worker at an Integrated Disposal Facility

Alternative	Dose (rem)								
	Waste Type								
	ILAW Glass	Bulk Vitrification Glass	Cast Stone	Steam Reforming Solids	PPF Glass	ETF Secondary	Sulfate Grout	Tank Closure Secondary	Discarded Melters
2A	1.6×10^{-3}	N/A[a]	N/A	N/A	N/A	3.3×10^{-4}	N/A	2.1×10^{-3}	5.4×10^{-5}
2B	1.6×10^{-3}	N/A	N/A	N/A	N/A	3.3×10^{-4}	N/A	2.2×10^{-3}	5.2×10^{-5}
3A	2.0×10^{-3}	1.7×10^{-2}	N/A	N/A	N/A	6.7×10^{-4}	N/A	2.7×10^{-3}	7.2×10^{-5}
3B	2.0×10^{-3}	N/A	1.3×10^{-2}	N/A	N/A	3.1×10^{-4}	N/A	3.6×10^{-3}	7.2×10^{-5}
3C	2.0×10^{-3}	N/A	N/A	1.7×10^{-2}	N/A	6.7×10^{-4}	N/A	3.6×10^{-3}	7.2×10^{-5}
4	2.9×10^{-3}	4.0×10^{-2}	9.9×10^{-4}	N/A	N/A	8.0×10^{-4}	N/A	3.1×10^{-3}	9.1×10^{-5}
5	2.6×10^{-3}	4.5×10^{-2}	9.6×10^{-4}	N/A	N/A	6.7×10^{-4}	9.9×10^{-4}	2.5×10^{-3}	9.5×10^{-5}
6A, Base Case	N/A	N/A	N/A	N/A	1.4×10^{-1}	3.3×10^{-4}	N/A	2.4×10^{-3}	2.0×10^{-3}
6A, Option Case	N/A	N/A	N/A	N/A	7.2×10^{-3}	3.3×10^{-4}	N/A	2.4×10^{-3}	1.0×10^{-4}
6B, Base Case	N/A	N/A	N/A	N/A	1.32×10^{-1}	3.3×10^{-4}	N/A	2.3×10^{-3}	3.1×10^{-3}
6B, Option Case	N/A	N/A	N/A	N/A	7.1×10^{-3}	3.3×10^{-4}	N/A	2.3×10^{-3}	1.6×10^{-4}
6C	N/A	N/A	N/A	N/A	N/A	3.3×10^{-4}	N/A	2.2×10^{-3}	N/A

[a] N/A=not applicable, this waste type is not generated for this alternative.
Key: ETF=Effluent Treatment Facility; ILAW=immobilized low-activity waste; PPF=Preprocessing Facility.

Table Q–361. Doses by Waste Management Waste Type to an American Indian Engaged in Residential Agriculture and a Well-Drilling Worker at an Integrated Disposal Facility

Waste Type	Dose for American Indian Resident Farmer (rem per year)	Dose for Drilling Worker (rem)
Onsite non-CERCLA waste	1.78×10^{-1}	5.20×10^{-4}
Waste management secondary waste	3.66×10^{-4}	1.5×10^{-4}
Offsite waste	2.67	5.77×10^{-3}
FFTF decommissioning secondary waste	3.4×10^{-3}	2.37×10^{-8}

Key: CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; FFTF=Fast Flux Test Facility.

Table Q–362. Doses by Tank Closure Waste Type to an American Indian Engaged in Residential Agriculture and a Well-Drilling Worker at the RPPDF

Alternative	Dose for American Indian Resident Farmer (rem per year)	Dose for Drilling Worker (rem)
2A	Not applicable[a]	Not applicable
2B	0.096	2.6×10^{-4}
3A	0.096	2.6×10^{-4}
3B	0.096	2.6×10^{-4}
3C	0.096	2.6×10^{-4}
4	0.544	1.2×10^{-3}
5	Not applicable	Not applicable
6A, Base Case	2.19	4.6×10^{-3}
6A, Option Case	2.28	6.3×10^{-3}
6B, Base Case	2.19	4.6×10^{-3}
6B, Option Case	2.28	6.3×10^{-3}
6C	0.096	

[a] N/A=not applicable, this waste type is not generated in this alternative.
Key: RPPDF=River Protection Project Disposal Facility.

Q.4 REFERENCES

Baes III, C.F., R.D. Sharp, A. L. Sjoreen, and R.W. Shor, 1984, *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture*, ORNL-5786, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Beyeler, W.E., W.A. Hareland, F.A. Durán, T.J. Brown, E. Kalinina, D.P. Gallegos, and P.A. Davis, 1999, *Residual Radioactive Contamination from Decommissioning, Parameter Analysis, Draft Report for Comment*, NUREG/CR-5512, Vol. 3, U.S. Nuclear Regulatory Commission, Washington, D.C., October.

DOE (U.S. Department of Energy), 1995, *Hanford Site Risk Assessment Methodology*, DOE/RL-91-45, Rev. 3, Richland Operations Office, Richland, Washington, May.

DOE and Ecology (U.S. Department of Energy, Richland Operations Office, Richland, Washington, and Washington State Department of Ecology, Olympia, Washington), 1996, *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement*, DOE/EIS-0189, August.

Eckerman, K.F., and J.C. Ryman, 1993, *External Exposure to Radionuclides in Air, Water, and Soil*, Federal Guidance Report No. 12, EPA-402-R-93-081, U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Washington D.C., September.

Eckerman, K.F., R.W. Leggett, C.B. Nelson, J.S. Puskin, and A.C.B. Richardson, 1999, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, Federal Guidance Report No. 13, EPA 402-R-99-001, U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Washington, D.C., September.

EPA (U.S. Environmental Protection Agency), 1991, *Risk Assessment Guidance for Superfund*, Vol. 1, *Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors, Interim Final*, OSWER Directive 9285.6-03, Office of Emergency and Remedial Response, Washington, D.C., March 25.

EPA (U.S. Environmental Protection Agency), 1996, *Soil Screening Guidance: User's Guide*, 2nd ed., EPA/540/R-96/018, Office of Emergency and Remedial Response, Washington, D.C., July.

EPA (U.S. Environmental Protection Agency), 1999, *Exposure Factors Handbook (EFH)*, EPA/600/C-99/001, Office of Research and Development, National Center for Environmental Assessment, Washington, D.C., February.

EPA (U.S. Environmental Protection Agency), 2000a, *Soil Screening Guidance for Radionuclides: Technical Background Document*, EPA/540-R-00-006, Office of Radiation and Indoor Air, Washington, D.C., October.

EPA (U.S. Environmental Protection Agency), 2000b, *Soil Screening Guidance for Radionuclides: User's Guide*, EPA/540-R-00-007, Office of Radiation and Indoor Air, Washington, D.C., October.

EPA (U.S. Environmental Protection Agency), 2002a, *Radionuclide Carcinogenicity Slope Factors: HEAST*, Radionuclide Table, "Radionuclide Carcinogenicity – Slope Factors," accessed through http://www.epa.gov/rpdweb00/heast/, April 16.

EPA (U.S. Environmental Protection Agency), 2002b, *Region 9 PRGs 2002 Table*, San Francisco, California, accessed through http://www.epa.gov/region9/waste/sfund/prg/index.htm, October 1.

EPA (U.S. Environmental Protection Agency), 2009, *Integrated Risk Information System*, accessed through http://www.epa.gov/iris, March 5.

Kennedy, W.E., Jr., and D.L. Strenge, 1992, *Residual Radioactive Contamination from Decommissioning: Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent, Final Report*, NUREG/CR-5512, Vol. 1, U.S. Nuclear Regulatory Commission, Washington, D.C., October.

Mann, F.M., and R.J. Puigh, 2001, *Data Packages for the Hanford Immobilized Low-Activity Tank Waste Performance Assessment: 2001 Version*, HNF-5636, Fluor Federal Services, Inc., Richland, Washington, February.

Meyer, P.D., and G.W. Gee, 1999, *Information on Hydrologic Conceptual Models, Parameters, Uncertainty Analysis, and Data Sources for Dose Assessments at Decommissioning Sites*, NUREG/CR-6656, U.S. Nuclear Regulatory Commission, Division of Risk Analysis and Applications, Washington, D.C., November.

Napier, B.A., D.L. Strenge, J.V. Ramsdell, P.W. Eslinger, and C. Fosmire, 2004, *GENII Version 2 Software Design Document*, PNNL-14584, Pacific Northwest National Laboratory, Richland, Washington, November.

NCRP (National Council on Radiation Protection and Measurements), 1987, *Ionizing Radiation Exposure of the Population of the United States*, NCRP Report No. 93, Bethesda, Maryland, September 1.

NRC (U.S. Nuclear Regulatory Commission), 1982, *Final Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste,"* NUREG-0945, Vol. 1, Office of Nuclear Material Safety and Safeguards, Washington, D.C., November.

NRC (U.S. Nuclear Regulatory Commission), 2000, *NMSS Decommissioning Standard Review Plan*, NUREG-1727, Office of Nuclear Material Safety and Safeguards, Division of Waste Management, Washington, D.C., September.

RAIS (Risk Assessment Management System), 2007, *Risk Assessment Tools*, U.S. Department of Energy, Office of Environmental Management, Oak Ridge Operations Office, and Center for Risk Excellence, accessed through http://rais.ornl.gov/homepage/rap_tool.shtml, May 2.

Sheppard, M.I., and D.H. Thibault, 1990, "Default Soil Solid/Liquid Partition Coefficients, K_ds, for Four Major Soil Types: A Compendium,"*Health Physics*, Vol. 59, pp. 471–482.

Staven, L.H., K. Rhoads, B.A. Napier, and D.L. Strenge, 2003, *A Compendium of Transfer Factors for Agricultural and Animal Products*, Pacific Northwest National Laboratory, PNNL-13421, June.

Travis, C.C., and A.D. Arms, 1988, "Bioconcentration of Organics in Beef, Milk, and Vegetation," *Environmental Science and Technology*, Vol. 22, pp. 271–274.

White, M.D., and M. Oostrom, 2000, *STOMP Subsurface Transport Over Multiple Phases, Version 2.0: Theory Guide*, PNNL-12030, Pacific Northwest National Laboratory, Richland, Washington, March.

White, M.D., and M. Oostrom, 2006, *STOMP Subsurface Transport Over Multiple Phases, Version 4.0: User's Guide*, PNNL-15782, Pacific Northwest National Laboratory, Richland, Washington, June.

USGS (U.S. Geological Survey), 2004, *MODFLOW 2000 Engine, Version 1.15.00*, August 6.

Yu, C., A.J. Zeilen, J.J. Cheng, D.J. LePoire, E. Gnanapragasam, S. Kamboj, J. Arnish, E. Wallo III, W.A. Williams, and H. Peterson, 2001, *User's Manual for RESRAD Version 6.0*, ANL/AED-4, Argonne National Laboratory, Argonne, Illinois, July.

Code of Federal Regulations

40 CFR 141, U.S. Environmental Protection Agency, "National Primary Drinking Water Regulations."

Executive Orders

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, February 11, 1994.

U.S. Department of Energy Guides and Orders

DOE Guide 453.1-1, *Implementation Guide for Use with DOE M 435.1-1*, July 9, 1999.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Change 2, January 7, 1993.

APPENDIX R
CUMULATIVE IMPACTS: ASSESSMENT METHODOLOGY

This appendix describes the cumulative impacts methodology for the U.S. Department of Energy *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*. The appendix is organized into sections on (1) regulations and guidance, (2) previous studies, (3) history of land use at the Hanford Site and in surrounding regions, (4) future land use at the Hanford Site, (5) future land use in surrounding regions, (6) approach to cumulative impacts analysis, (7) uncertainties, (8) selection of resource areas for analysis, (9) resource area methodologies, (10) spatial and temporal considerations, (11) past and present actions, and (12) selection of reasonably foreseeable future actions. The results of the cumulative impacts analysis are presented in Chapter 6. Supporting information for the short-term cumulative impacts analysis is presented in Appendix T; long-term, in Appendix U. The details of inventory development and end states for the cumulative groundwater modeling are described in Appendix S.

The Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) (40 CFR 1500–1508) define cumulative impacts as impacts on the environment that result from the proposed actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Thus, the cumulative impacts of an action on a resource (e.g., land, air, water, soil) ecosystem or human community comprise the effects of that action and all other activities affecting that resource no matter what entity (Federal, non-Federal, or private) is taking the action (EPA 1999:2).

Cumulative impacts are analyzed for activities occurring at the Hanford Site (Hanford). Under the Fast Flux Test Facility (FFTF) Decommissioning Entombment and Removal Alternatives, Idaho options were evaluated for management and disposition of the FFTF remote-handled special components and bulk sodium. These options involve shipping the remote-handled special components to the proposed Idaho National Laboratory (INL) Remote Treatment Facility for treatment and the bulk sodium to the existing INL Sodium Processing Facility for processing to produce a caustic sodium hydroxide solution, which would be returned to Hanford for reuse in the Waste Treatment Plant (WTP) pretreatment processes. Construction of these facilities was, or would be, largely unrelated to the processing of materials from Hanford. The additional materials processing would not contribute substantially to the cumulative impacts of activities at INL because (1) there would be no marked increase in daily effluent emissions from, or waste generation by, the facilities; (2) sodium hydroxide, produced at INL's Sodium Processing Facility, would be returned to Hanford for use in processing tank waste; (3) hazardous and radioactive wastes would not be disposed of at INL; and (4) impacts of the activities would be small. Accordingly, only the cumulative impacts of transporting materials and waste to and from INL are evaluated in this *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)*. Cumulative impacts of activities at INL have been evaluated in the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE 1995a:C-4.6.7-1) and *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems* (DOE 2005a:4-65).

R.1 REGULATIONS AND GUIDANCE

Cumulative impacts analysis in U.S. Department of Energy (DOE) NEPA documents is governed by the CEQ regulations (40 CFR 1500–1508) and the DOE NEPA implementing procedures (10 CFR 1021). Additional guidance on how to conduct such analyses was obtained from *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997) and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (EPA 1999).

As noted, cumulative impacts on the environment result from proposed actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over an extended period of time. They can also result from the spatial or temporal crowding of environmental perturbations. That is, increased environmental impact can be expected when a second perturbation occurs at a site before that site can fully rebound from the effects of the first.

While there is no universally accepted framework for cumulative impacts analysis, eight general principles (CEQ 1997:8) have gained acceptance and thus inform the methodology adopted for this *TC & WM EIS*. These principles are based on the premise that any resource, ecosystem, or human community can experience stress, and that for each there are thresholds, or levels of stress, beyond which conditions degrade. The following is a summary of the CEQ's eight principles of cumulative effects analysis:

1. Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions. This includes all actions that affect the same resources.

2. Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, or human community of all actions taken, no matter who (Federal, non-Federal, or private entity) has taken the actions. Effects from individual activities may interact to cause additional effects not apparent when looking at individual effects one at a time.

3. Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, or human community being affected, rather than from the perspective of the proposed actions. Analyzing cumulative effects involves developing an understanding of how the resources are susceptible to effects.

4. It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those effects that are truly meaningful. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly.

5. Cumulative effects on a given resource, ecosystem, or human community are rarely aligned with political or administrative boundaries. Cumulative effects analysis of natural systems must use natural boundaries, and analysis of human communities must use actual sociocultural boundaries to ensure that all effects are included.

6. Cumulative effects may result from accumulation of similar effects or from the synergistic interaction of different effects. Accordingly, the cumulative effect can in some cases be greater than the sum of the individual effects.

7. Cumulative effects may last for many years beyond the life of the action(s) that caused the effects. Radioactive contamination is an example. Cumulative effects analysis must involve application of the best science and forecasting techniques.

8. Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters. The most effective cumulative effects analysis focuses on what is needed to ensure long-term productivity or sustainability of the resource.

In *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (known as *The Green Book*) (DOE 2004a:1, 2, 19, 20), DOE expands on the CEQ instruction (40 CFR 1502.2(b)) by stating that impacts should be discussed in proportion to their significance and

that this sliding-scale approach applies to all *Green Book* recommendations. *The Green Book* stipulates use of the sliding scale for impact identification and quantification and provides the following basic recommendations:

- Quantify impacts consistent with the sliding-scale approach and available information.
- Provide sufficient information so the validity of analytical methods and results can be reviewed.
- Acknowledge uncertainty and incompleteness in data and how they may affect significance in the analysis.
- Do not quantify impacts when they are virtually absent.
- Define and compare impacts in their appropriate context using both relative and absolute information.
- Define, where possible, the actual impact on health or the environment, not just contaminant concentrations or release rates.

Included in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997:49–57) is discussion of various techniques for analyzing cumulative effects. Implicit in that discussion is the idea that there is no one appropriate method for such an analysis.

R.2 PREVIOUS STUDIES

Cumulative impacts at Hanford were evaluated in the *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement* (*TWRS EIS*) (DOE and Ecology 1996) and the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement (Hanford Comprehensive Land-Use Plan EIS)* (DOE 1999a). Presented in Table R–1 is a breakdown of the resource areas addressed in those evaluations. While the entries attest to evaluation of certain areas in both documents, they do not necessarily reflect evaluations at the same level of detail.

Table R–1. Resource Areas Evaluated in Recent Major Hanford Cumulative Impacts Analyses

Resource Area	*TWRS EIS*[a]	*Hanford Comprehensive Land-Use Plan EIS*[b]
Land resources	X	X
Noise and vibration	–	X
Air quality	X	X
Geology and soils	–	X
Water resources	–	X
Ecological resources	X	X
Cultural resources	–	X
Socioeconomics	X	X
Public health and safety—normal operations	X	X
Occupational health and safety	–	X
Long-term groundwater quality	X	–

[a] DOE and Ecology 1996:5-237–5-251.

[b] DOE 1999a:5-65–5-72.

Key: *Hanford Comprehensive Land-Use Plan EIS=Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement; TWRS EIS=Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement.*

R.3 HISTORY OF LAND USE AT THE HANFORD SITE AND IN SURROUNDING REGIONS

This section provides information on past land use in the region to illustrate how the land and its resources have changed since European-American colonization. Such information helps determine the impacts of past actions.

The 151,775-hectare (375,040-acre) Hanford Site is in the Columbia Basin Ecoregion, an area historically including over 6 million hectares (14.8 million acres) of steppe and shrub-steppe vegetation extending across most of central and southeastern Washington and portions of north-central Oregon. In the early 1800s, the dominant plant in the Hanford area was big sagebrush underlain by perennial Sandberg's bluegrass and bluebunch wheatgrass. Many places on Hanford are fairly free of nonnative species and extensive enough to retain characteristic populations of shrub-steppe plants and animals absent or scarce in developed areas of the ecoregion. Hanford's location provides important connectivity with other undeveloped portions of the ecoregion (Neitzel 2005:4.73). Washington State considers pristine shrub-steppe habitat as a priority habitat because it is scarce in the state and important to several state-listed wildlife species (WDFW 2007). Sagebrush communities are also considered a Level III resource under the *Hanford Site Biological Resources Management Plan* (DOE 2001a). Impacts on such resources should be avoided or minimized; however, when avoidance and minimization are not possible, rectification or compensatory mitigation is recommended (DOE 2002a:4.7).

In prehistoric and early historic times, American Indians of various tribal affiliations heavily populated the area along the Columbia River in eastern Washington, including the area occupied by Hanford, and some of their descendants still live in the region (DOE 2000a:3-125). When Euro-American explorers arrived in the early 1800s, people presently referred to as "the Wanapum" (the River People) were observed inhabiting numerous villages and fishing camps scattered throughout this segment of the mid-Columbia River. Neighboring groups known today as the Yakama, Umatilla, Cayuse, Walla Walla, Palus, Nez Perce, and Middle Columbia Salish frequented the area to trade, gather resources, and conduct

other activities. Many descendants of these tribes and bands are affiliated with the Wanapum, Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Reservation, Nez Perce Tribe of Idaho, or the Confederated Tribes of the Colville Reservation (Neitzel 2005:4.102, 4.103). Present-day tribal members retain traditional secular and religious ties to the region, and many have knowledge of their cultural ceremonies and lifeways (DOE 2000a:3-125).

Under separate treaties signed in 1855, the land area of much of what is now eastern Washington, Oregon, and Idaho was ceded to the United States by a number of regional American Indian tribes. The land area includes land occupied by Hanford. Under these treaties, the tribes retained the right to fish in usual and accustomed places. Tribal fishing rights are recognized on rivers within the ceded lands, including the Columbia River, which flows through Hanford. In addition to fishing rights, the tribes retained under the treaties the privilege to hunt, gather roots and berries, and pasture horses and cattle on open and unclaimed lands. It is the position of DOE that Hanford, like other ceded lands that were settled or used for specific purposes, is not open and unclaimed land. While reserving all rights to assert their respective positions regarding treaty rights, the tribes are participants in DOE's land use planning process, and DOE considers tribal concerns in that process.

American Indian traditional cultural places within Hanford include, but are not limited to, a wide variety of places and landscapes: archaeological sites, cemeteries, trails and pathways, campsites and villages, fisheries, hunting grounds, plant-gathering areas, holy lands, landmarks, important places in American Indian history and culture, places of persistence and resistance, and landscapes of the heart (Neitzel 2005:4.104). Culturally important localities and geographic features include Rattlesnake Mountain, Gable Mountain, Gable Butte, Goose Egg Hill, Coyote Rapids, and the White Bluffs portion of the Columbia River. The Wanapum resided on land that is now part of Hanford until 1942, when the site was established, then moved to Priest Rapids (DOE 1987).

Lewis and Clark were among the first European Americans to visit the Hanford region during their 1804–1806 expedition. They were followed by fur trappers, military units, and miners. It was not until the 1860s that merchants set up stores, a freight depot, and the White Bluffs Ferry on the Hanford Reach, and gold miners began to work the gravel bars. Cattle ranches opened in the 1880s, and farmers soon followed. Land use began to change as settlers populated the area (Neitzel 2005:4.104). By the beginning of the twentieth century, much of the area was used for farming and grazing (DOE 1999a:4-1, 4-3). The Grand Coulee Dam was built on the Columbia River in the 1940s, and the Columbia Irrigation Project brought more water for farming. The population then increased in Franklin County, across the Columbia River from Hanford (DOE 2004a:21).

Several small, thriving towns, including Hanford, White Bluffs, and Ringold, grew up along the riverbanks in the early twentieth century. The accessibility of these communities to outside markets expanded with the arrival of the Chicago, Milwaukee, St. Paul, and Pacific Railroad branch line in 1913. These towns, and nearly all other structures, were razed after the U.S. Government acquired the land for the original Hanford Engineer Works in 1943 (part of the Manhattan Project). Although agriculture and livestock production were the primary activities within the region and in Hanford at the beginning of the twentieth century, these activities ceased at the site when it was acquired by the Government (Neitzel 2005:4.73, 4.104). Today, remnants of homesteads, farm fields, ranches, abandoned military installations, and other buildings can be found throughout Hanford. Nearly 5,200 hectares (13,000 acres) of abandoned agricultural lands remain on the site (DOE and Ecology 1996:4-37).

During the Manhattan Project and Cold War era, numerous nuclear reactors and associated reprocessing facilities were constructed at Hanford. The reactor sites cover over 900 hectares (2,300 acres) of land. All reactor buildings still stand, although many ancillary support structures have been removed (DOE and Ecology 1996:4-37; Neitzel 2005:4.107).

Hanford is owned and used primarily by DOE, but portions are owned, leased, or administered by other Government agencies. Only about 6 percent of the land area has been disturbed and is actively used, leaving mostly vacant land with widely scattered facilities (Neitzel 2005:4.144).

Currently, land use within the Hanford vicinity includes wildlife protection areas and areas used for urban and industrial development, recreation, military training, irrigated and dryland farming, and grazing. At the time of the 2002 Census of Agriculture, Benton, Franklin, and Grant Counties had a total of 949,772 hectares (2,346,912 acres) of land in farms. Of that farmland, 72 to 77 percent was used as cropland, 18 to 24 percent was pastureland, and 4 to 5 percent had other uses (USDA 2002). In 2006 land committed for the Conservation Reserve Program of the U.S. Department of Agriculture included 49,067 hectares (121,246 acres) in Benton County, 47,819 hectares (118,163 acres) in Franklin County, and 34,756 hectares (85,882 acres) in Grant County (USDA 2006:275).

Residential, commercial, and industrial land uses are predominant in the Tri-Cities area (Richland, Kennewick, and Pasco) southeast of Hanford and around other cities near the southern boundary of Hanford, including Benton City, Prosser, and West Richland (USDA 2003).

R.4 FUTURE LAND USE AT THE HANFORD SITE

This section contains a description of the land use planning at Hanford. An understanding of expected future land use at Hanford sets the stage for reasonably foreseeable actions that may occur.

On May 15, 1989, DOE, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) signed a comprehensive agreement for cleaning up Hanford. The Hanford Federal Facility Agreement and Consent Order (Ecology, EPA, and DOE 1989), or Tri-Party Agreement, is an agreement for achieving compliance with the remedial action provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the treatment, storage, and disposal unit regulations and corrective action provisions of the Resource Conservation and Recovery Act (RCRA). The Tri-Party Agreement (1) defines and ranks CERCLA and RCRA cleanup commitments, (2) establishes responsibilities, (3) provides a basis for budgeting, and (4) establishes aggressive goals for site remediation, with enforceable milestones to ensure compliance. Compliance with the Tri-Party Agreement necessitates that DOE consider future land use at Hanford.

Recognizing the need for a comprehensive land use plan, DOE issued the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a) in September 1999; this document provides the framework within which future use of lands and resources at Hanford would occur. The overall *Hanford Comprehensive Land-Use Plan* as adopted by the Record of Decision (ROD) (64 FR 61615) is to accomplish the following for Hanford:

- Protect the Columbia River and associated natural and cultural resources and water quality.
- Wherever possible, locate new development, including cleanup- and remediation-related projects, in previously disturbed areas.
- Protect and preserve the natural and cultural resources for the enjoyment, education, study, and use of future generations.
- Honor treaties with American Indian tribes as they relate to land uses and resource uses.
- Reduce exclusive-use zone areas to maximize the amount of land available for alternative uses while still protecting the public from inherently hazardous operations.

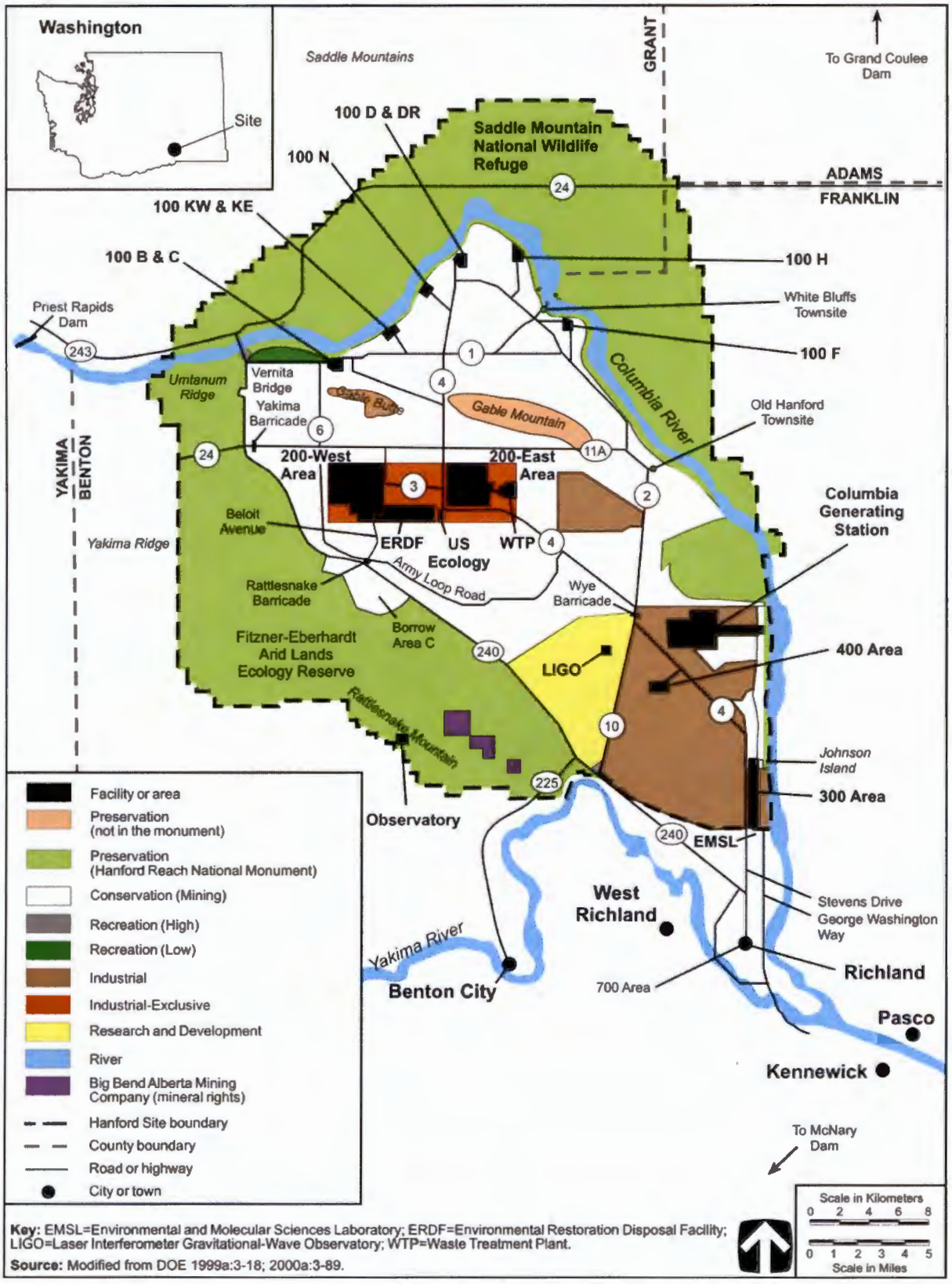
- Allow access for other uses (e.g., recreation) outside of active waste management areas, consistent with the land use designation.
- Ensure that a public involvement process is used for amending the *Hanford Comprehensive Land-Use Plan EIS* and land use designations to respond to changing conditions.
- As feasible and practical, remove pre-existing, nonconforming uses.
- Facilitate cleanup and waste management.

These *Hanford Comprehensive Land-Use Plan EIS* policies are intended to provide for the protection of environmental and cultural resources; the siting of new development, utility, and transportation corridors; and economic development (DOE 2008a:2-6).

Figure R–1 shows the generalized land use at Hanford as developed in the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a) and modified by establishment of the Hanford Reach National Monument (65 FR 37253). DOE anticipates multiple uses of Hanford, including consolidation of waste management activities in the Central Plateau; industrial development in the eastern and southern portions, including the 400 Area; increased recreational access to the Columbia River; expansion of the Saddle Mountain National Wildlife Refuge to include all of the Wahluke Slope; and management of the Fitzner-Eberhardt Arid Lands Ecology Reserve by the U.S. Fish and Wildlife Service (USFWS) (64 FR 61615).

Important areas within the Preservation land use designation include the 78,900-hectare (195,000-acre) Hanford Reach National Monument, which incorporates a portion of the Columbia River corridor (65 FR 37253). The area known as the Hanford Reach includes the quarter-mile strip of public land on either side of the last free-flowing, nontidal segment of the Columbia River in the United States (DOE 2000a:3-91). The USFWS (with DOE as a cooperating agency) prepared the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement, Adams Benton, Grant and Franklin Counties, Washington* (USFWS 2008) for all lands within the monument. Alternative E, selected as the preferred alternative in that environmental impact statement (EIS), attempts to strike a balance between resource protection and the level of public use and access the USFWS believes the public will expect.

Since the issuance of the *Hanford Comprehensive Land-Use Plan EIS* and ROD, numerous actions have been taken and decision documents issued pertaining to Hanford that potentially could impact the land use plan. A supplement analysis to the *Hanford Comprehensive Land-Use Plan EIS* was recently prepared to help inform DOE's determination of whether that EIS remains adequate, or whether a new EIS or supplement to the existing EIS should be prepared (DOE 2008a:Summary-1, Summary-2). The supplement analysis concludes that the information on land use developed since issuance of the *Hanford Comprehensive Land-Use Plan EIS* continues to support the land use designations and stated policies of the land use plan (DOE 2008a:Summary-3). DOE has not identified significant changes in circumstances or substantial new information since 1999 that would affect the basis for its decisions as documented in the *Hanford Comprehensive Land-Use Plan EIS* ROD (64 FR 61615).



Key: EMSL=Environmental and Molecular Sciences Laboratory; ERDF=Environmental Restoration Disposal Facility; LIGO=Laser Interferometer Gravitational-Wave Observatory; WTP=Waste Treatment Plant.

Source: Modified from DOE 1999a:3-18; 2000a:3-89.

Figure R–1. Generalized Land Use at the Hanford Site

The *Hanford Site End State Vision* (DOE 2005b) describes a postcleanup condition for Hanford. That end state is based on the land use plan contained in the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a). The following paragraphs describe the end-state vision for the 100, 200, and 300 Areas:

100 Areas. Contamination in the 100 Areas will be remediated according to 50-year conservation and preservation land use exposure scenarios for recreational, resident park ranger, and tribal activities, including fishing. Unlimited use is anticipated after 50 years. Remediation of waste sites consistent with the current CERCLA Interim Action RODs will continue. There will be no further degradation of the quality of groundwater that is currently above drinking water standards, and groundwater quality will be restored when practicable (DOE 2005c:iv).

Eight of nine reactors will be cocooned and left in place to decay for up to 75 years. B Reactor was recently designated a National Historic Landmark (DOE and DOI 2008). Therefore, B Reactor will not be decommissioned and moved to the Hanford Central Plateau for disposal as analyzed in the *Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1989, 1992) and assumed in this *TC & WM EIS*. DOE will make a final decision on whether to cut up and move the eight reactor cores to the Central Plateau after sufficient decay has occurred. Reactor pipelines will be left in place in the Columbia River if risk levels are protective and removal would result in additional impacts. The pipelines will be stabilized if required (DOE 2005b:vi).

200 Areas. A Central Plateau Core Zone will be designated as a permanent waste management area to remain under Federal control for the next 150 years or longer. A buffer area will be maintained between the Core Zone and the remainder of the Central Plateau during cleanup operations. After Core Zone cleanup is complete, the buffer area will be reduced, and land use between the Core Zone and the Columbia River will be similar to that in the 100 Areas (DOE 2005b:v).

Waste sites in the Core Zone will be addressed through the CERCLA process consistent with Industrial-Exclusive, Conservation, or Preservation land use scenarios identified in the land use plan and within the timeframe identified in the *Hanford Comprehensive Land-Use Plan EIS* ROD (at least 50 years). Waste sites will be remediated and monitored to achieve human health and environmental protection goals under CERCLA. Small waste sites will be removed and consolidated to optimize placement and minimize the number of surface barriers. Disposition of buried pipelines in the Central Plateau will be achieved through the RCRA and CERCLA remove-treat-dispose of or stabilize-in-place processes. Canyon buildings that are robust will be used as engineered waste disposal facilities. Equipment, debris, and plutonium holdup material will be removed from the Plutonium Finishing Plant (PFP) and disposed of at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, or on site in accordance with waste acceptance criteria and CERCLA decision documents. The PFP will be demolished to slab-on-grade (DOE 2005b:v, vi).

Retrievably stored suspect transuranic (TRU) waste will be retrieved and treated, and the TRU waste portion will be shipped to WIPP. The low-level radioactive waste (LLW) portion of the retrieved waste will be treated and disposed of on site. Radioactive waste buried before 1970 containing TRU materials will be managed per CERCLA decisions (DOE 2005b:v).

Groundwater contamination across the Central Plateau Core Zone will be managed in accordance with the *Hanford Site Groundwater Strategy: Protection, Monitoring, and Remediation* (DOE 2004b; 2005b:v).

300 Area. Waste sites in the 300 Area will be remediated to achieve remedial action objectives based on Industrial land use exposure scenarios. Remediation of waste sites to industrial standards will continue as required under the current CERCLA Interim Action RODs. Remediated sites will be

backfilled to support unlimited surface use where practicable, and, depending on the success of future groundwater cleanup activities, irrigation and groundwater use may be restricted. DOE will work to meet the goals of no further degradation of the groundwater that is currently above drinking water standards and restoration of groundwater quality when practicable (DOE 2005b:iv).

The *Plan for Central Plateau Closure* (Fluor Hanford 2004) presents a strategic approach to closing the Central Plateau area of Hanford. That approach addresses nearly 4,000 items requiring closure action consistent with Hanford's environmental restoration mission. It divides the Central Plateau into 22 geographic zones organized around significant processing and waste management facilities, then organizes the major constituents of those zones into five logically grouped closure elements: canyons, underground tanks, waste sites, structures, and wells. The *Plan for Central Plateau Closure* provides the framework for integrating ongoing operations with the closure of facilities no longer used, all with a view to closing the Central Plateau by 2035. Primary objectives are to demolish structures; remove or stabilize contaminants; and establish institutional controls, such as postclosure groundwater care, consistent with long-term stewardship. The ultimate goals are to minimize risks to groundwater and return the Central Plateau to a state that supports the ecosystem (Fluor Hanford 2004:ES-2). The plan is based on the following assumptions (Fluor Hanford 2004:ES-3, ES-4):

- The Central Plateau will remain under institutional control for the foreseeable future.
- Ninety-five percent of the plutonium currently present on Hanford will be removed and shipped off site.
- Contaminated materials and soils will be left in place, unless removal and disposal are more cost-effective.
- Barriers over contaminated structures and waste sites will effectively minimize biointrusion and reduce the transport rate of contaminants to the groundwater.

This approach represents the first planning effort to identify the full range of actions that must be accomplished to close the Central Plateau and position DOE to complete its environmental management mission (Fluor Hanford 2004:ES-9).

The waste site closure element of the *Plan for Central Plateau Closure* focuses on 884 sites, including cribs, ponds, ditches, retention basins, burial grounds, pipelines, and areas of unplanned releases (i.e., areas in which liquid or solid waste contaminated with radioactive materials or hazardous chemicals were disposed of or released). In compliance with CERCLA, remedial actions are being taken at waste sites in groups of operable units as established by the Tri-Party Agreement. The closure approach for these waste sites involves a combination of the following actions:

- Removing, treating, and disposing of contaminated materials, especially soil
- Taking no action for sites that represent minimal hazard
- Maintaining the existing soil cover
- Capping with protective barriers where required to protect groundwater or mitigate intrusion (Fluor Hanford 2004:ES-5, ES-6)

The structures closure element of the *Plan for Central Plateau Closure* consists of 955 varied structures, including offices, shops, trailers, and water tanks, as well as large processing, storage, or handling facilities such as the PFP. The closure approach for structures is as follows:

- Demolish aboveground structures.
- Fill voids in belowground structures.
- Stabilize the surface.
- Cap with protective barriers where required to protect groundwater or mitigate intrusion (Fluor Hanford 2004:ES-6).

The wells closure element for the *Plan for Central Plateau Closure* includes 1,968 groundwater or vadose zone wells that have been used for monitoring and characterization and are noncompliant with applicable regulations or will not be needed following closure. These wells will be closed to eliminate a pathway for migration of contamination to the groundwater. The closure approach for wells is to decommission through filling or demolition (Fluor Hanford 2004:ES-6).

The canyon closure element for the *Plan for Central Plateau Closure* includes the five major defense production facilities originally designed for fuel-reprocessing operations. Four of the five—U Plant, B Plant, the Plutonium-Uranium Extraction (PUREX) Plant, and the Reduction-Oxidation Facility (S Plant)—are currently under surveillance and maintenance. The fifth—T Plant—is being used for waste management. The remedial action for each canyon will be evaluated using the CERCLA process (Fluor Hanford 2004:ES-4).

The Canyon Disposition Initiative is the result of the 1996 Agreement-in-Principle among the signatories of the Tri-Party Agreement to define the path forward for determining the final disposition for Hanford's five canyon buildings (i.e., B Plant, S Plant, T Plant, U Plant, and the PUREX Plant). The purpose of the initiative is to investigate the potential for using the canyon buildings as disposal sites for Hanford remediation waste, rather than demolishing the structures and transferring the resulting waste to the Environmental Restoration Disposal Facility (DOE 2004c:4).

The 221-U Facility is the first canyon building to be addressed under the Canyon Disposition Initiative. The selected remedy is to partially demolish 221-U, dispose of contaminated equipment and demolition debris inside and adjacent to the remaining structure, fill void spaces with grout, and cover the remnants with an engineered barrier (DOE 2005d). Disposition of 221-U is considered to be a pilot project for disposition of the remaining four canyon buildings. However, the complexity and costs for implementation could vary significantly for each building because of varying amounts, types, and locations of radiological contamination within the five canyon buildings (DOE 2004c:1, 4).

The PUREX tunnels in the 200-East Area contain equipment contaminated with approximately 2.8 million curies of various radionuclides and with other hazardous materials (DOE 2003a:552, 553). These tunnels will be managed as an RCRA storage unit until closure can be coordinated with the final closure plan for the PUREX Plant. The current DOE vision calls for the PUREX tunnels to be filled with grout and covered with a surface barrier (DOE 2005b:vi; Fluor Hanford 2004:A3-2). Final closure of the tunnels will require an evaluation of alternatives (Bergeron, Freeman, and Wurstner 2001:3.26).

Because most of the 300 Area is within the City of Richland's Urban Growth Boundary, Richland funded a *Preliminary Assessment of Redevelopment Potential for the Hanford 300 Area* (Richland 2005a). The recently issued *Supplement Analysis, Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE 2008a) considered the City of Richland's *Preliminary Assessment of Redevelopment*

Potential for the Hanford 300 Area in its review of new information on land use considerations developed since the *Hanford Comprehensive Land-Use Plan EIS* was issued in 1999 (DOE 1999a). The supplement analysis concluded that no significant new information or changes in circumstances had developed since 1999 that would affect the basis for DOE's land use decisions as documented in the ROD for the *Hanford Comprehensive Land-Use Plan EIS* (64 FR 61615).

R.5 FUTURE LAND USE IN SURROUNDING REGIONS

This section contains a description of the land use planning in the counties surrounding Hanford. An understanding of expected future land use and development provides the underpinnings for reasonably foreseeable actions that may occur in the region.

The 1990 Washington State Growth Management Act (RCW 36.70A.020) requires counties in the region around Hanford to have comprehensive plans. Cities and other government jurisdictions adopt comprehensive plans to serve as guides for future activities within their jurisdictions. These plans attempt to project 20 years into the future for land development, housing, infrastructure, and community services needs. Table R–2 describes the 13 broad goals described in the Washington State Growth Management Act that local governments must consider when developing their comprehensive plans.

The following plans exist for counties in the region around Hanford and for the Cities of Richland and Kennewick:

- *Adams County Comprehensive Plan* (ACPC 2005)
- *Benton County Comprehensive Land Use Plan* (BCPC 2003)
- *City of Richland Comprehensive Land Use Plan* (Richland 2002, 2005b)
- *City of Kennewick Comprehensive Plan 2006, Executive Document* (Kennewick 2006)
- *Franklin County Growth Management Comprehensive Plan* (Franklin County 2005)
- *Grant County Comprehensive Plan* (GCDCD 1999)
- *Kittitas County Comprehensive Plan* (Kittitas County 2001)
- *Klickitat County, Washington, Comprehensive Plan* (Dreyer 2007)
- *Plan 2015: A Blueprint for Yakima County Progress* (Yakima County 1998)
- *Walla Walla County Integrated Comprehensive Plan and EIS* (Walla Walla County 2007)

These plans are updated periodically. Generally, the plans encourage growth in urban growth areas (UGAs) and discourage growth outside these areas. A comprehensive plan is not a legally enforceable document; zoning is the enforceable means for controlling growth.

Under the Growth Management Act (RCW 36.70A), the Washington State Office of Financial Management has the responsibility to project population growth rates for local planning purposes. Population projections are used by cities and counties to identify the amounts and locations of rural land needed for conversion to urban use as urban growth occurs (BCPC 2003).

To set aside or designate lands necessary for future population growth (beyond those undeveloped lands already within city boundaries), the Growth Management Act requires counties to designate UGAs outside of, but adjacent to, the corporate boundary of each city. UGAs are the land areas that, though not currently within a city's corporate limits, are designated for conversion to urban use in the normal process of urban growth. UGAs must be large enough to accommodate 20 years of urban growth. The identification of amounts of land to be converted to urban use has important economic implications for both cities and counties (BCPC 2003).

Table R–2. Washington State Growth Management Act Planning Goals

Goal	Description
Urban growth	Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
Reduce sprawl	Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
Transportation	Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.
Housing	Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.
Economic development	Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.
Property rights	Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.
Permits	Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.
Natural resources industries	Maintain and enhance natural-resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.
Open space and recreation	Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks.
Environment	Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.
Citizen participation and coordination	Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.
Public facilities and services	Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.
Historic preservation	Identify and encourage the preservation of lands, sites, and structures that have historical or archaeological significance.

Source: RCW 36.70A.020; Yakima County 1998:I-4.

The size of UGAs is not determined solely by the projected rate of population growth. Other possible considerations include a city's need for commercial- and industrial-zoned lands to meet the economic goals and objectives identified in its comprehensive plan. Land may also be deemed unsuitable as a UGA because of its value as natural resource land (i.e., agricultural, mineral, and forestland) or its value to local residents as a unique low-density rural community (BCPC 2003).

Of primary importance to the initial establishment and future expansion of UGAs into unincorporated areas is the projected need for additional lands in relation to the existing available supply of undeveloped land already inside a city's UGA. Equally important, however, is the maintenance of low-enough densities outside the UGA to enable its logical and cost-effective expansion in the distant future (30 to 70 years) (BCPC 2003).

The phenomenon of city boundary enlargement and expansion into rural county lands will continue with population growth. Designation of UGAs endeavors to set standards and mechanisms whereby legitimate needs for new urban lands are met while rural communities and natural resource lands are protected.

Cities can neither annex lands nor generally extend municipal services to lands outside of UGAs (BCPC 2003).

Because the majority of Hanford lies within Benton County and the majority of Hanford workers live in Benton County and the city of Richland, the following discussion concentrates on future land use in these regions.

Benton County. As described in *Benton County Sustainable Development Overall Economic Development Plan* (Benton County 2006), 263,049 hectares (650,000 acres) of the county are planned for agriculture and agribusiness, 2,045 hectares (5,053 acres) for commercial and industrial use, and 5,541 hectares (13,693 acres) for tourism and recreation. This does not include the 30,352 hectares (75,000 acres) and 4,346 hectares (10,740 acres) within Hanford designated for commercial/industrial and recreational use, respectively, in the *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a).

Historically, the Cities of West Richland, Richland, and Kennewick have aggressively pursued annexation of unincorporated lands, largely in response to the boom-and-bust cycles of Hanford. Between 1985 and 2003, 7,328 hectares (18,107 acres) were annexed even though each city still had over half its incorporated acreage undeveloped. Kennewick has 2,428 hectares (6,000 acres) of vacant or undeveloped land designated for low-density residential use; Richland, 8,789 hectares (21,719 acres); and West Richland has 5,520 hectares (13,641 acres), some actually designated for rural densities and lower (BCPC 2003).

City of Richland. The City of Richland recently released an updated *City of Richland Comprehensive Land Use Plan* (Richland 2005b). Although this plan is for the period ending in 2035, it contains few quantitative estimates of future changes. Therefore, the 1997 *City of Richland Comprehensive Land Use Plan,* as amended through December 10, 2002 (Richland 2002), was used to obtain the pertinent information. The 1995–2015 planning horizon of that plan (Richland 2002:ES 1-1–ES 1-5) reflects the following projected changes:

- Gain of 11,041 jobs
- Demand for 3,134 residential units requiring 170 hectares (420 acres) of the 1,281 hectares (3,165 acres) of currently vacant land
- Demand for an additional 490 hectares (1,212 acres) of vacant developable land
- Demand for an additional 42 hectares (104 acres) of parkland
- Growth in the student population of 1,504
- Falling level-of-service ratings on 19 roadway segments
- Increasing demand for irrigation water for landscaping as unused open space and agricultural land are converted to public facility and residential uses

Also indicated (Richland 2002:3-6) are the following changes in land use patterns expected between 1995 and 2015:

- Land designated for residential uses will increase from 31 to 33 percent of the total land area.
- Land designated for industrial uses will increase from 19 to 26 percent of the total land area. Most of this increase will be attributable to the addition of Hanford land.

- Land designated for agricultural uses will decrease from 21 to 3 percent of the total land area. Most of this decrease will result from the redesignation of lands in the Horn Rapids area from agricultural to Urban Reserve and public facility uses.

- Land designated for commercial uses will increase slightly to 6 percent of the total land area.

- Land designated for public facilities and open space will increase from 12 to 23 percent of the total land area.

- Land designated for Urban Reserve use will be approximately 8 percent of the total land area.

The UGA in the *City of Richland Comprehensive Land Use Plan, Final* (Richland 2002:3-4) covers an area of 8,954 hectares (22,125 acres). Of that area, 4,563 hectares (11,275 acres) are currently developed, and 4,391 hectares (10,850 acres) are vacant and available for future development.

Although changes will inevitably occur due to the pressures of continued population growth, land use in the region surrounding Hanford is not expected to change drastically during the upcoming decades. It is assumed that the largest land use in the region will continue to be agricultural, and that populations will increase mainly around the current urban areas (DOE 2004a:22).

R.6 APPROACH TO CUMULATIVE IMPACTS ANALYSIS

A flowchart of the methodology used to estimate cumulative impacts is presented as Figure R–2. This flowchart, which incorporates the CEQ's eight principles of cumulative effects analysis (CEQ 1997:8), is divided into four phases: (1) selection of resource areas and appropriate regions of influence (ROIs), (2) selection of reasonably foreseeable future actions, (3) estimation of cumulative impacts, and (4) identification of monitoring and mitigation.

Phase 1—Selection of Resource Areas and Appropriate ROIs. This phase concentrates on selecting resource areas most likely to incur meaningful cumulative impacts. Steps in this process include the following:

1a. Examine resource areas evaluated in recent Hanford NEPA documents, areas evaluated in this *TC & WM EIS* (see Chapter 4), and areas subjected to historically significant impacts to develop a list of resource areas likely to exhibit cumulative effects.

> **Region of Influence:**
> A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur.

1b. Identify the ROI—i.e., the spatial limits—for each resource area to be evaluated for cumulative impacts. ROIs are described in the introduction to Chapter 3 of this *TC & WM EIS* and are summarized in Section R.9.

Phase 2—Selection of Reasonably Foreseeable Future Actions. In this phase, reasonably foreseeable future actions are examined and screened to determine which must be included in the cumulative impacts analysis. Steps in this process include the following:

2a. Identify future actions—Federal, non-Federal, or private—occurring in the ROI. Typical information sources include RODs, RCRA, CERCLA, NEPA, and Washington State Environmental Policy Act documents; the Tri-Party Agreement; permits and permit applications; and land use and development plans.

> **Reasonably foreseeable actions** are ongoing and will continue into the future, are funded for future implementation, or are included in firm near-term plans.

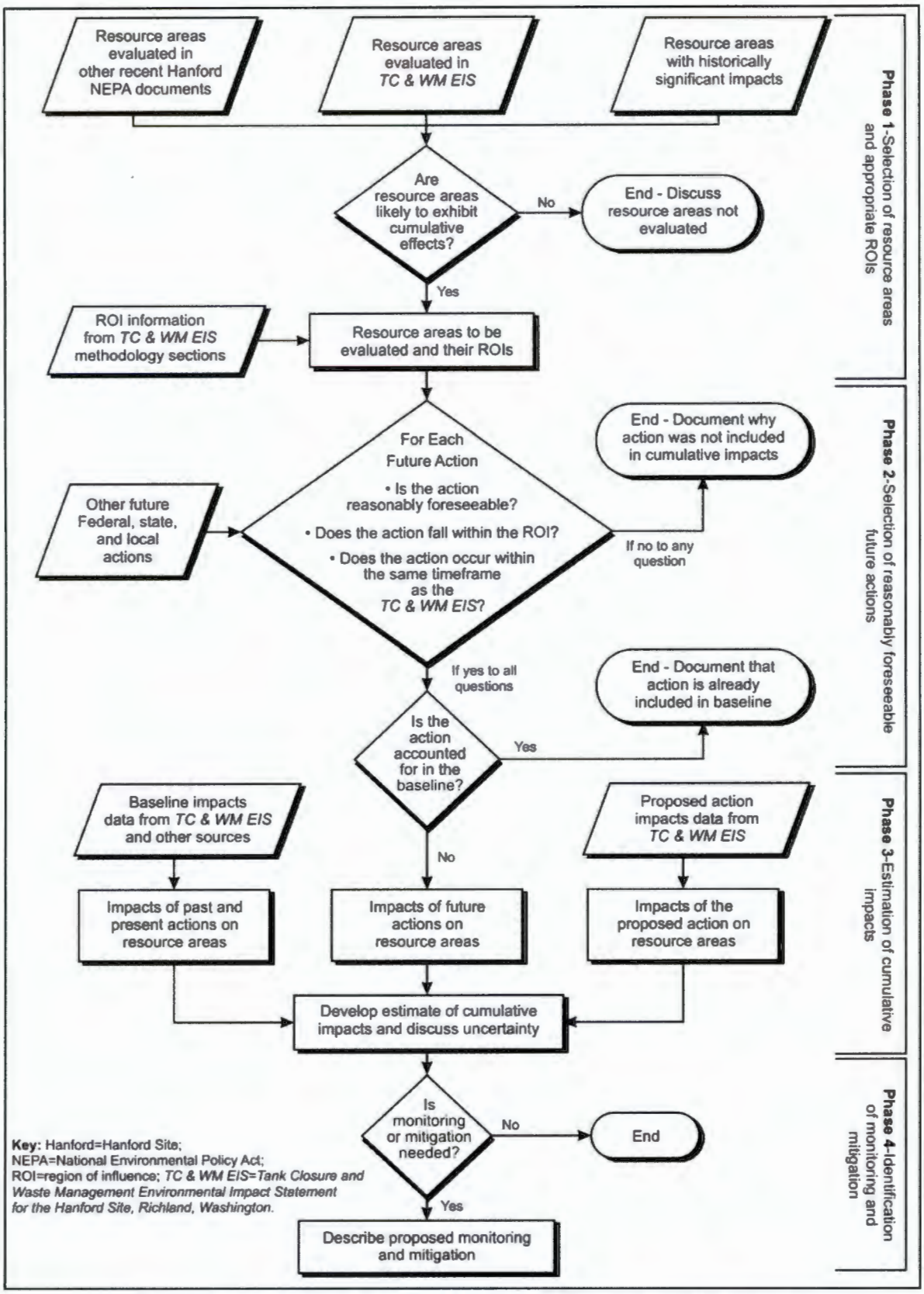


Figure R–2. Flow Diagram for Identifying and Evaluating Cumulative Impacts

2b. Examine each future action to determine whether the action is reasonably foreseeable, occurs within the ROI, occurs within the same timeframe as the *TC & WM EIS* action, and is not already accounted for in the baseline impacts.

2c. Retain for analysis future actions meeting the criteria listed in item 2b, and eliminate from further consideration future actions not meeting all those criteria.

Phase 3—Estimation of Cumulative Impacts. In this phase, impact indicators for the proposed actions are added to baseline values and to values for reasonably foreseeable future actions to estimate cumulative impacts. Steps in this process include the following:

3a. Identify, and, to the extent possible, quantify baseline impacts. Baseline impacts (i.e., the level of degradation that a resource is currently experiencing) include effects of past and present actions. These impacts are generally those described in Chapter 3 of this *TC & WM EIS*. Present actions include cleanup activities that could reduce impacts of a past action, as well as actions that could add to the degradation of a resource. The importance of past actions to cumulative impacts is resource-specific. For example, past air pollutant releases would not affect the baseline (current) site air quality, whereas liquid releases to the ground could have a lasting effect and could impact the baseline. Therefore, only past actions continuing to have impacts on the resource are considered in the cumulative impacts analysis.

3b. Identify impacts of the *TC & WM EIS* Preferred Alternative and the combined *TC & WM EIS* alternative combinations from Chapter 4.

3c. Identify impacts of the reasonably foreseeable future actions identified in Phase 2. If quantitative data are available, incorporate the values into a quantitative or semiquantitative cumulative impacts analysis. If quantitative data are not available, use qualitative data.

3d. Aggregate the effects on each resource of past, present, and reasonably foreseeable future actions, including the proposed actions. Use aggregate effects to estimate cumulative impacts for each resource area. Determine the degree of impact using largely the same impact measures that were used for Chapter 4 of this *TC & WM EIS*.

The results of the cumulative impacts analysis are presented in Chapter 6. Supporting information for the short-term cumulative impacts analysis is presented in Appendix T; long-term, in Appendix U.

Phase 4—Identification of Monitoring and Mitigation. In this phase, resultant estimates of cumulative impacts are examined to determine whether monitoring and/or mitigation activities are needed. Steps in this process include the following:

4a. Determine those resource areas where appreciable cumulative impacts are predicted.

4b. Describe measures that may be used to monitor or mitigate these potentially appreciable cumulative impacts.

R.7 UNCERTAINTIES

Many uncertainties are inherent to the estimation of cumulative impacts. The uncertainties in the cumulative impacts described in this *TC & WM EIS* are largely the result of the following assumptions and conditions:

- Small changes in current activities are generally not documented and therefore not considered.

- Individual activities disturbing less than 40 hectares (100 acres) are generally not considered.
- Detailed information for many of the future activities considered in this cumulative impacts analysis is limited.
- Information on projects to be implemented 10 or more years in the future is limited.
- Future changes to laws and regulations cannot be considered.
- Future fluctuations and changes to the environment, including climate change and the effects of climate change on water resources, ecological resources, and man, are not considered.

The contribution of most of these assumptions and conditions to the determination of Hanford's cumulative impacts, is believed to be small, at least for the short term. Although not quantified, the chance that these assumptions and conditions would change the conclusions of the *TC & WM EIS* cumulative impacts analysis is unlikely. Given the extended duration of the analysis, resulting projections of long-term cumulative impacts are subject to a high degree of uncertainty.

As described in the previous sections, cumulative impacts were assessed by combining the potential effects of *TC & WM EIS* activities with the effects of other past, present, and reasonably foreseeable actions in the ROI. It must be noted, of course, that many actions occur at different times and locations across the ROI—e.g., the set of actions impacting air quality—and thus their impacts are not entirely cumulative. Therefore, this approach should yield a conservative estimate of cumulative impacts for the activities considered.

R.8 SELECTION OF RESOURCE AREAS FOR ANALYSIS

Because of the comprehensive nature of this *TC & WM EIS*, cumulative impacts were evaluated for all resource areas except for the impacts of accidents on public and occupational health and safety. Except under an extremely unlikely catastrophic earthquake scenario, it is highly unlikely that accidents in separate facilities would occur at the same time and be close enough to each other to have appreciable additive effects.

R.9 RESOURCE AREA METHODOLOGIES

This *TC & WM EIS* incorporates a range of methods for cumulative impacts because of differences in the anticipated significance of the impact on a given resource area, the availability of adequate data, and the specific needs of decisionmakers and the public.

In general, long-term impacts, including impacts on groundwater quality, were evaluated quantitatively (i.e., they were modeled). Analyses of short-term impacts were generally semiquantitative (i.e., simple addition of impact indicators) or qualitative (i.e., descriptions were based on non-numerical data). Where data were not uniformly available or comparable for a particular resource across its ROI, however, analysis entailed a combination of semiquantitative and qualitative methods. And with regard to those resource areas for which a detailed analysis was preferable but data were simply insufficient to support that level of analysis, the analysis was performed qualitatively. Table R–3 identifies, for each resource area, the method of analysis and the rationale for its application.

Table R–3. Methods of Cumulative Impacts Analysis for Different Resource Areas

Resource Area	Region of Influence	Method of Analysis	Indicator	Note
Short-Term Impacts				
Land use	Hanford and nearby offsite areas	Semiquantitative	Land area disturbed or occupied	Amount of land disturbed or occupied for other actions[a] is added to present a total.
Visual resources	Hanford and nearby offsite areas in the viewshed	Qualitative	Visual resource alteration in the viewshed	Resource area does not lend itself to a quantitative analysis.
Infrastructure	Hanford utility infrastructure	Semiquantitative	Utility use (electricity, fuel, and water)	Utility resources used for other actions[a] are added to present a site total.
Noise	Hanford, nearby offsite areas, and access routes to the site	Qualitative	Noise levels	Noise data are not likely to be available to perform a quantitative analysis.
Air quality	Hanford and nearby offsite areas within the airshed	Semiquantitative	Concentrations of criteria and toxic air pollutants	Air quality indicators for other actions[a] are added to present a conservative total, given that the values likely occur at different locations and at different times.
Geology and soils	Hanford and nearby offsite areas where geologic and soil resources may be affected	Semiquantitative	Volumes of geologic and soil resources used	Geologic and soil resources used for other actions[a] are added to present a total.
Water resources	Hanford and nearby offsite areas in the Columbia River and Yakima River watersheds	Semiquantitative Qualitative	Amount of surface water and groundwater used Surface-water and groundwater quality	Water use for other actions[a] is added to present a total.
Ecological resources	Hanford and nearby offsite areas with similar habitat	Semiquantitative Qualitative	Sensitive habitat (e.g., shrub steppe) disturbed or occupied Disturbance of threatened and endangered species	Amount of habitat disturbed for other actions[a] is added to present a total.
Cultural and paleontological resources	Hanford and nearby offsite areas that may contain significant cultural resources	Qualitative	Disturbance of National Register of Historic Places—listed or eligible—historic properties or archaeologic, American Indian, or paleontologic resources	Potential for cumulative impacts on cultural resources is discussed qualitatively.
Socioeconomics	Hanford and nearby counties where at least 90 percent of Hanford employees reside	Semiquantitative	Direct and indirect employment Traffic from employee and truck trips	Employment and vehicle trips for other actions[a] are added to present a total.

Table R–3. Methods of Cumulative Impacts Analysis for Different Resource Areas *(continued)*

Resource Area	Region of Influence	Method of Analysis	Indicator	Note
Short-Term Impacts *(continued)*				
Public and occupational health and safety—normal operations	Hanford and offsite areas within 80 kilometers (50 miles) of the site	Semiquantitative	Population and MEI doses and LCFs from radiological air emissions and Hazard Indices for chemical air emissions	Public health indicators for other actions[a] are added to present a total.
	Occupational impacts limited to Hanford workers		Worker doses and LCFs from radiological exposure and Hazard Indices for chemical exposure	Worker health indicators for other actions[a] are added to present a total, as resource is suitable for addition of impact indicators.
Public and occupational health and safety—transportation	Hanford roads and railroads and selected offsite transportation corridors to waste disposal facilities	Semiquantitative	Population and MEI doses, LCFs, and accident fatalities for transport crew and public along transportation routes	Transportation indicators for other actions[a] are added to present a total.
Waste management	Hanford waste management facilities and offsite facilities where Hanford waste is managed	Semiquantitative	Waste generation for TRU, low-level radioactive, mixed low-level radioactive, hazardous, dangerous, and nonhazardous wastes	Waste volumes/weights generated for other actions[a] are added to present a total.
Long-Term Impacts				
Groundwater	Portions of the groundwater basin that may be adversely affected by *TC & WM EIS* activities; bounded by groundwater discharge locations along the Columbia River	Quantitative	Radionuclide and chemical contaminant concentrations	Analysis required by Settlement Agreement re: *State of Washington v. Bodman* (Civil No. 2:03-cv-05018-AAM). Analysis is per the Technical Guidance Document for *Tank Closure Environmental Impact Statement, Vadose Zone and Groundwater Revised Analyses*, Final Rev. 0, dated March 25, 2005 (DOE 2005d), due to "significance" of the resource area (groundwater) at Hanford.
Human health	Potential future onsite groundwater users and users of the Columbia River downstream from the site	Quantitative	MEI dose, LCFs, and Hazard Indices for drinking-water well user, resident farmer, American Indian resident farmer, and American Indian hunter-gatherer, and population dose, LCFs, and Hazard Indices for downstream surface-water users	Direct inputs are obtained from long-term groundwater modeling results.

Table R–3. Methods of Cumulative Impacts Analysis for Different Resource Areas *(continued)*

Resource Area	Region of Influence	Method of Analysis	Indicator	Note
Long-Term Impacts *(continued)*				
Environmental justice	Potential future onsite subsistence farmers and American Indian users, and users of the Columbia River downstream from the site	Quantitative	MEI dose, LCFs, and Hazard Indices for future onsite subsistence farmers and American Indians	Direct inputs are obtained from long-term groundwater modeling results.
Ecological risk	Plants and animals using Hanford and the Columbia River adjacent to and downstream from the site	Quantitative	Risk to indicator species at the shore of the Columbia River (terrestrial) and in the river (aquatic)	Direct inputs are obtained from long-term groundwater modeling results.

[a] Other past, present, and future actions in the region of influence that may contribute to cumulative impacts. The proposed approaches for cumulative impacts described in this table are dependent on the availability of information for the other past, present, and reasonably foreseeable future actions. If numerical data are not available, qualitative cumulative impacts analyses will be performed.

Key: Hanford=Hanford Site; LCF=latent cancer fatality; MEI=maximally exposed individual; *TC & WM EIS=Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*; TRU=transuranic.

Source: Based on Chapter 3, Table 3–1.

R.10 SPATIAL AND TEMPORAL CONSIDERATIONS

Cumulative environmental impacts—i.e., the impacts of all past, present, and reasonably foreseeable actions—have limits in space and time. For cumulative impact analysis, those recognized spatial limits help determine the specific geographic expanse (ROI) to be evaluated for each resource area. The ROIs used in the cumulative impacts analysis—many are the same as those described in the introduction to Chapter 3—are summarized in Table R–3.

To conclusively address the temporal limits of environmental impact, short- and long-term cumulative impact analyses were performed for each resource area. Short-term cumulative impacts are associated with the active project phase, extending through the applicable administrative control, institutional control, or postclosure care period. For this *TC & WM EIS*, short-term cumulative impacts are deemed to extend up to 188 years (2006 through 2193 under Tank Closure Alternative 2A). Long-term cumulative impacts extend beyond the active project phase, thus beyond the appropriate period of administrative control, institutional control, or postclosure care. For this EIS, long-term cumulative impacts are assessed for approximately 10,000 years into the future.

R.11 PAST AND PRESENT ACTIONS

To determine the baseline impacts on a resource, the impacts of past and present actions must be identified. For most resource areas, baseline impacts were culled from information on the affected environment provided in Chapter 3 of this *TC & WM EIS*. For example, the current air quality in the ROI as described in Chapter 3 adequately reflects both past and present activities. In contrast, current resource use alone may not adequately account for past resource loss, and thus, may not be a good indicator of baseline impacts.

Past and present actions that may contribute to cumulative impacts include those conducted by government agencies, businesses, or individuals within the ROIs considered. Examples of past Hanford activities include operation of the fuel fabrication plants, production reactors, the PUREX Plant and other fuel reprocessing facilities, the PFP, and research facilities, as well as the treatment and disposal of waste. Current Hanford activities include site cleanup, waste disposal, and tank waste stabilization.

Examples of past and present offsite activities that may contribute to cumulative impacts include the clearing of land for agriculture and urban development, water diversion and irrigation projects, waste management, industrial and commercial development, mining, power generation, and the development of transportation and utility networks.

R.12 SELECTION OF REASONABLY FORESEEABLE FUTURE ACTIONS

As described in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997), Principle 1 of cumulative effects analysis reads, "Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions." Principle 2 reads, in part, "Cumulative effects are the total effect... of all actions taken, no matter who (Federal, non-Federal, or private) has taken the actions." Therefore, it is important to identify future actions that may appreciably degrade the resources or add to the impacts of the proposed actions, regardless of the agency or individual undertaking the actions.

The *Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a) lays out the future vision for land use at Hanford. Both DOE and non-DOE actions may occur within the current Hanford boundaries. The major DOE activities will include continuation of site cleanup, waste consolidation and disposal, facility closure and decontamination and decommissioning, and the various high-level radioactive waste treatment and tank closure activities. Non-DOE actions are expected within the areas at Hanford set aside for industrial use, research and development, preservation, mining, and recreation (see Figure R–1).

DOE Actions at Hanford

The *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a) describes the major DOE activities that are occurring or would occur at Hanford to achieve the vision set forth in the *Hanford Comprehensive Land-Use Plan EIS*. The list of activities reflected in that plan was modified by eliminating those activities within the scope of this *TC & WM EIS* and those that have already been completed, and adding new activities planned for Hanford (72 FR 40135; DOE 2006a; DOE, EPA, and Ecology 2006, 2007; PHMC 2006a, 2006b; Poston et al. 2007). Present and future DOE activities at Hanford include the following:

- Cleanup and restoration activities across all areas of Hanford
- Decommissioning of surplus production reactors and their support facilities in the 100 Areas along the Columbia River[1]
- Deactivation of the PFP in the 200-West Area
- Actions to remove the sludge and decommission the K Basins in the 100-K Area
- U Plant regional closure
- Final disposition of the canyon buildings (i.e., B Plant, S Plant, T Plant, U Plant, and the PUREX Plant), PUREX tunnels, and other facilities in the 200 Areas, and cleanup of the Central Plateau to Industrial-Exclusive land use standards

[1] B Reactor was recently designated a National Historic Landmark (DOE and DOI 2008). Therefore, B Reactor will not be decommissioned and moved to the Hanford Central Plateau for disposal as analyzed in the *Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1989, 1992) and assumed in this *TC & WM EIS*.

- Transport of sodium-bonded spent nuclear fuel from the Fast Flux Test Facility in the 400 Area to INL for treatment
- Excavation and use of geologic materials
- Continued disposal of waste in the Environmental Restoration Disposal Facility near the 200-West Area
- Implementation of the programmatic waste management decisions described in the RODs for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a)
- Retrieval of suspect TRU waste buried after 1970
- Cleanup and protection of groundwater
- Potential disposal of greater-than-Class C LLW
- Transport of TRU waste to WIPP

Non-DOE Actions at Hanford

The aforementioned review of documentation for data bearing on cumulative impacts also entailed consideration of non-DOE activities inside the Hanford boundary. These included Federal, state, or local initiatives; industrial or commercial ventures; utility or infrastructure construction and operation; and waste treatment and disposal. Specific non-DOE activities at Hanford include the following:

- Continued transport of U.S. Navy reactor plants via the Columbia River and disposal thereof in trench 218-E-12B in the 200-East Area
- Continued operation of the Columbia Generating Station (previously Washington Public Power Supply System, Nuclear Project No. 2)
- Continued operation of the US Ecology commercial LLW disposal site
- Management of the Hanford Reach of the Columbia River as a national monument and a national wildlife refuge

Other Actions in the Region

It was also necessary to consider activities outside Hanford but within the ROI. These included Federal actions, state and local development initiatives, industrial and commercial ventures, residential development, and infrastructure projects. Activities in the region surrounding Hanford include the following:

- Future land use in the region as described in city and county comprehensive land use plans
- Base realignment and closure and other U.S. Department of Defense activities
- Cleanup of toxic, hazardous, and dangerous waste disposal sites
- Columbia River and Yakima River water management, including the Black Rock Reservoir proposal

- Power generation and transmission line projects
- Wind energy projects
- Pipeline projects
- Transportation projects

For more information on anticipated future activities that could contribute to cumulative impacts, data were also collected from the Cities of Kennewick, Pasco, Richland, West Richland, and Yakima in Washington; the Counties of Adams, Benton, Franklin, Grant, Kittitas, Klickitat, Walla Walla, and Yakima in Washington; the Counties of Morrow and Umatilla in Oregon; and the Yakama Nation, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation. No additional major future actions were identified by the Cities of Richland or Pasco in Washington; Adams, Benton, Franklin, Grant, Kittitas, Klickitat, Walla Walla, or Yakima Counties in Washington; Umatilla County in Oregon; or the Confederated Tribes of the Umatilla Indian Reservation or Nez Perce Tribe (Adams 2007; Bailor 2007; D'Hondt 2007; Jennings 2007; Lamb 2007; Lilligren 2007a, 2007b; Patterson 2007; Prentice 2007; Rolph 2007; Shuttleworth 2007; Smith 2007; Torres 2007; Wendt 2007). Future activities that were identified for the region surrounding Hanford include the following:

- The 1,012-hectare (2,500-acre) South Ridge Development Zone in Kennewick, Washington, designated for mixed-use development over the next 5 to 10 years (Romine 2007).
- The 130-hectare (320-acre) Red Mountain Center mixed-use development area in West Richland, Washington, that broke ground in 2007 and is expected to be completed in 2010 (Gouk 2007).
- The annexation of approximately 648 hectares (1,600 acres) of land near the Apple Tree Golf Course by the City of Yakima for residential development over the next 5 to 10 years (Benson 2007).
- The 567-hectare (1,400-acre) Multi-Purpose Motor Speedway Project 4.8 kilometers (3 miles) west of Boardman, Oregon, that began construction in 2007. Future expansions could total 2,833 hectares (7,000 acres) over the next 10 years (McClane 2007; PNMP 2007).
- The 162-hectare (400-acre) multitenant industrial park for the Port of Morrow in Boardman, Oregon, that was expected to begin construction in 2007 (McClane 2007).
- The 648-hectare (1,600-acre) Destination Resort Complex mixed vacation-style residential development with golf course and marina along the Columbia River 4.8 kilometers (3 miles) west of Boardman, Oregon, that is expected to begin construction within 5 years (McClane 2007).
- The development of biofuels (including ethanol) facilities in Finley, Moses Lake, and Plymouth, Washington, and biodiesel facilities in Burbank, Ellensburg, Sunnyside, Toppenish, and Warden, Washington (Riggsbee 2007; WSU 2007).

Because of the distance from Hanford; the routine nature of most actions; and various zoning, permitting, environmental review, and construction requirements, most other actions are not expected to interact with Hanford activities to produce cumulative impacts.

Benton, Franklin, and Grant Counties had a total of 949,772 hectares (2,346,912 acres) of farmland in 2002 (USDA 2002). This farmland area is 65 percent of the 1,457,298 hectares (3,601,024 acres) of the total land area of these counties (WOFM 2007). Little growth in agriculture is expected through 2025 (WSTC 2006:B-8).

Many areas of the Columbia River Basin have the potential for natural gas accumulations in underground sediments. Although significant production has not occurred, small amounts of gas were produced from the Rattlesnake Hills Gas Field north of Richland. No oil or gas production wells have been completed in the state of Washington since 1962 (Lingley 2005), although state and Federal lands in the region around Hanford continue to be leased for natural gas exploration (WDNR 2007a).

As described in Chapter 3, sand, gravel, and basalt are the primary geologic resources extracted from the earth in the region around Hanford. There are many commercial surface mines in the region (WDNR 2006), and it is expected that mines will be expanded and new mines developed to satisfy the future need for these construction materials. Long-term cumulative impacts of these activities are not expected because the Washington State Surface Mine Reclamation Act (RCW 78.44) ensures that surface mines more than 1.2 hectares (3 acres) in size or with a highwall that is higher than 9.1 meters (30 feet) and steeper than 45 degrees are reclaimed (WDNR 2007b).

The Yakima Training Center is in central Washington in Yakima and Kittitas Counties, approximately 11 kilometers (7 miles) northeast of the city of Yakima (Army 2007:365). Land use at the center is separated into two major areas: the cantonment area (approximately 400 hectares [1,000 acres]) and the training areas (approximately 132,000 hectares [326,000 acres]) (Army 2007:367). The cantonment area, which includes residential, administrative, commercial, light industrial, and open spaces, is in the southwest corner of the installation (Army 2007:365). The training areas include a large maneuver area and a variety of large- and small-caliber live-fire ranges (Army 2007:355). Units from Fort Lewis and elsewhere use the Yakima Training Center to conduct maneuver and live-fire training, and then return home to their respective installations (Army 2007:355).

Construction activities planned for the foreseeable future at the Yakima Training Center include the following:

- Construction of a digital multipurpose range complex for fiscal year 2008
- Construction of an Armed Forces Reserve Center for fiscal year 2008
- Construction of a sniper field fire range for fiscal year 2010
- Construction of a multipurpose machine gun range for fiscal year 2011
- Construction of an aviation gunnery range for fiscal year 2011
- Construction of a fire station for fiscal year 2013
- Natural gas exploration and drilling (Army 2007:369)

In May 2005 the U.S. Department of Defense announced its latest round of base realignment and closure activities (AFIS 2005; BRAC 2005). These activities can impact areas around military facilities by reducing or increasing direct and indirect employment and activities that have environmental impacts. The Umatilla Army Depot is the only major military facility in the Hanford ROI to be closed. Closure of the depot and the associated loss of 884 regional jobs (512 direct and 372 indirect) (BRAC 2005:Ind-14, C-20) and reduction in activities will have inevitable environmental impacts. While the precise impacts of closure and reuse of the depot have not been evaluated, they will be the subject of future NEPA documentation. Because the depot is over 48 kilometers (30 miles) from the Hanford boundary, little in the way of cumulative impacts are expected.

The sites on EPA's National Priorities List (NPL) (also known as Superfund [Superfund Amendments and Reauthorization Act] sites) were reviewed to determine whether any could contribute to cumulative impacts at Hanford. Seven active NPL sites are in Hanford or within 80 kilometers (50 miles) of the site boundary. Three of these sites are the Hanford 100, 200, and 300 Areas. The closest of the remaining four NPL sites is the Pasco Sanitary Landfill near Pasco, Washington, approximately 19 kilometers (12 miles) southeast of the site boundary (EPA 2006a, 2006b). The State of Washington also actively pursues the cleanup of contaminated sites through the State Toxics Cleanup Program. Approximately

145 State of Washington sites are within 80 kilometers (50 miles) of Hanford, including 4 in Adams County, 19 in Benton County (6 in the city of Richland), 8 in Franklin County, 19 in Grant County, 7 in Kittitas County, 6 in Walla Walla County, and 82 in Yakima County (Ecology 2006a). In addition to being some distance from Hanford, most of the NPL and Washington State Toxics Cleanup Program sites are well into the control and cleanup process, and thus would not substantially contribute to cumulative impacts.

The Columbia River Water Management Act (RCW 90.90) requires Ecology to "aggressively pursue the development of water supplies to benefit both in-stream and out-of-stream uses." Ecology is in the process of developing a Columbia River Water Management Program to facilitate compliance with the legislation. No specific storage or conservation projects have been identified for implementation under the management program (Ecology 2007a:1).

The proposed Black Rock Reservoir, a water storage and electrical power generation project currently being evaluated for the Yakima River Basin, could have substantial environmental and economic effects on the region. This project could include the construction of a 160-meter-high (525-foot-high), central core rockfill dam, creating a reservoir with a active storage volume of 1,300,000 acre-feet. A pipeline would take water from the Columbia River upstream of Priest Rapids Dam, store it in the reservoir, and then discharge it to the Yakima River Valley. The total project construction cost is estimated at $4.5 billion, with an annual operating cost of 60.2 million. This reservoir would be approximately 8 kilometers (5 miles) west of Hanford's nearest boundary. Other alternatives to the Black Rock Reservoir that are being considered are the Wymer Dam and Reservoir Alternative, Wymer Dam Plus Yakima River Pump Exchange Alternative, Enhanced Water Conservation Alternative, Market-Based Reallocation of Water Resources Alternative, and Groundwater Storage Alternative. None of the alternatives has been identified as a preferred alternative (BOR and Ecology 2008:xvi, xxi, xviii, 2-37).

In December of 2008 Ecology issued the *Supplemental Draft Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study* (Ecology 2008). This document is a supplement to the January 2008 *Draft Planning Report/Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study, Yakima Project, Washington* (BOR and Ecology 2008), which evaluated alternatives for Yakima River Basin water storage, including construction and operation of a Black Rock Reservoir. Ecology prepared the supplemental draft EIS to evaluate an additional water supply alternative. The Integrated Water Resource Management Alternative included in the supplemental draft EIS includes four general elements to improve water resources in the Yakima River Basin—fish passage improvements, modification of existing operations and facilities, new storage, and fish habitat enhancement on mainstem rivers and tributaries. The analysis in the supplemental draft EIS is programmatic in nature. If the decision is made to implement this alternative, any individual projects that are carried forward will require additional environmental review when they are proposed (Ecology 2008:FS-1, FS-3).

The Priest Rapids Hydroelectric Project, consisting of the Priest Rapids and Wanapum Dams, is directly upstream of Hanford. The project occupies an estimated 1,256 hectares (3,104 acres) of Federal land managed by the U.S. Bureau of Reclamation, U.S. Bureau of Land Management, U.S. Department of the Army, USFWS, DOE, and Bonneville Power Administration. It also occupies an estimated 1,135 hectares (2,804 acres) of Washington State land (FERC 2006a:xvi). The project has operated since 1955 under a 50-year license with the Federal Energy Regulatory Commission. In anticipation of license expiration in 2005, the Grant County Public Utility District filed a relicensing application with the commission in October 2003 and an EIS was completed in 2006 (FERC 2006a; Grant County PUD 2003). In the future, the Grant County Public Utility District proposes to improve the project by installing advanced-design turbines, improving downstream fish bypass facilities, creating new programs to protect and enhance anadromous and resident fish and wildlife, and implementing additional cultural resources protections (Grant County PUD 2003:1, 2). It is expected that these improvements will reduce

the impacts of operation of the Priest Rapids Hydroelectric Project to levels below those currently experienced. A 44-year license extension was granted for the project in April of 2008 (FERC 2008:58).

Information on power generation and transmission line projects was collected to determine whether major projects are planned for the region around Hanford (BPA 2005a, 2007a, 2007b, 2008; EFSEC 2007; RNP 2006). Long-term planning by the Bonneville Power Administration and the Pacific Northwest Electric Power Planning and Conservation Council suggests a need for up to 8,000 megawatts of electricity in the region over the next 10 years. To that end, a number of power generation projects have been proposed for the ROI (BPA 2003:2). Utility projects either proposed or recently completed include the following:

- Plymouth Generation Facility, a 306-megawatt natural-gas-fired turbine electricity-generating facility (Benton and BPA 2003; BPA 2007c, 2008)
- Wanapa Energy Center, a 1,200-megawatt gas and steam turbine electricity-generating facility (BIA 2004; BPA 2008)
- Wind projects, including Big Horn, Combine Hills II, Desert Claim, and Wild Horse (BPA 2007a, 2007c; EFSEC 2007, 2009)
- New transmission lines, including the 127-kilometer (79-mile), 500-kilovolt line between McNary and John Day Substations (BPA 2008)
- Transmission line upgrades, including the Tucannon River-to-North Lewiston Rebuild (BPA 2007b)

The Plymouth Generation Facility would be approximately 40 kilometers (25 miles) south of the Hanford boundary (Benton and BPA 2003); the Wanapa Energy Center, approximately 48 kilometers (30 miles) south (BIA 2004:3.6-4). These facilities would be approximately 64 kilometers (40 miles) from the 200 Areas. As of September 2008, both projects were on hold (BPA 2008).

Four wind projects would be within 80 kilometers (50 miles) of Hanford's boundary. The recently completed Big Horn Wind Project is approximately 72 kilometers (45 miles) southwest of Hanford's boundary. The proposed Combine Hills II Wind Project would be alongside the Combine Hills I Wind Project southeast of Hanford's boundary approximately 56 kilometers (35 miles) away. The recently completed Wild Horse Wind Project is approximately 56 kilometers (35 miles) northwest of Hanford's boundary (BPA 2007a; EFSEC 2007). The proposed Desert Claim Wind Project is approximately 72 kilometers (45 miles) northwest of Hanford's boundary (EFSEC 2009). In total, these wind projects involve the construction of 418 wind turbines that would generate 682 megawatts of electricity (EFSEC 2009; NPCC 2006).

Most transmission line projects are some distance from Hanford's boundary. The McNary–John Day transmission line would be approximately 40 kilometers (25 miles) from Hanford (BPA 2005a). As of September 2008, this project was on hold (BPA 2008).

In addition, information on water and gas pipeline projects was reviewed. No major water or gas pipeline projects are planned for the region around Hanford (FERC 2007a, 2007b).

Information on road and rail transportation projects was collected to determine whether major projects could impact the region around Hanford (WSDOT 2006, 2007, 2009a, 2009b; WFLHD 2006, 2007). Some of the more-substantial transportation projects in the region include the following:

- Adding 4.8 kilometers (3 miles) of additional lanes to State Route 240 between Kennewick and Richland (completed in 2007) (WSDOT 2007, 2009a)
- Widening 4.8 kilometers (3 miles) of State Route 17 in Moses Lake (completed in 2007) (WSDOT 2006, 2009a)
- Constructing a new 16-kilometer (10-mile) road between Interstate 82 and State Route 397 in the Finley area (completed in 2008) (WSDOT 2006, 2009b)
- Realigning approximately 823 meters (2,700 feet) of the Naches River channel away from U.S. Route 12 in Yakima (completed in 2008) (WSDOT 2006, 2009a)
- Adding 4 kilometers (2.5 miles) of passing lanes to State Route 240 in Hanford (to be completed in 2009) (WSDOT 2007)
- Widening 13 kilometers (8 miles) of U.S. Route 12 between McDonald Road and the city of Walla Walla, Washington (to be completed in 2009) (WSDOT 2006, 2009b)

Some of the major development activities planned in Richland over the next several years are described below. Future development beyond the next several years is, for the most part, speculative.

Pacific Northwest National Laboratory (PNNL) has selected a parcel of land just north of Horn Rapids Road to construct a new Physical Sciences Facility to replace that which will be lost in the 300 Areas. The parcel, referred to as the "Horn Rapids Triangle," is adjacent to PNNL's existing campus and the Tri-Cities Science and Technology Park (DOE 2004d). Construction of the Physical Sciences Facility began in 2007 and is expected to be completed in 2010 (PNNL 2007). In addition, ground was broken for the new PNNL Biological Sciences Facility and Computational Sciences Facility in 2008. These facilities are expected to be completed in 2009 (PNNL 2008).

Plans have been approved for Richland's Washington State University Tri-Cities (WSU-TC) campus to more than double in size over the next 10 years. The campus, which borders the Columbia River in North Richland, serves about 1,200 students (Richland 2004). WSU-TC partnered with PNNL to open a new Bioproducts, Sciences, and Engineering Laboratory at its North Richland campus in 2008 (WSU 2008).

The Kadlec Medical Center and Columbia Basin Community College opened a new health science building near the Kadlec Medical Center campus in 2006 (Trumbo 2006). The Kadlec Medical Center broke ground in 2006 on a $70 million expansion of its Richland campus, including a six-story tower (Kadlec 2008; Richland 2006:4). The new tower was completed in 2008 (Kadlec 2008). The hospital's workforce has been increasing rapidly, with 500 new employees added in the past few years (Richland 2004).

Ground was broken on the Hanford Reach National Monument Heritage and Visitors Center on December 5, 2003. The $40 million center will include interpretive galleries, office space, classrooms, and a 220-seat auditorium, and will focus on increasing understanding and appreciation of the history and resources of the Hanford Reach and the Columbia River (Richland 2004). Construction is scheduled to begin in 2009, with dedication expected in 2010 (The Reach 2008).

The Red Mountain American Viticultural Area (AVA), established in 2001, is a 1,781-hectare (4,400-acre) federally designated grape- and wine-producing region on the south-facing slope of Red Mountain. There are 10 wineries in the AVA, with about 283 hectares (700 acres) currently planted in wine grapes; 10 more wineries are likely to be constructed in the next 5 years. Visitor projections show that, by the year 2025, the Red Mountain AVA will attract approximately 175,000 wine-oriented visitors—a nearly ninefold increase over the current level. Elements of the Red Mountain AVA Conceptual Plan include the expansion of existing vineyard and winery operations; a number of new wineries; new visitor-oriented facilities, including recreation and interpretive experiences; and additional development of adjacent areas. When fully developed, it is estimated that approximately 20 to 30 additional wineries will be located in the AVA (Benton County 2006:B-14, G-3, G-4).

Table R–4 shows the activities examined as potential contributors to cumulative impacts at Hanford, the sources used, and why activities were or were not carried forward for cumulative impacts analysis. This determination follows the methodology documented in Figure R–2. Future activities that are speculative or not well defined were not carried forward for analysis. The activities and their end states considered in the cumulative groundwater modeling are described in Appendix S.

A number of actions are considered in the cumulative transportation risk analysis that are not listed in Table R–4. These other actions are listed in Appendix T, Table T–4, and include transportation of radioactive materials and wastes in the United States from DOE and non-DOE activities. The transportation risk analysis considers information from recently released DOE NEPA documents, including the *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement* (DOE 2008b), *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (DOE and NYSERDA 2008), and *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2008c). These actions are not considered elsewhere in the cumulative impacts analysis because (1) they do not include activities at Hanford, (2) the activities that would occur at Hanford are already considered in the *TC & WM EIS* alternatives, or (3) insufficient information is available to analyze their contribution to cumulative impacts at Hanford.

Table R–4. Activities Considered for the Cumulative Impacts Analysis

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]?
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
DOE Activities							
Cleanup and restoration activities across all areas of the Hanford Site	• *Draft Hanford Remedial Action EIS and Comprehensive Land Use Plan* (DOE 1996a)[e] • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a) • *Hanford Site End State Vision* (DOE 2005b) • *Plan for Central Plateau Closure* (Fluor Hanford 2004) • *River Corridor Closure Project, TPA Quarterly Review for Period: December 2006–February 2007* (DOE, EPA, and Ecology 2007) • *CERCLA Five-Year Review Report for the Hanford Site* (DOE 2006a) • *River Corridor Closure Project, March 2007 Monthly Performance Report* (WCH 2007) • *Cumulative Impact Data for "Tank Closure and Waste Management EIS"* (CEES 2006)	2146 (DOE 1996a:S-12, S-20) 2035 (DOE 2002a:8) 2035 (Fluor Hanford 2004:ES-8)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Changes in land use at Hanford	• *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a) • "ROD: *Hanford Comprehensive Land-Use Plan EIS*" (64 FR 61615) • *Supplement Analysis, Hanford Comprehensive Land-Use Plan EIS* (DOE 2008a) • "Amended ROD for the *Hanford Comprehensive Land-Use Plan EIS*" (73 FR 55824) • *Hanford Site End State Vision* (DOE 2005b)	2050 (64 FR 61615)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Decommissioning of the eight surplus production reactors and their support facilities in the 100 Areas along the Columbia River[f]	• *Draft EIS, Decommissioning of Eight Surplus Production Reactors at the Hanford Site* (DOE 1989) • *Addendum (Final EIS), Decommissioning of Eight Surplus Production Reactors at the Hanford Site* (DOE 1992) • "ROD: *Decommissioning of Eight Surplus Production Reactors at the Hanford Site*" (58 FR 48509) • *Surplus Reactor Final Disposition Engineering Evaluation* (DOE 2005c) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a) • "DOI Designates B Reactor as a National Historic Landmark" (DOE and DOI 2008)	2080 (DOE 1989:3.52)	Yes	Yes (on site)	Yes	No (five of the eight reactors have already been cocooned)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Decommissioning of the N Reactor and support facilities	• *Surplus Reactor Final Disposition Engineering Evaluation* (DOE 2005c)	2068 (DOE 2005c:19)	Yes	Yes (on site)	Yes	No	Yes
Safe storage of surplus plutonium at the Plutonium Finishing Plant in the 200-West Area until it can be shipped to the Savannah River Site for disposition	• *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS* (DOE 1996b) • "ROD: *Storage and Disposition of Weapons-Usable Fissile Materials Final PEIS*" (62 FR 3014) • *Surplus Plutonium Disposition Final EIS* (DOE 1999b) • "ROD: *Surplus Plutonium Disposition Final EIS*" (65 FR 1608) • "Amended ROD: Storage of Surplus Plutonium Materials at the Savannah River Site" (72 FR 51807)	2010 (72 FR 51807)	Yes	Yes (on site)	Yes	Yes (ongoing activity)	No
Deactivation of the Plutonium Finishing Plant in the 200-West Area	• *EA, Deactivation of the Plutonium Finishing Plant, Hanford Site* (DOE 2003b) • *FONSI, "EA, Deactivation of the Plutonium Finishing Plant"* (DOE 2003c) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a)	2009 (DOE 2002a:A-20) 2009 (DOE 2003c:5-7)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Actions to empty the K Basins in the 100-K Area and implement dry storage of the fuel rods in the Canister Storage Building in the 200-East Area	• *Draft EIS, Management of Spent Nuclear Fuel from the K Basins at the Hanford Site* (DOE 1995b) • *Addendum (Final EIS), Management of Spent Nuclear Fuel from the K Basins at the Hanford Site* (DOE 1996c) • "ROD: *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site*" (61 FR 10736) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a)	2036 (61 FR 10736)	Yes	Yes (on site)	Yes (note: the movement of K Basin spent nuclear fuel to the 200 Areas was completed in 2005)	No (ongoing activity)	Yes
Complete U Plant regional closure	• *Final Feasibility Study for the Canyon Disposition Initiative (221-U Facility)* (DOE 2004e) • *Proposed Plan for Remediation of the 221-U Facility (Canyon Disposition Initiative)* (DOE 2004b) • *ROD, "221-U Facility (Canyon Disposition Initiative)," Hanford Site* (DOE 2005d) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a)	2014 (DOE 2004e:K-14)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Final disposition of the canyons, PUREX Plant, PUREX tunnels, and other facilities in the 200 Areas and cleanup to Industrial-Exclusive land use standards	• *Plan for Central Plateau Closure* (Fluor Hanford 2004) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a)	2035 (DOE 2002a:8)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Transport of sodium-bonded spent nuclear fuel to INL for treatment	• *Final EIS for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel* (DOE 2000b) • "ROD for the *Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*" (65 FR 56565)	2012 (DOE 2000b:4-21)	Yes	Yes (transportation corridors)	Yes	No	Yes
Deactivation of FFTF in the 400 Area	• *EA, Shutdown of the FFTF, Hanford Site* (DOE 1995c) • *"Shutdown of the FFTF, Hanford Site," DOE, FONSI* (DOE 1995d) • *EA, "Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, FFTF Project," Hanford Site* (DOE 2006b) • *FONSI, "EA, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, FFTF Project, Hanford Site"* (DOE 2006c) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a)	2016 (SAIC 2007a)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Construction and operation of a PNNL Physical Sciences Facility	• *EA, Construction and Operation of a Physical Sciences Facility at PNNL* (DOE 2007a) • *FONSI for "Construction and Operation of a Physical Sciences Facility at the PNNL"* (DOE 2007b)	Construction completed in 2010 (PNNL 2007)	Yes	Yes (on site)	Yes	No (relocation of activities from 300 Area)	Yes
Excavation and use of geologic materials from existing borrow pits	• *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999a) • "*ROD: Hanford Comprehensive Land-Use Plan EIS*" (64 FR 61615) • *EA, Use of Existing Borrow Areas, Hanford Site* (DOE 2001b) • *FONSI, "Use of Existing Borrow Areas, Hanford Site"* (DOE 2001c) • *EA, Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas* (DOE 2003d) • *FONSI, "Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas"* (DOE 2003e) • *Supplement Analysis, Hanford Comprehensive Land-Use Plan EIS* (DOE 2008a) • "Amended ROD for the *Hanford Comprehensive Land-Use Plan EIS*" (73 FR 55824)	2050 (64 FR 61615) 2011 (DOE 2001c) 2013 (DOE 2003e)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Construction and operation of the Environmental Restoration Disposal Facility near the 200-West Area	• *Remedial Investigation and Feasibility Study Report for the Environmental Restoration Disposal Facility* (DOE 1994) • *Proposed Plan for an Amendment to the Environmental Restoration Disposal Facility ROD, Hanford Site* (DOE 2001d)	2024 (DOE 1994:9-23)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Implementation of the programmatic waste management decisions described in the RODs for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*	• *Final Waste Management PEIS for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a) • "ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (63 FR 3629) • "ROD for the DOE's Waste Management Program: Treatment of Non-wastewater Hazardous Waste" (63 FR 41810) • "ROD for the DOE's Waste Management Program: Storage of High-Level Radioactive Waste" (64 FR 46661) • "ROD for the DOE's Waste Management Program: Treatment and Disposal of Low-Level Waste and Mixed Low-Level Waste" (65 FR 10061)	2017 (DOE 1997a)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Implementation of the programmatic waste management decisions described in the RODs for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (continued)*	• "Revision to the ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (65 FR 82985) • "Revision to the ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (66 FR 38646) • "Revision to the ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (67 FR 56989) • "Revision to the ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (69 FR 39446) • "Revision to the ROD for the DOE's Waste Management Program" (70 FR 60508) • "Amendment to the ROD for the DOE's Waste Management Program: Treatment and Storage of Transuranic Waste" (73 FR 12401)	2017 (DOE 1997a)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Retrieval of suspect TRU waste buried after 1970	• *EA, Transuranic Waste Retrieval from the 218-W-4B and 218-W-4C Low-Level Burial Grounds, Hanford Site* (DOE 2002b) • *FONSI, "Transuranic Waste Retrieval from the 218-W-4B and 218-W-4C Low-Level Burial Grounds, Hanford Site"* (DOE 2002c) • *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a) • "Retrieval of Retrievably Stored TRU Waste from the Alpha Caissons" (SAIC 2007b)	2007 (DOE 2002b) 2010 (DOE 2002a:47) 2018 (SAIC 2007b)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Construction and operation of facilities for disposal of greater-than-Class C low-level radioactive waste	• "Notice of Intent to Prepare an *EIS for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste*" (72 FR 40135)	Not available	Yes	Yes (if a disposal facility is located at Hanford)	Yes	No	Yes
Cleanup and protection of groundwater	• *Performance Management Plan for the Accelerated Cleanup of the Hanford Site* (DOE 2002a) • *CERCLA Five-Year Review Report for the Hanford Site* (DOE 2006a)	2018 (DOE 2002a:A-33)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Transport of TRU waste to WIPP near Carlsbad, New Mexico	• *WIPP Disposal Phase Final Supplemental EIS* (DOE 1997b) • "ROD for the DOE's *WIPP Disposal Phase*" (63 FR 3624)	2033 (63 FR 3624)	Yes	Yes (transportation corridors)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Non-DOE Activities on Hanford Site							
Transport of Navy reactor plants from the Columbia River and their disposal in trench 218-E-12B in the 200-East Area	• *Final EIS on the Disposal of Decommissioned, Defueled Cruiser, OHIO Class, and LOS ANGELES Class Naval Reactor Plants* (Navy 1996) • "NEPA ROD for the *Disposal of Decommissioned, Defueled Cruiser, Ohio Class, and Los Angeles Class Naval Reactor Plants*" (61 FR 41596)	2029 (Navy 1996:S-11)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Continued operation of the Columbia Generating Station (previously Washington Public Power Supply System, Nuclear Project No. 2)	• *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007) • *2004 Annual Report* (Energy Northwest 2004) • *Columbia Generating Station 2005 Annual Radiological Environmental Operating Report* (Energy Northwest 2006)	2026 (Energy Northwest 2004)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Operation of the US Ecology commercial low-level radioactive waste disposal site near the 200-East Area	• *Final EIS for the Commercial Low-Level Radioactive Waste Disposal Site, Richland, Washington* (Ecology and WSDOH 2004) • *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007) • *Annual Environmental Monitoring Report for Calendar Year 2006* (US Ecology 2007)	2056 (Ecology and WSDOH 2004:i)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Management of the Hanford Reach National Monument and Saddle Mountain National Wildlife Refuge	• *Hanford Reach of the Columbia River: Final River Conservation Study and EIS* (NPS 1994) • ROD, *"Hanford Reach of the Columbia River Final EIS for Comprehensive River Conservation Study"* (DOI 1996) • ROD, "Extension of the Saddle Mountain National Wildlife Refuge Acquisition Boundary" (64 FR 66928) • *Hanford Reach Protection and Management Program Interim Action Plan* (CAP 1998) • *"Establishment of the Hanford Reach National Monument"* (65 FR 37253) • *Hanford Reach National Monument Final Comprehensive Conservation Plan and EIS* (USFWS 2008)	2022 (USFWS 2008:i)	Yes	Yes (on site)	Yes	No (ongoing activity)	Yes
Operation of the Laser Interferometer Gravitational-Wave Observatory	• *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007)	Not available	Yes	Yes (on site)	Yes	Yes (ongoing activity)	No

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Other Activities in the Region							
Changes in land use in the region	• *Adams County Comprehensive Plan* (ACPC 2005) • *Benton County Comprehensive Land Use Plan* (BCPC 2003) • *Benton County Sustainable Development Overall Economic Development Plan* (BCPC 2006) • *City of Richland Comprehensive Land Use Plan* (Richland 2002) • *Preliminary Assessment of Redevelopment Potential for the Hanford 300 Area* (Richland 2005a) • *City of Kennewick Comprehensive Plan 2006* (Kennewick 2006) • *Franklin County Growth Management Comprehensive Plan* (Franklin County 2005) • *Grant County Comprehensive Plan* (GCDCD 1999) • *Kittitas County Comprehensive Plan* (Kittitas County 2001) • *Klickitat County, Washington, Comprehensive Plan* (Dreyer 2007)	2024 (Richland 2005b:1-1) 2025 (Kennewick 2006:23) 2018 (BCPC 2003) 2015 (Yakima County 1998) 2018 (GCDCD 1999) 2021 (Kittitas County 2001) 2026 (Benton County 2006:1) 2023 (Franklin County 2005) 2025 (Walla Walla County 2007:1-14)	Yes	Yes (various)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Changes in land use in the region *(continued)*	• *Plan 2015: A Blueprint for Yakima County Progress* (Yakima County 1998) • *Walla Walla County Integrated Comprehensive Plan and EIS* (Walla Walla County 2007)						
Operation of the Perma-Fix Northwest (formerly Pacific Ecosolutions) waste treatment facility in Richland, Washington	• *EA, Non-thermal Treatment of Hanford Site Low-Level Mixed Waste* (DOE 1998a) • *FONSI, "Non-thermal Treatment of Hanford Site Low-Level Mixed Waste"* (DOE 1998b) • *Final EIS for Treatment of Low-Level Mixed Waste* (Richland 1998) • *EA, Offsite Thermal Treatment of Low-Level Mixed Waste* (DOE 1999c) • *EA, "Offsite Thermal Treatment of Low-Level Mixed Waste," FONSI* (DOE 1999d) • *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007) • *Annual Environmental Monitoring Report for 2006* (Pacific Ecosolutions 2007)	2019 (Richland 1998:1, 25)	Yes	Yes (0.8 km south)	Yes	No (ongoing activity)	Yes
Operation of the AREVA NP nuclear fuel fabrication facility in Richland, Washington	• *NRC Inspection Report No. 70-1257/2004-001* (NRC 2004)	Not available	Yes	Yes (directly south)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Operation of the AREVA NP nuclear fuel fabrication facility in Richland, Washington *(continued)*	• *NRC Inspection Report No. 70-1257/2005-002* (NRC 2005) • *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007) • *Supplement to Applicant's Environmental Report* (AREVA 2006)	Not available	Yes	Yes (directly south)	Yes	No (ongoing activity)	Yes
Operation of the Westinghouse Service Center decontamination facility in Richland, Washington	• *Hanford Site Environmental Report for Calendar Year 2006* (Poston et al. 2007)	Not available	Yes	Yes (1.5 km south)	Yes	No (ongoing activity)	Yes
Operation of the IsoRay medical facility in Richland, Washington	• "Results of 2006 Air Emissions Monitoring" (Boyce 2007)	Not available	Yes	Yes (1 km south)	Yes	No (ongoing activity)	Yes
Operation of the Moravek Biochemicals facility in Richland, Washington	• *Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions* (Moravek 2005)	Not available	Yes	Yes (2 km south)	Yes	No (ongoing activity)	Yes
Cleanup of EPA NPL sites and state toxic waste sites	• *National Priorities List Sites in Oregon* (EPA 2006a) • *National Priorities List Sites in Washington* (EPA 2006b) • *Hazardous Sites List* (Ecology 2006a)	Various	Yes	Yes (various)	Yes	No (ongoing activity)	Yes
Oil and gas leasing and exploration	• *Leasing Washington State-Owned Lands for Oil and Gas Exploration* (WDNR 2007a)	Not applicable (ongoing)	Yes	Yes (various)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Oil and gas leasing and exploration (*continued*)	• *Final Supplemental EIS on the Oil and Gas Leasing Program for State Lands* (WDNR 2005)	Not applicable (ongoing)	Yes	Yes (various)	Yes	No (ongoing activity)	Yes
Surface mining	• *Surface Mining Reclamation Program* (WDNR 2007b) • *Directory of Washington State Surface Mining Reclamation Sites–2006* (WDNR 2006)	Not applicable (ongoing)	Yes	Yes (various)	Yes	No (ongoing activity)	Yes
Operation of the U.S. Army Yakima Training Center	• *Final Programmatic Environmental Impact Statement for Army Growth and Force Structure Realignment* (Army 2007)	Realignment complete in 2013 (Army 2007:iii)	Yes	Yes (10 km northwest)	Yes	No (ongoing activity)	Yes
DoD base realignment and closure—Umatilla Army Depot	• *2005 Defense Base Closure and Realignment Commission Report* (BRAC 2005) • *Commission Makes More BRAC Decisions* (AFIS 2005)	2011 (BRAC 2005:Ind-14)	Yes	Yes (55 km south)	Yes	No	Yes
Construction and operation of the Wanapa Energy Center	• *Wanapa Energy Center Final EIS* (BIA 2004) • "Wanapa Energy Center: Notice of Availability of ROD" (70 FR 10612) • *Generation and Interconnection Projects on Hold* (BPA 2008)	2055 (BIA 2004:ES-14)	No; project on hold (BPA 2008)	Yes (48 km south)	Yes	No	No
Construction and operation of the Plymouth generating facility	• *Final EIS, Plymouth Generating Facility* (Benton and BPA 2003) • ROD, *"Plymouth Generating Facility"* (68 FR 60342) • *Generation and Interconnection Projects on Hold* (BPA 2008)	Not available	No; project on hold (BPA 2008)	Yes (40 km south)	Yes	No	No

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Big Horn Wind Project	• *Supporting the Development of Wind Resources in the Pacific Northwest* (BPA 2005b) • *Completed Wind Projects* (BPA 2007c) • *ROD for the Electrical Interconnection of the Big Horn Wind Energy Project* (BPA 2005c) • "PPM Announces 200 MW Big Horn Wind Project" (PPM Energy, Inc. 2005) • *Renewable Energy Projects Serving Northwest Load* (RNP 2006)	Not available	Yes	Yes (72 km southwest)	Yes	No (ongoing activity)	Yes
Combine Hills II Wind Project	• *Supporting the Development of Wind Resources in the Pacific Northwest* (BPA 2005b) • *Current Wind Projects* (BPA 2007a)	Not available	Yes	Yes (56 km southeast)	Yes	No	Yes
Desert Claim Wind Project	• *Desert Claim Wind Power Project, Final EIS* (Kittitas County 2004) • *Desert Claim Wind Power Project - Revised* (EFSEC 2009)	Not available	Yes	Yes (72 km northwest)	Yes	No	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Wild Horse Wind Project	• *Supporting the Development of Wind Resources in the Pacific Northwest* (BPA 2005b) • *Renewable Energy Projects Serving Northwest Load* (RNP 2006)	Not available	Yes	Yes (56 km northwest)	Yes	No (ongoing activity)	Yes
Designation of west-wide energy corridors	• *PEIS, Designation of Energy Corridors on Federal Land in the 11 Western States* (DOE and BLM 2008)	Not applicable	Yes	No	Yes	No	No
McNary–John Day transmission line project	• *McNary–John Day Transmission Line Project, Draft EIS* (BPA and DOE 2002a) • *McNary–John Day Transmission Line Project, Abbreviated Final EIS* (BPA and DOE 2002b) • *"McNary–John Day Transmission Line Project" ROD* (BPA and DOE 2002c) • *Generation and Interconnection Projects on Hold* (BPA 2008)	2003–2007 (BPA and DOE 2002c:1, 2)	No; project on hold (BPA 2008)	Yes (40 km south)	Yes	No	No
Columbia River Basin water management	• *Final PEIS for the Columbia River Water Management Program* (Ecology 2007a) • *Upper Columbia Alternative Flood Control and Fish Operations, Columbia River Basin, Final EIS* (USACE 2006) • *Potholes Reservoir Supplemental Feed Route Draft EA* (BOR 2007a) • *Initial Alternative Development and Evaluation: Odessa Subarea Special Study* (BOR 2006a)	Ongoing management activities	Yes	Yes (various)	Yes	No (ongoing activity)	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Priest Rapids Hydroelectric Project relicensing	• *Priest Rapids Project License Application, FERC No. 2114, Executive Summary* (Grant County PUD 2003) • *Final EIS, Priest Rapids Hydroelectric Project, Washington* (FERC 2006a) • *Order Issuing New License* (FERC 2008)	2052 (FERC 2008)	Yes	Yes (6 km northwest)	Yes	No (upgrades not included in baseline)	Yes
Yakima River Basin water management (also see the next row on Black Rock Reservoir)	• *Sunnyside Division Board of Control, Water Conservation Program, Yakima Project, Washington: FONSI and Final EA* (BOR 2004a) • *Phase I Assessment Report, Storage Dam Fish Passage Study, Yakima Project, Washington* (BOR 2005) • *Supplemental Draft EIS, Yakima River Basin Water Storage Feasibility Study* (Ecology 2008)	Ongoing management activities	Yes	Yes (various)	Yes	No	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Construction and operation of the Black Rock Reservoir or Wymer Reservoir	• *Yakima River Storage Enhancement Initiative, Black Rock Reservoir Study* (WIS 2002) • *Summary Report Appraisal Assessment of the Black Rock Alternative,* Executive Summary (BOR 2004b) • *Yakima River Basin Storage Alternatives Appraisal Assessment* (BOR 2006b) • *Recreation Demand and User Preference Analysis: A Component of Yakima River Basin Water Storage Feasibility Study* (BOR 2007b) • *Potential Impacts of Leakage from Black Rock Reservoir on the Hanford Site Unconfined Aquifer* (Freedman 2008) • *Modeling Groundwater Hydrologic Impacts of the Potential Black Rock Reservoir* (BOR 2007c) • *One-Dimensional Hydraulic Modeling of the Yakima Basin* (Hilldale and Mooney 2007) • *Yakima River Basin Storage Study, Wymer Dam and Reservoir Appraisal Report* (BOR 2007d) • *Draft Planning Report/EIS, Yakima River Basin Water Storage Feasibility Study* (DOI and Ecology 2008)	10-year construction period, 100-year operations period (McCartney 2007)	Yes	Yes Black Rock Reservoir (8 km west); Wymer Reservoir (45 km northwest)	Yes	No	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Construction and operation of water pipelines	• *Projects Near You* (FERC 2007a)	Not applicable	Yes	No	Yes	No	No
Construction and operation of biofuels facilities	• *Biofuel Development in Washington* (WSU 2007) • *NorthWest Biofuels, Inc., SEPA Checklist* (CCH 2006) • *SEPA Checklist for the Central Washington Biodiesel Ellensburg Plant* (Central Washington Biodiesel, LLC 2006) • *Walla Walla County Mitigated Determination, of Non-significance,* Gen-X Energy Group Biodiesel Production Facility (WWCCDD 2006) • *Determination of Non-significance,* Central Washington Biodiesel Ellensburg Plant (Ecology 2006b) • *SEPA Environmental Checklist, Washington Ethanol Plant, Moses Lake, Washington* (Washington Ethanol, LLC 2006) • "Biofuel or Ethanol Production" (Plummer 2007)	Various	Yes	Yes (various)	Yes	No	Yes

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Construction and operation of biofuels facilities (*continued*)	• *Mitigated Determination of Non-significance, Moses Lake Ethanol Plant* (GCPD 2007) • *SEPA Checklist for the Moses Lake Ethanol Plant* (Liquafaction Corporation 2007) • *Mitigated Determination of Nonsignificance,* Washington Ethanol LLC Plant (Ecology 2007b) • *SEPA Environmental Checklist for the Columbia Ethanol Plant* (Columbia Ethanol Plant Holdings, LLC 2006) • *Revised SEPA Mitigated Determination of Nonsignificance for the Proposed Columbia Ethanol Facility* (Ecology 2006c) • *Notice of Construction, Final Order of Approval No. 2006-0009,* Columbia Ethanol Plant Holdings, LLC (Benton Clean Air Authority 2007)						
Construction and operation of natural gas terminals, pipelines, and storage projects	• *Projects Near You* (FERC 2007a) • *Major Storage Projects on the Horizon* (FERC 2006b) • *Major Pipeline Projects on the Horizon* (FERC 2007b) • *Existing and Proposed North American LNG Terminals* (FERC 2007c)	Not applicable	Yes	No	Yes	No	No

Table R–4. Activities Considered for the Cumulative Impacts Analysis *(continued)*

Activity	Source Document	Completion Date[a]	Evaluation Criteria[b]				Considered in *TC & WM EIS* Cumulative Impacts[d]
			Reasonably Foreseeable?	Within the Regions of Influence?[c]	Within the Timeframe of *TC & WM EIS*?	Accounted for in Baseline?	
Regional road projects	• *Washington Projects* (WFLHD 2007) • *Oregon Projects* (WFLHD 2006) • *Making Every Dollar Count for Benton County* (WSDOT 2007) • *Agency Projects: Highway, Ferry and Rail Construction and Improvement Projects* (WSDOT 2006, 2009b) • *Agency Projects: Completed Projects* (WSDOT 2009a)	2009 (WSDOT 2006, 2009a, 2009b)	Yes	Yes (various)	Yes	No	Yes
Regional rail projects	• *WSDOT Projects: Highway, Ferry and Rail Construction and Improvement Projects* (WSDOT 2006)	Not applicable	Yes	No	Yes	No	No

a The "completion date" is the date the activity is expected to be completed. This information determines if the activity is within the same time period as the *TC & WM EIS* alternatives.

b These evaluation criteria are used to help determine if the activity should be considered in the *TC & WM EIS* cumulative impacts analysis. See Figure R–2 (Phase 2) for a description of how the criteria are used.

c Because regions of influence vary by resource, the action may lie outside the region of influence for one resource and within it for another. Distances measured using Google Earth Version 4.2.0198.2451.

d This column presents the results of the assessment performed in Phase 2 of Figure R–2 for each activity evaluated.

e Appendix A of the *Draft Hanford Remedial Action EIS and Comprehensive Land Use Plan* (DOE 1996a) describes the activities analyzed in that EIS. Page A-3 notes that decommissioning of major canyon facilities in the 200 Areas (i.e., T Plant, B Plant, and the PUREX Plant) are not included.

f B Reactor was recently designated a National Historic Landmark (DOE and DOI 2008). Therefore, B Reactor will not be decommissioned and moved to the Hanford Central Plateau for disposal as analyzed in the *Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1989, 1992) and assumed in this *TC & WM EIS*.

Note: B Reactor was recently designated a National Historic Landmark (DOE and DOI 2008). Therefore, B Reactor will not be decommissioned and moved to the Hanford Central Plateau for disposal as analyzed in the *Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington* (DOE 1989, 1992) and assumed in this *TC & WM EIS*. To convert kilometers to miles, multiply by 0.6214.

Key: BRAC=Base Realignment and Closure; CERCLA=Comprehensive Environmental Response, Compensation, and Liability Act; DOE=U.S. Department of Energy; DoD=U.S. Department of Defense; DOI=U.S. Department of the Interior; EA=environmental assessment; EIS=environmental impact statement; EPA=U.S. Environmental Protection Agency; FERC=Federal Energy Regulatory Commission; FFTF=Fast Flux Test Facility; FONSI=Finding of No Significant Impact; INL=Idaho National Laboratory; km=kilometers; MW=megawatt; NEPA=National Environmental Policy Act; NPL=National Priorities List; NRC=Nuclear Regulatory Commission; *PEIS=Programmatic Environmental Impact Statement;* PNNL=Pacific Northwest National Laboratory; PPM=Pacific Core Power Marketing, Inc.; PUREX=Plutonium-Uranium Extraction; ROD=Record of Decision; SEPA=State Environmental Policy Act; *TC & WM EIS=Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington*; TPA=Tri-Party Agreement; TRU=transuranic; WIPP=Waste Isolation Pilot Plant; WSDOT=Washington State Department of Transportation.

R.13 REFERENCES

ACPC (Adams County Planning Commission), 2005, *Adams County Comprehensive Plan*, February 3.

Adams, J., 2007, City of Pasco, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 12.

AFIS (American Forces Information Service), 2005, "Commission Makes More BRAC Decisions," August 26.

AREVA (AREVA NP, Inc.), 2006, *Supplement to Applicant's Environmental Report*, E06-04-004, Version 2.0, Richland, Washington, October.

Army (U.S. Army), 2007, *Final Programmatic Environmental Impact Statement for Army Growth and Force Structure Realignment*, U.S. Army Environmental Command, Aberdeen Proving Ground, Aberdeen, Maryland, October.

Bailor, T., 2007, Professional Services and Outreach, Confederated Tribes of the Umatilla Indian Reservation, personal communication (telephone conversation) with M. Burandt, U.S. Department of Energy Office of River Protection, Richland, Washington, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," July 27.

Benson, B., 2007, City of Yakima, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 11.

Benton Clean Air Authority, 2007, *Notice of Construction, Final Order of Approval No. 2006-0009*, Richland, Washington, February 13.

BCPC (Benton County Planning Commission), 2003, *Benton County Comprehensive Land Use Plan*, October 27.

Benton and BPA (Benton County, Planning/Building Department, Prosser, Washington, and Bonneville Power Administration, Portland, Oregon), 2003, *Final Environmental Impact Statement, Plymouth Generating Facility, Plymouth, Washington*, DOE/EIS-0345, June.

Benton County, 2006, *Benton County Sustainable Development: Overall Economic Development Plan*, Prosser, Washington, April.

Bergeron, M.P., E.J. Freeman, and S.K. Wurstner, 2001, *Addendum to Composite Analysis for Low-Level Waste Disposal in the 200 Area Plateau of the Hanford Site*, PNNL-11800, Addendum 1, Pacific Northwest National Laboratory, Richland, Washington, September.

BIA (U.S. Bureau of Indian Affairs), 2004, *Wanapa Energy Center Final Environmental Impact Statement*, DOE/EIS-0342, Umatilla Agency, Pendleton, Oregon, December.

BOR (U.S. Bureau of Reclamation), 2004a, *Sunnyside Division Board of Control, Water Conservation Program, Yakima Project, Washington: Finding of No Significant Impact and Final Environmental Assessment*, Pacific Northwest Region, Upper Columbia Area Office, Yakima, Washington, September.

BOR (U.S. Bureau of Reclamation), 2004b, *Summary Report Appraisal Assessment of the Black Rock Alternative: A Component of Yakima River Basin Water Storage Feasibility Study, Washington*,

Executive Summary, Technical Series No. TS-YSS-7, Pacific Northwest Region, Boise, Idaho, December.

BOR (U.S. Bureau of Reclamation), 2005, *Phase I Assessment Report, Storage Dam Fish Passage Study, Yakima Project, Washington*, Technical Series No. PN-YDFP-001, Pacific Northwest Region, Boise, Idaho, April.

BOR (U.S. Bureau of Reclamation), 2006a, *Initial Alternative Development and Evaluation: Odessa Subarea Special Study, Columbia Basin Project, Washington*, Pacific Northwest Region, Boise, Idaho, September.

BOR (U.S. Bureau of Reclamation), 2006b, *Yakima River Basin Storage Alternatives Appraisal Assessment: A Component of Yakima River Basin Water Storage Feasibility Study, Washington*, Technical Series No. TS-YSS-8, Pacific Northwest Region, Boise, Idaho, May.

BOR (U.S. Bureau of Reclamation), 2007a, *Potholes Reservoir Supplemental Feed Route Draft Environmental Assessment: Columbia Basin Project, Grant County, Washington*, Pacific Northwest Region, Boise, Idaho, April.

BOR (U.S. Bureau of Reclamation), 2007b, *Recreation Demand and User Preference Analysis: A Component of Yakima River Basin Water Storage Feasibility Study, Washington Pacific Northwest Region*, Technical Series No. TS-YSS-10, Upper Columbia Area Office, Yakima, Washington, February.

BOR (U.S. Bureau of Reclamation), 2007c, *Modeling Groundwater Hydrologic Impacts of the Potential Black Rock Reservoir: A Component of the Yakima River Basin Water Storage Feasibility Study, Washington Pacific Northwest Region*, Technical Series No. TS-YSS-19, Pacific Northwest Region, Boise, Idaho, September.

BOR (U.S. Bureau of Reclamation), 2007d, *Yakima River Basin Storage Study, Wymer Dam and Reservoir Appraisal Report: A Component of the Yakima River Basin Water Storage Feasibility Study, Washington*, Technical Series No. TS-YSS-16, Pacific Northwest Region, Boise, Idaho, September.

BOR and Ecology (U.S. Bureau of Reclamation, Pacific Northwest Region, Upper Columbia Area Office, Yakima, Washington, and Washington State Department of Ecology, Central Regional Office, Yakima, Washington), 2008, *Draft Planning Report/Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study, Yakima Project, Washington*, Ecology Publication No. 07-11-044, January.

Boyce, D.E., 2007, IsoRay Medical Inc., Richland, Washington, personal communication (letter) to A. Grumbles, Washington State Department of Health, Olympia, Washington, "Results of 2006 Air Emissions Monitoring," RS 07-008, June 29.

BPA (Bonneville Power Administration), 2003, *Bonneville Power Administration Record of Decision for the "Wallula–McNary Transmission Line Project and Wallula Power Project,"* Portland, Oregon, March.

BPA (Bonneville Power Administration), 2005a, *Infrastructure Program Update*, DOE/BP-3547, accessed through http://www.transmission.bpa.gov/PlanProj/Transmission_Projects/, March.

BPA (Bonneville Power Administration), 2005b, *Supporting the Development of Wind Resources in the Pacific Northwest*, DOE/BP-3606, March.

BPA (Bonneville Power Administration), 2005c, *Record of Decision for the Electrical Interconnection of the Big Horn Wind Energy Project, March 2005*, accessed through http://www.transmission.bpa.gov/PlanProj/Wind/default.cfm?page=bighorn, March.

BPA (Bonneville Power Administration), 2007a, *Current Wind Projects*, accessed through http://www.transmission.bpa.gov/PlanProj/Wind/, January 10.

BPA (Bonneville Power Administration), 2007b, *Transmission Projects*, accessed through http://www.transmission.bpa.gov/PlanProj/Transmission_Projects/, January 10.

BPA (Bonneville Power Administration), 2007c, *Completed Wind Projects*, accessed through http://www.transmission.bpa.gov/PlanProj/Wind/completed.cfm, January 10.

BPA (Bonneville Power Administration), 2008, *Generation and Interconnection Projects on Hold*, accessed through http://www.transmission.bpa.gov/PlanProj/Transmission_Projects/projectsonhold.cfm, September 19.

BPA and DOE (Bonneville Power Administration and U.S. Department of Energy), 2002a, *McNary–John Day Transmission Line Project, Draft Environmental Impact Statement*, DOE/EIS-0332, Portland, Oregon, February.

BPA and DOE (Bonneville Power Administration and U.S. Department of Energy), 2002b, *McNary–John Day Transmission Line Project, Abbreviated Final Environmental Impact Statement*, DOE/EIS-0332, Portland, Oregon, August.

BPA and DOE (Bonneville Power Administration and U.S. Department of Energy), 2002c, *"McNary–John Day Transmission Line Project" Record of Decision*, Portland, Oregon, October 30.

BRAC (Defense Base Closure and Realignment Commission), 2005, *2005 Defense Base Closure and Realignment Commission Report*, Arlington, Virginia, September.

CAP (Citizens' Advisory Panel), 1998, *Hanford Reach Protection and Management Program Interim Action Plan*, accessed through http://206.61.210.104/pl/iap/iapindex.htm, August 28.

CCH (Chemical Consortium Holdings, Inc.), 2006, *NorthWest Biofuels, Inc., SEPA Checklist*, Bellingham, Washington, August.

CEES (Columbia Energy & Environmental Services, Inc.), 2006, *Cumulative Impact Data for "Tank Closure and Waste Management EIS,"* Rev. 1, Richland, Washington, November 2.

Central Washington Biodiesel LLC, 2006, *State Environmental Policy Act Environmental Checklist for the Central Washington Biodiesel Ellensburg Plant, Ellensburg, Washington*, May 19.

CEQ (Council on Environmental Quality), 1997, *Considering Cumulative Effects Under the National Environmental Policy Act*, Executive Office of the President, Washington, D.C., January.

Columbia Ethanol Plant Holdings, LLC, 2006, *State Environmental Policy Act Environmental Checklist for the Columbia Ethanol Plant, Finley, WA*, Richland Washington, August 30.

D'Hondt, D., 2007, Construction Management, Kittitas County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 7.

DOE (U.S. Department of Energy), 1987, *Final Environmental Impact Statement, Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington*, DOE/EIS-0113, Washington, D.C., December.

DOE (U.S. Department of Energy), 1989, *Draft Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119D, Washington, D.C., March.

DOE (U.S. Department of Energy), 1992, *Addendum (Final Environmental Impact Statement), Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington*, DOE/EIS-0119F, Washington, D.C., December.

DOE (U.S. Department of Energy), 1994, *Remedial Investigation and Feasibility Study Report for the Environmental Restoration Disposal Facility*, DOE/RL-93-99, Rev. 1, Richland, Washington, October.

DOE (U.S. Department of Energy), 1995a, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs, Final Environmental Impact Statement*, DOE/EIS-0203-F, Office of Environmental Management, Idaho Operations Office, Idaho Falls, Idaho, April.

DOE (U.S. Department of Energy), 1995b, *Draft Environmental Impact Statement, Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington*, DOE/EIS-0245D, Richland Operations Office, Richland, Washington, October.

DOE (U.S. Department of Energy), 1995c, *Environmental Assessment, Shutdown of the Fast Flux Test Facility, Hanford Site, Richland, Washington*, DOE/EA-0993, Richland Operations Office, Richland, Washington, May.

DOE (U.S. Department of Energy), 1995d, *"Shutdown of the Fast Flux Test Facility, Hanford Site, Richland, Washington," U.S. Department of Energy, Finding of No Significant Impact*, Richland Operations Office, Richland, Washington, May.

DOE (U.S. Department of Energy), 1996a, *Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan*, DOE/EIS-0222D, Washington, D.C., August.

DOE (U.S. Department of Energy), 1996b, *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*, DOE/EIS-0229, Office of Fissile Materials Disposition, Washington, D.C., December.

DOE (U.S. Department of Energy), 1996c, *Addendum (Final Environmental Impact Statement), Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, Washington*, DOE/EIS-0245F, Richland Operations Office, Richland, Washington, January.

DOE (U.S. Department of Energy), 1997a, *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, Office of Environmental Management, Washington, D.C., May.

DOE (U.S. Department of Energy), 1997b, *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement, Summary*, DOE/EIS-0026-S-2, Carlsbad Area Office, Carlsbad, New Mexico, September.

DOE (U.S. Department of Energy), 1998a, *Environmental Assessment, Non-thermal Treatment of Hanford Site Low-Level Mixed Waste*, DOE/EA-1189, Richland Operations Office, Richland, Washington, September.

DOE (U.S. Department of Energy), 1998b, *Finding of No Significant Impact, "Non-thermal Treatment of Hanford Site Low-Level Mixed Waste, Hanford Site, Richland, Washington,"* Richland Operations Office, Richland, Washington, September.

DOE (U.S. Department of Energy), 1999a, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, DOE/EIS-0222-F, Richland Operations Office, Richland, Washington, September.

DOE (U.S. Department of Energy), 1999b, *Surplus Plutonium Disposition Final Environmental Impact Statement*, DOE/EIS-0283, Office of Fissile Materials Disposition, Washington, D.C., November.

DOE (U.S. Department of Energy), 1999c, *Environmental Assessment, Offsite Thermal Treatment of Low-Level Mixed Waste*, DOE/EA-1135, Richland Operations Office, Richland, Washington, May.

DOE (U.S. Department of Energy), 1999d, *"Environmental Assessment, Offsite Thermal Treatment of Low-Level Mixed Waste," Finding of No Significant Impact*, Richland Operations Office, Richland, Washington, May.

DOE (U.S. Department of Energy), 2000a, *Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility*, DOE/EIS-0310, Office of Nuclear Energy, Science and Technology, Washington, D.C., December.

DOE (U.S. Department of Energy), 2000b, *Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*, DOE/EIS-0306, Office of Nuclear Energy, Science and Technology, Washington, D.C., July.

DOE (U.S. Department of Energy), 2001a, *Hanford Site Biological Resources Management Plan*, DOE/RL 96-32, Rev. 0, Richland Operations Office, Richland, Washington, August.

DOE (U.S. Department of Energy), 2001b, *Environmental Assessment, Use of Existing Borrow Areas, Hanford Site, Richland, Washington*, DOE/EA-1403, Richland Operations Office, Richland, Washington, October.

DOE (U.S. Department of Energy), 2001c, *Finding of No Significant Impact, "Use of Existing Borrow Areas, Hanford Site, Richland, Washington,"* Richland Operations Office, Richland, Washington, October.

DOE (U.S. Department of Energy), 2001d, *Proposed Plan for an Amendment to the Environmental Restoration Disposal Facility Record of Decision, Hanford Site, Richland, Washington*, DOE/RL-2001-44, Rev. 0, Richland, Washington, October.

DOE (U.S. Department of Energy), 2002a, *Performance Management Plan for the Accelerated Cleanup of the Hanford Site*, DOE/RL-2002-47, Rev. D, Richland Operations Office and Office of River Protection, Richland, Washington, August.

DOE (U.S. Department of Energy), 2002b, *Environmental Assessment, Transuranic Waste Retrieval from the 218-W-4B and 218-W-4C Low-Level Burial Grounds, Hanford Site, Richland, Washington*, DOE/EA-1405, Washington, D.C., March.

DOE (U.S. Department of Energy), 2002c, *Finding of No Significant Impact, "Transuranic Waste Retrieval from the 218-W-4B and 218-W-4C Low-Level Burial Grounds, Hanford Site, Richland, Washington,"* Richland Operations Office, Richland, Washington, March.

DOE (U.S. Department of Energy), 2003a, *Hanford Site Waste Management Units Report*, DOE/RL-88-30, Rev. 12, Richland Operations Office, Richland, Washington, January.

DOE (U.S. Department of Energy), 2003b, *Environmental Assessment, Deactivation of the Plutonium Finishing Plant, Hanford Site, Richland, Washington*, DOE/EA-1469, Richland Operations Office, Richland, Washington, October.

DOE (U.S. Department of Energy), 2003c, *Finding of No Significant Impact, "Environmental Assessment, Deactivation of the Plutonium Finishing Plant, Hanford Site, Richland, Washington,"* DOE/EA-1469, Richland Operations Office, Richland, Washington, October 20.

DOE (U.S. Department of Energy), 2003d, *Environmental Assessment, Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas*, DOE/EA-1454, Rev. 0, Richland Operations Office, Richland, Washington, March.

DOE (U.S. Department of Energy), 2003e, *Finding of No Significant Impact, "Reactivation and Use of Three Former Borrow Sites in the 100-F, 100-H, and 100-N Areas,"* Richland Operations Office, Richland, Washington, March.

DOE (U.S. Department of Energy), 2004a, *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements*, 2nd ed., Office of Environment, Safety and Health, Office of NEPA Policy and Compliance, Washington, D.C., December.

DOE (U.S. Department of Energy), 2004b, *Hanford Site Groundwater Strategy: Protection, Monitoring, and Remediation*, DOE/RL-2002-59, Richland Operations Office, Richland, Washington, February.

DOE (U.S. Department of Energy), 2004c, *Proposed Plan for Remediation of the 221-U Facility (Canyon Disposition Initiative)*, DOE/RL-2001-29, Rev. 0, Richland Operations Office, Richland, Washington, November.

DOE (U.S. Department of Energy), 2004d, *Hanford Communities*, Winter 2005 Newsletter, Vol. 11, 1st ed., Richland Operations Office, Richland, Washington.

DOE (U.S. Department of Energy), 2004e, *Final Feasibility Study for the Canyon Disposition Initiative (221-U Facility)*, DOE/RL-2001-11, Rev. 1, Richland Operations Office, Richland, Washington, November.

DOE (U.S. Department of Energy), 2005a, *Draft Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems*, DOE/EIS-0373D, Office of Nuclear Energy, Science and Technology, Washington, D.C., June.

DOE (U.S. Department of Energy), 2005b, *Hanford Site End State Vision*, DOE/RL-2005-57, Richland Operations Office, Richland, Washington, October.

DOE (U.S. Department of Energy), 2005c, *Surplus Reactor Final Disposition Engineering Evaluation*, DOE/RL-2005-45, Rev. 0, Richland Operations Office, Richland, Washington, August.

DOE (U.S. Department of Energy), 2005d, *Record of Decision, "221-U Facility (Canyon Disposition Initiative)," Hanford Site, Washington*, Richland Operations Office, Richland, Washington, October 3.

DOE (U.S. Department of Energy), 2006a, *CERCLA Five-Year Review Report for the Hanford Site*, DOE/RL-2006-20, Rev. 0, Richland Operations Office, Richland, Washington, May.

DOE (U.S. Department of Energy), 2006b, *Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test Facility (FFTF) Project, Hanford Site, Richland, Washington*, DOE/EA-1547F, Richland Operations Office, Richland, Washington, March.

DOE (U.S. Department of Energy), 2006c, *Finding of No Significant Impact, "Environmental Assessment, Sodium Residuals Reaction/Removal and Other Deactivation Work Activities, Fast Flux Test Facility (FFTF) Project, Hanford Site, Richland, Washington,"* Richland Operations Office, Richland, Washington, March 31.

DOE (U.S. Department of Energy), 2007a, *Environmental Assessment, Construction and Operation of a Physical Sciences Facility at Pacific Northwest National Laboratory, Richland, Washington*, DOE/EA-1562, Pacific Northwest Site Office, Richland, Washington, January.

DOE (U.S. Department of Energy), 2007b, *Finding of No Significant Impact for "Construction and Operation of a Physical Sciences Facility at the Pacific Northwest National Laboratory, Richland, Washington," DOE/EA-1562*, Office of Science, Pacific Northwest Site Office, Richland, Washington, January 29.

DOE (U.S. Department of Energy), 2008a, *Supplement Analysis, Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, DOE/EIS-0222-SA-01, Richland Operations Office, Richland, Washington, June.

DOE (U.S. Department of Energy), 2008b, *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement*, DOE/EIS-0236-S4, National Nuclear Security Administration, Washington, D.C., October.

DOE (U.S. Department of Energy), 2008c, *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico*, DOE/EIS-0380, National Nuclear Security Administration, Albuquerque, New Mexico, May.

DOE and BLM (U.S. Department of Energy and U.S. Department of the Interior, U.S. Bureau of Land Management), 2008, *Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States*, DOE/EIS-0386, November.

DOE and DOI (U.S. Department of Energy, Office of Public Affairs, Washington, D.C., and U.S. Department of the Interior, Office of Public Affairs, Washington, D.C.), 2008, "DOI Designates B Reactor at DOE's Hanford Site As a National Historic Landmark: DOE to Offer Regular Public Tours in 2009," August 25.

DOE and Ecology (U.S. Department of Energy, Richland Operations Office, Richland, Washington, and Washington State Department of Ecology, Olympia, Washington), 1996, *Tank Waste Remediation System, Hanford Site, Richland Washington, Final Environmental Impact Statement*, DOE/EIS-0189, August.

DOE, EPA, and Ecology (U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology), 2006, *River Corridor Closure Project, TPA Quarterly Review for Period: March 2006–May 2006*, Richland, Washington, June 15.

DOE, EPA, and Ecology (U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology), 2007, *River Corridor Closure Project, TPA Quarterly Review for Period: December 2006–February 2007*, Richland, Washington, March 15.

DOE and NYSERDA (U.S. Department of Energy and New York State Energy Research and Development Authority), 2008, *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, DOE/EIS-0226-D (Revised), West Valley, New York, November.

DOI (U.S. Department of the Interior), 1996, *Record of Decision, "Hanford Reach of the Columbia River Final Environmental Impact Statement for Comprehensive River Conservation Study,"* July 16.

DOI and Ecology (U.S. Department of Interior, Bureau of Reclamation, Pacific Northwest Region, Upper Columbia Area Office, Yakima, Washington and Washington State Department of Ecology, Yakima, Washington), 2008, *Draft Planning Report/Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study, Yakima Project, Washington*, Ecology Publication No. 07-11-044, January.

Dreyer, C., 2007, Klickitat County Planning, Goldendale, Washington, personal communication (email) to J. DiMarzio, Science Applications International Corporation, Germantown, Maryland, *"Klickitat County, Washington, Comprehensive Plan,"* November 9.

Ecology (Washington State Department of Ecology), 2006a, *Hazardous Sites List*, Publication No. 06-09-041QQ, Toxics Cleanup Program, Olympia, Washington, accessed through http://www.ecy.wa.gov/biblio/0609041qq.html, August 23.

Ecology (Washington State Department of Ecology), 2006b, *Determination of Non-significance*, Central Washington Biodiesel, LLC, Ellensburg, Washington, Central Regional Office, Yakima, Washington, July 5.

Ecology (Washington State Department of Ecology), 2006c, *Revised State Environmental Policy Act (SEPA) Mitigated Determination of Nonsignificance (MDNS) for the Proposed Columbia Ethanol Facility*, Industrial Section, Olympia, Washington, October 30.

Ecology (Washington State Department of Ecology), 2007a, *Final Programmatic Environmental Impact Statement for the Columbia River Water Management Program*, Ecology Publication No. 07-11-009, Olympia, Washington, February 15.

Ecology (Washington State Department of Ecology), 2007b *Mitigated Determination of Nonsignificance (MDNS)*, Washington Ethanol, LLC, Moses Lake, Washington, Eastern Regional Office, Spokane, Washington, February 9.

Ecology (Washington State Department of Ecology), 2008, *Supplemental Draft Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study*, Ecology Publication No. 07-11-044A, Yakima, Washington, December.

Ecology and WSDOH (Washington State Department of Ecology, Nuclear Waste Program, and Washington State Department of Health, Office of Radiation Protection), 2004, *Final Environmental Impact Statement for the Commercial Low-Level Radioactive Waste Disposal Site, Richland, Washington*, DOH Publication 320-031, Olympia, Washington, June 30.

Ecology, EPA, and DOE (Washington State Department of Ecology, Olympia, Washington; U.S. Environmental Protection Agency, Washington, D.C.; and U.S. Department of Energy, Richland, Washington), 1989, Hanford Federal Facility Agreement and Consent Order, 89-10, as amended, accessed through http://www.hanford.gov/tpa/tpahome.htm, May 15.

EFSEC (Energy Facility Site Evaluation Council), 2007, *Projects Under EFSEC Jurisdiction*, accessed through http://www.efsec.wa.gov/proj.shtml, January 10.

EFSEC (Energy Facility Site Evaluation Council), 2009, *Desert Claim Wind Power Project – Revised*, accessed through http://www.efsec.wa.gov/Desert%20Claim.shtml, February 6.

Energy Northwest, 2004, *2004 Annual Report*, accessed through http://www.energy-northwest.com.

Energy Northwest, 2006, *Columbia Generating Station 2005 Annual Radiological Environmental Operating Report*, Richland, Washington.

EPA (U.S. Environmental Protection Agency), 1999, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, EPA 315-R-99-002, Office of Federal Activities, Washington, D.C., May.

EPA (U.S. Environmental Protection Agency), 2006a, *National Priorities List Sites in Oregon*, accessed through http://www.epa.gov/superfund/sites/npl/or.htm, February 24.

EPA (U.S. Environmental Protection Agency), 2006b, *National Priorities List Sites in Washington*, accessed through http://www.epa.gov/superfund/sites/npl/wa.htm, April 25.

FERC (Federal Energy Regulatory Commission), 2006a, *Final Environmental Impact Statement, Priest Rapids Hydroelectric Project, Washington (FERC Project No. 2114)*, FERC/FEIS-0190F, Office of Energy Projects, Washington, D.C., November.

FERC (Federal Energy Regulatory Commission), 2006b, *Major Storage Projects on the Horizon As of December 19, 2006*, accessed through http://www.ferc.gov/for-citizens/projectsearch/Search Projects.aspx?Region=Northwest, December 19.

FERC (Federal Energy Regulatory Commission), 2007a, *Projects Near You*, accessed through http://www.ferc.gov/for-citizens/projectsearch/SearchProjects.aspx?Region=Northwest, January 9.

FERC (Federal Energy Regulatory Commission), 2007b, *Major Pipeline Projects on the Horizon (MMCf/d), January 2007*, accessed through http://www.ferc.gov/for-citizens/projectsearch/ SearchProjects.aspx?Region=Northwest, Office of Energy Projects, January 10.

FERC (Federal Energy Regulatory Commission), 2007c, *Existing and Proposed North American LNG Terminals*, accessed through http://www.ferc.gov/for-citizens/projectsearch/SearchProjects. aspx?Region=Northwest, January 8.

FERC (Federal Energy Regulatory Commission), 2008, *Public Utility District No. 2 of Grant County, Washington, Project No. 2114-116, Order Issuing New License*, April 17.

Fluor Hanford (Fluor Hanford, Inc.), 2004, *Plan for Central Plateau Closure*, CP-22319-DEL, Rev. 0, Richland, Washington, September.

Franklin County, 2005, *Franklin County Growth Management Comprehensive Plan*, Pasco, Washington, June 1.

Freedman, V.L., 2008, *Potential Impacts of Leakage from Black Rock Reservoir on the Hanford Site Unconfined Aquifer: Initial Hypothetical Simulations of Flow and Contaminant Transport*, PNNL-16272, Rev. 1, Pacific Northwest National Laboratory, Richland, Washington, January.

GCDCD (Grant County Department of Community Development), 1999, *Grant County Comprehensive Plan/Environmental Impact Statement*, Chapter 14, "Environmental Analysis," accessed through http://www.co.grant.wa.us/planning/LongRange/CompPlan/index.htm, October 11.

GCPD (Grant County Planning Department), 2007, *Mitigated Determination of Non-significance*, Liquafaction Corp., Moses Lake Ethanol Plant, Washington, File No. 07-4960, Ephrata, Washington.

Gouk, T., 2007, City of West Richland, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 11.

Grant County PUD (Grant County Public Utility District), 2003, *Priest Rapids Project License Application, FERC No. 2114, Executive Summary*, October.

Hilldale, R., and D. Mooney, 2007, *One-Dimensional Hydraulic Modeling of the Yakima Basin: A Component of Yakima River Basin Water Storage Feasibility Study, Washington*, Technical Series No. TS-YSS-14, U.S. Bureau of Reclamation, Pacific Northwest Region, Boise, Idaho, October.

Jennings, R., 2007, Planning Department, Umatilla County, Oregon, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions That Should be Considered in Evaluating Cumulative Impacts," June 8.

Kadlec (Kadlec Medical Center), 2008, *Kadlec River Pavilion Opens to Patients*, accessed through http://www.kadlecmed.org/about/eventarticle.php?id=129, September 19.

Kennewick (City of Kennewick), 2006, *City of Kennewick Comprehensive Plan 2006, Executive Document*, Kennewick, Washington.

Kittitas County, 2001, *Kittitas County Comprehensive Plan*, accessed through http://www.co.kittitas.wa.us/cds/compplan.asp, December.

Kittitas County, 2004, *Desert Claim Wind Power Project, Final Environmental Impact Statement, Kittitas County,* Community Development Services, Planning Division, Ellensburg, Washington, August.

Lamb, S., 2007, Adams County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 4.

Lilligren, S., 2007a, Environmental Restoration and Waste Management, Nez Perce Tribe, Lapwai, Idaho, personal communication (telephone conversation) with M. Burandt, U.S. Department of Energy, Office of River Protection, Richland, Washington, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," July 27.

Lilligren, S., 2007b, Nez Perce Tribe, Environmental Restoration and Waste Management, Lapwai, Idaho, personal communication (email) to M. Burandt, U.S. Department of Energy, Office of River Protection, Richland, Washington, "Large Scale Project Projections," July 31.

Lingley, W.S., 2005, *Background on Washington State's Petroleum Geology*, Washington State Department of Natural Resources, accessed through http://www.dnr.wa.gov/htdocs/sales_leasing/leasing/oilandgas/auction/index.html.

Liquafaction Corporation, 2007, *SEPA Checklist for the Moses Lake Ethanol Plant*, No. 07-4960-01, Redmond, Washington, October 12.

McCartney, K., 2007, U.S. Bureau of Reclamation, Upper Columbia Area Office, Yakima, Washington, personal communication (email) to J.A. DiMarzio, Science Applications International Corporation, Germantown, Maryland, "Yakima River Basin Water Storage Study," May 31.

McClane, C., 2007, Planning Department, Morrow County, Oregon, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 6.

Moravek (Moravek Biochemicals, Inc.), 2005, *Report on Compliance with the Clean Air Act Limits for Radionuclide Emissions from the Comply Code – VI.6*, Richland, Washington, January 4.

Navy (U.S. Department of the Navy), 1996, *Final Environmental Impact Statement on the Disposal of Decommissioned, Defueled Cruiser, OHIO Class, and LOS ANGELES Class Naval Reactor Plants*, DOE/EIS-0259, Bremerton, Washington, April.

Neitzel, D.A., ed., 2005, *Hanford Site National Environmental Policy Act (NEPA) Characterization*, PNNL-6415, Rev. 17, Pacific Northwest National Laboratory, Richland, Washington, September.

NPCC (Northwest Power and Conservation Council), 2006, *Power Plant Development in the Pacific Northwest*, accessed through http://www.nwcouncil.org/energy/powersupply/newprojects.xls, July 20.

NPS (National Park Service), 1994, *Hanford Reach of the Columbia River: Final River Conservation Study and Environmental Impact Statement*, Pacific Northwest Regional Office, Seattle, Washington, June.

NRC (U.S. Nuclear Regulatory Commission), 2004, *NRC Inspection Report No. 70-1257/2004-001*, February 23.

NRC (U.S. Nuclear Regulatory Commission), 2005, *NRC Inspection Report No. 70-1257/2005-002*, May 24.

Pacific Ecosolutions, 2007, *Annual Environmental Monitoring Report for 2006*, Richland, Washington, June 29.

Patterson, D., 2007, Public Services, Yakima County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 4.

PHMC (Project Hanford Management Contract), 2006a, *PHMC Performance Report*, Section A, "PHMC Contract Overview," DOE/RL-2000-76, Rev. 69, Richland, Washington, July.

PHMC (Project Hanford Management Contract), 2006b, *PHMC Performance Report*, Section A, "PHMC Contract Overview," DOE/RL-2000-76, Rev. 72, Richland, Washington, October.

Plummer, P., 2007, Washington State Department of Ecology, SEPA Unit, Olympia, Washington, personal communication (letter) to J.A. DiMarzio, Science Applications International Corporation, Germantown, Maryland, "Biofuel or Ethanol Production," November 28.

PNMP (Pacific Northwest Motorsports Park), 2007, "Groundbreaking for Pacific Northwest Motorsports Park Thursday, October 25th," accessed through http://www.pnwmotorsportspark.com/textfiles/MediaAlert071022.rtf, October 22.

PNNL (Pacific Northwest National Laboratory), 2007, "Construction Begins on Physical Sciences Facility Complex," *Pacific Northwest Technology Today*, Vol. 2, No. 8, accessed through http://regionaloutreach.pnl.gov/nwtechtoday/article.asp?id=73, September 27.

PNNL (Pacific Northwest National Laboratory), 2008, "PNNL to Break Ground on Two New Research Facilities," accessed through http://www.pnl.gov/news/release.asp?id=313, June 9.

Poston, T.M., R.W. Hanf, J.P. Duncan, and R.L. Dirkes, eds., 2007, *Hanford Site Environmental Report for Calendar Year 2006 (Including Some Early 2007 Information)*, PNNL-16623, Pacific Northwest National Laboratory, Richland, Washington, September.

PPM Energy, Inc., 2005, "PPM Announces 200 MW Big Horn Wind Project," accessed through http://www.ppmenergy.com/rel_05.10.28a.html, October 28.

Prentice, L., 2007, Planning Commission, Walla Walla County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 8.

Richland (City of Richland), 1998, *Final Environmental Impact Statement for Treatment of Low-Level Mixed Waste*, Richland, Washington, February.

Richland (City of Richland), 2002, *City of Richland Comprehensive Land Use Plan, Final*, December 10.

Richland (City of Richland), 2004, *Business and Economic Development Report*, Vol. VIII, No. 4, Fall 2004, Office of Business and Economic Development, Richland, Washington.

Richland (City of Richland), 2005a, *Preliminary Assessment of Redevelopment Potential for the Hanford 300 Area, Final Report*, Pasco, Washington, March.

Richland (City of Richland), 2005b, *City of Richland Comprehensive Land Use Plan*, accessed through http://www.ci.richland.wa.us/RICHLAND/planning/index.cfm?PageNum=11, December 6.

Richland (City of Richland), 2006, *Economic Development Status Report: Status as of June 30, 2006*, Office of Business and Economic Development, Richland, Washington.

Riggsbee, W., 2007, Environmental Restoration/Waste Management, Yakama Nation, Richland, Washington, personal communication (in person) with M. Burandt, U.S. Department of Energy, Office of River Protection, Richland, Washington, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," August 28.

RNP (Renewable Northwest Project), 2006, *Renewable Energy Projects Serving Northwest Load*, accessed through http://www.rnp.org/Projects/projectlist.php, October 10.

Rolph, J., 2007, City of Richland, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 8.

Romine, W., 2007, City of Kennewick, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 11.

SAIC (Science Applications International Corporation), 2007a, *Fast Flux Test Facility Alternatives, Scaled Data Sets to Support the "Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington,"* Germantown, Maryland.

SAIC (Science Applications International Corporation), 2007b, *"TC & WM EIS" Data Scaling Package, Cumulative Impacts, Retrievably Stored TRU Waste*, "Retrieval of Retrievably Stored TRU Waste from the Alpha Caissons," 6734-LLBG-001, Rev. 1, Germantown, Maryland, May 11.

Shuttleworth, M., 2007, Planning Department, Benton County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 7.

Smith, S., 2007, Klickitat County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," May 31.

The Reach, 2008, *Frequently Asked Questions*, accessed through http://visitthereach.org/faqs.html, September 19.

Torres, H., 2007, Planning Commission, Grant County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 1.

Trumbo, J., 2006, "CBC, Kadlec Team up for Health Sciences Center," *Tri-City Herald*, accessed through http://www.kadlecmed.org/about/eventarticle.php?id=90, September 24.

USACE (U.S. Army Corps of Engineers), 2006, *Upper Columbia Alternative Flood Control and Fish Operations, Columbia River Basin, Final Environmental Impact Statement*, Seattle District, Seattle, Washington, April.

USDA (U.S. Department of Agriculture), 2002, *2002 Census of Agricultural County Profile: Benton, Franklin, and Grant, Washington*, Washington Agricultural Statistics Service, Washington, D.C.

USDA (U.S. Department of Agriculture), 2003, *1997 Census of Agriculture, Highlights of Agriculture: 1997 and 1992, Washington*, accessed through http://www.nass.usda.gov/census/census97/highlights/wa/wa.htm, February 18.

USDA (U.S. Department of Agriculture), 2006, *The Conservation Reserve Program, 33rd Signup, County by County Summary*, Farm Service Agency, Washington, D.C., June.

US Ecology (US Ecology Washington, Inc.), 2007, *Annual Environmental Monitoring Report for Calendar Year 2006: US Ecology Washington Low-Level Radioactive Waste Disposal Facility*, Richland, Washington, May 25.

USFWS (U.S. Fish and Wildlife Service), 2008, *Hanford Reach National Monument Final Comprehensive Conservation Plan and Environmental Impact Statement, Adams, Benton, Grant and Franklin Counties, Washington*, Burbank, Washington, August.

Walla Walla County, 2007, *Walla Walla County Integrated Comprehensive Plan and EIS*, Vol. I, "Comprehensive Plan: Walla Walla County Comprehensive Plan Update 2007," Department of Community Development, Walla Walla, Washington, December.

Washington Ethanol, LLC, 2006, *SEPA Environmental Checklist, Washington Ethanol Plant, Moses Lake, Washington*, November 28.

WCH (Washington Closure Hanford), 2007, *River Corridor Closure Project, March 2007 Monthly Performance Report*, Richland, Washington, March.

WDFW (Washington Department of Fish and Wildlife), 2007, *Priority Habitats and Species*, accessed through http://www.wa.gov/hab/phehabs.htm, June 27.

WDNR (Washington State Department of Natural Resources), 2005, *Final Supplemental Environmental Impact Statement on the Oil and Gas Leasing Program for State Lands*, Olympia, Washington, July.

WDNR (Washington State Department of Natural Resources), 2006, *Directory of Washington State Surface Mining Reclamation Sites – 2006*, Open File Report 2006-1, Washington Division of Geology and Earth Resources, Olympia, Washington, May.

WDNR (Washington State Department of Natural Resources), 2007a, *Leasing Washington State-Owned Lands for Oil and Gas Exploration*, accessed through http://www.dnr.wa.gov/htdocs/sales_leasing/leasing/oilandgas/auction/index.html, November 13.

WDNR (Washington State Department of Natural Resources), 2007b, *Surface Mining Reclamation Program*, accessed through http://www.dnr.wa.gov/geology/smr.htm, October 19.

Wendt, G., 2007, Planning and Building Department, Franklin County, Washington, personal communication (telephone conversation) with S.D. Heiser, Science Applications International Corporation, Germantown, Maryland, "Current or Future Actions Occurring in the Region That Should be Considered in Evaluating Cumulative Impacts," June 8.

WFLHD (Western Federal Lands Highway Division), 2006, *Oregon Projects*, accessed through http://www.wfl.fhwa.dot.gov/projects/oregon.htm, December 14.

WFLHD (Western Federal Lands Highway Division), 2007, *Washington Projects*, accessed through http://www.wfl.fhwa.dot.gov/projects/washington.htm, January 4.

WIS (Washington Infrastructure Services), 2002, *Yakima River Storage Enhancement Initiative, Black Rock Reservoir Study, Final Report*, Bellevue, Washington, May.

WOFM (Washington State Office of Financial Management), 2007, *Population Density and Land Area by County*, accessed through http://www.ofm.wa.gov/popden, July 12.

WSDOT (Washington State Department of Transportation), 2006, *WSDOT Projects: Highway, Ferry and Rail Construction and Improvement Projects*, accessed through http://www.wsdot.wa.gov/Projects, September 15.

WSDOT (Washington State Department of Transportation), 2007, *Making Every Dollar Count for Benton County*, accessed through http://www.wsdot.wa.gov/accountability/2005GasTax/Benton/Default.htm, January 11.

WSDOT (Washington State Department of Transportation), 2009a, *Agency Projects: Completed Projects*, accessed through http://www.wsdot.wa.gov/Projects/completed.htm, February 17.

WSDOT (Washington State Department of Transportation), 2009b, *Agency Projects: Highway, Ferry and Rail Construction and Improvement Projects*, accessed through http://www.wsdot.wa.gov/projects/?s=county.funding.location.route, February 17.

WSTC (Washington State Transportation Commission), 2006, *Statewide Rail Capacity and System Needs Study: Task 2.1.A – Economic Growth and Demand*, Olympia, Washington, July.

WSU (Washington State University), 2007, *Biofuel Development in Washington*, Pacific Regional Biomass Energy Partnership, Extension Energy Program, Olympia, Washington, June 30.

WSU (Washington State University), 2008, *The BSEL Building Dedication Ceremony, Richland, Washington*, accessed through http://www.tricity.wsu.edu/bsel/opening.html, May 8.

WWCCDD (Walla Walla County Community Development Department), 2006, *Walla Walla County Mitigated Determination of Non-significance*, Gen-X Energy Group Biodiesel Production Facility, Burbank, Washington, No. 06-2627, Walla Walla, Washington, July 20.

Yakima County, 1998, *Plan 2015: A Blueprint for Yakima County Progress*, Yakima County Planning Department, Yakima, Washington, December 28.

Code of Federal Regulations

10 CFR 1021, U.S. Department of Energy, "National Environmental Policy Act Implementing Procedures."

40 CFR 1500–1508, Council on Environmental Quality, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act.

40 CFR 1502.2, Council on Environmental Quality, "Environmental Impact Statement: Implementation."

40 CFR 1508.7, Council on Environmental Quality, "Terminology and Index: Cumulative Impact."

Federal Register

58 FR 48509, U.S. Department of Energy, 1993, "Record of Decision; *Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, WA*," September 16.

61 FR 10736, U.S. Department of Energy, 1996, "Record of Decision: *Management of Spent Nuclear Fuel from the K Basins at the Hanford Site, Richland, WA*," March 15.

61 FR 41596, U.S. Department of Energy, 1996, "National Environmental Policy Act Record of Decision for the *Disposal of Decommissioned, Defueled Cruiser, Ohio Class, and Los Angeles Class Naval Reactor Plants*," August 9.

62 FR 3014, U.S. Department of Energy, 1997, "Record of Decision for the *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*," January 21.

63 FR 3624, U.S. Department of Energy, 1998, "Record of Decision for the Department of Energy's *Waste Isolation Pilot Plant Disposal Phase*," January 23.

63 FR 3629, U.S. Department of Energy, 1998, "Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," January 23.

63 FR 41810, U.S. Department of Energy, 1998, "Record of Decision for the Department of Energy's Waste Management Program: Treatment of Non-wastewater Hazardous Waste," August 5.

64 FR 46661, U.S. Department of Energy, 1999, "Record of Decision for the Department of Energy's Waste Management Program: Storage of High-Level Radioactive Waste," August 26.

64 FR 61615, U.S. Department of Energy, 1999, "Record of Decision: *Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)*," November 12.

64 FR 66928, U.S. Fish and Wildlife Service, 1999, Record of Decision, "Extension of the Saddle Mountain National Wildlife Refuge Acquisition Boundary," November 30.

65 FR 1608, U.S. Department of Energy, 2000, "Record of Decision for the *Surplus Plutonium Disposition Final Environmental Impact Statement*," January 11.

65 FR 10061, U.S. Department of Energy, 2000, "Record of Decision for the Department of Energy's Waste Management Program: Treatment and Disposal of Low-Level Waste and Mixed Low-Level Waste; Amendment of the Record of Decision for the Nevada Test Site," February 25.

65 FR 37253, Executive Office of the President, 2000, "Proclamation 7319 of June 9, 2000: Establishment of the Hanford Reach National Monument," June 13.

65 FR 56565, U.S. Department of Energy, 2000, "Record of Decision for the *Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*," September 19.

65 FR 82985, U.S. Department of Energy, 2000, "Revision to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," December 29.

66 FR 38646, U.S. Department of Energy, 2001, "Revision to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," July 25.

67 FR 56989, U.S. Department of Energy, 2002, "Revision to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," September 6.

68 FR 60342, U.S. Department of Energy, Bonneville Power Administration, 2003, Record of Decision, *"Plymouth Generating Facility,"* October 22.

69 FR 39446, U.S. Department of Energy, 2004, "Revision to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," June 30.

70 FR 10612, U.S. Department of Energy, Bonneville Power Administration, 2005, "Wanapa Energy Center; Notice of Availability of Record of Decision (ROD)," March 4.

70 FR 60508, U.S. Department of Energy, 2005, "Revision to the Record of Decision for the Department of Energy's Waste Management Program," October 18.

72 FR 40135, U.S. Department of Energy, 2007, "Notice of Intent to Prepare an *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste*," July 23.

72 FR 51807, U.S. Department of Energy, 2007, "Amended Record of Decision: Storage of Surplus Plutonium Materials at the Savannah River Site," September 11.

73 FR 12401, U.S. Department of Energy, 2008, "Amendment to the Record of Decision for the Department of Energy's Waste Management Program: Treatment and Storage of Transuranic Waste," March 7.

73 FR 55824, U.S. Department of Energy, 2008, "Amended Record of Decision for the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement*," September 26.

Revised Code of Washington

RCW 36.70A.020, "Growth Management – Planning by Selected Counties and Cities: Planning Goals."

RCW 78.44, "Surface Mining."

RCW 90.90, "Columbia River Basin Water Supply."

APPENDIX S
WASTE INVENTORIES FOR CUMULATIVE IMPACT ANALYSES

Integral to development of the inventory data set for the cumulative impact analyses presented in this *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* was identification of those waste sites potentially contributing to cumulative impacts on groundwater. Their identification involved two semi-independent, convergent processes: a Waste Information Data System Screen and a Technical Baseline Review.

S.1 WASTE INFORMATION DATA SYSTEM SCREEN

The Waste Information Data System (WIDS) Screen began with the universe of sites reflected in the *Hanford Site Waste Management Units Report* (Shearer 2005a), also referred to as the "WIDS database," and focused on the assignment of each site to one of two classes: (1) those sites that potentially contribute significantly to cumulative impacts and (2) those sites that are not expected to contribute significantly to cumulative impacts. The WIDS database is an environmental database specific to the Hanford Site (Hanford) and includes information on the waste sites identified at Hanford. The objectives of the WIDS screening process are presented in Table S–1.

Table S–1. Objectives of Waste Information Data System Screening

Objective 1	Identify all potential groundwater sources (radiological and chemical)
Objective 2	Confirm and screen out *de minimis* sources
Objective 3	Identify inventories and associated information (e.g., end states) for screened groundwater sources
Objective 4	Further screen sites remaining after completion of Objective 3 with risk/hazard analysis
Objective 5	Record the source by name, location, source type, and reference
Objective 6	Seek additional documentation from site owners

Overall strategy for the screening involved four steps:

1. Reviewing approximately 2,800 WIDS sites included in the *Hanford Site Waste Management Units Report* (Shearer 2005a)
2. Applying the screening rules as described below
3. Confirming the site locations using the Hanford Site Atlas (BHI 2001)
4. Performing quality assurance verifications of the sites that failed each round of screening and were therefore not included in the cumulative impact inventory data set

In preparation for the screening (step 2 above), various rules were specified for retaining sites as potentially significant contributors or for eliminating sites from consideration in cumulative impacts. Those rules and the assignment of site screen codes are described in the following sections.

S.1.2 Screen 1 Rules

Screen 1 involved reviewing all WIDS sites and asking the question: Is the site a potential source to include in the *Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington (TC & WM EIS)* cumulative impacts analysis?

If the answer to the question was "Yes," the site passed the Screen 1 test and was assigned a Screen 1 reason code as follows:

1. Known inventory + potential for release
2. Reported cleanup + possible residual contamination
3. Unknown inventory

If the answer to the question was "No," the site failed the Screen 1 test and was assigned a Screen 1 reason code as follows:

1. WIDS status for the site is rejected as a potential waste site and not reclassified as accepted for continued consideration in WIDS, plus the site is inactive and has a description consistent with the designated WIDS status.
2. Site is a duplicate site.
3. Site has been consolidated with another WIDS site; sources for the consolidated site become a part of the "parent" site.
4. Site is included in the *TC & WM EIS* alternatives. Facilities and equipment of the single-shell tank system are described in RPP-15043, *Single-Shell Tank System Description* (Field 2003).
5. Site is a satellite storage/accumulation site.

S.1.3 Screen 2 Rules

Screen 2 involved a review of all WIDS sites that passed the Screen 1 test, and further screening based on the WIDS classification system for sites as potential waste sites.

The WIDS site was assigned a "No" (fail) for Screen 2 for any of the following WIDS classifications. (There was an additional evaluation of all of these "No" sites to determine if the *TC & WM EIS* team was in agreement with the classification, and some "No" sites were changed to "Yes" sites regardless of the WIDS classification if the *TC & WM EIS* team believed the site required further consideration or the information was not clear for its classification.)

- Rejected
- Accepted, then reclassified as rejected
- Accepted, then reclassified as "No Action" or "Closed Out"

The WIDS site was assigned a "Yes" (pass) for Screen 2 for all "Accepted" classifications.

S.1.4 Screen 3 Rules

Screen 3 involved a review of all WIDS sites that passed the Screen 2 test and focused on the waste types. If the site met the criteria below under the Screen 3 rules it was rejected.

General Screen 3 rules for all waste types were as follows:

- Non-liquid-effluent areas previously identified as contaminated areas that are not currently posted as such are assumed to contain no active contamination and do not pass through Screen 3.
- If constituent $K_d > 10$, there was complete retention of the constituent in the vadose zone and the contamination was removed, consequently there was no release to the groundwater and the site does not pass through Screen 3.
- If the site is not a groundwater source, then the site does not pass through Screen 3. For example, if the site is an outfall to the river, within 100 meters (328 feet) of the river shoreline or within the river floodplain, then the site is not considered to be a source of groundwater contamination.
- If the release consists primarily of a petroleum product or polychlorinated biphenyls, then the site does not pass through Screen 3. Releases that contained polychlorinated biphenyls may continue for consideration if they are part of a large liquid release or solid disposal.

Screen 3 rules for each specific waste type are listed in Table S–2.

Table S–2. Screen 3 Rules of the Waste Information Data System for Specific Waste Types

Waste Type	Rule
Abandoned chemicals	No, if the quantities are laboratory or bench scale.
Abandoned pipe trench	No, if remediation is expected.
Animal waste	Yes, if the animals or animal byproducts were associated with radiological experiments or unknown.
Asbestos	No, if the only constituent of concern is asbestos; the site may contain demolition/building debris and miscellaneous trash.
Ash	No, if EP Toxicity Testing indicates it is nontoxic.
Barrels/drums/buckets/cans	No, if their content is clearly not associated with nuclear materials production/processing.
Batteries	No, if the site contains only batteries.
Building floor drains	No, if the building is clearly not associated with nuclear materials production/processing.
Bunker pipeline	No, if it is a petroleum carrying pipeline.
Burial ground	Yes, but only if it is the site of a process- or production-related release or unknown.
Chemicals	Yes, but only if their release was production-related or unknown.
Chemical release	Yes, but only if it was production-related or unknown.
Construction debris	Yes, if it contains radiological contaminants or unknown.
Contaminated ramp	Yes, if the contaminants are radiological or unknown.
Contaminated soil	Yes, if it contains radiological or chemical contaminants for which there is no remediation or unknown.
Contamination area	Yes, if it contains radiological or chemical contaminants for which there is no remediation; no, if it is clearly only surface contamination or unknown.
Control structure	Yes, if the contamination is radiological or unknown.
Demolition and inert waste	No, unless there is evidence of chemical or radiological production waste.
Drywell	No, unless there is evidence of chemical or radiological production waste.
Dumping area	No, unless there is evidence of chemical or radiological production waste.
Electric substation	No, if the content is only petroleum-based waste or PCBs.
Equipment	Yes, but only if it was used in a process- or production-related release or unknown.
Floodplain	No, if it is a large, diffused area within 100 meters (328 feet) of the river.
French drain	Yes, but only if it was used in a process- or production-related release or unknown.
Fuel tank	No, if the content is only petroleum-based waste or PCBs.
Honey dump station	Yes, but only if it is the site of a process- or production-related release or unknown.
Injection/reverse well	Yes, but only if it is the site of a process- or production-related release or unknown.
Maintenance garage	No, if it is only a petroleum-based waste site.
Military compound	Yes, but only if the site was used for a process- or production-related release or unknown.
Miscellaneous pipelines	Yes, but only if they were used for a process- or production-related release or unknown.
Miscellaneous trash and debris	Yes, but only if it is the result of a process- or production-related release or unknown.
Neutralization tank	Yes, but only if it is the site of a process- or production-related release or unknown.

Table S–2. Screen 3 Rules of the Waste Information Data System for SpecificWaste Types *(continued)*

Waste Type	Rule
Oil	No, if it is only petroleum-based waste or PCBs.
Ordnance	Yes, but only if it is the site of a process- or production-related release or unknown.
Process effluent	Yes, but only if it is the result of an untreated process- or production-related release or unknown; no, if the effluent was contained or treated.
Process sewer	Yes, but only if it is the site of an untreated process- or production-related release or unknown.
Product piping	Yes, but only if it is the site of an untreated process- or production-related release or unknown.
Rad site	Yes, but only if it is the site of an untreated process- or production-related release or unknown.
Reactor exhaust stack	Yes, but only if it is the site of an untreated process- or production-related release or unknown.
Sanitary sewer	Yes, if it is the site of an untreated process- or production-related release; yes, if it was used for the disposal of animals or animal byproducts associated with radiological experiments or unknown.
Septic tank	Yes, if it is the site of an untreated process- or production-related release; yes, if it was used for the disposal of animals or animal byproducts associated with radiological experiments or unknown.
Sludge	Yes, but only if it is the result of an untreated process- or production-related release or unknown.
Sodium storage facility	No, if it is an active regulated facility.
Soil	Yes, if it is the site of an untreated process- or production-related release; no, if only airborne contamination was involved or unknown.
Steam condensate	Yes, if it is the result of an untreated process- or production-related release or unknown.
Storage	Yes, if the site was used to store untreated process- or production-related waste or unknown.
Storage tank	Yes, if it was used to store untreated process- or production-related waste or unknown.
Stormwater runoff	No, unless it is chemically or radiologically contaminated or associated with a process- or production-related release.
Surface debris	Yes, if there is evidence of process- or production-related contamination or unknown.
Underground radioactive area	Yes, if it was the site of an untreated process- or production-related release or unknown.
Unplanned release	Yes, if it was an untreated process- or production-related release or unknown.
Vegetation	Yes, if it is the site of an untreated process- or production-related liquid release or unknown.
Waste storage	Yes, if the site was used to store untreated process- or production-related waste or unknown.
Water	Yes, if it is associated with an untreated process- or production-related liquid release or unknown.
Water treatment facility	Yes, if it is the site of an untreated process- or production-related liquid release or unknown.
Wood and coal debris	Yes, if there is evidence of process- or production-related contamination or unknown.

Key: EP=Extraction Procedure; PCB=polychlorinated biphenyls.

S.1.5 Screen 4 Rules

In addition to a review of the Waste Management Units Area document used for Screens 1 through 3, Screen 4 included review of an updated, more-detailed WIDS site description document (Shearer 2005b). Published Comprehensive Environmental Response, Compensation and Liability Act Records of Decision were also reviewed to determine the status of WIDS sites reviewed in Screen 4. Furthermore, the Composite Analyses Revision 0 inventory was reviewed to validate independent screening decisions.

Screen 4 involved an additional review of all WIDS sites that passed the Screen 3 test according to the following screening criteria. If the site met the criteria listed below under Screen 4 rules it was rejected.

- Facility-Specific Screen: The WIDS site is assigned a "No" (fail) if the facility associated with the release is not a process- or production-related facility. "Yes" (pass) is assigned to the WIDS site if the facility or original source is unknown.

- Minimum-Inventory Screen: The WIDS site is assigned a "No" (fail) if the inventory is identified and will be coded as noted below.

- For WIDS sites assigned a "No," one of the following Screen 4 codes is assigned. The *de minimis* criteria were selected by a team of subject matter experts using engineering judgment and groundwater modeling experience, the objective being to limit the WIDS sites to those that are likely to contribute significantly to the cumulative impact. Given the waste information available, each criterion is believed to be the limit at which the WIDS site would have a significant impact.

  - Updated information provided in new WIDS site description document (regulatory status does not drive the decision)
  - More specificity of process information (location/building/room)
  - *De minimis* contaminant quantity < 0.45 kilograms (1 pound) of chemicals
  - *De minimis* contaminant quantity < 1 curie of radionuclides
  - *De minimis* contaminant quantity < 379 liters (100 gallons)
  - *De minimis* contaminant quantity (dry, residual) < 50,000 disintegrations per minute of alpha, beta, gamma per gram

- For WIDS sites assigned a "Yes," one of the following Screen 4 codes is assigned.

  - Inventory information available in new WIDS description document
  - No inventory information available but may be available in other documentation
  - Reference to inventory available in new WIDS description document
  - No inventory information available and no inventory data are expected to be found
  - Permitted facility inventory to be provided by applicable documentation, e.g., facility waste acceptance criteria

The WIDS does not suffice for the analysis of cumulative impacts at Hanford. It is not a complete set of sites potentially contributing to cumulative impacts. Some Hanford facilities and some facilities not located on Hanford are not included in the WIDS. Equally important, the WIDS has little inventory data. Therefore, other sources of information about waste sites, such as Hanford technical baseline documents, were used to supplement the identification of sites potentially contributing significantly to cumulative impacts and to locate the waste inventory data for those sites. This process is described in Section S.2.

S.2 TECHNICAL BASELINE REVIEW

The Technical Baseline Review (TBR) was a systematic search of documents and databases to identify waste sites and inventory data. Documents describing facilities and waste sites in the Hanford operable units were collected. In addition to the technical baseline documents for the 100, 200, 300, 400, and 600 Areas at Hanford, offsite sources such as those described in the Environmental Data Resources, Inc., online database were reviewed. References to additional documents potentially containing inventory data for these waste sites were recorded, and the referenced documents were reviewed (SAIC 2006).

All sites in a technical baseline or similar source document were assigned to one of four categories (see Table S–3) based on the information in the TBR source documents. (Note: Waste sites included in the *TC & WM EIS* alternatives analysis were excluded from this review.)

Table S–3. Technical Baseline Review Categories

Category 1	Sites containing radiological or chemical COPCs above *de minimis* contamination levels
Category 2	Sites expected to contain a radiological or chemical COPC inventory above *de minimis* contamination levels, but without inventory information
Category 3	Sites for which process knowledge indicates a lack of contamination, or sites containing radiological or chemical COPCs below *de minimis* contamination levels
Category 4	Nonliquid waste sites where the contamination would be removed and therefore would not contribute to groundwater contamination

Key: COPC=constituent of potential concern.

This accounting of waste sites potentially contributing to cumulative impacts is independent of the WIDS Screen and serves as a check on the results of that screen for common sites. Combined, these two sets of sites (WIDS and TBR) are expected to include all known sites, with most sites common to the two sets. In addition to identifying waste sites not in the WIDS, the TBR identified reference documents for waste inventory data. It was also determined that the 1987 version of the WIDS (specifically, the *Hanford Site Waste Management Units Report*, known as the Cramer Report [DOE 1987]) could be used as a waste inventory reference in lieu of the more-recent WIDS because the more-recent version of WIDS did not include the detailed inventory data.

S.3 "MARRIAGE" OF WASTE INFORMATION DATA SYSTEM SCREEN AND TECHNICAL BASELINE REVIEW

To develop the inventory for the cumulative impacts analysis, the WIDS sites had to be combined with the TBR waste sites. This was accomplished by the development of Excel spreadsheets that document Site and Inventory information by site areas. This included a significant "data mining" effort.

Excel Workbooks includes two individual worksheets: Sites and Inventory. The elements of each are described in Tables S–4 and S–5. The columns in the "Sites" worksheet are explained in Table S–4.

The columns in the "Inventory" worksheet are described in Table S–5. It should be noted that there are uncertainties related to the contamination volumes and concentrations found in the available documents. Some of these uncertainties relate to the limited available data for many waste sites. More-detailed discussions on inventory uncertainties can be found in the documents used to develop the inventory worksheets described in Table S–5.

Table S–4. Content of Sites Worksheet of Excel Workbooks

Table Entry	Comment/Assumption[a]
Site Number	Sequential numbering system to provide an efficient index between the site list on the spreadsheets for each area and the site locations on the maps developed to graphically represent the waste sites.
Common Site Name	Taken from (1) the technical baseline documents (SAIC 2006), (2) the latest version of WIDS (Shearer 2005b), (3) the *Hanford Site Waste Management Units Report* (DOE 1987), known as the Cramer Report, or (4) some other source.
WIDS ID	Taken from the latest version of WIDS (Shearer 2005b).
Operable Unit	Taken from the latest version of WIDS (Shearer 2005b).
Site Type	Based on available descriptive information, site was assigned a site type (e.g., pond, crib, trench, ditch, burial ground, tank, septic tank, building, equipment, contaminated soil). Conflicting information was resolved through reliance on the latest version of WIDS (Shearer 2005b).
Source Type	Based on available descriptive information, source was assigned a type (i.e., liquid, solid, liquid/solid, N/A [not applicable], or UNK [unknown]).
Centroids (coordinates)	Taken from (1) the Hanford Site Atlas (BHI 2001) index, (2) the latest version of WIDS (Shearer 2005b), or (3) estimated from maps in the Hanford Site Atlas (BHI 2001).
Effective Area (bottom area [L×W] of feature) square feet	Taken from (1) the latest version of WIDS (Shearer 2005b), (2) the technical baseline documents (SAIC 2006), or (3) the Cramer Report (DOE 1987). If the Cramer Report was used for inventory data, it was also used for effective area.
Liquid Volume (volume of liquid released) liters	If inventory is found, then it is taken from that reference. Otherwise, liquid volume is taken from (1) the *Hanford Soil Inventory Model, Rev. 1* (Corbin et al. 2005), (2) *Radionuclide Inventories of Liquid Waste Disposal Sites on the Hanford Site* (Diediker 1999), (3) the Cramer Report (DOE 1987), (4) the latest version of WIDS (Shearer 2005b), or (5) the technical baseline documents (SAIC 2006).
Solid Volume, Solid Mass (volume or mass of waste) cubic meters or kilograms	Generally, these entries were only used for burial grounds. If inventory is found, then it is taken from that reference. Otherwise, it is taken from (1) the latest version of WIDS (Shearer 2005b), (2) the Cramer Report (DOE 1987), or (3) the technical baseline documents (SAIC 2006).
Decay Date	If radionuclide inventory is found, then it is taken from that reference.
Start/Stop Dates (year unit started and stopped operation or started and stopped receiving waste)	If inventory is found, then it is taken from that reference. Otherwise, it is taken from (1) the latest version of WIDS (Shearer 2005b), (2) the technical baseline documents (SAIC 2006), or (3) the Cramer Report (DOE 1987).
Status (current status including important cleanup and closure milestones)	Taken from (1) the latest version of WIDS (Shearer 2005b), (2) the technical baseline documents (SAIC 2006), or (3) the Cramer Report (DOE 1987).
End State, Barrier Type, Completion Date	For the 200 Areas, it is taken from the *Plan for Central Plateau Closure* (Fluor Hanford 2004). For other areas, it is taken from applicable cleanup (1) RODs, (2) closure plans, and (3) other documents.
Comments to Analysts	References and page numbers are provided. Important comments are also noted.
Comparison to WIDS	If differences were found between the results of the WIDS screening and the results of the TBR, they were resolved and noted.
References	References for each area are included at the bottom of the Sites worksheet.

[a] Numerical listings of source documents are in order of priority.

Key: ROD=Record of Decision; TBR=Technical Baseline Review; WIDS=Waste Information Data System.

Table S–5. Content of Inventory Worksheet of Excel Workbooks

Table Entry	Comment/Assumption[a]
Site Number	Sequential numbering system to provide an efficient index between the site list on the spreadsheets for each area and the site locations on the maps developed to graphically represent the waste sites.
Common Site Name	Taken from (1) the technical baseline documents (SAIC 2006), (2) the latest version of WIDS (Shearer 2005b), (3) the *Hanford Site Waste Management Units Report*, known as the Cramer Report (DOE 1987), or (4) some other source.
WIDS ID	Taken from the latest version of WIDS.
Radionuclides[b]	Liquid release inventories taken from (1) *Hanford Soil Inventory Model, Rev. 1* (Corbin et al. 2005), (2) *Radionuclide Inventories of Liquid Waste Disposal Sites on the Hanford Site* (Diediker 1999), (3) the Cramer Report (DOE 1987), (4) the technical baseline documents (SAIC 2006), (5) the latest version of WIDS (Shearer 2005b), or (6) other sources. Solid waste inventories taken from (1) *Summary of Radioactive Solid Waste Received in the 200 Areas During Calendar Year 1995* (Anderson and Hagel 1996) or other site-specific solid waste references, (2) the Cramer Report (DOE 1987), (3) technical baseline documents (SAIC 2006), (4) the latest version of WIDS (Shearer 2005b), or (5) other sources.
Chemicals[c]	Liquid release inventories taken from (1) *Hanford Soil Inventory Model, Rev.1*, (2) the Cramer Report (DOE 1987), (3) technical baseline documents (SAIC 2006), (4) the latest version of WIDS (Shearer 2005b), or (5) other sources. Solid waste inventories taken from (1) site-specific solid waste references, (2) the Cramer Report (DOE 1987), (3) the technical baseline documents (SAIC 2006), (4) the latest version of WIDS (Shearer 2005b), or (5) other sources.
Comments	Important comments regarding the inventories are noted.

[a] Numerical listings of source documents are in order of priority.

[b] Curies of radionuclides (half-life > 10 years and inventory greater than 1 curie [cumulative or individual]).

[c] Kilograms of chemicals (inventory greater than 0.45 kilograms (1 pound) of chemicals that have MCLs or a health-based ingestion standard in IRIS, and compounds that have constituents with MCLs or a health-based ingestion standard in IRIS).

Key: IRIS=Integrated Risk Information System maintained by the U.S. Environmental Protection Agency; MCL=maximum contaminant level; WIDS=Waste Information Data System.

Combining the WIDS Screening results and the TBR results requires resolving any conflicts between the two independent screening processes. The WIDS screening sites were compared to the TBR sites and the differences were reviewed and reconciled. For example, during the "marriage" of the two processes, TBR sites were reclassified from sites having inventories with a potential to contribute significantly to cumulative impacts to sites that are not expected to contribute significantly to cumulative impacts if the only contamination present or released from the site was radionuclides with half-lives less than 10 years, such as cobalt-60 (half-life 5.27 years).

S.3.1 End-State Approach

End-state analysis included the review of applicable documents and consultation with the U.S. Department of Energy's (DOE's) Office of River Protection (ORP) and Richland Operations Office (RL). The end states for all waste sites were reviewed and concurred upon by each responsible ORP and DOE-RL manager to ensure accuracy and completeness. The approach for determining which end state to use for each waste site followed specific guidelines. The guidelines for selecting an end state were based on the following broad criteria:

- The end state should represent a reasonably foreseeable outcome for a particular facility or group of facilities. The implementing approach should not assume excessive research and development or relying on undeveloped technology.
- The end state should comply with current regulations and agreements where applicable, based on the following hierarchy:
  - Environmental documents submitted to or approved by regulatory agencies (e.g., remedial investigations/feasibility studies, interim records of decision, Resource Conservation and Recovery Act closure plans) (SAIC 2006)
  - Milestones stipulated in the Hanford Federal Facility Agreement and Consent Order (also known as the Tri-Party Agreement) (Ecology, EPA, and DOE 1989)
  - Outcomes defined by Requests for Proposal or Contracts (e.g., river corridor)
  - Planning documents (e.g., *Plan for Central Plateau Closure* [Fluor Hanford 2004])
- End states should represent a consistent application of DOE policies and procedures. Exceptions have to be documented to support a reason for a policy change.
- If a different end state is proposed than those identified above, the end states must be in a publicly available, referenced document.

The end states identified using the approach described above are current through October 2006 when the cumulative impact groundwater inventory was completed. Since that time, additional or different decisions on end states may have been made and it is quite possible that other decisions may be made as DOE progresses through the closure and cleanup process at Hanford. However, to complete the groundwater analysis for cumulative impacts in the *Draft TC & WM EIS*, a cutoff date had to be determined.

S.3.2 Independent Review and Verification (Quality Assurance) Process

Following each step of the cumulative impact inventory development process (i.e., screening steps 1, 2, 3, and 4, and the "marriage" of the WIDS Screen and the TBR), an independent quality assurance review was conducted. These independent quality assurance reviews were conducted to ensure data accuracy and integrity. This included verification that the data are traceable to the source document, and verification of radionuclide and chemical inventory values. These reviews also verified that the inventory development process was consistently applied in the preparation of the Excel Sites and Inventory worksheets for each Hanford area.

S.3.3 Emerging Data

As new and emerging data were identified, the Excel Workbooks' Sites and Inventory worksheets were revised and updated as necessary. For example, the latest version of SIM [the Hanford Soil Inventory Model] (Corbin et al. 2005) was obtained and reviewed to determine applicability. The updated data from this document were incorporated into the Sites and Inventory worksheets. This included adding individual worksheets for each waste site provided by Revision 1 of SIM. The cutoff date for revisions or updates to the inventory database was October 2006.

S.3.4 Results of Initial Screening

Based on the screening approach discussed above, over 2,300 sites and sources were documented. These sites were identified for 18 geographical areas. Of this total, 383 sites were identified as sites with referenceable inventories containing radiological or chemical constituents of potential concern (COPCs) above *de minimis* contamination levels. Approximately 403 sites were identified as sites expected to contain a radiological or chemical COPC inventory above *de minimis*, but no referenceable inventory information was available. A total of 1,429 sites were identified as sites for which process knowledge indicates a lack of contamination, or sites containing radiological or chemical COPCs below *de minimis* contamination levels as defined in the Screen 4 Rule; and approximately 106 nonliquid waste sites where the contamination would be removed and thus would not contribute to groundwater contamination.

S.3.5 Analysis of Sites with Missing Inventory

As previously discussed, the cumulative impacts analysis inventory looked at a total of 2,321 sites. The 403 sites identified as having unknown inventory expected to contain radiological or chemical COPCs represent about 17 percent of the total. The remainder, 1,918 sites, or 83 percent of the total, have known inventory. The percentage of sites with unknown inventory varies by area as shown in Table S–6.

Table S–6. Unknown-Inventory Sites per Area at the Hanford Site

Area	Total Sites	Unknown-Inventory Sites	Percent Unknown-Inventory Sites
100 Areas	808	132	16
200 Areas	957	194	20
300 Area	440	66	15
400 Area	76	1	1
Permitted facilities	2	0	0
Other sites	38	10	26
Total	**2,321**	**403**	**17**

In the core of the production area at Hanford (100, 200, and 300 Areas), characterization is most advanced for the 100 and 300 Areas. Therefore, the 100 and 300 Areas have corresponding lower percentages of unknown-inventory sites.

The simplest inference that can be drawn from these initial observations is that the cumulative impacts analysis inventory might be about 17 percent low because data are missing for about 17 percent of the sites. This inference is based on the assumption that each of the sites with unknown inventory actually has inventory equal to the average of the sites with known inventory.

The cumulative impacts analysis inventory additionally categorized the sites with known inventory into three groups:

1. Sites with inventories that would be released into the environment at their original disposal locations

2. Sites with inventories that would be removed, treated, and disposed of in permitted facilities
3. Sites with inventories that are essentially zero (*de minimis*)

Another assumption is that the sites with unknown inventory behave similarly (statistically) to the sites with known inventory (this assumption is examined in more detail below). The COPCs at 293 sites with known inventories are not negligible and based on the end-state information would not be removed, treated, and disposed of in permitted facilities. These sites represent about 15 percent of the 1,918 sites with known inventory. If the sites with unknown inventory have a similar COPC population to the sites with known inventory, then we might expect that about 15 percent of the 403 sites with unknown inventory, or about 65 sites, actually contain non-negligible amounts of inventory that will be released to the environment outside of permitted facilities. The missing inventory (estimated to be about 17 percent of the total inventory) might be contained in only 15 percent of the sites with unknown inventory. This observation suggests that it might be useful to examine the sites with unknown inventory individually to try to identify the 15 percent of the unknown-inventory sites that are significant to the total inventory.

To follow this thought, a third analysis of the sites with unknown inventory was performed to evaluate their significance. A weight-of-evidence approach was used by reviewing the WIDS description (and technical baseline documents where necessary) to categorize the unknown-inventory sites into three groups:

1. Sites that most likely have significant inventory
2. Sites that most likely have insignificant inventory
3. Sites where no judgment of significance could be made

As shown in Figures S–1 through S–3, the 200-B Area has a rather high percentage of unknown-inventory sites and was selected as an area in which to evaluate the utility of the weight-of-evidence approach. Three independent teams performed this evaluation. The independent teams each reviewed the 37 sites with unknown inventory in the 200-B Area.

All three teams concluded that the missing inventory is probably not spread evenly over the 37 sites with unknown inventory in the 200-B Area. The teams concluded that the unknown-inventory sites likely had a higher proportion of significant sites than the 15 percent observed in the known inventory population. A conservative estimate is that the percentage of unknown-inventory sites that are most likely to be significant in the 200-B Area is about 50 percent. This suggests that about half of the 403 unknown-inventory sites in the total population, about 202, are most likely to be insignificant to the analysis if the other areas are similar to the 200-B Area. The missing inventory is currently estimated to be 17 percent of the known inventory.

The significance of the missing inventory should be considered in the context of the inventory for the alternatives impacts analysis. If the inventory for the cumulative impacts analysis is smaller than that for the alternatives impacts analysis, then we would expect that uncertainties in the sum of both inventories would be dominated by uncertainties in the alternatives impacts analysis. Similarly, if the inventory for the cumulative impacts analysis is larger than that for the alternatives impacts analysis, then we would expect that uncertainties in the sum of both inventories would be dominated by uncertainties in the cumulative impacts analysis. If the uncertainties in the two inventories are of the same order of magnitude, then uncertainties in both inventories contribute to the overall uncertainty.

Reflected in Table S–7 is the relative uncertainty of the two inventories. For example, technetium-99 has an alternatives inventory of 29,700 curies in tanks (DOE 2003), 312 curies in past leaks (CH2M HILL 2002; Jones et al. 2000, 2001; Myers 2005; Wood and Jones 2003; Wood et al. 2003), and 142 curies disposed of in cribs and trenches (ditches) (Corbin et al. 2005), for a total of 30,154 curies. The spreadsheets of the October 2006, Revision 4, Cumulative Impact Analysis reflect a cumulative

inventory of 762 curies for technetium-99 (SAIC 2006). Thus, we expect missing inventory because data incompleteness in the cumulative inventory of about 17 percent would be dominated by uncertainty in the alternatives inventory. It can be concluded that the effects of potentially missing inventory in the cumulative impacts inventory would not be an important factor in evaluating the sum of the alternatives and cumulative inventories.

Table S–7. Uncertainty of Alternatives and Cumulative Radionuclide and Chemical Inventories at the Hanford Site

Constituent	Alternatives Inventory[a]	Known Cumulative Inventory[b]	Uncertainties Dominating Overall Uncertainty
Technetium-99	30,200	762	Alternatives inventory
Iodine-129	49	25	Alternatives inventory
Uranium-238	964	3,220	Cumulative inventory
Strontium-90	50,900,000	2,100,000	Alternatives inventory
Cesium-137	47,100,000	2,430,000	Alternatives inventory
Hydrogen-3 (tritium)	19,700	1,500,000	Cumulative inventory
Carbon-14	3,180	43,500	Cumulative inventory

[a] CH2M HILL 2002; Corbin et al. 2005; DOE 2003; Field 2003; Jones et al. 2000, 2001; Myers 2005; Wood and Jones 2003; Wood et al. 2003.

[b] SAIC 2006.

Similarly, these data suggest that missing inventory in the cumulative impacts analysis because of data incompleteness for strontium-90 and cesium-137 is not a driver of the uncertainty in the total inventory for the same reasons given above for technetium-99.

For iodine-129, missing cumulative impacts analysis inventory is probably a minor issue. The Inventory Data Package suggested that the uncertainty in the iodine-129 inventory (49 curies) for the alternatives impacts analysis is ± 21 curies. This suggests that the inventory for the alternatives impacts analysis will be between 28 curies and 70 curies. The October 2, 2006, spreadsheets show an inventory for the cumulative impacts analysis of 25 curies for iodine-129, and our inference is that 17 percent of that inventory (about 4 curies) may be missing because of data incompleteness. The expected value for the total inventory is about 74 curies, with an uncertainty of ± 21 curies in the portion of the inventory reflected in the alternatives impacts analysis, and an estimated 4 curies missing because of data incompleteness. The uncertainty of the iodine-129 inventory in the alternatives impacts analysis is thus five times greater than that in the cumulative impacts analysis.

For uranium-238, hydrogen-3 (tritium), and carbon-14, missing inventory plays a potentially important role in the uncertainty of the total inventory.

Presented as Figures S–1, S–2, and S–3 are the proportions of known and unknown inventory for the various areas, sites, and facilities at Hanford. The figures suggest rather even proportions of unknown inventory for the subareas of the 100 Areas (see Figure S–1). Those proportions are more variable, however, within the 200 Areas (see Figure S–2); unknown inventory is proportionally high for the B, PUREX, S, T, and U Areas relative to that for B Pond, Gable North, 2 Area, and the Nonradioactive Dangerous Waste Landfill (NRDWL). Substantial disparity in the proportion of unknown inventory is evident for the other Hanford areas, sites, and facilities (see Figure S–3).

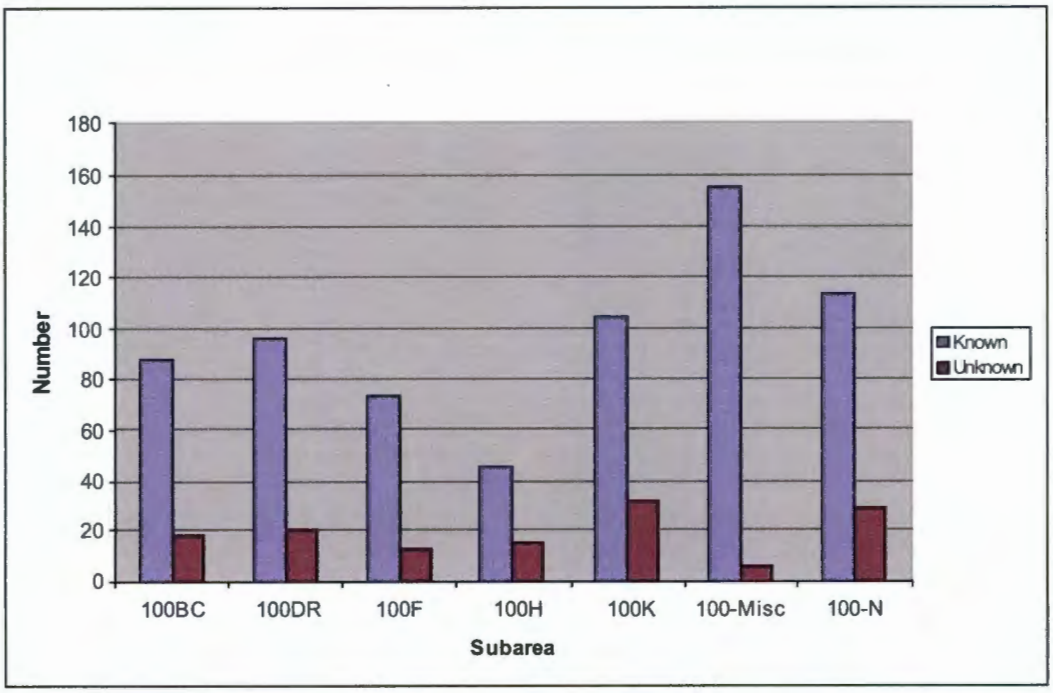


Figure S–1. Known and Unknown Inventory in 100 Area Sites at Hanford

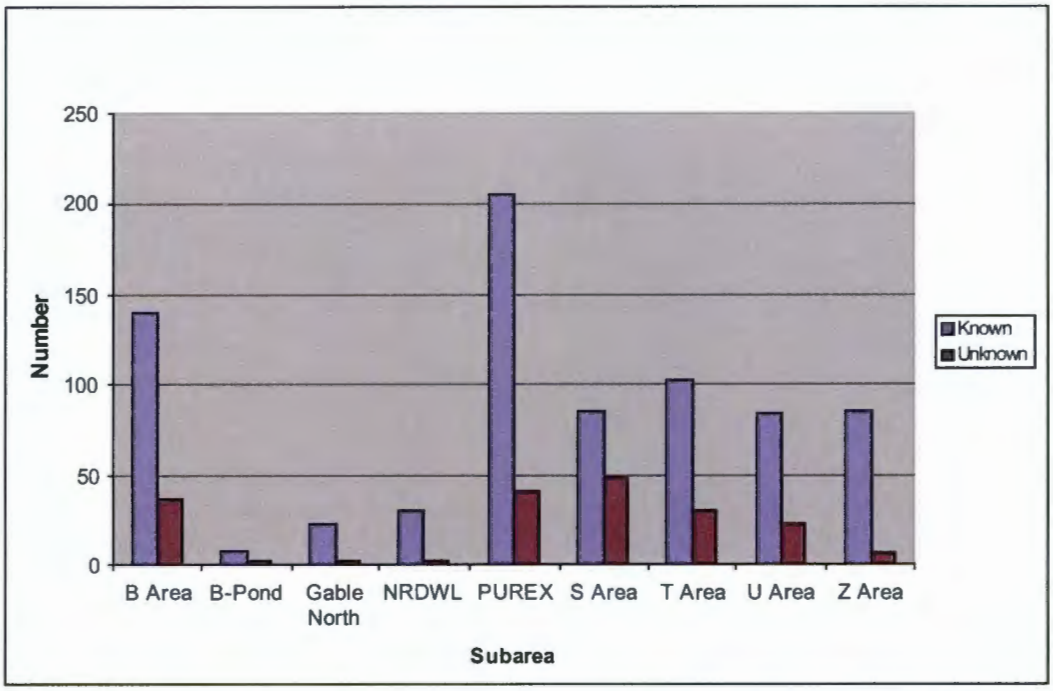


Figure S–2. Known and Unknown Inventory in 200 Area Sites at Hanford

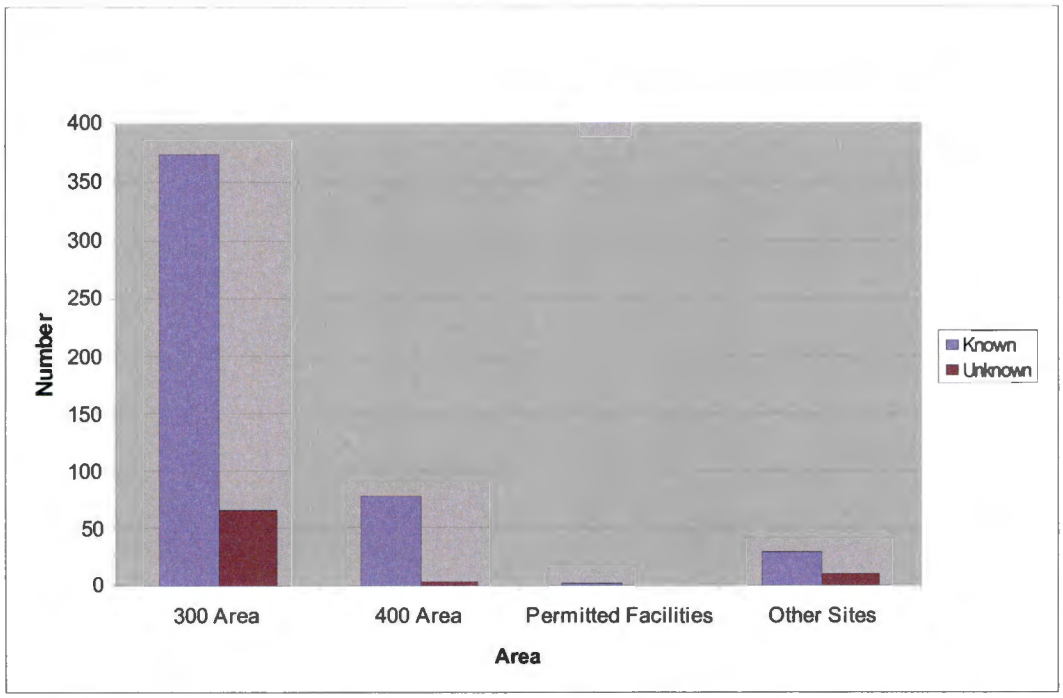


Figure S–3. Known and Unknown Inventory in 300 Area, 400 Area, Permitted Facilities, and Other Sites at Hanford

S.3.6 Determination of Final Inventory Used for Cumulative Analysis

The initial list of radionuclides included those with half-lives greater than 10 years, and the initial list of chemicals included those with a health risk from ingestion—that is, they have maximum contaminant levels or are listed in the Integrated Risk Information System as having health-based ingestion standards. Not all the radionuclides and chemical constituents on the initial list are important in exposure scenarios used to assess cumulative impacts in this *TC & WM EIS*. Therefore, to focus attention on constituents that control impacts, an additional screening analysis was performed. The primary focus of that analysis was to consider groundwater release scenarios for cumulative impact analysis sources and to ensure consistency with the screening done for the alternative analysis, allowing for cumulative impacts to be added to the alternative impacts. For radionuclides, only groundwater consumption was considered, release was assumed to be partition-limited, and decay during transport was considered. For purposes of the analysis, estimation of relative impacts was based on the distribution of radionuclides in the cumulative impacts inventory. Radionuclides contributing less than 1 percent of impacts under well scenarios were eliminated from the detailed analysis. To screen for hazardous chemicals, reported chemical inventories for the cumulative impact sites were compared with health-based limits. Chemicals present in the inventories at levels above health-based limits were selected for detailed analysis. As indicated in Table S–8, the screening resulted in reduction of the original set of radionuclides and chemical constituents to a final set of 14 radionuclides and 26 chemical constituents, which include those constituents also identified for the alternative impact analysis. The final list of cumulative impact waste inventories, waste sites, and end states was provided to DOE-RL and ORP responsible managers for review and concurrence to ensure accuracy and completeness.

Table S–8. Radionuclide and Chemical Constituents

Radionuclides	Chemicals	
Hydrogen-3 (tritium)	1,2-Dichloroethane	Lead
Carbon-14	1,4-Dioxane	Manganese
Potassium-40	1-Butanol	Mercury
Strontium-90	2,4,6-Trichlorophenol	Molybdenum
Zirconium-93	Acetonitrile	Nickel (soluble salts)
Technetium-99	Arsenic, inorganic	Nitrate
Iodine-129	Benzene	Polychlorinated biphenyls
Cesium-137	Boron and compounds	Silver
Gadolinium-152	Cadmium	Strontium (stable)
Thorium-232	Carbon tetrachloride	Total uranium
Uranium isotopes (includes uranium-233, -234, -235, -238)	Chromium[a]	Trichloroethylene
Neptunium-237	Dichloromethane	Vinyl chloride
Plutonium isotopes (includes plutonium-239, -240)	Fluoride	
Americium-241	Hydrazine/hydrazine sulfate	

[a] For purposes of long-term impacts, it was assumed that this is hexavalent chromium.

Locations of the sites of the WIDS screening and TBR are depicted in the maps provided as Figures S–4 through S–30. The final results of the WIDS screening, the TBR, the marriage of these two approaches, and the additional screening process are provided in Tables S–9 through S–34. The radionuclide inventories for the sites listed in these tables are provided in Tables S–35 through S–60 and the chemical inventories, in Tables S–61 through S–86.

As discussed in Chapter 1, DOE is preparing the *Environmental Impact Statement for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste (GTCC EIS)*, DOE/EIS-0375 (72 FR 40135), addressing the disposal of low-level radioactive waste (LLW) generated by activities licensed by the U.S. Nuclear Regulatory Commission or an Agreement State and containing radionuclides in concentrations exceeding 10 CFR 61 Class C limits. The *GTCC EIS* would also consider DOE LLW and transuranic waste having characteristics similar to greater-than-Class C (GTCC) LLW and possibly no identified path to disposal.

Hanford is being considered as a candidate location for a new GTCC waste disposal facility in the *GTCC EIS*. Such a facility is not expected to be operational until after 2013. In addition, DOE estimates there is about 11,000 cubic meters (388,000 cubic feet) of GTCC LLW and similar DOE waste (Joyce 2009) already in storage or projected to be generated from facilities in operation or that could result from proposals being analyzed in other National Environmental Policy Act (NEPA) reviews, including the *Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, DOE/EIS-0226-D (Revised) (DOE and NYSERDA 2008), and the *Environmental Impact Statement for the Proposed Consolidation of Nuclear Operations Related to Production of Radioisotope Power Systems*, DOE/EIS-0373 (69 FR 67139).

If Hanford were selected to host a GTCC disposal facility pursuant to the *GTCC EIS*, DOE would conduct an appropriate project-specific NEPA review, including a cumulative impacts analysis. These offsite inventories were not included in the groundwater analysis for this *TC & WM EIS* because the *Draft GTCC EIS* is still under development.

Figure S–4. Alternative and Cumulative Sites Index Map

Figure S–5. Map 1: Cumulative Sites in the 100-BC Area

Figure S–6. Map 2: Cumulative Sites in the 100-K Area

Figure S–7. Map 3: Cumulative Sites in the 100-N Area

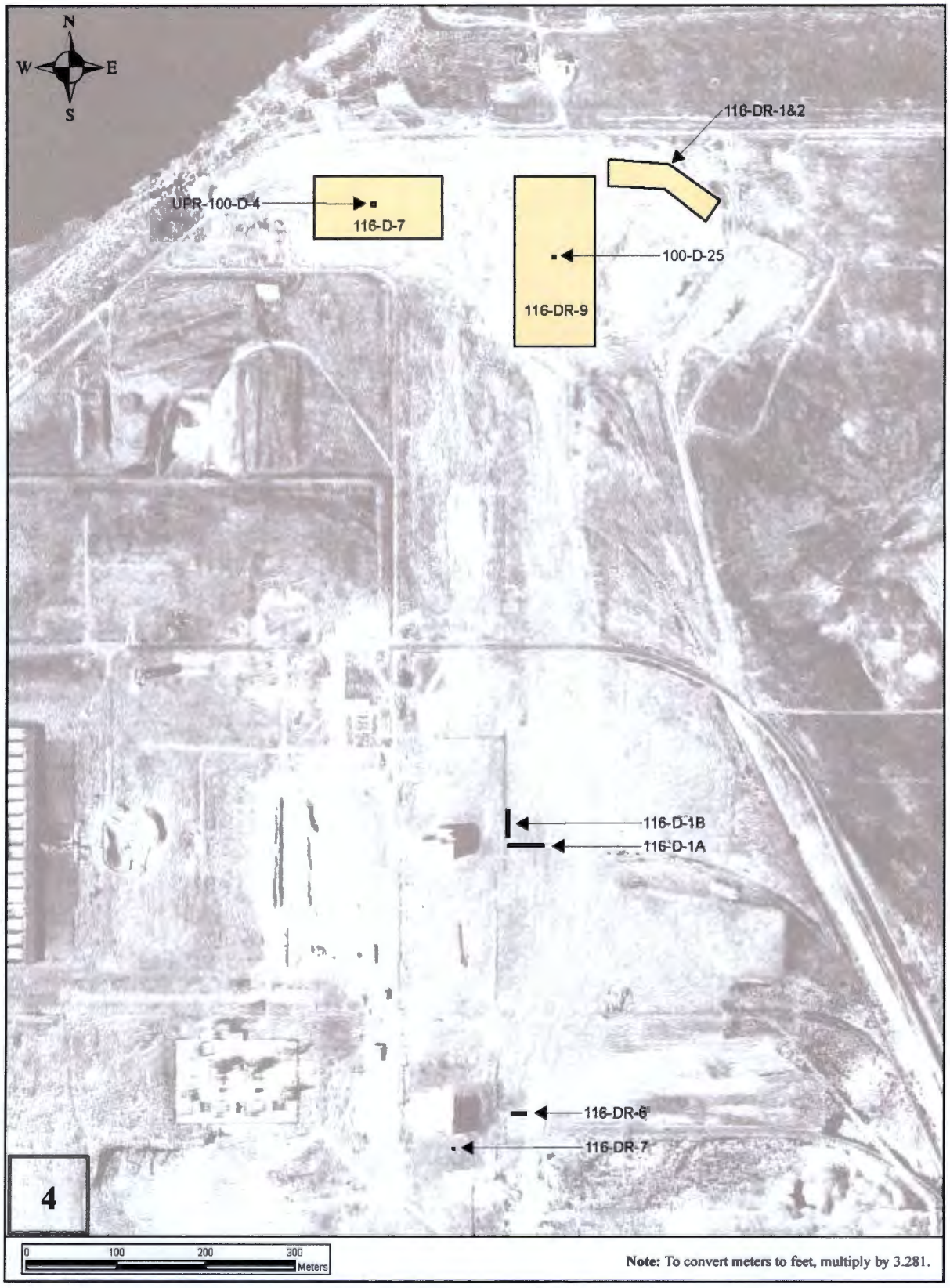


Figure S–8. Map 4: Cumulative Sites in the 100-D Area

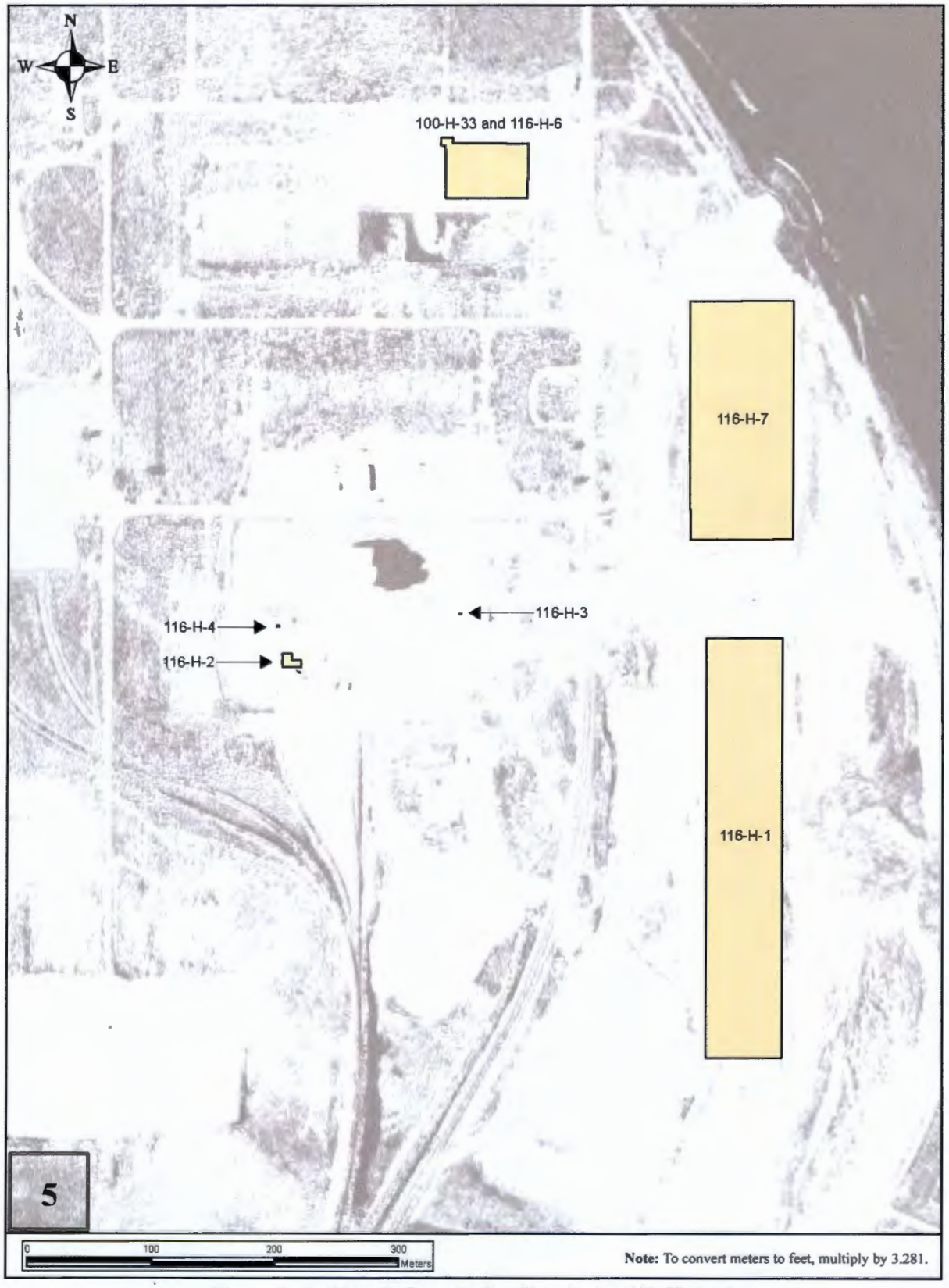


Figure S–9. Map 5: Cumulative Sites in the 100-H Area

Figure S–10. Map 6: Cumulative Sites in the 100-F Area

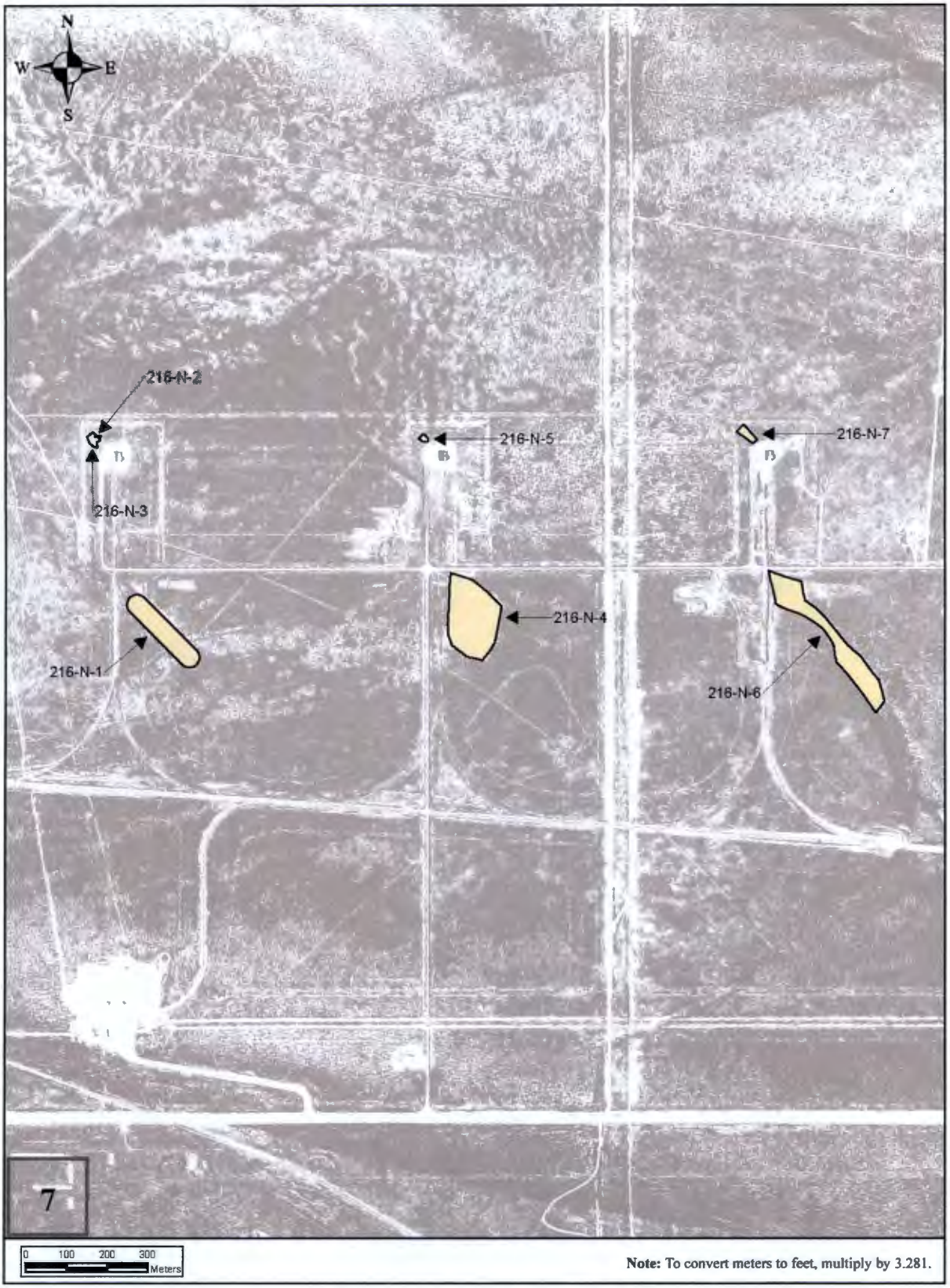


Figure S–11. Map 7: Cumulative Sites in the 216-N Area

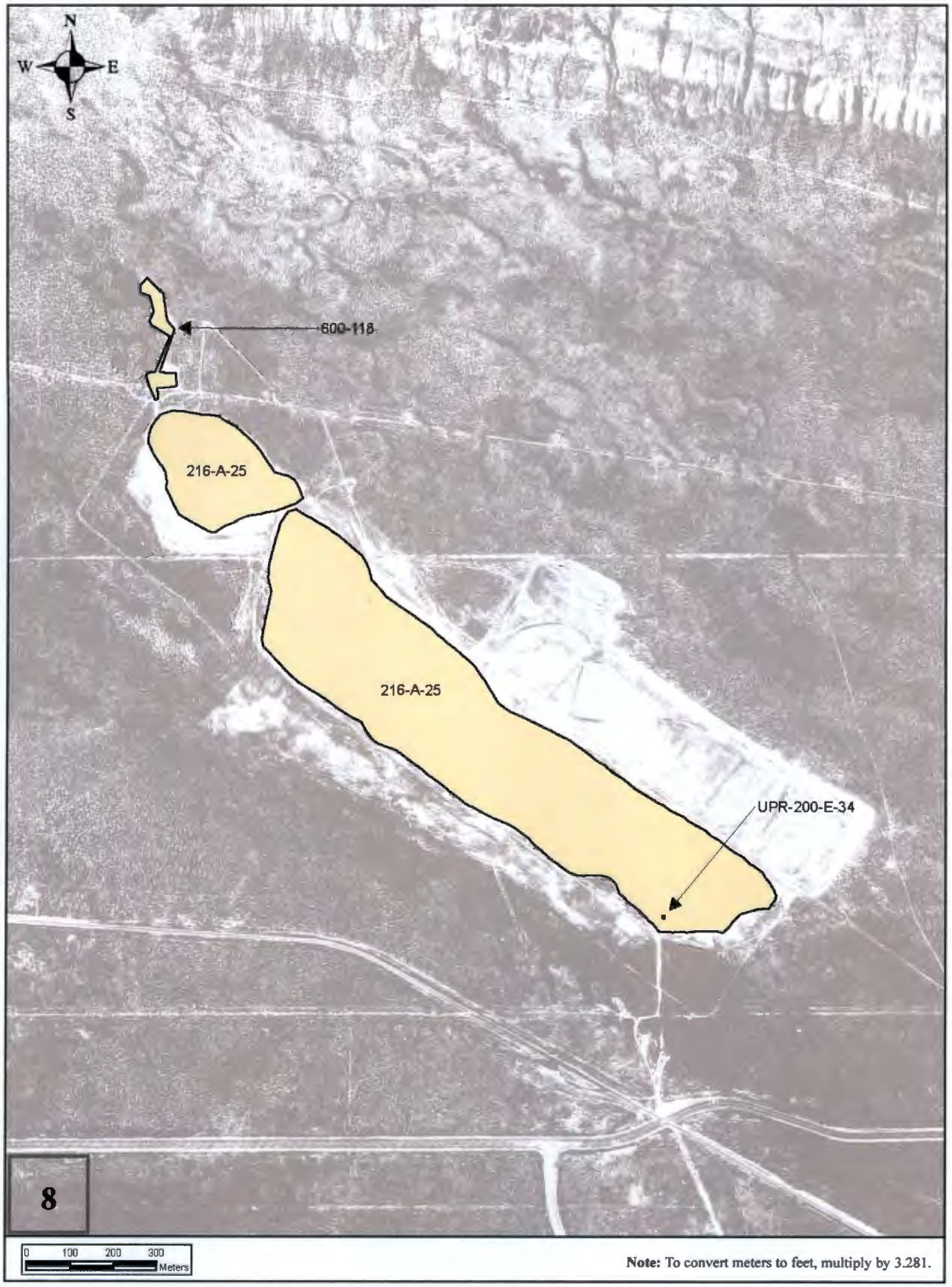


Figure S–12. Map 8: Cumulative Sites in the Gable Mountain Pond Area

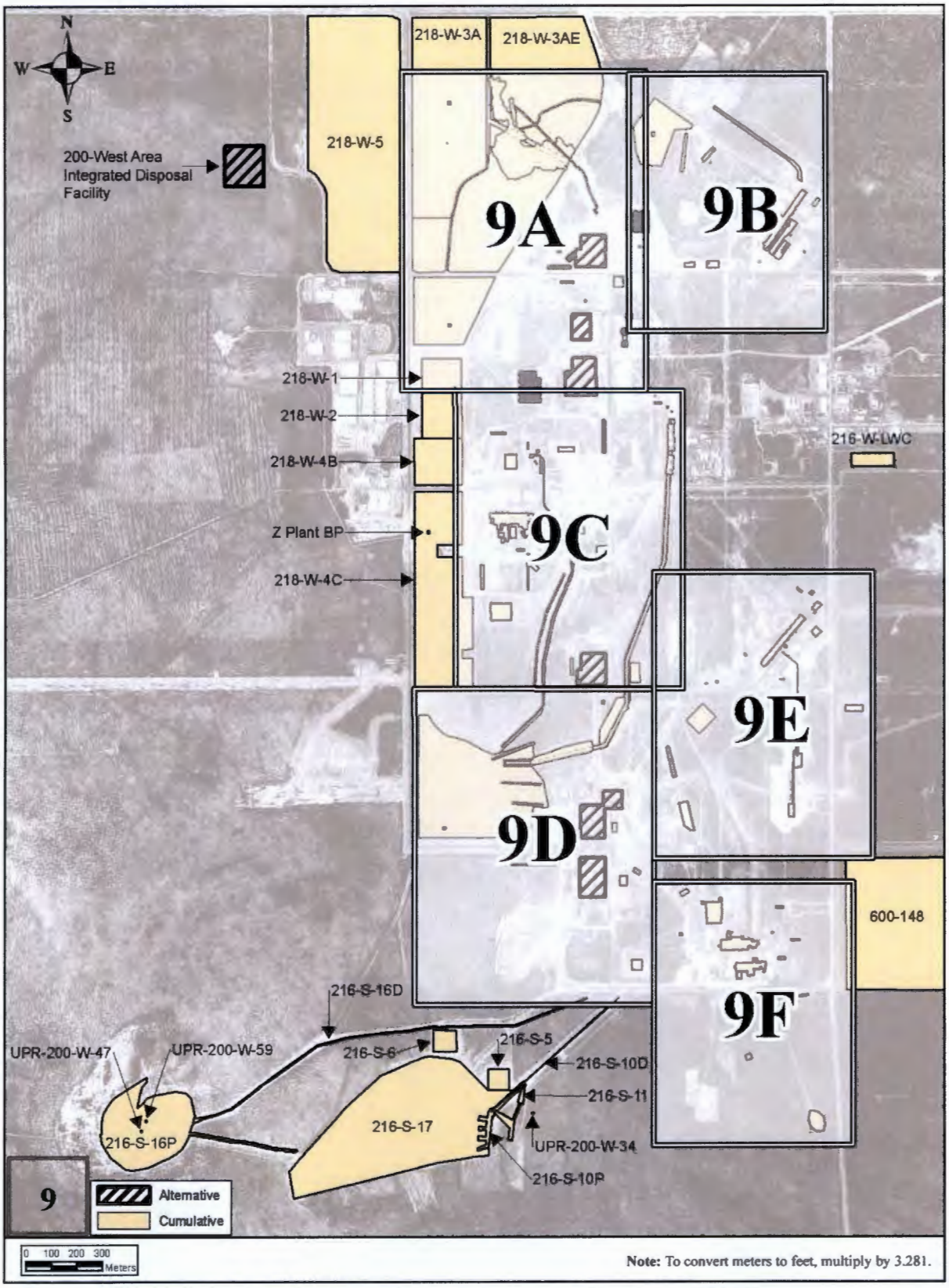


Figure S–13. Map 9: Alternative and Cumulative Sites in the 200-West Area

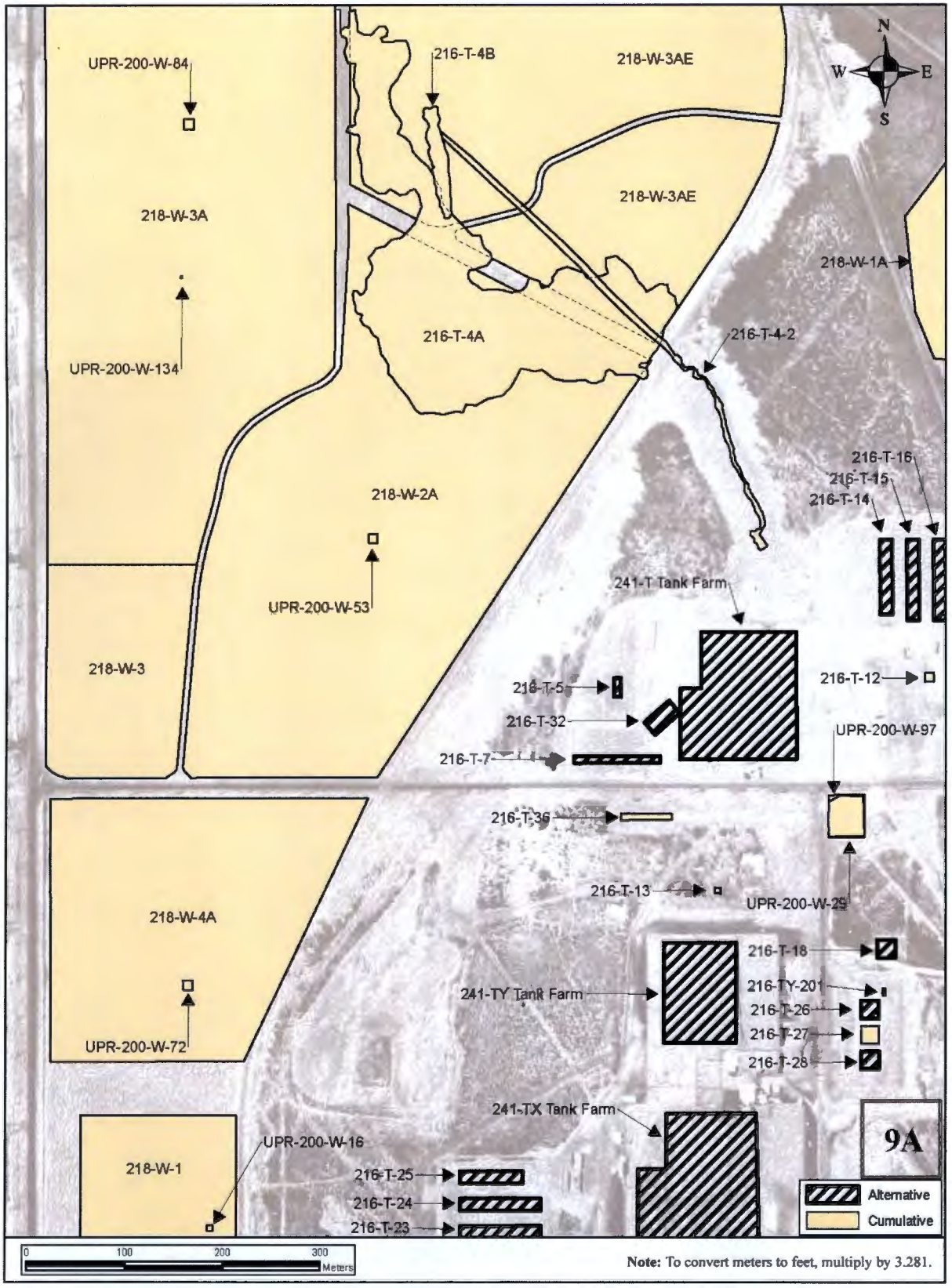


Figure S–14. Map 9A: Alternative and Cumulative Sites in the 200-West Area

Figure S–15. Map 9B: Alternative and Cumulative Sites in the 200-West Area

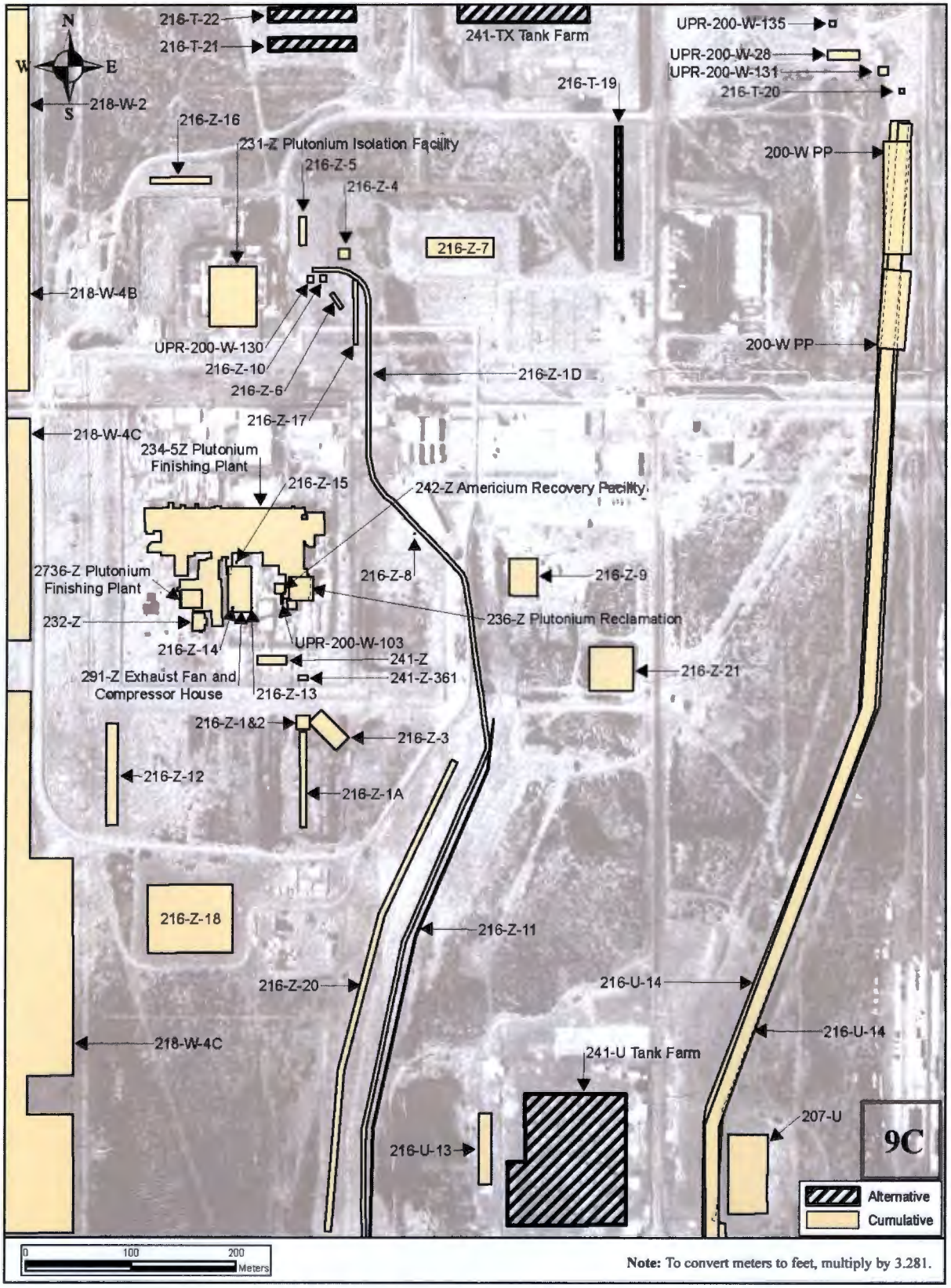


Figure S–16. Map 9C: Alternative and Cumulative Sites in the 200-West Area

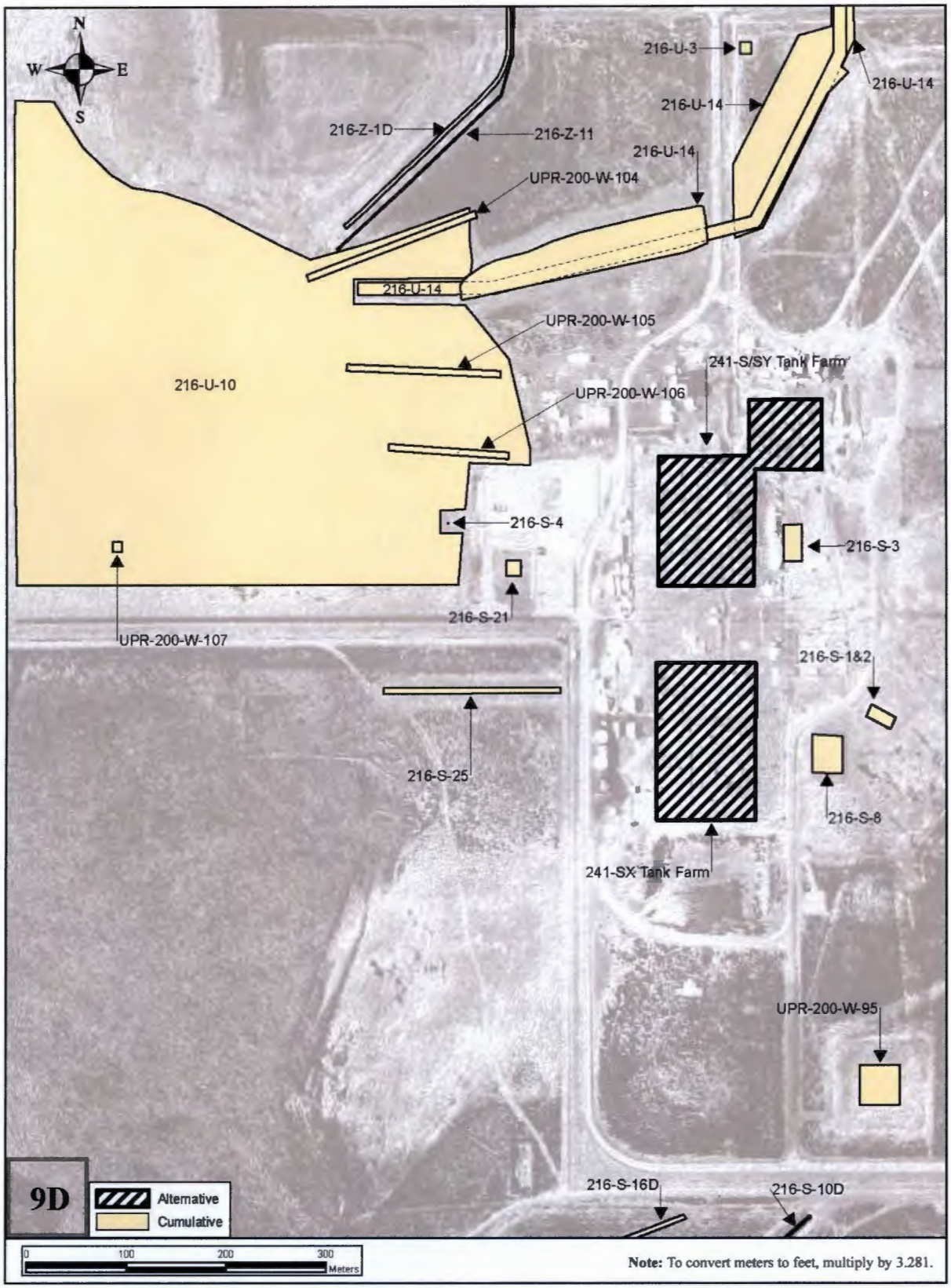


Figure S–17. Map 9D: Alternative and Cumulative Sites in the 200-West Area

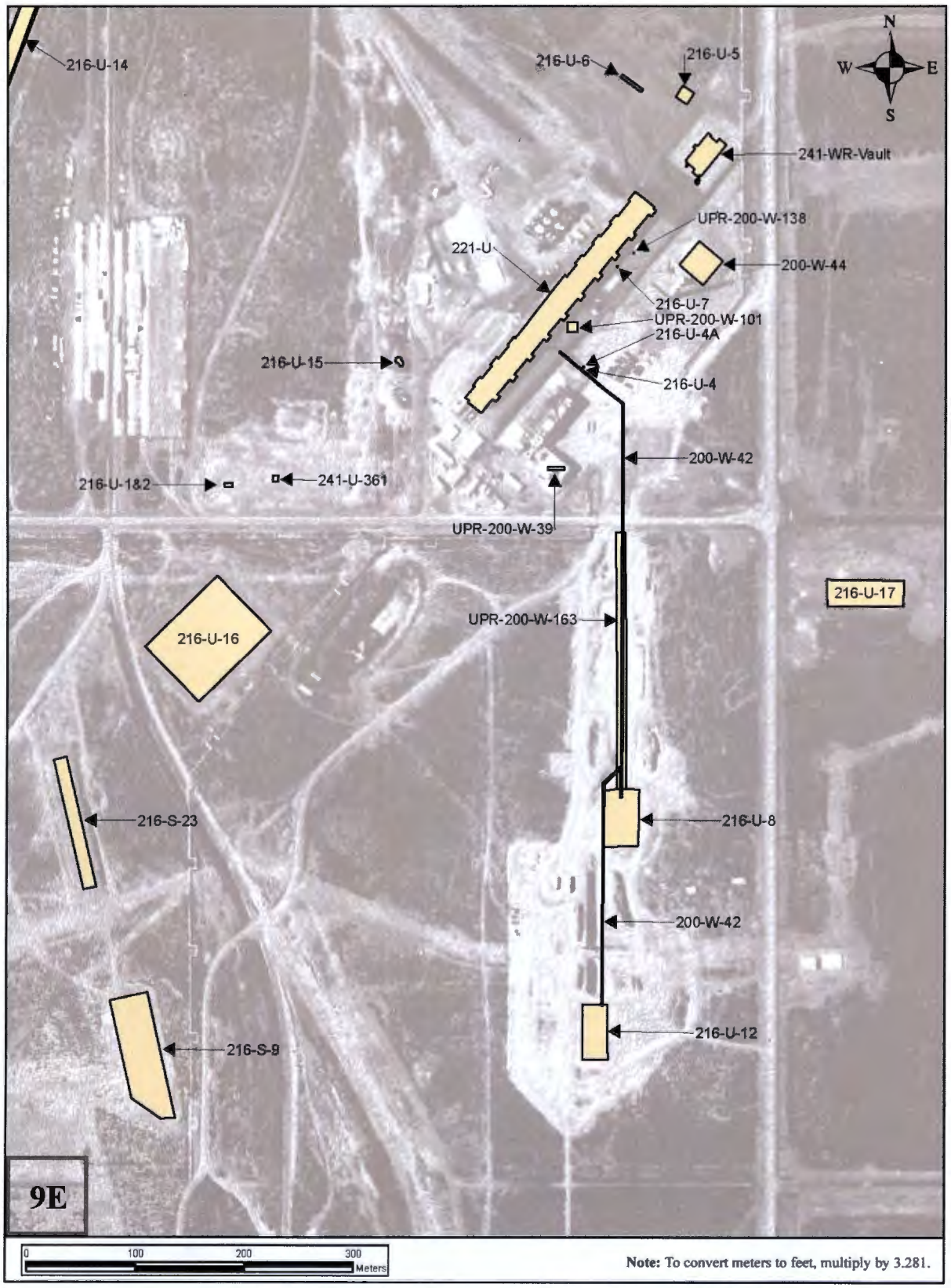


Figure S–18. Map 9E: Cumulative Sites in the 200-West Area

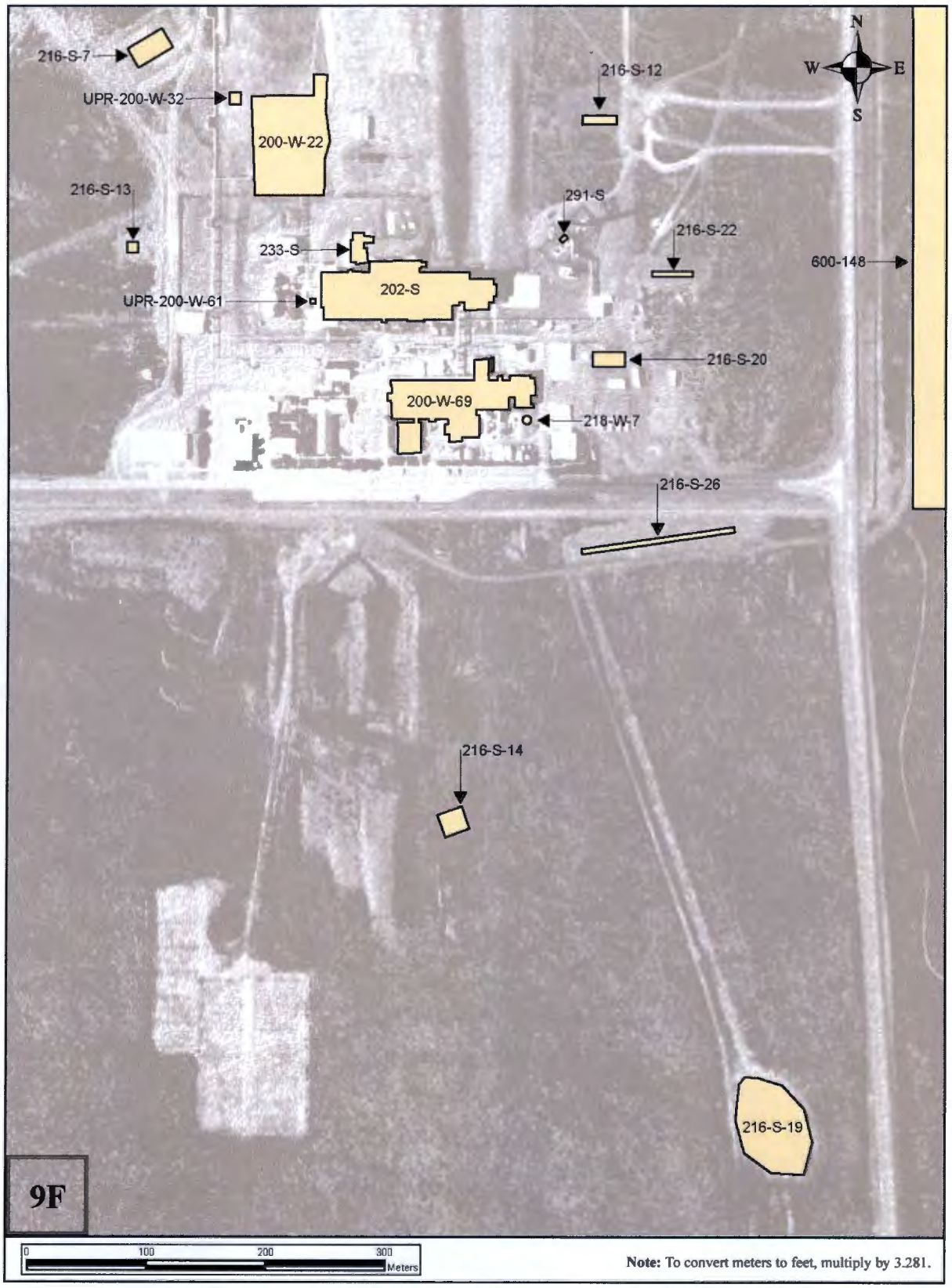


Figure S–19. Map 9F: Cumulative Sites in the 200-West Area

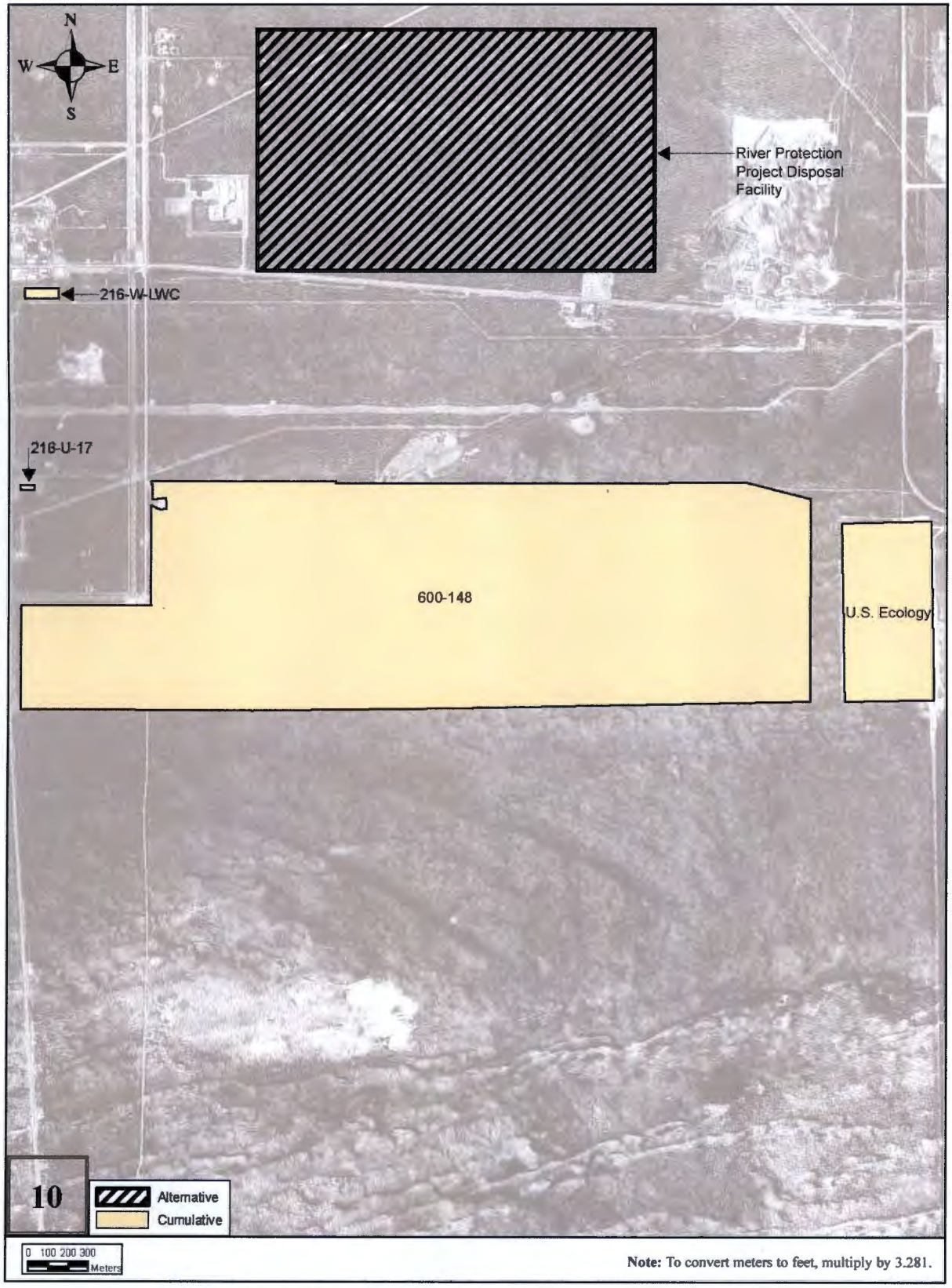


Figure S–20. Map 10: Alternative and Cumulative Sites in the Environmental Restoration Disposal Facility Area

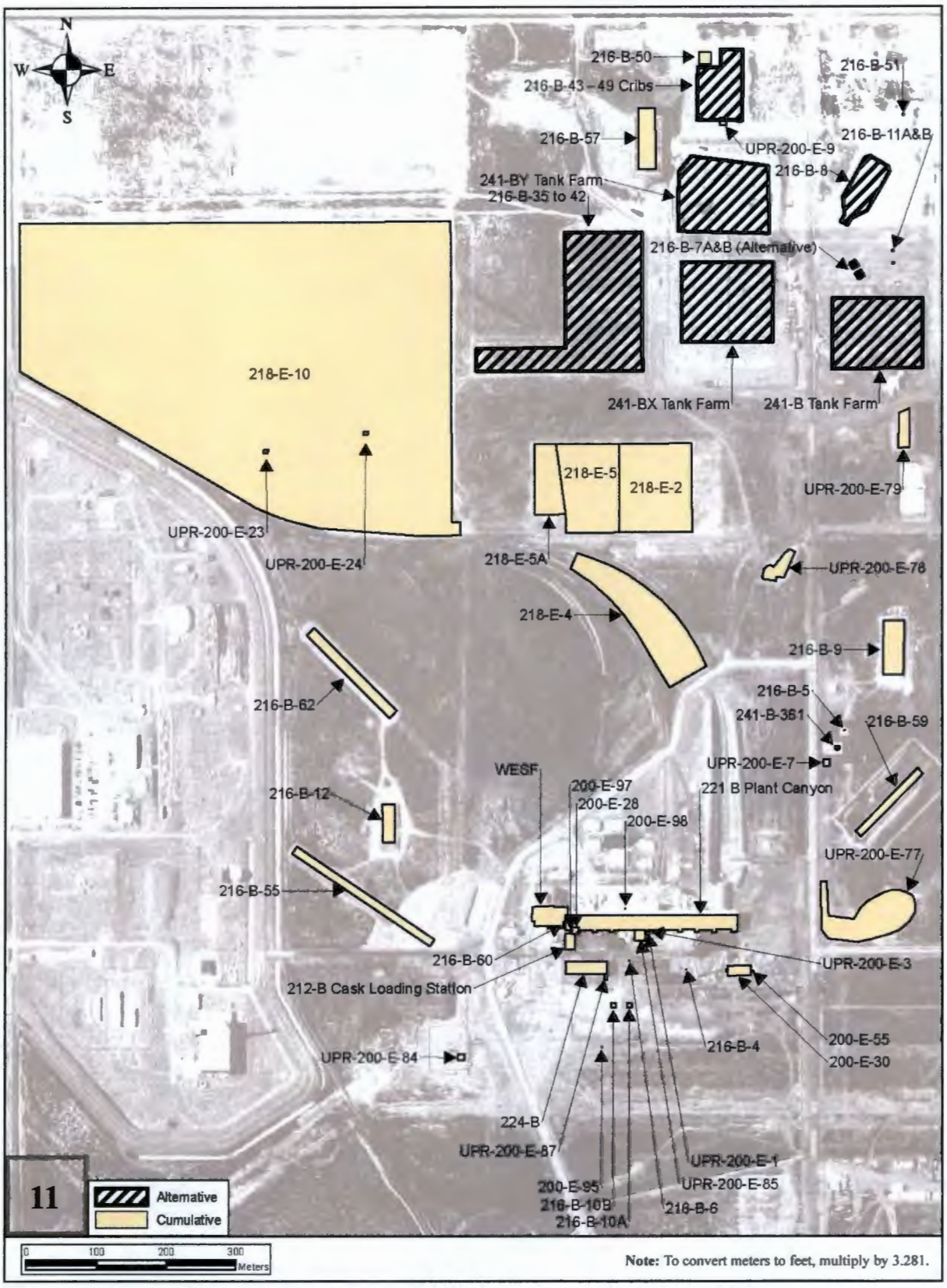


Figure S–21. Map 11: Alternative and Cumulative Sites in the 200-East Area

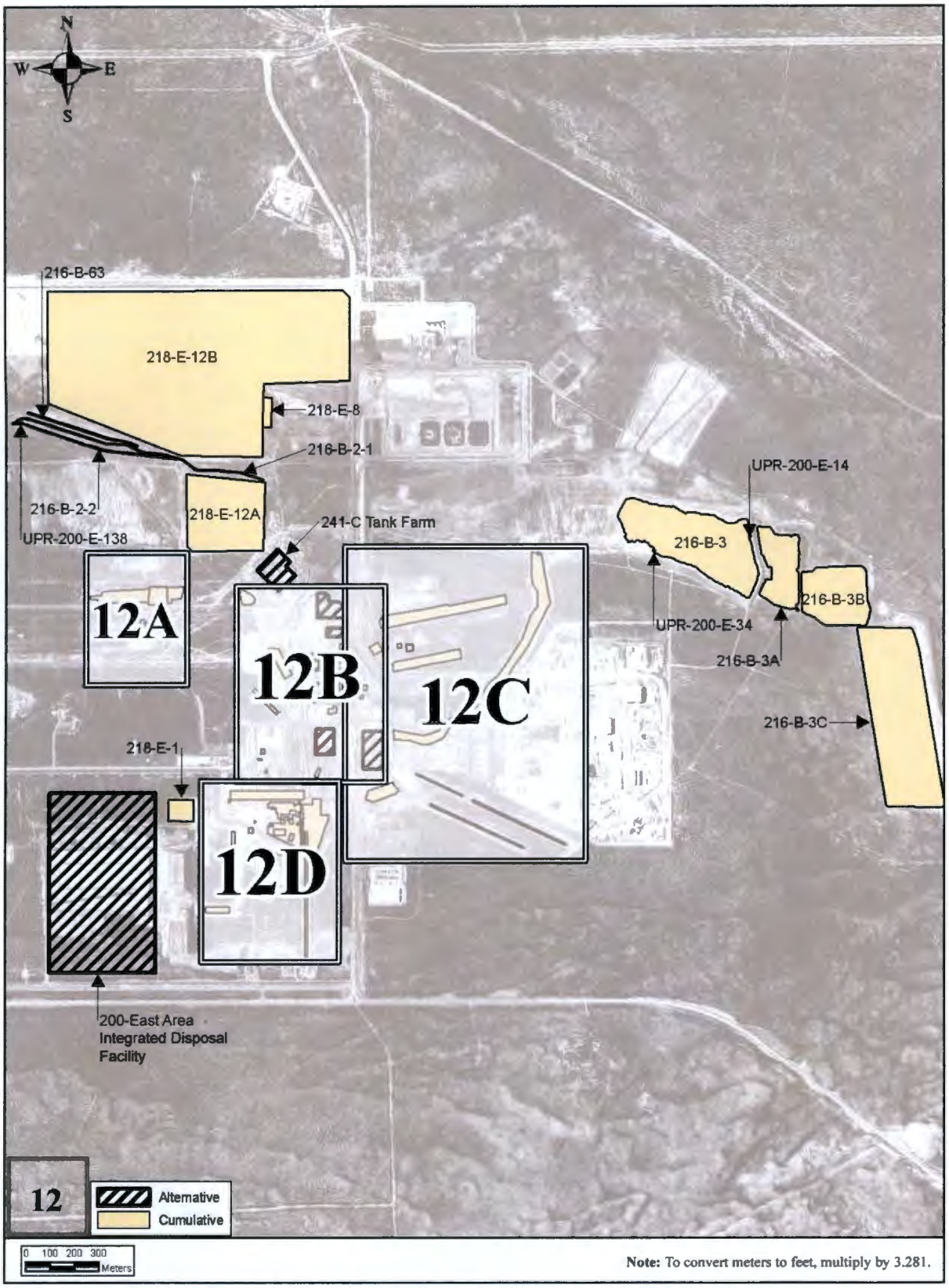


Figure S–22. Map 12: Alternative and Cumulative Sites in the 200-East Area

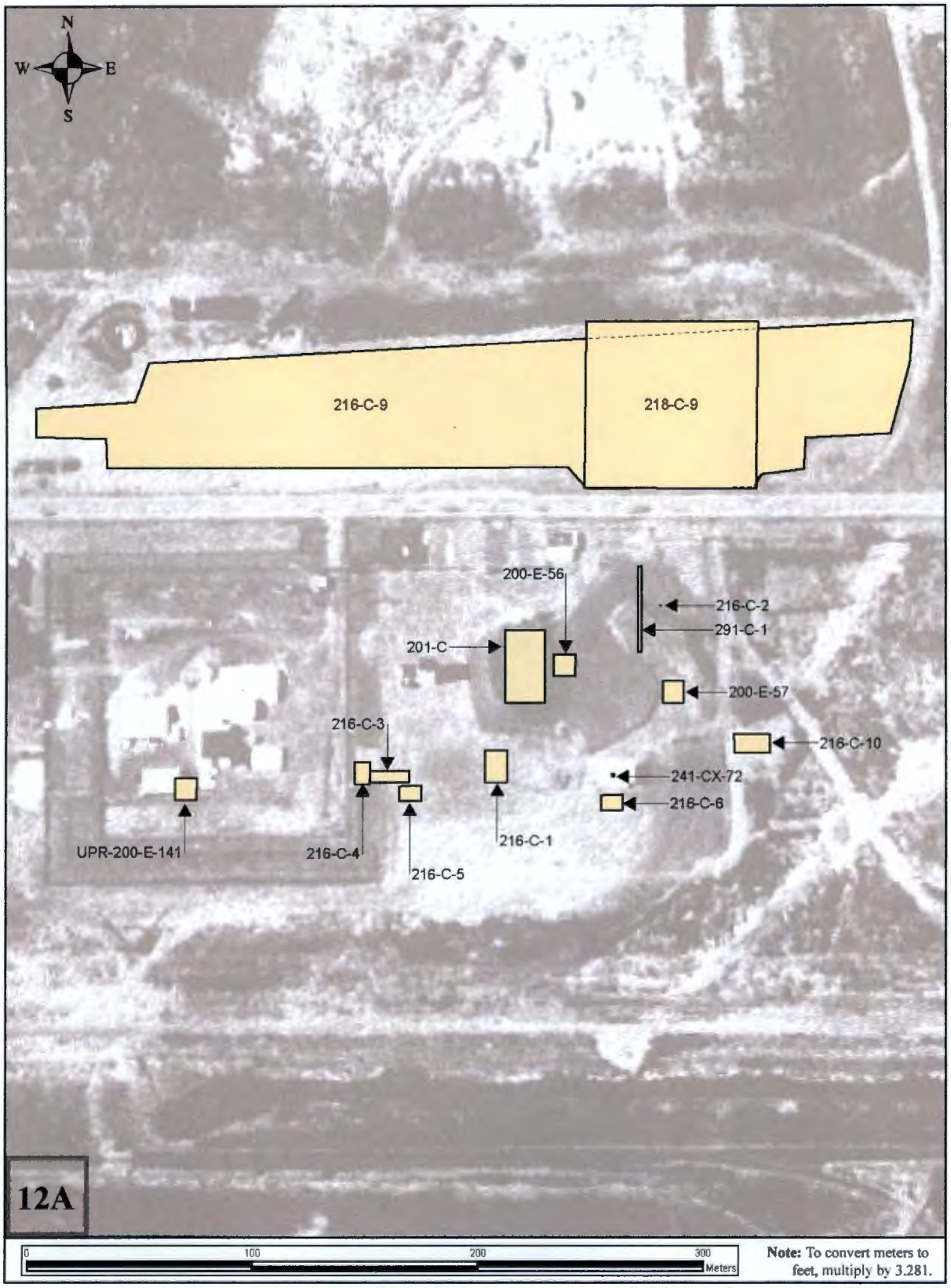


Figure S–23. Map 12A: Cumulative Sites in the 200-East Area

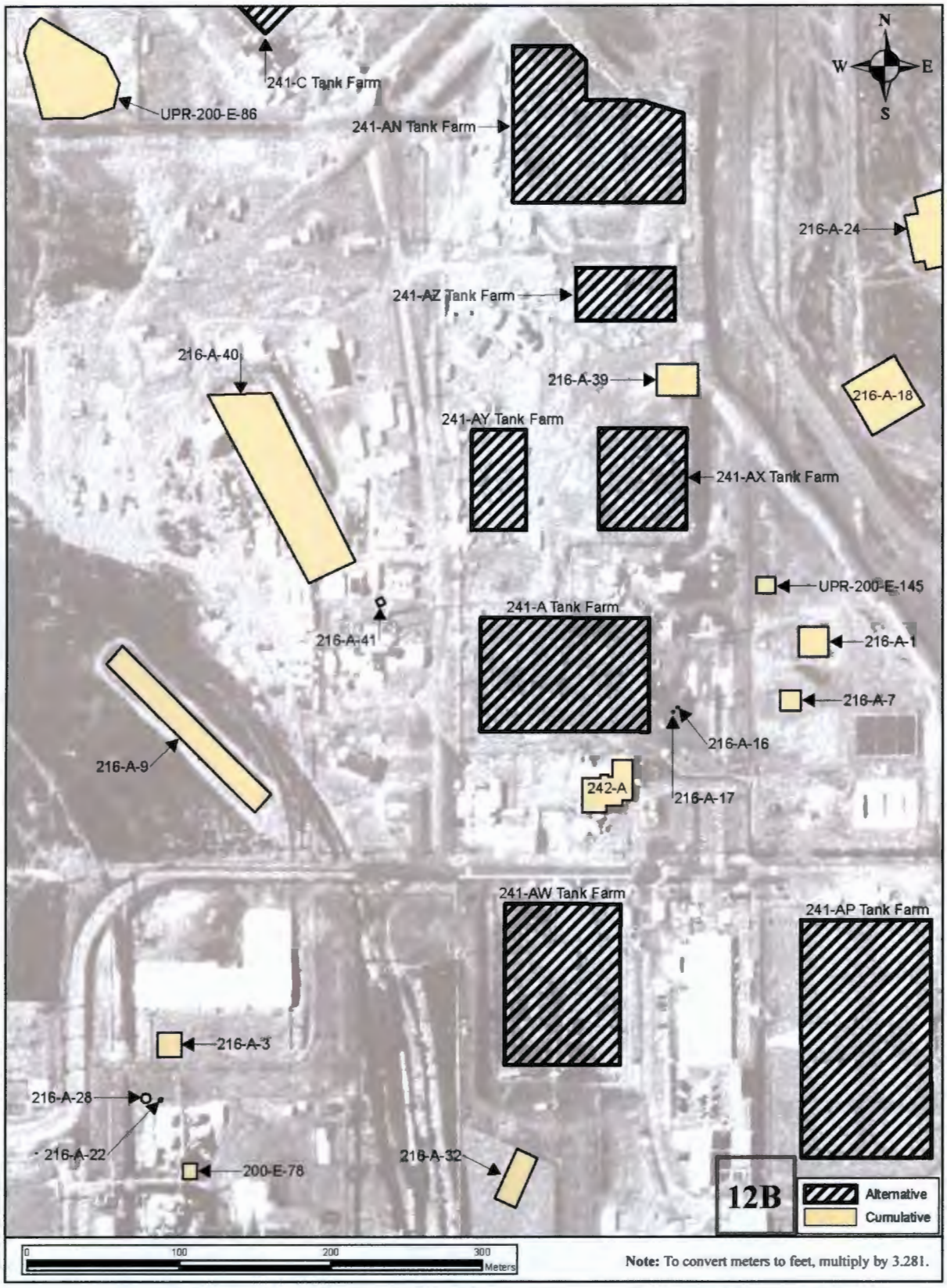


Figure S–24. Map 12B: Alternative and Cumulative Sites in the 200-East Area

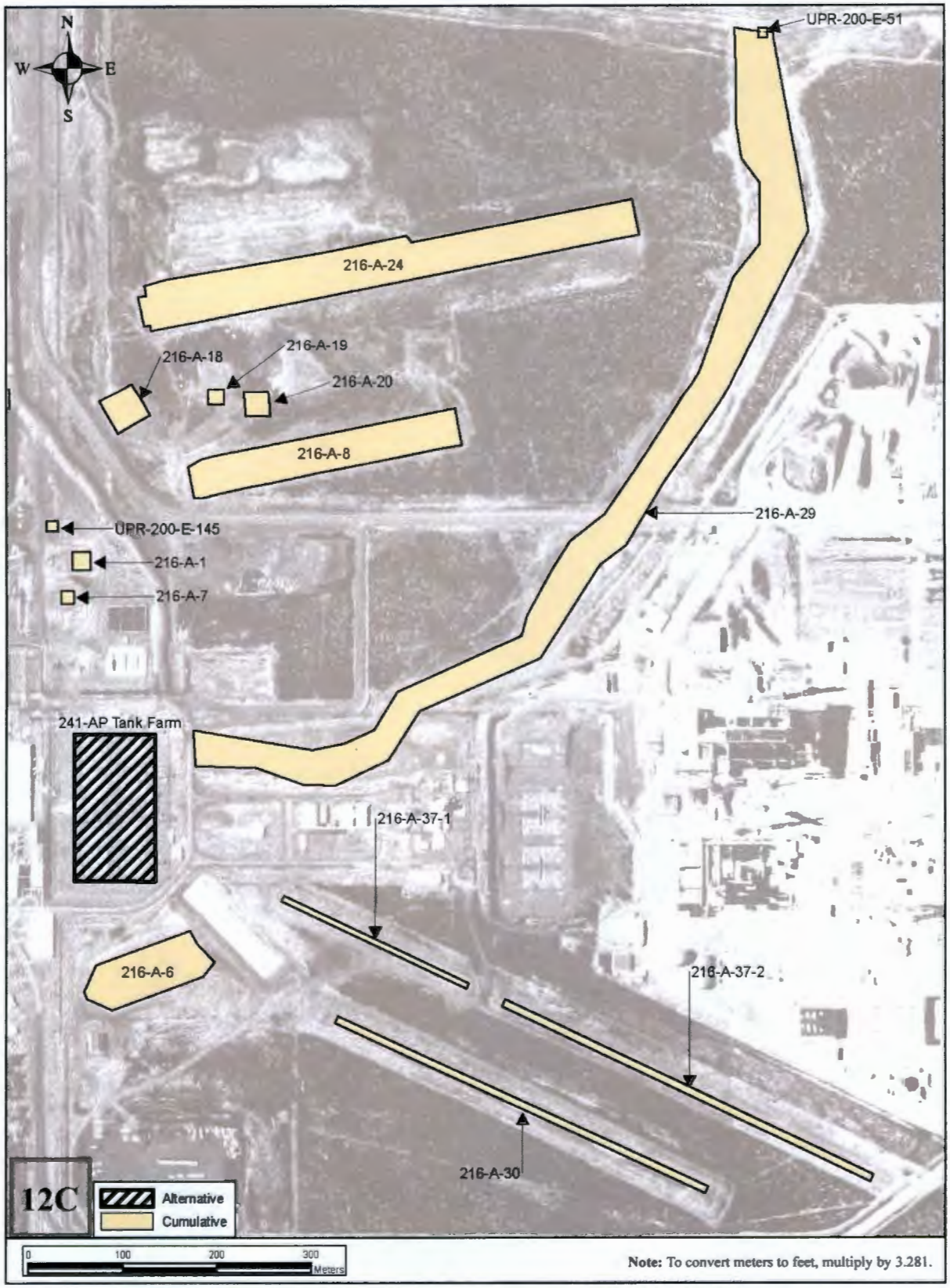


Figure S–25. Map 12C: Alternative and Cumulative Sites in the 200-East Area

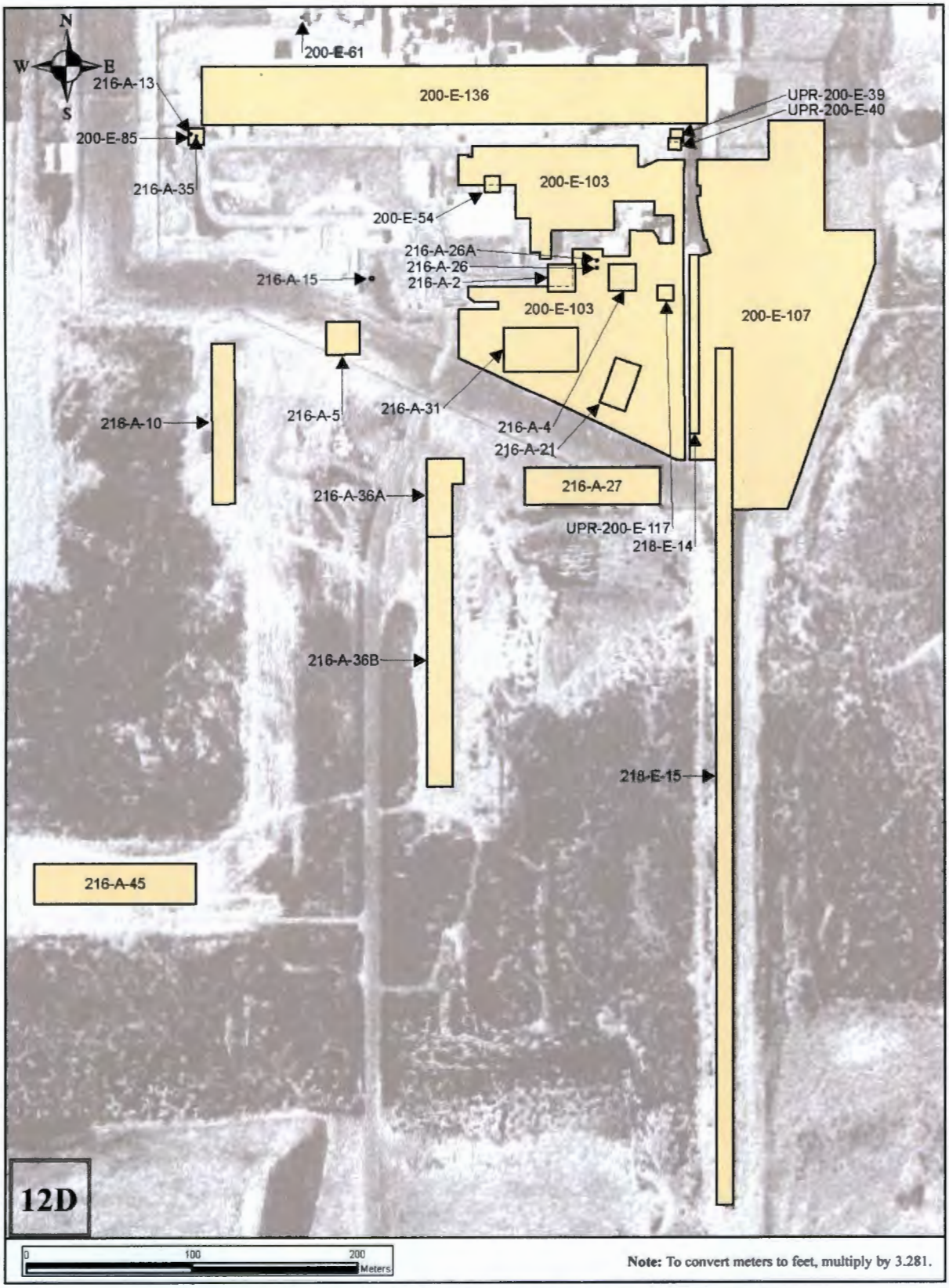


Figure S–26. Map 12D: Cumulative Sites in the 200-East Area

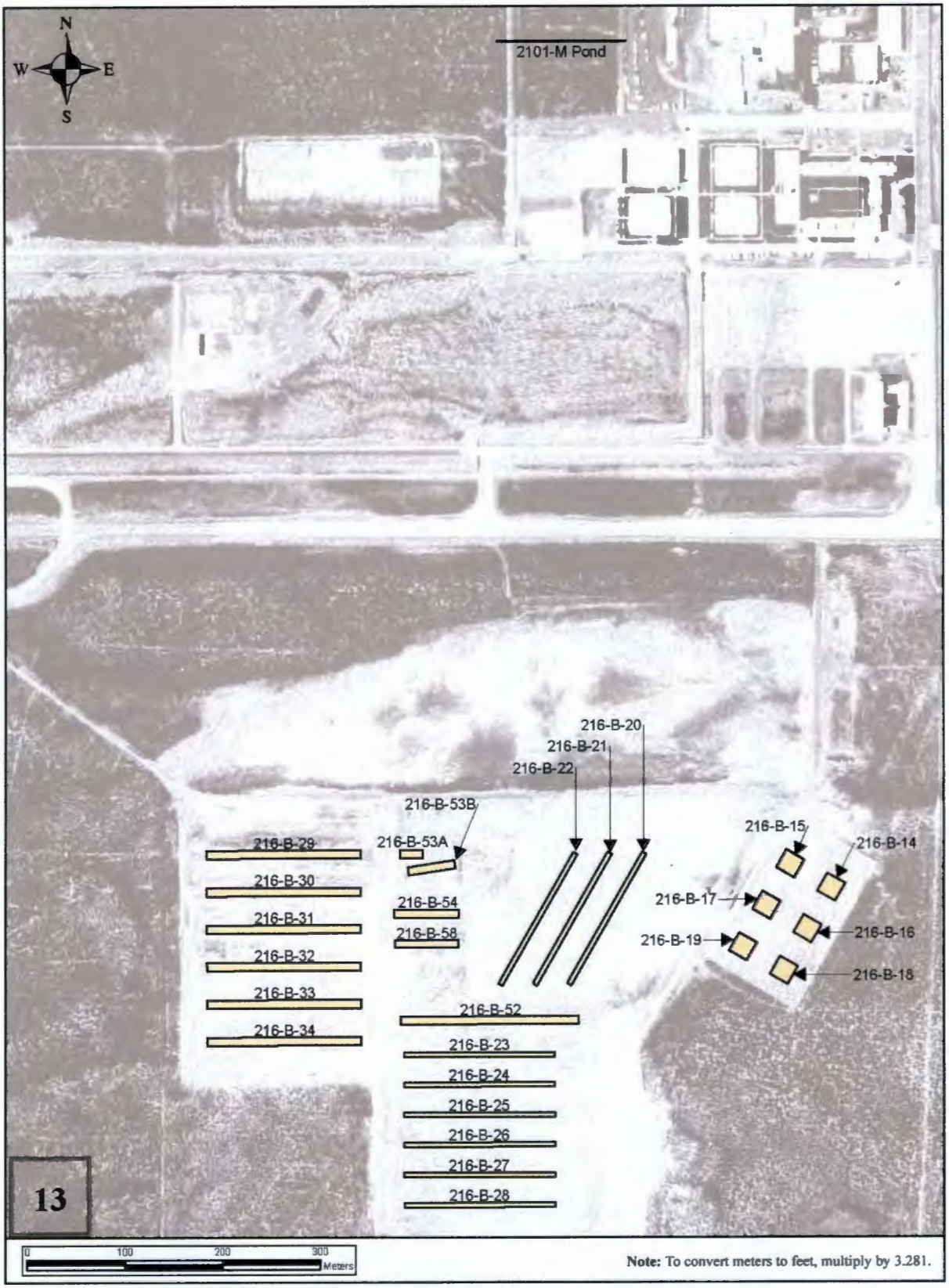


Figure S–27. Map 13: Cumulative Sites in the 200-East Area

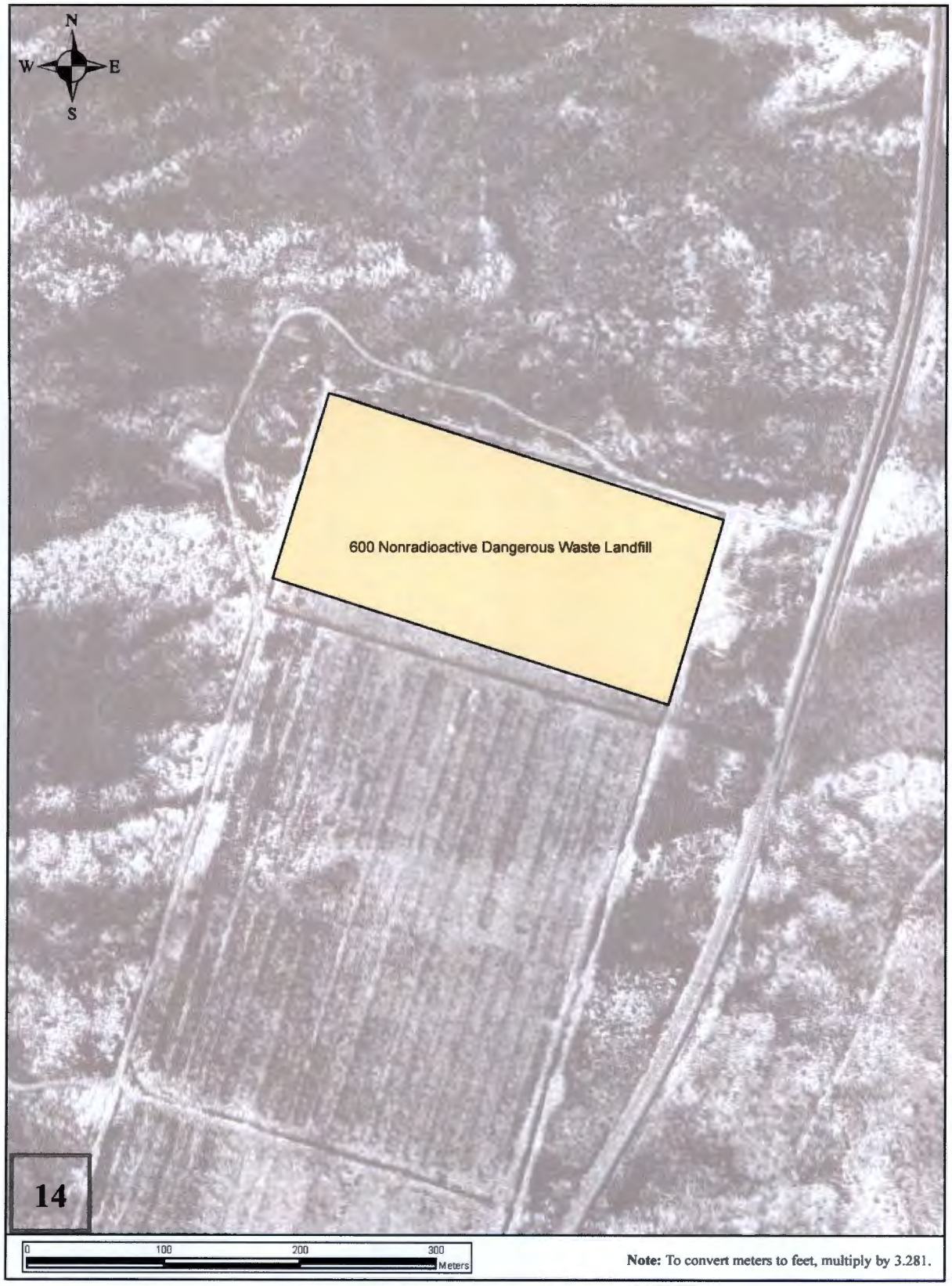


Figure S–28. Map 14: Cumulative Sites in the 600 Area

Figure S–29. Map 15: Alternative and Cumulative Sites in Vicinity of the 300 and 400 Areas

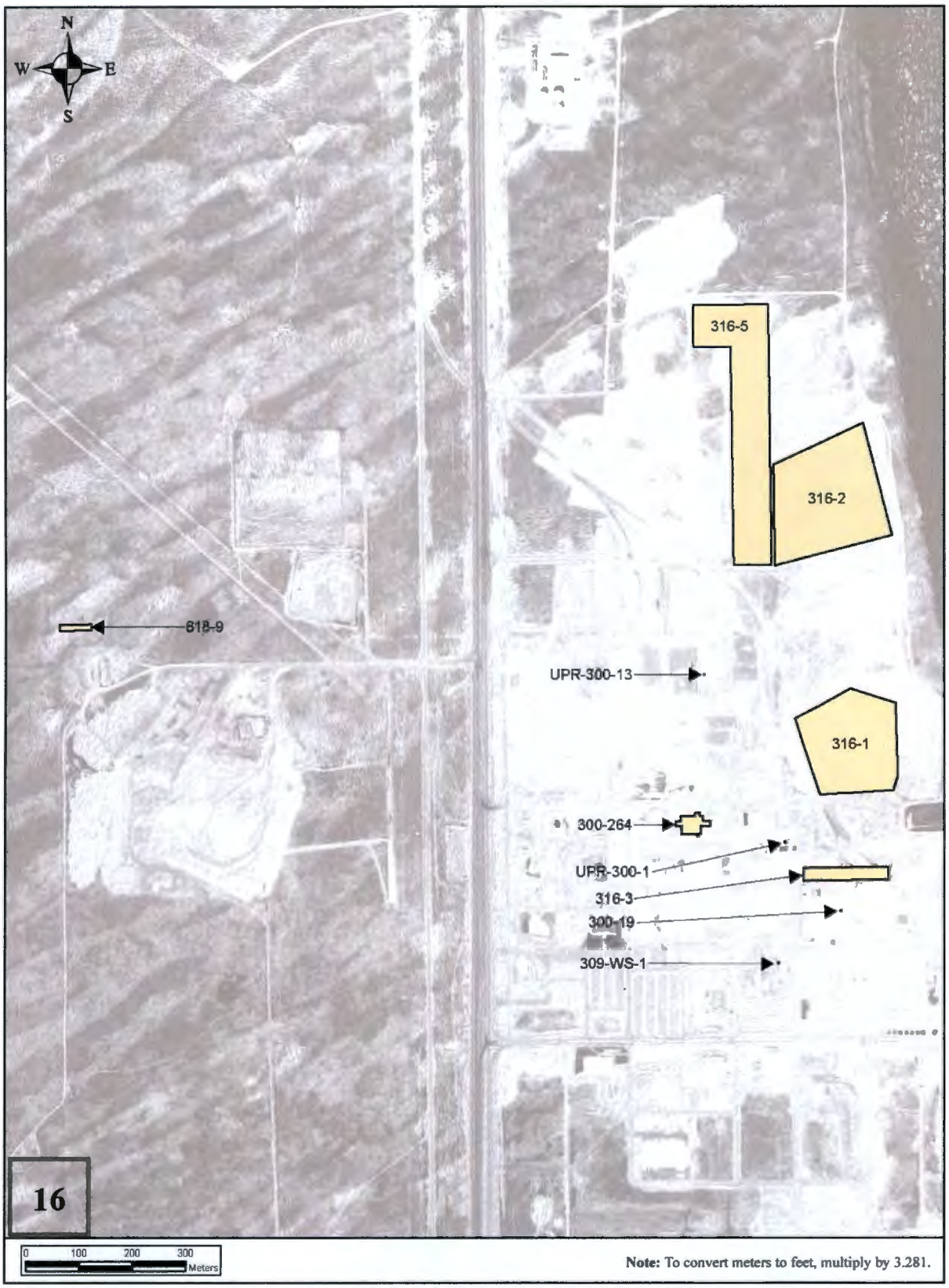


Figure S–30. Map 16: Cumulative Sites in the 300 Area

Table S–9. Cumulative Impact Sites for Map 1

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
116-B-1	107-B Liquid Waste Disposal Trench	Trench	Liquid	6.0×10^7	–	1950	1968	Remediated and closed out in 1999
116-B-4	105-B Dummy Decontamination French Drain	French Drain	Liquid	3.0×10^5	–	1957	1968	Remediated and closed out in 2000
116-B-5	108-B Crib (116-B-5 Crib)	Crib	Liquid	1.0×10^7	–	1950	1968	Site excavated in 1995 and contaminated soil disposed of in ERDF
116-B-6A	116-B-6-1 Crib	Crib	Liquid	5.0×10^3	–	1951	1968	Excavated and remediated in 1999
116-B-6B	116-B-6-2 Crib	Crib	Liquid	1.0×10^4	–	1950	1953	Excavated and remediated in 1999
116-B-11	107-B Retention Basins	Retention Basin	Liquid	Unknown	–	1944	1968	Excavated and remediated in 1999
116-C-5	107-C Retention Basins	Retention Basin	Liquid	Unknown	–	1952	1969	Tanks excavated, remediated, and closed out in 1999
116-C-1	107-C Liquid Waste Disposal Trench	Trench	Liquid	1.0×10^8	–	1952	1968	Tanks excavated, remediated, and closed out in 1999
116-C-2A	105-C Pluto Crib	Crib	Liquid	3.50×10^6	–	1952	1968	Backfilled with 15 feet of soil in 1968; area excavated and contaminated soil removed to ERDF in 1999
116-C-2C	105-C Pluto Crib Sand Filter	Crib/ Sand filter	Liquid	3.50×10^6	–	1952	1969	Site excavated and removed to ERDF in 1999

Key: Dash (–)=not applicable; ERDF=Environmental Restoration Disposal Facility; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–10. Cumulative Impact Sites for Map 2

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
116-K-1	100-K Crib	Crib	Liquid	4.00×10^{7}	–	1955	1971	Contaminated soil removed and disposed of at ERDF in 2003
116-K-2	100-K Mile Long Trench	Trench	Liquid	3.00×10^{11}	–	1955	1971	Contaminated soil removed in 1996; site backfilled and stabilized
116-KE-4	107-KE Retention Basins	Retention Basin	Liquid	Unknown	–	1955	1971	Steel walls of tanks removed, site interim-stabilized, and bottoms of tanks left in place and backfilled in 1995; large pieces of contaminated effluent piping and scrap metal removed and taken to ERDF in 1999
116-KW-3	107-KW Retention Basin	Retention Basin	Liquid	Unknown	–	1955	1970	Steel walls of tanks removed, site interim-stabilized, bottoms of tanks left in place, and site backfilled in 1995; large pieces of contaminated effluent piping and scrap metal removed and taken to ERDF in 1999
116-KE-1	115-KE Condensate Crib	Crib	Liquid	8.00×10^{5}	–	1955	1971	Crib and pipeline removed to ERDF and site covered with clean backfill
116-KE-2	1706-KER Waste Crib	Crib	Liquid	3.00×10^{6}	–	1955	1971	Inactive; site retired in 1971
116-KW-1	115-KW Condensate Crib	Crib	Liquid	8.00×10^{5}	–	1955	1971	Crib and pipeline removed to ERDF and site covered with clean backfill in 2004
UPR-100-K-1	100-KE Fuel Storage Basin Leak	Unplanned Release	Liquid	Unknown	–	1974	1979	Inactive
120-KE-1	183-KE Filter Waste Facility Drywell	Sump	Liquid/ Solid	Unknown	–	1955	1971	Drain backfilled and surface stabilized in August 2000

Key: Dash (–)=not applicable; ERDF=Environmental Restoration Disposal Facility; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–11. Cumulative Impact Sites for Map 3

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
116-N-1	1301-N Liquid Waste Disposal Facility	Crib	Liquid	8.37×10^{10}	–	1964	1985	Inactive; crib stabilized and trench backfilled
116-N-3	1325-N Liquid Waste Disposal Facility	Crib	Liquid	7.61×10^{9}	–	1983	1991	Remediated and closed out
UPR-100-N-3	Spacer Disposal System Transport Line Leak	Unplanned Release	Liquid	1.36×10^{6}	–	1978	1978	Line repaired, contaminated soil removed, and sinkhole backfilled
UPR-100-N-7	Rad Line Leak	Unplanned Release	Liquid	1.91×10^{6}	–	1985	1985	Inactive; no remediation action reported
UPR-100-N-35	100-N Fuel Storage Basin Drainage System Leak	Unplanned Release	Liquid	Unknown	–	1986	1986	Inactive; no remediation action reported

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–12. Cumulative Impact Sites for Map 4

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
116-D-1A	105-D Storage Basin Trenches 1	Trench	Liquid	2.00×10^5	–	1947	1952	Site excavated and contaminated soil disposed of in ERDF; backfilled with clean soil in 2000
116-D-1B	105-D Storage Basin Trenches 2	Trench	Liquid	8.00×10^6	–	1953	1967	Site excavated and contaminated soil disposed of in ERDF; backfilled with clean soil in 2000
116-D-7	107-D Retention Basin	Retention Basin	Liquid	Unknown	–	1944	1967	Site excavated and contaminated soil disposed of in ERDF in 1997; closed out in 2000
116-DR-9	107-DR Retention Basin	Retention Basin	Liquid	Unknown	–	1950	1967	Site excavated and contaminated soil disposed of in ERDF; closed out in 1999
100-D-25	107-DR Basin Leaks	Unplanned Release	Liquid	Unknown	–	1951	Unknown	Site excavated and contaminated soil disposed of in ERDF; closed out in 1999
UPR-100-D-4	107-D Basin Leaks	Unplanned Release	Liquid	Unknown	–	1950	Unknown	Site excavated and contaminated soil disposed of in ERDF in 1997; closed out in 2000
116-DR-1&2	107-DR Liquid Waste Disposal Trenches	Trench	Liquid	8.00×10^7	–	1951	1967	Site excavated and contaminated soil disposed of in ERDF in 1997; closed out in 2000
116-DR-6	1608-DR Liquid Disposal Trench	Trench	Liquid	7.00×10^6	–	1953	1965	Site excavated and contaminated soil disposed of in ERDF; closed out in 2000
116-DR-7	105-DR Inkwell Crib	Crib	Liquid	4.00×10^3	–	1953	1953	Site excavated and contaminated soil disposed of in ERDF in 1999

Key: Dash (–)=not applicable; ERDF=Environmental Restoration Disposal Facility; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–13. Cumulative Impact Sites for Map 5

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
100-H-33	183-H Solar Evaporation Basins Radionuclide Components	Retention Basin	Liquid	9.63×10^6	–	1949	1985	Remediated in 1985 and 1996 and closed out in 1997
116-H-6	183-H Solar Evaporation Basins	Retention Basin	Liquid	See 100-H-33	–	1949	1985	Remediated in 1985 and 1996 and closed out in 1997
116-H-1	107-H Liquid Disposal Trench	Trench	Liquid	9.00×10^7	–	1952	1965	Contaminated soil removed and disposed of at ERDF in 2000
116-H-2	1608-H Liquid Waste Disposal Trench	Trench	Liquid	6.00×10^9	–	1953	1965	Contaminated soil removed and disposed of at ERDF in 2001
116-H-4	105-H Pluto Crib	Crib	Liquid	1.00×10^3	–	1950	1952	Contaminated material moved in 1960 and placed in 118-H-5 burial ground
116-H-7	107-H Retention Basin	Retention Basin	Liquid	Unknown	–	1949	1965	Contaminated soil removed and disposed of at ERDF in 2001
116-H-3	105-H Dummy Decontamination French Drain	French Drain	Liquid	4.00×10^5	–	1950	1965	Contaminated soil removed and disposed of at ERDF in 2000

Key: Dash (–)=not applicable; ERDF=Environmental Restoration Disposal Facility; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–14. Cumulative Impact Sites for Map 6

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
116-F-1	Lewis Canal	Trench	Liquid	1.00×10^8	–	1953	1965	Soil and debris removed and disposed of at ERDF in 2002; backfilled to grade with clean soil
116-F-2	107-F Liquid Waste Disposal Trench	Trench	Liquid	6.00×10^7	–	1950	1965	Soil and debris removed and disposed of at ERDF in 2002; backfilled to grade with clean soil
116-F-9	Animal Waste Leaching Trench	Trench	Liquid	3.00×10^8	–	1963	1976	Soil and debris removed and disposed of at ERDF in 2002; backfilled to grade with clean soil
116-F-3	105-F Storage Basin Trench	Trench	Liquid	4.00×10^6	–	1949	1951	Contaminated soil removed and disposed of at ERDF in 2003
116-F-6	105-F Cooling Water Trench	Trench	Liquid	1.00×10^5	–	1952	1965	Contaminated soil removed and disposed of at ERDF in 2002
116-F-4	105-F Pluto Crib	Crib	Liquid	4.00×10^3	–	1950	1956	Contaminated soil removed and disposed of at ERDF in 1993
116-F-10	105-F Dummy Decontamination French Drain	French Drain	Liquid	4.00×10^5	–	1953	1965	Contaminated soil removed and disposed of at ERDF in 2003
116-F-14	107-F Retention Basin	Retention Basin	Liquid	–	–	1945	1965	Decommissioned in stages from 1965 to 1999; excavation and disposal at ERDF completed in 2002

Key: Dash (–)=not applicable; ERDF=Environmental Restoration Disposal Facility; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–15. Cumulative Impact Sites for Map 7

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-N-1	216-N-1 Pond	Pond	Liquid	9.47×10^8	–	1944	1952	Deactivated and backfilled; removal, treatment, and disposal planned
216-N-2	216-N-2 Trench	Trench	Liquid	7.57×10^6	–	1947	1947	Deactivated and backfilled; removal, treatment, and disposal planned
216-N-3	216-N-3 Trench	Trench	Liquid	7.57×10^6	–	1952	1952	Deactivated and backfilled; removal, treatment, and disposal planned
216-N-4	216-N-4 Pond	Pond	Liquid	9.47×10^8	–	1944	1952	Deactivated and backfilled; removal, treatment, and disposal planned
216-N-5	216-N-5 Trench	Trench	Liquid	7.57×10^6	–	1952	1952	Deactivated and backfilled; removal, treatment, and disposal planned
216-N-6	216-N-6 Pond	Pond	Liquid	9.47×10^8	–	1944	1952	Deactivated in 1952; removal, treatment, and disposal planned
216-N-7	216-N-7 Trench	Trench	Liquid	7.57×10^6	–	1952	1952	Deactivated and backfilled; removal, treatment, and disposal planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–16. Cumulative Impact Sites for Map 8

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-A-25	216-A-25 Gable Mountain Pond	Pond	Liquid	2.94×10^{11}	–	1957	1985	Backfilled in 1988, surface stabilized in 1997
UPR-200-E-34	UPR-200-E-34	Contaminated Soil	Liquid	Unknown	–	1964	1964	Surface stabilized
600-118	600-118 Ditch	Soil	Liquid	Unknown	–	Unknown	Unknown	Backfilled with clean soil

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–17. Cumulative Impact Sites for Map 9

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-S-5	216-S-5 Crib	Crib	Liquid	4.08×10^9	–	1954	1957	Surface stabilized in 1990; landfill closure planned
216-S-6	216-S-6 Crib	Crib	Liquid	4.44×10^9	–	1954	1972	Surface stabilized in 1990; landfill closure planned
216-S-10D	216-S-10D Ditch	Ditch	Liquid	4.66×10^9	–	1954	1991	Portion backfilled and stabilized in 1984
216-S-10P	216-S-10P Pond	Pond	Liquid	6.73×10^9	–	1951	1991	Backfilled and stabilized in 1984; landfill closure planned
216-S-11	216-S-11 Pond	Pond	Liquid	2.23×10^9	–	1954	1965	Interim-stabilized in 1983; landfill closure planned
216-S-16D	216-S-16D Ditch	Ditch	Liquid	4.00×10^8	–	1957	1975	Backfilled and surface stabilized
216-S-16P	216-S-16P Pond	Pond	Liquid	4.07×10^{10}	–	1957	1972	Surface stabilized with additional backfill in 1984; landfill closure planned
216-S-17	216-S-17 Pond	Pond	Liquid	6.44×10^9	–	1951	1954	Backfilled in 1954; surface stabilized with additional backfill in 1984; landfill closure planned
UPR-200-W-47	UPR-200-W-47	Contaminated Soil	Liquid	Unknown	–	1958	1959	Surface stabilized in 1984; landfill closure planned
UPR-200-W-59	UPR-200-W-59	Pond	Liquid	Unknown	–	1965	1965	Landfill closure planned
UPR-200-W-34	UPR-200-W-34	Contaminated Soil	Liquid	Unknown	–	1955	1955	Stabilized in 1984
218-W-1	218-W-1 Burial Ground	Burial Ground	Solid	–	7.0×10^3	1944	1953	Surface stabilized in 1983; landfill closure planned
218-W-2	218-W-2 Burial Ground	Burial Ground	Solid	–	8.2×10^3	1953	1956	Surface stabilized in 1983; landfill closure planned
218-W-4B	218-W-4B Burial Ground	Burial Ground	Solid	–	1.0×10^4	1967	1990	Trenches 1–7 stabilized in 1983; remaining trenches stabilized in 1995; landfill closure planned
218-W-4C	218-W-4C Burial Ground	Burial Ground	Solid	–	1.6×10^4	1978	active	Landfill closure planned
218-W-5	218-W-5 Burial Ground	Burial Ground	Solid	–	3.6×10^4	1986	active	Landfill closure planned
218-W-3AE	218-W-3AE Burial Ground	Burial Ground	Solid	–	2.2×10^4	1981	active	Landfill closure planned
218-W-3A	218-W-3A Burial Ground	Burial Ground	Solid	–	1.0×10^5	1970	active	Landfill closure planned
Z Plant BP	Z Plant Burning Pit	Burning Pit	Solid	–	Unknown	1950	1960	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–18. Cumulative Impact Sites for Map 9A

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
218-W-3	218-W-3 Burial Ground	Burial Ground	Solid	–	1.1×10^4	1957	1961	Surface stabilized in 1983; landfill closure planned
218-W-4A	218-W-4A Burial Ground	Burial Ground	Solid	–	1.8×10^4	1959	1968	Surface stabilized in 1983; landfill closure planned
218-W-2A	218-W-2A Burial Ground	Burial Ground	Solid	–	2.5×10^4	1954	1985	Backfilled and stabilized in 1980; landfill closure planned
UPR-200-W-84	UPR-200-W-84	Contaminated Soil	Liquid	Unknown	–	1980	1980	Landfill closure planned
UPR-200-W-134	UPR-200-W-134	Contaminated Soil	Solid	–	Unknown	1975	1975	Landfill closure planned
UPR-200-W-53	UPR-200-W-53	Contaminated Soil	Liquid	Unknown	–	1959	1959	Backfilled and stabilized
UPR-200-W-72	UPR-200-W-72	Contaminated Soil	Solid	–	Unknown	1975	1975	Stabilized in 1975; landfill closure planned
UPR-200-W-16	UPR-200-W-16	Contaminated Soil	Solid	–	Unknown	1952	1952	Landfill closure planned
216-T-4A	216-T-4A Pond	Pond	Liquid	4.28×10^{10}	–	1944	1995	Interim-stabilized in 1995; landfill closure planned
216-T-4B	216-T-4B Pond	Pond	Liquid	Included in 216-T-4A	–	1972	1995	Landfill closure planned
216-T-36	216-T-36 Crib	Crib	Liquid	5.09×10^5	–	1967	1969	Surface stabilized in 2000; removal, treatment, and disposal planned
216-T-4-2	216-T-4-2 Ditch	Ditch	Liquid	Unknown	–	1972	1995	Backfilled and stabilized in 1995; removal, treatment, and disposal planned
UPR-200-W-97	UPR-200-W-97 Unplanned Release	Contaminated Soil	Liquid	2.00×10^3	–	1966	1966	Partial soil removal in 1966; surface stabilized in 1978; landfill closure planned
UPR-200-W-29	UPR-200-W-29 Unplanned Release	Contaminated Soil	Liquid	3.79×10^3	–	1954	1954	Backfilled and covered with gravel; landfill closure planned
216-T-13	216-T-13 Trench	Trench	Liquid	9.84×10^4	–	1954	1964	Soil excavated and removed in 1972; landfill closure planned
216-T-27	216-T-27 Crib	Crib	Liquid	7.19×10^6	–	1965	1965	Surface stabilized in 1990; landfill closure planned
216-TY-201	216-TY-201 Settling Tank	Tank	Liquid	2.40×10^4	–	1953	1966	Isolated in 1981; surface stabilized in 1990; landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–19. Cumulative Impact Sites for Map 9B

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-T-12	216-T-12 Trench	Trench	Liquid	5.01×10^6	–	1954	1954	Site backfilled and surface stabilized; landfill closure planned
218-W-1A	218-W-1A Burial Ground	Burial Ground	Solid	–	1.4×10^4	1944	1960	Site backfilled and surface stabilized in 1983; landfill closure planned
UPR-200-W-26	UPR-200-W-26	Contaminated Soil	Solid	–	Unknown	1953	1953	Landfill closure planned
216-T-29	216-T-29 Crib	Crib	Liquid	7.40×10^4	–	1949	1964	Deactivated; landfill closure planned
216-T-33	216-T-33 Crib	Crib	Liquid	1.90×10^6	–	1963	1963	Surface stabilized in 1991; landfill closure planned
216-T-34	216-T-34 Crib	Crib	Liquid	1.73×10^7	–	1966	1967	Interim-stabilized in 1990; landfill closure planned
216-T-35	216-T-35 Crib	Crib	Liquid	5.73×10^6	–	1967	1968	Surface stabilized in 1990; landfill closure planned
216-T-1	216-T-1 Ditch (221-T Ditch)	Ditch	Liquid	2.75×10^8	–	1945 1964	1956 1995	Backfilled and stabilized in 1995; landfill closure planned
216-T-2	216-T-2 Reverse Well	French Drain	Liquid	6.01×10^6	–	1945	1950	Surface stabilized
216-T-3	216-T-3 Reverse Well	French Drain	Liquid	1.13×10^7	–	1945	1946	Surface stabilized in 1993
216-T-6	216-T-6 Cribs	Crib	Liquid	4.50×10^7	–	1946	1947	Surface stabilized in 1993; landfill closure planned
216-T-8	216-T-8 Crib	Crib	Liquid	5.00×10^5	–	1950	1951	Stabilized in 1981; landfill closure planned
200-W-45	200-W-45 Sand Filter	Sand Filter	Solid	–	Unknown	1949	1979	Inactive
200-W-20	2706-T Equipment Decontamination Building	Building	Solid	–	Unknown	1944	Unknown	Landfill closure planned
200-W-20	T Plant Complex (including 221-T)	Building	Solid	–	Unknown	1944	Unknown	Landfill closure planned
224-T	224-T Canyon	Building	Liquid/ Solid	Unknown	–	1944	1956	Landfill closure planned
200-W-9	200-W-9 Unplanned Release	Contaminated Soil	Liquid	1.36×10^5	–	1994	1994	Landfill closure planned
UPR-200-W-2	UPR-200-W-2 Unplanned Release	Contaminated Soil	Liquid	1.23×10^4	–	1947	1947	Landfill closure planned
UPR-200-W-21	UPR-200-W-21	Contaminated Soil	Liquid	1.11×10^4	–	1953	1953	Covered with blacktop; entire area covered with shotcrete in 1991; landfill closure planned
UPR-200-W-38	UPR-200-W-38 Unplanned Release	Contaminated Soil	Liquid	7.70×10^3	–	1955	1955	Backfilled with soil in 1955; surface stabilized in 1991; landfill closure planned
UPR-200-W-98	UPR-200-W-98 Unplanned Release	Contaminated Soil	Liquid	3.30×10^2	–	1945	1945	Covered with 4 feet of soil in 1945; currently located under blacktop road; landfill closure planned
UPR-200-W-102	UPR-200-W-102 Unplanned Release	Contaminated Soil	Liquid	2.88×10^4	–	1972	1972	Landfill closure planned
TRUSAF	TRUSAF (in 224-T Canyon)	Building	Liquid/ Solid	Unknown	Unknown	1944	Standby	Landfill closure planned
241-T-361	241-T-361 Settling Tank	Tank	Liquid/ Solid	1.06×10^5	–	1944	1951	Liquids pumped out and isolated in 1985; surface stabilized in 1993; landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–20. Cumulative Impact Sites for Map 9C

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-Z-16	216-Z-16 Crib	Crib	Liquid	1.02×10^8	–	1968	1977	Landfill closure planned
231-Z	231-Z Plutonium Isolation Facility	Building	Solid		Unknown	1945	1975	Partially cleaned out and decontaminated after 1975; landfill closure planned
216-Z-4	216-Z-4 Trench	Trench	Liquid	1.10×10^4	–	1945	1945	Deactivated and backfilled in 1945; interim-stabilized in 1990; landfill closure planned
216-Z-5	216-Z-5 Crib	Crib	Liquid	3.10×10^7	–	1945	1947	Deactivated in 1947; surface stabilized in 1990; landfill closure planned
216-Z-6	216-Z-6 Crib	Crib	Liquid	9.80×10^4	–	1945	1945	Surface stabilized in 1990; landfill closure planned
216-Z-7	216-Z-7 Crib	Crib	Liquid	7.99×10^7	–	1947 1965	1957 1966	Backfilled in 1967; interim-stabilized in 1990; landfill closure planned
216-Z-8	216-Z-8 Trench	French Drain	Liquid	1.04×10^4	–	1957	1961	Landfill closure planned
216-Z-9	216-Z-9 Trench	Trench	Liquid	4.09×10^6	–	1955	1962	Gravel biobarrier placed in 1999; landfill closure planned
216-Z-10	216-Z-10 Reverse Well	Reverse Well	Liquid	1.00×10^6	–	1945	1945	Interim-stabilized 1990; landfill closure planned
UPR-200-W-130	UPR-200-W-130	Contaminated Soil	Liquid	3.30×10^2	–	1967	1967	Covered with clean soil; landfill closure planned
216-Z-17	216-Z-17 Trench	Trench	Liquid	3.68×10^7	–	1967	1968	Backfilled in 1975; surface stabilized in 1990; landfill closure planned
216-Z-15	216-Z-15 French Drain	French Drain	Liquid	4.81×10^7	–	1949	1997	Landfill closure planned
234-5Z	234-5Z Plutonium Finishing Plant	Building	Solid	–	Unknown	1949	1988	Landfill closure planned
2736-Z	2736-Z Plutonium Finishing Plant	Building	Liquid/ Solid	Unknown	Unknown	1971	Active	Landfill closure planned
242-Z	242-Z Americium Recovery Facility	Building	Solid	–	Unknown	1964	1976	Landfill closure planned
216-Z-1D	216-Z-1(D) Ditch	Ditch	Liquid	1.00×10^6	–	1944	1959	Backfilled in 1959; landfill closure planned
236-Z	236-Z Plutonium Reclamation Facility	Building	Solid	–	Unknown	1964	1991	Landfill closure planned
216-Z-14	216-Z-14 French Drain	French Drain	Liquid	5.18×10^7	–	1949	2001	Landfill closure planned
291-Z	291-Z Exhaust Fan and Compressor House	Building	Solid	–	Unknown	1949	Active	Landfill closure planned
UPR-200-W-103	UPR-200-W-103	Contaminated Soil	Liquid	2.97×10^2	–	1971	1971	Part of soil removed; landfill closure planned
241-Z	241-Z Treatment Tank	Tank	Liquid	Unknown	–	1948	Active	Landfill closure planned
241-Z-361	241-Z-361 Settling Tank	Tank	Liquid	7.50×10^2	76	1949	1976	Landfill closure planned
216-Z-13	216-Z-13 French Drain	French Drain	Liquid	4.98×10^7	–	1949	1999	Active
216-Z-1&2	216-Z-1 & 2 Cribs	Crib	Liquid	3.37×10^7	–	1949 1966	1952 1969	Landfill closure planned
216-Z-3	216-Z-3 Crib	Crib	Liquid	1.78×10^8	–	1952	1959	Landfill closure planned
216-Z-12	216-Z-12 Crib	Crib	Liquid	2.72×10^8	–	1959	1973	Landfill closure planned

Table S–20. Cumulative Impact Sites for Map 9C *(continued)*

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-Z-1A	216-Z-1A Tile Field	Tile Field	Liquid	6.21×10^6	–	1949 1964	1959 1969	Deactivated in 1969; landfill closure planned
216-Z-18	216-Z-18 Crib	Crib	Liquid	3.86×10^6	–	1969	1973	Landfill closure planned
216-Z-20	216-Z-20 Crib	Crib	Liquid	4.19×10^9	–	1981	1995	Backfilled and isolated; landfill closure planned
216-Z-21	216-Z-21 Seepage Basin	Pond	Liquid	1.57×10^9	–	1980	1995	Landfill closure planned
216-Z-11	216-Z-11 Ditch	Ditch	Liquid	Unknown	–	1959	1971	Backfilled in 1981; landfill closure planned
216-U-13	216-U-13 Trench	Trench	Liquid	1.14×10^4	–	1952	1956	Contaminated soil removed in 1956; landfill closure planned
216-U-14	216-U-14 Ditch	Ditch	Liquid	4.88×10^9	–	1944	1994	Stabilized in 1995
207-U	207-U Retention Basin	Basin	Liquid	1.30×10^4	–	1952	Unknown	Converted into active stormwater basin; stabilization planned
UPR-200-W-135	UPR-200-W-135 Unplanned Release	Contaminated Soil	Liquid	3.79×10^3	–	1954	1954	Stabilized with soil in 1990; landfill closure planned
UPR-200-W-28	UPR-200-W-28	Contaminated Soil	Liquid	2.31×10^3	–	1954	1954	Covered with clean soil; landfill closure planned
UPR-200-W-131	UPR-200-W-131	Contaminated Soil	Liquid	15.1	–	1953	1953	Covered with clean gravel in 2002; landfill closure planned
200-W PP	200-W PP Powerhouse Pond	Pond	Liquid	3.41×10^9	–	1984	1995	Stabilized in 1995
216-T-20	216-T-20 Trench	Trench	Liquid	1.89×10^4	–	1952	1952	Deactivated and backfilled; landfill closure planned
232-Z	232-Z Waste Incinerator	Building	Solid	–	Unknown	1959	1976	Isolated and stabilized; landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–21. Cumulative Impact Sites for Map 9D

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-U-10	216-U-10 Pond	Pond	Liquid	1.60×10^{11}	–	1944	1994	Backfilled and stabilized; landfill closure planned
216-U-3	216-U-3 French Drain	Crib	Liquid	7.91×10^{5}	–	1954	1955	Landfill closure planned
UPR-200-W-104	UPR-200-W-104	Contaminated Soil	Liquid	Unknown	–	Unknown	Unknown	Stabilized in 1985; landfill closure planned
UPR-200-W-105	UPR-200-W-105	Contaminated Soil	Liquid	Unknown	–	Unknown	Unknown	Stabilized in 1985; landfill closure planned
UPR-200-W-106	UPR-200-W-106	Contaminated Soil	Liquid	Unknown	–	Unknown	Unknown	Stabilized in 1985; landfill closure planned
216-S-4	216-S-4 French Drain	French Drain	Liquid	9.99×10^{5}	–	1953	1956	Stabilized; landfill closure planned
216-S-3	216-S-3 Crib	Crib	Liquid	4.20×10^{6}	–	1953	1956	Landfill closure planned
216-S-21	216-S-21 Crib	Crib	Liquid	8.71×10^{7}	–	1954	1969	Interim-stabilized in 1990; landfill closure planned
UPR-200-W-107	UPR-200-W-107	Contaminated Soil	Liquid	Unknown	–	1952	1957	Stabilized in 1985; landfill closure planned
216-S-25	216-S-25 Crib	Crib	Liquid	2.88×10^{8}	–	1973 1985	1980 1985	Landfill closure planned
216-S-1&2	216-S-1 and 216-S-2 Cribs	Cribs	Liquid	1.60×10^{8}	–	1952	1956	Surface stabilized in 1994; landfill closure planned
216-S-8	216-S-8 Trench	Trench	Liquid	1.00×10^{7}	–	1951	1952	Backfilled and surface stabilized in 1994; landfill closure planned
UPR-200-W-95	UPR-200-W-95	Contaminated Soil	Liquid	39.7	–	1951	1954	Lined basin covered with clean soil in 1984

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–22. Cumulative Impact Sites for Map 9E

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-U-5	216-U-5 Trench	Trench	Liquid	2.25×10^6	–	1952	1952	Backfilled in 1952; surface stabilized in 1994; removal, treatment, and disposal planned
216-U-6	216-U-6 Trench	Trench	Liquid	2.25×10^6	–	1952	1952	Backfilled in 1952; surface stabilized in 1994; removal, treatment, and disposal planned
221-U	221-U Process Canyon	Building	Liquid/ Solid	Unknown	Unknown	1945	1961	Landfill closure planned
241-WR-Vault	241-WR Vault	Building	Liquid	Unknown	–	1952	1976	Covered with plastic; landfill closure planned
216-U-15	216-U-15 Trench	Trench	Liquid	6.81×10^4	–	1957	1957	Backfilled in 1957; removal, treatment, and disposal planned
UPR-200-W-138	UPR-200-W-138	Contaminated Soil	Liquid	1.49×10^4	–	1953	1953	Covered with clean soil 1998; landfill closure planned
200-W-44	200-W-44 Sand Filter	Sand Filter	Solid	–	Unknown	1948	active	Active
216-U-7	216-U-7 French Drain	French Drain	Liquid	7.00×10^3	–	1952	1957	Surface stabilized in 1998; landfill closure planned
UPR-200-W-101	UPR-200-W-101 Unplanned Release	Contaminated Soil	Liquid	4.50×10^3	–	1957	1957	Covered with clean backfill in 1998; landfill closure planned
216-U-4	216-U-4 Reverse Well	Reverse Well	Liquid	3.00×10^5	–	1947	1955	Landfill closure planned
216-U-4A	216-U-4A French Drain	French Drain	Liquid	5.45×10^5	–	1955 1965	1961 1970	Landfill closure planned
216-U-1&2	216-U-1 and 2 Cribs	Crib	Liquid	1.59×10^7	–	1951 1958 1966	1956 1960 1967	Landfill closure planned
241-U-361	241-U-361 Settling Tank	Tank	Liquid	1.04×10^5	–	1951	1967	Interim-stabilized in 1985; surface stabilized in 1992; landfill closure planned
UPR-200-W-39	UPR-200-W-39 Unplanned Release	Contaminated Soil	Liquid	3.85×10^2	–	1954	1954	Covered with clean soil and building; landfill closure planned
200-W-42	200-W-42 Process Sewer	Process Sewer	Liquid	1.11×10^4	–	1952	1988	Portions stabilized with gravel in 1995 and 2001; removal, treatment, and disposal planned
UPR-200-W-163	UPR-200-W-163 Unplanned Release	Contaminated Vegetation	Liquid	3.35×10^4	–	1952	1988	Partially stabilized
216-U-16	216-U-16 Crib	Crib	Liquid	4.09×10^8	–	1984	1985	Backfilled in 2000
216-S-9	216-S-9 Crib	Crib	Liquid	4.96×10^7	–	1965	1969	Surface stabilized in 1995; landfill closure planned
216-S-23	216-S-23 Crib	Crib	Liquid	3.41×10^7	–	1969	1972	Interim-stabilized in 1985; landfill closure planned
216-U-8	216-U-8 Crib	Crib	Liquid	3.75×10^8	–	1952	1960	Interim-stabilized in 1995; landfill closure planned
216-U-12	216-U-12 Crib	Crib	Liquid	1.49×10^8	–	1960 1981	1972 1988	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–23. Cumulative Impact Sites for Map 9F

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-S-19	216-S-19 Pond	Pond	Liquid	1.30×10^9	–	1952	1984	Stabilized in 1984; removal, treatment, and disposal planned
216-S-14	216-S-14 Trench	Trench	Liquid	7.60×10^4	–	1952	1952	Backfilled; removal, treatment, and disposal planned
216-S-7	216-S-7 Crib	Crib	Liquid	3.90×10^8	–	1956	1965	Surface stabilized in 1992; landfill closure planned
UPR-200-W-32	UPR-200-W-32	Contaminated Soil	Liquid	3.30×10^2	–	1954	1954	Contaminated soil covered with clean soil in 1954; removal, treatment, and disposal planned
216-S-13	216-S-13 Crib	Crib	Liquid	5.00×10^6	–	1951	1966	Interim-stabilized in 1991; landfill closure planned
216-S-12	216-S-12 Trench	Trench	Liquid	7.48×10^4	–	1954	1954	Landfill closure planned
200-W-22	200-W-22 Unplanned Release	Contaminated Soil	Liquid	32	–	1952	1983	Aboveground contamination removed; removal, treatment, and disposal planned
233-S	233-S Plutonium Concentration Facility	Building	Solid	Unknown	–	1952	1967	Demolished in 2004; concrete cap placed over foundation
200-W-69	200-W-69 Lab Complex (includes 222-S Lab, 222-S DMWSA, 219-S, 222-SA, 296-S-21, 296-S-16, 296-S-23, 296-S-13)	Chemicals	Liquid/ Solid	Unknown	–	1951	active	Landfill closure planned
UPR-200-W-61	UPR-200-W-61	Contaminated Soil	Liquid	9.24×10^2	–	1966	1966	Landfill closure planned
202-S	202-S (REDOX)	Building	Solid	Unknown	–	1952	1967	Landfill closure planned
291-S	291-S Sand Filter	Sand Filter/ Equipment	Solid	Unknown	–	1952	Active	Active
216-S-20	216-S-20 Crib	Crib	Liquid	1.35×10^8	–	1952 1972	1969 1973	Deactivated in 1974; sinkholes backfilled; removal, treatment, and disposal planned
216-S-22	216-S-22 Crib	Crib	Liquid	9.83×10^4	–	1957	1959	Landfill closure planned
216-S-26	216-S-26 Crib	Crib	Liquid	2.19×10^8	–	1984	1995	Isolated; manhole filled with concrete; removal, treatment, and disposal planned
218-W-7	218-W-7 Burial Ground (222-S Vault)	Burial Ground	Solid	–	1.59×10^2	1952	1960	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; REDOX=Reduction-Oxidation (Facility); WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–24. Cumulative Impact Sites for Map 10

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
600-148	Environmental Restoration Disposal Facility	Disposal Facility	Solid	–	2.1×10^7	1996	2031	Disposal operations to be completed in 2031, barrier construction to be completed in 2033
N/A	US Ecology	Disposal Facility	Solid	–	7.1×10^5	1965	2056	Operations assumed to end in 2056; barrier placed in stages
216-W-LWC	216-W-LWC Crib	Crib	Liquid	9.99×10^8	–	1981	1993	Isolated in 1994; landfill closure planned
216-U-17	216-U-17 Crib	Crib	Liquid	5.93×10^6	–	1988 1992	1989 1994	Stabilized

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; N/A=not applicable; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–25. Cumulative Impact Sites for Map 11

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
218-E-10	218-E-10 Trench	Burial Ground	Solid	–	2.18×10^4	1960	Unknown	Active; partially stabilized 1980; landfill closure planned
UPR-200-E-23	UPR-200-E-23	Contaminated Soil	Solid	Unknown	–	Unknown	Unknown	Addressed in 218-E-10
UPR-200-E-24	UPR-200-E-24	Contaminated Soil	Solid	Unknown	–	Unknown	Unknown	Addressed in 218-E-10
216-B-50	216-B-50 Crib	Crib	Liquid	5.47×10^7	–	1965	1974	Interim-stabilized in 1991; landfill closure planned
216-B-57	216-B-57 Crib	Crib	Liquid	8.43×10^7	–	1968	1973	Surface stabilized in 1991; covered with Hanford prototype barrier in 1994; landfill closure planned
UPR-200-E-9	UPR-200-E-9	Contaminated Soil	Liquid	4.16×10^4	–	1955	1955	Most contaminated soil removed; remainder stabilized in 1955; landfill closure planned
216-B-11A & B	216-B-11A & B	Reverse Well	Liquid	2.96×10^7	–	1952	1954	Backfilled in 1992; landfill closure planned
216-B-51	216-B-51 French Drain	French Drain	Liquid	1.00×10^3	–	1956	1958	Stabilized in 1992
218-E-5	218-E-5 Burial Ground	Burial Ground	Solid	–	3.17×10^3	1954	1956	Surface stabilized in 1980; landfill closure planned
218-E-5A	218-E-5A Burial Ground	Burial Ground	Solid	–	6.17×10^3	1956	1959	Surface stabilized in 1980; landfill closure planned
218-E-2	218-E-2 Burial Ground	Burial Ground	Solid	–	9.03×10^3	1945	1953	Backfilled and stabilized in 1979; landfill closure planned
UPR-200-E-79	UPR-200-E-79 Unplanned Release	Contaminated Soil	Liquid	3.85×10^3	–	1953	1953	Contaminated soil covered with soil
UPR-200-E-78	UPR-200-E-78 Unplanned Release	Contaminated Soil	Liquid	1.54×10^2	–	1955	1955	Covered with clean soil; landfill closure planned
218-E-4	218-E-4 Burial Ground	Burial Ground	Solid	–	1.59×10^3	1955	1956	Surface stabilized in 1980; landfill closure planned
216-B-5	216-B-5 Reverse Well	Reverse Well	Liquid	3.21×10^7	–	1945	1947	Interim-stabilized in 1994
216-B-9	216-B-9 Crib	Crib	Liquid	3.60×10^7	–	1948	1951	Inactive; surface stabilized; landfill closure planned
216-B-59	216-B-59 Trench	Trench	Liquid	4.77×10^5	–	1968	1968	Inactive; removal, treatment, and disposal planned
241-B-361	241-B-361 Settling Tank	Tank	Liquid	–	83	1945	1947	Interim-stabilized in 1985; landfill closure planned
UPR-200-E-7	UPR-200-E-7 Unplanned Release	Contaminated Soil	Liquid	1.89×10^4	–	1954	1954	Stabilized; removal, treatment, and disposal planned
221-B	221-B B Plant/Canyon	Building	Solid	–	Unknown	1945	1984	Deactivated; landfill closure planned
200-E-28	200-E-28 UPR	Steam Condensate	Liquid	5.86×10^5	–	1990	1990	Closed out as part of completion of 221-B
200-E-97	200-E-97 French Drain	French Drain	Liquid	2.32×10^5	–	1945	1997	Inactive
200-E-98	200-E-98 French Drain	French Drain	Liquid	1.92×10^5	–	1945	1997	Inactive
WESF	WESF (Building 225-B)	Waste Storage	Solid	unknown	–	1974	active	Cesium/strontium capsules to be removed; landfill closure planned
216-B-62	216-B-62 Crib	Crib	Liquid	2.80×10^8	–	1973	1986	Inactive; isolated; landfill closure planned
216-B-12	216-B-12 Crib	Crib	Liquid	5.20×10^8	–	1952 1967	1957 1973	Inactive; stabilized in 1993; landfill closure planned

Table S–25. Cumulative Impact Sites for Map 11 *(continued)*

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-B-55	216-B-55 Crib	Crib	Liquid	1.20×10^9	–	1967 1988	1986 1990	Inactive; isolated; landfill closure planned
212-B	212-B Cask Loading Station	Building	Solid	–	Unknown	Unknown	Unknown	Deactivated in 1998; landfill closure planned
216-B-60	216-B-60 Crib	Crib	Liquid	1.89×10^4	–	1968	1968	Inactive; landfill closure planned
UPR-200-E-84	UPR-200-E-84 Unplanned Release	Contaminated Soil	Liquid	6.43×10^3	–	1953	1953	Landfill closure planned
224-B	224-B Plutonium Concentration Facility	Equipment	Solid	–	Unknown	1945	1976	Landfill closure planned
UPR-200-E-87	UPR-200-E-87 Unplanned Release	Contaminated Soil	Liquid	2.88×10^4	–	1949	1949	Landfill closure planned
UPR-200-E-1	UPR-200-E-1 Unplanned Release	Contaminated Soil	Liquid	2.04×10^4	–	1946	1946	Area covered; landfill closure planned
UPR-200-E-3	UPR-200-E-3 Unplanned Release	Contaminated Soil	Liquid	3.30×10^2	–	1951	1951	Cleanup of highly radioactive areas prohibited; landfill closure planned
UPR-200-E-85	UPR-200-E-85 Unplanned Release	Contaminated Soil	Liquid	2.48×10^3	–	1972	1972	Stabilized in 1984; landfill closure planned
216-B-4	216-B-4 Reverse Well	Reverse Well	Liquid	1.00×10^4	–	1945	1949	Inactive; landfill closure planned
216-B-6	216-B-6 Reverse Well	Reverse Well	Liquid	6.00×10^6	–	1945	1949	Inactive; landfill closure planned
200-E-30	200-E-30 Sand Filter (291-B Sand Filter)	Soil	Solid	unknown	–	1948	1997	Inactive; deactivated
200-E-55	200-E-55 French Drain	French Drain	Liquid	2.31×10^5	–	1945	1997	Landfill closure planned
200-E-95	200-E-95 French Drain	French Drain	Liquid	2.19×10^5	–	1945	1994	Inactive
216-B-10A	216-B-10A Crib	Crib	Liquid	9.98×10^6	–	1949	1952	Stabilized in 1983; removal, treatment, and disposal planned
216-B-10B	216-B-10B Crib	Crib	Liquid	2.80×10^4	–	1969	1973	Stabilized in 1983; removal, treatment, and disposal planned
UPR-200-E-77	UPR-200-E-77 Unplanned Release	Contaminated Soil	Liquid	34.7	–	1946	1946	Stabilized in 1946; landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–26. Cumulative Impact Sites for Map 12

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
218-E-12B	218-E-12B Burial Ground	Burial Ground	Solid	–	7.3×10^4	1967	Unknown	Seventeen trenches stabilized in 1981; landfill closure planned
218-E-12A	218-E-12A Burial Ground	Burial Ground	Solid	–	1.5×10^4	1953	1967	Surface stabilized in 1980 and 1994; landfill closure planned
216-B-63	216-B-63 Ditch	Ditch	Liquid	7.98×10^9	–	1970	1992	Inactive; backfilled and stabilized; remove, treat and disposal planned
216-B-2-2	216-B-2-2 Ditch	Ditch	Liquid	1.49×10^{11}	–	1963	1970	Inactive; backfilled in 1970; surface stabilized in 1987; removal, treatment, and disposal planned
216-B-2-1	216-B-2-1 Ditch	Ditch	Liquid	1.49×10^{11}	–	1945	1963	Backfilled and stabilized; removal, treatment, and disposal planned
UPR-200-E-138	UPR-200-E-138 Unplanned Release	Contaminated Soil	Liquid	Unknown	–	1970	1970	Surface stabilized in 1987
218-E-8	218-E-8 Burial Ground	Burial Ground	Solid	–	2.3×10^3	1958	1959	Surface stabilized in 1980; landfill closure planned
218-E-1	218-E-1 Burial Ground	Burial Ground	Solid	–	3.0×10^3	1945	1953	Surface stabilized in 1981; landfill closure planned
216-B-3	216-B-3 Pond	Pond	Liquid	2.8×10^{11}	–	1945	1997	Pond backfilled and surface stabilized in 1994
216-B-3A Pond / 216-B-3A RAD	216-B-3A Pond / 216-B-3A RAD	Pond	Liquid	Unknown	–	1983	1984	Closed as RCRA TSD site in 1995; interim-stabilized with B Pond
216-B-3B Pond / 216-B-3B-RAD	216-B-3B Pond / 216-B-3B-RAD	Pond	Liquid	Unknown	–	1984	1985	Closed as RCRA TSD site in 1995; interim-stabilized with B Pond
216-B-3C Pond / 216-B-3C RAD	216-B-3C Pond / 216-B-3C RAD	Pond	Liquid	Unknown	–	1985	1997	Backfilled in 1997; clean-closed under RCRA in 1995
UPR-200-E-14	Unplanned Release-UPR-200-E-14	Contaminated Soil	Liquid	Unknown	–	1958	1958	Released from radiation zone status in 1970; covered by 216-B-3A Pond Lobe in 1983; contaminated zone covered with clean soil
UPR-200-E-34	UPR-200-E-34	Contaminated Soil	Liquid	Unknown	–	1964	1964	Surface stabilized

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; RCRA=Resource Conservation and Recovery Act; TSD=treatment, storage, and disposal; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–27. Cumulative Impact Sites for Map 12A

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-C-9	216-C-9 Swamp	Pond	Liquid	1.04×10^9	–	1953	1985	Backfilled and interim-stabilized in 1989
218-C-9	218-C-9 Burial Ground	Burial Ground	Solid		2.3×10^3	1985	1989	Backfilled and stabilized in 1989; landfill closure planned
UPR-200-E-141	UPR-200-E-141	Contaminated Soil	Liquid	2.08×10^2	–	1984	1984	Contamination cleaned up
200-E-56	200-E-56 Unplanned release	Contaminated Soil	Liquid	7.55×10^4	–	1957	1957	Landfill closure planned
201-C	201-C Process Building	Buildings	Liquid/ Solid	Unknown	Unknown	1949	1967	Core entombed in 1986; area covered with 10 feet of ash in 1992; landfill closure planned
216-C-1	216-C-1 Hot Semi Work Crib	Crib	Liquid	2.34×10^7	–	1952	1957	Stabilized in 1979; entombed in concrete in 1986; landfill closure planned
216-C-3	216-C-3 Hot Semi Work Crib	Crib	Liquid	5.00×10^6	–	1953	1954	Stabilized in 1979; landfill closure planned
216-C-4	216-C-4 Hot Semi Work Crib	Crib	Liquid	1.70×10^5	–	1955 1962	1957 1964	Stabilized and backfilled in 2000; landfill closure planned
216-C-5	216-C-5 Hot Semi Work Crib	Crib	Liquid	3.89×10^4	–	1955	1955	Stabilized in 1979; landfill closure planned
216-C-6	216-C-6 Hot Semi Work Crib	Crib	Liquid	5.31×10^5	–	1955 1962	1957 1964	Deactivated in 1964; landfill closure planned
216-C-10	216-C-10 Hot Semi Work Crib	Crib	Liquid	8.97×10^5	–	1964	1967	Surface stabilized in 1989; landfill closure planned
216-C-2	216-C-2 Semi Works Reverse Well	Reverse Well	Liquid	3.15×10^6	–	1953	1988	Sealed with concrete in 1988; landfill closure planned
200-E-57	200-E-57 Unplanned release	Contaminated Soil	Liquid	1.13×10^5	–	1957	1957	Some soil removed; removal, treatment, and disposal planned
241-CX-72	241-CX-72 Storage Tank and Vault	Equipment	Liquid/ Solid	Unknown	1.32×10^2	1957	1976	Filled with grout in 1986; landfill closure planned
291-C-1	291-C-1 Burial Ground	Burial Ground	Solid	–	Unknown	1949	1987	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–28. Cumulative Impact Sites for Map 12B

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
UPR-200-E-86	UPR-200-E-86	Contaminated Soil	Liquid	7.00×10^4	–	1971	1971	Surface covered with shotcrete in 1995; landfill closure planned
216-A-40	216-A-40 Trench	Trench	Liquid	9.46×10^5	–	1968	1979	Backfilled with soil in 1994; removal, treatment, and disposal planned
216-A-41	216-A-41 Crib	Crib	Liquid	1.00×10^4	–	1968	1974	Removal, treatment, and disposal planned
216-A-9	216-A-9 Crib	Crib	Liquid	9.81×10^8	–	1956 1966	1958 1967	Surface stabilized; removal, treatment, and disposal planned
216-A-3	216-A-3 Crib	Crib	Liquid	3.05×10^6	–	1956 1976	1966 1981	Backfilled with gravel; removal, treatment, and disposal planned
216-A-39	216-A-39 Crib	Trench	Liquid	20.0	–	1966	1966	Landfill closure planned
216-A-18	216-A-18 Trench	Trench	Liquid	4.88×10^5	–	1955	1955	Surface stabilized in 1990; landfill closure planned
216-A-1	216-A-1 Crib	Crib	Liquid	9.84×10^4	–	1955	1955	Backfilled in 1992; landfill closure planned
216-A-7	216-A-7 Crib	Crib	Liquid	3.27×10^5	–	1955 1966	1956 1966	Backfilled in 1992; landfill closure planned
UPR-200-E-145	UPR-200-E-145	Contaminated Soil	Liquid	6.25×10^3	–	1993	1993	Covered with clean soil in 2003
216-A-16	216-A-16 French Drain	French Drain	Liquid	1.22×10^5	–	1956	1969	Landfill closure planned
216-A-17	216-A-17 French Drain	French Drain	Liquid	6.00×10^4	–	1956	1969	Landfill closure planned
242-A	242-A Evaporator	Equipment	Liquid	Unknown	–	1977	Active	Landfill closure planned
216-A-22	216-A-22 Crib (French Drain)	Crib	Liquid	9.99×10^3	–	1956	1959	Removal, treatment, and disposal planned
216-A-28	216-A-28 French Drain	French Drain	Liquid	3.00×10^4	–	1960	1960	Excavated in 1981; removal, treatment, and disposal planned
216-A-32	216-A-32 Crib	Crib	Liquid	4.00×10^3	–	1959	1972	Surface stabilized in 2001
200-E-78	200-E-78 Reverse Well	Reverse Well	Liquid	1.84×10^5	–	1955	1996	Inactive

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–29. Cumulative Impact Sites for Map 12C

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
UPR-200-E-51	UPR-200-E-51	Chemicals	Liquid	Unknown	–	1977	1977	Backfilled
216-A-24	216-A-24 Crib	Crib	Liquid	8.21×10^8	–	1958 1971 1978	1967 1976 1978	Surface stabilized in 1988; landfill closure planned
216-A-6	216-A-6 Crib	Crib	Liquid	3.36×10^9	–	1955 1966	1961 1970	Surface stabilized with sand and plastic sheeting in 1972 and 1993; landfill closure planned
216-A-19	216-A-19 Trench	Trench	Liquid	1.10×10^6	–	1955	1955	Surface stabilized in 1990; landfill closure planned
216-A-20	216-A-20 Trench	Trench	Liquid	9.61×10^5	–	1955	1955	Surface stabilized in 1990; landfill closure planned
216-A-8	216-A-8 Crib	Crib	Liquid	1.15×10^9	–	1955 1966 1978 1983	1958 1976 1978 1985	Surfaced stabilized in 1990; landfill closure planned
216-A-29	216-A-29 Ditch	Ditch	Liquid	Unknown	–	1955	1991	Surface stabilized in 1991
216-A-30	216-A-30 Crib	Crib	Liquid	7.64×10^9	–	1961 1976	1973 1991	Backfilled with gravel in 2001; landfill closure planned
216-A-37-1	216-A-37-1 Crib	Crib	Liquid	3.68×10^8	–	1977	1989	Landfill closure planned
216-A-37-2	216-A-37-2 Crib	Crib	Liquid	1.10×10^9	–	1984 1988	1986 1991	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–30. Cumulative Impact Sites for Map 12D

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
216-A-13	216-A-13 French Drain	French Drain	Liquid	1.00×10^4	–	1956	1962	Landfill closure planned
200-E-61	200-E-61 Reverse Well	Reverse Well	Liquid	1.80×10^6	–	1955	2001	Landfill closure planned
200-E-136	200-E-136 PUREX Plant (202-A and Others)	Building	Solid	–	Unknown	1956	1990	Landfill closure planned
UPR-200-E-39	UPR-200-E-39 (@ 216-A-36B)	Contaminated Soil	Liquid	1.52×10^3	–	1968	1968	Inactive
UPR-200-E-40	UPR-200-E-40	Contaminated Soil	Liquid	1.17×10^2	–	1968	1968	Contaminated blacktop removed in 1968; covered with clean gravel in 1999
200-E-85	200-E-85 Reverse Well	Reverse Well	Liquid	1.43×10^6	–	1955	1997	Landfill closure planned
216-A-35	216-A-35 French Drain	French Drain	Liquid	1.00×10^4	–	1963	1966	Landfill closure planned
200-E-54	200-E-54 Unplanned Release	Contaminated Soil	Liquid	2.01×10^5	–	1991	1991	Inactive
200-E-103	200-E-103 PUREX Stabilized Area	Contaminated Soil	Liquid	4.00×10^3	–	1960	1960	Interim-stabilized in 1999; landfill closure planned
UPR-200-E-117	UPR-200-E-117	Contaminated Soil	Liquid	3.30×10^2	–	1972	1972	Covered with clean backfill in 1999; landfill closure planned
216-A-2	216-A-2 Crib	Crib	Liquid	2.30×10^5	–	1956	1960	Landfill closure planned
216-A-26	216-A-26 French Drain	French Drain	Liquid	3.86×10^3	–	1965	1991	Inactive
216-A-26A	216-A-26A French Drain	French Drain	Liquid	1.00×10^3	–	1959	1965	Landfill closure planned
216-A-15	216-A-15 French Drain	French Drain	Liquid	1.00×10^7	–	1955	1972	Landfill closure planned
200-E-107	200-E-107 Unplanned Release	Contaminated Soil	Liquid	4.00×10^3	–	2000	2000	Surface stabilized with clean soil in 2001; landfill closure planned
218-E-14	218-E-14 PUREX Tunnel 1	Equipment	Solid	–	5.7×10^2	1960	1965	Landfill closure planned
218-E-15	218-E-15 PUREX Tunnel 2	Equipment	Solid	–	Unknown	1967	1996	Landfill closure planned
216-A-4	216-A-4 Crib	Crib	Liquid	6.21×10^6	–	1955	1958	Surface stabilized in 1999; landfill closure planned
216-A-5	216-A-5 Crib	Crib	Liquid	1.63×10^9	–	1955 1966	1961 1966	Surface stabilized in 1983; landfill closure planned
216-A-10	216-A-10 Crib	Crib	Liquid	3.16×10^9	–	1956 1961 1977 1981	1956 1973 1978 1987	Deactivated in 1987; landfill closure planned
216-A-21	216-A-21 Crib	Crib	Liquid	7.79×10^7	–	1957	1965	Landfill closure planned
216-A-27	216-A-27 Crib	Crib	Liquid	2.32×10^7	–	1965	1970	Landfill closure planned
216-A-31	216-A-31 Crib	Crib	Liquid	3.05×10^4	–	1964 1966	1964 1966	Landfill closure planned
216-A-36-A	216-A-36A Crib	Crib	Liquid	1.07×10^6	–	1965	1966	Landfill closure planned
216-A-36-B	216-A-36B Crib	Crib	Liquid	3.15×10^8	–	1966 1982	1972 1987	Landfill closure planned
216-A-45	216-A-45 Crib	Crib	Liquid	1.03×10^8	–	1987	1989	Landfill closure planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; PUREX=Plutonium-Uranium Extraction; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–31. Cumulative Impact Sites for Map 13

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
2101-M Pond	2101-M Pond	Pond	Liquid	1.11×10^9	–	1953	1995	Inactive
216-B-54	216-B-54 Trench	Trench	Liquid	9.99×10^5	–	1963	1965	Surface of backfilled trenches stabilized in 1982; removal, treatment, and disposal planned
216-B-14	216-B-14 Crib	Crib	Liquid	8.67×10^6	–	1956	1956	Stabilized in 1981; landfill closure planned
216-B-15	216-B-15 Crib	Crib	Liquid	6.32×10^6	–	1956	1957	Stabilized in 1981; landfill closure planned
216-B-16	216-B-16 Crib	Crib	Liquid	5.60×10^6	–	1956	1956	Stabilized in 1981; landfill closure planned
216-B-17	216-B-17 Crib	Crib	Liquid	3.41×10^6	–	1956	1956	Stabilized in 1981; landfill closure planned
216-B-18	216-B-18 Crib	Crib	Liquid	8.52×10^6	–	1956	1956	Stabilized in 1981; landfill closure planned
216-B-19	216-B-19 Crib	Crib	Liquid	6.35×10^6	–	1957	1957	Stabilized in 1981; landfill closure planned
216-B-20	216-B-20 Trench	Trench	Liquid	4.68×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-21	216-B-21 Trench	Trench	Liquid	4.67×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-22	216-B-22 Trench	Trench	Liquid	4.74×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-23	216-B-23 Trench	Trench	Liquid	4.52×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-24	216-B-24 Trench	Trench	Liquid	4.87×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-25	216-B-25 Trench	Trench	Liquid	4.91×10^6	–	1956	1956	Stabilized in 1982; landfill closure planned
216-B-26	216-B-26 Trench	Trench	Liquid	4.75×10^6	–	1956	1957	Stabilized in 1982; landfill closure planned
216-B-27	216-B-27 Trench	Trench	Liquid	4.42×10^6	–	1957	1957	Stabilized in 1982; landfill closure planned
216-B-28	216-B-28 Trench	Trench	Liquid	5.05×10^6	–	1957	1957	Stabilized in 1982; landfill closure planned
216-B-29	216-B-29 Trench	Trench	Liquid	4.83×10^6	–	1957	1957	Stabilized in 1982; landfill closure planned
216-B-30	216-B-30 Trench	Trench	Liquid	4.78×10^6	–	1957	1957	Stabilized in 1982; landfill closure planned
216-B-31	216-B-31 Trench	Trench	Liquid	4.85×10^6	–	1957	1957	Stabilized in 1982; landfill closure planned
216-B-32	216-B-32 Trench	Trench	Liquid	4.75×10^6	–	1956	1957	Stabilized in 1982; landfill closure planned
216-B-33	216-B-33 Trench	Trench	Liquid	4.75×10^6	–	1956	1957	Stabilized in 1982; landfill closure planned
216-B-34	216-B-34 Trench	Trench	Liquid	4.88×10^6	–	1956	1957	Stabilized in 1982; landfill closure planned
216-B-52	216-B-52 Trench	Trench	Liquid	8.53×10^6	–	1957	1958	Stabilized in 1982; landfill closure planned
216-B-53A	216-B-53A Trench	Trench	Liquid	5.49×10^5	–	1965	1965	Stabilized in 1982; removal, treatment, and disposal planned
216-B-53B	216-B-53B Trench	Trench	Liquid	2.01×10^4	–	1962	1963	Stabilized in 1982; removal, treatment, and disposal planned
216-B-58	216-B-58 Trench	Trench	Liquid	4.17×10^5	–	1965	1967	Stabilized in 1982; removal, treatment, and disposal planned

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–32. Cumulative Impact Sites for Map 14

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
600 NRDWL	600 Nonrad Dangerous Waste Landfill	Landfill	Solid	Unknown	1.41×10^5	1975	1985	Backfilled and covered; landfill closure planned

Key: Dash (-)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–33. Cumulative Impact Sites for Map 15

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
618-11	300 Wye Burial Ground	Burial Ground	Solid	–	Unknown	1962	1967	Surface stabilized in 1987
400 RFD	400 Area Retired French Drains	French Drain	Liquid	Unknown	–	Unknown	Unknown	Inactive
316-4	300 North Cribs, 321 Cribs	Crib	Liquid	2.00×10^5	–	1948	1955	Remedial excavation work begun in 2004

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–34. Cumulative Impact Sites for Map 16

WIDS ID/ Building Number	Common Site Name	Site Type	Source Type	Volume Liquid (L)	Solid Volume (m^3)/ Mass (kg)	Time Start	Time Stop	Status/Future End State
618-9	300 West Burial Ground	Burial Ground	Solid	–	Unknown	1950	1956	Remediated in 1991; site exhumed and all waste removed
316-1	300 Area South Process Ponds	Pond	Liquid	5.11×10^{10}	–	1944	1975	Remediated and closed out; removal, treatment, and disposal planned
316-2	300 Area North Process Ponds	Pond	Liquid	3.73×10^{10}	–	1949	1975	Remediated and closed out; removal, treatment, and disposal planned
316-5	300 Area Process Trenches	Trench	Liquid	3.63×10^{10}	–	1975	1985	Remediated and closed out; removal, treatment, and disposal planned
UPR-300-1	307-340 Waste Line Leak	Unplanned Release	Liquid	Unknown	–	1969	1969	Top 2 feet of contaminated soil removed and disposed of in 200 Areas
300-19	324 Sodium Removal Pilot Plant	Process Unit/Plant	Liquid	Unknown	–	1979	1987	Reaction vessel decommissioned and removed in 1991
UPR-300-13	Acid Neutralization Tank Leak East of 333 Building	Unplanned Release	Liquid	4.93×10^{3}	–	1973	1973	Tank and contaminated soil removed
300-264	327 Building, Postirradiation Testing Laboratory	Laboratory	Liquid	Unknown	–	1953	1996	Currently in stabilization and deactivation stage
309-WS-1	309 Plutonium Recycle Test Reactor Ion Exchange Vault	Process Unit/Plant	Liquid	Unknown	–	1961	1969	Deactivated in 1995; vault decontaminated and residual contamination stabilized
316-3	307 Disposal Trenches	Trench	Liquid	1.00×10^{9}	–	1953	1963	Contaminated sediments excavated and removed in 1963; trench backfilled in 1965

Key: Dash (–)=not applicable; ID=identifier; kg=kilograms; L=liters; m^3=cubic meters; WIDS=Waste Information Data System.
Source: SAIC 2006.

Table S–35a. Map 1: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
116-B-1	107-B Liquid Waste Disposal Trench	Liquid	1998	2.51×10^{-2}	–	–	4.98×10^{-2}	–	–	–
116-B-4	105-B Dummy Decontamination French Drain	Liquid	1998	–	–	–	–	–	–	–
116-B-5	108-B Crib	Liquid	1998	8.29×10^{1}	–	–	8.10×10^{-4}	–	–	–
116-B-6A	116-B-6-1 Crib	Liquid	1998	–	–	–	6.37×10^{-1}	–	–	–
116-B-6B	116-B-6-2 Crib	Liquid	1998	3.31×10^{-3}	–	–	1.33×10^{-4}	–	–	–
116-B-11	107-B Retention Basins	Liquid	1998	1.82	–	–	6.58×10^{-1}	–	–	–
116-C-5	107-C Retention Basins	Liquid	1998	3.68×10^{-1}	–	–	1.7	–	–	–
116-C-1	107-C Liquid Waste Disposal Trench	Liquid	1998	3.87×10^{-1}	–	–	1.16	–	–	–
116-C-2A	105-C Pluto Crib	Liquid	1998	1.38×10^{-1}	–	–	6.94×10^{-1}	–	–	–
116-C-2C	105-C Pluto Crib Sand Filter	Liquid	1998	1.24×10^{-1}	–	–	1.27	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–35b. Map 1: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
116-B-1	107-B Liquid Waste Disposal Trench	Liquid	1998	2.17×10^{-1}	–	–	6.15×10^{-9}	–	8.18×10^{-3}	–
116-B-4	105-B Dummy Decontamination French Drain	Liquid	1998	–	–	–	–	–	–	–
116-B-5	108-B Crib	Liquid	1998	1.46×10^{-3}	–	–	–	–	–	–
116-B-6A	116-B-6-1 Crib	Liquid	1998	1.05×10^{-1}	–	–	4.53×10^{-11}	–	2.00×10^{-3}	–
116-B-6B	116-B-6-2 Crib	Liquid	1998	1.46×10^{-4}	–	–	–	–	–	–
116-B-11	107-B Retention Basins	Liquid	1998	5.24	–	–	1.09×10^{-6}	–	9.13×10^{-1}	–
116-C-5	107-C Retention Basins	Liquid	1998	8.78×10^{-1}	–	–	6.06×10^{-7}	–	2.94×10^{-1}	–
116-C-1	107-C Liquid Waste Disposal Trench	Liquid	1998	4.10	–	–	2.94×10^{-9}	–	1.30×10^{-1}	–
116-C-2A	105-C Pluto Crib	Liquid	1998	5.86×10^{-4}	–	–	–	–	–	–
116-C-2C	105-C Pluto Crib Sand Filter	Liquid	1998	5.86	–	–	7.15×10^{-6}	–	1.20×10^{-1}	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–36a. Map 2: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
116-K-1	100-K Crib	Liquid	1998	–	–	–	4.39×10^{-1}	–	–	–
116-K-2	100-K Mile Long Trench	Liquid	1998	1.44×10^{1}	–	–	1.08×10^{1}	–	–	–
116-KE-4	107-KE Retention Basins	Liquid	1998	3.61×10^{-2}	–	–	9.40×10^{-2}	–	–	–
116-KW-3	107-KW Retention Basin	Liquid	1998	1.38×10^{-1}	–	–	4.65×10^{-2}	–	–	–
116-KE-1	115-KE Condensate Crib	Liquid	1998	5.65×10^{1}	1.10×10^{2}	–	–	–	–	–
116-KE-2	1706-KER Waste Crib	Liquid	1986	–	1.46×10^{1}	–	–	–	–	–
116-KW-1	115-KW Condensate Crib	Liquid	1998	3.59×10^{1}	–	–	4.40×10^{-3}	–	–	–
UPR-100-K-1[b]	100-KE Fuel Storage Basin Leak	Liquid	Unknown	–	–	–	–	–	–	–
120-KE-1	183-KE Filter Waste Facility Drywell	Liquid/ Solid	N/A	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System ; Zr=zirconium.

Source: SAIC 2006.

Table S–36b. Map 2: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
116-K-1	100-K Crib	Liquid	1998	1.29×10^{1}	–	–	8.38×10^{-7}	–	1.41×10^{-1}	–
116-K-2	100-K Mile Long Trench	Liquid	1998	1.06×10^{2}	–	–	1.14×10^{-5}	–	4.99	–
116-KE-4	107-KE Retention Basins	Liquid	1998	9.97×10^{-1}	–	–	1.26×10^{-9}	–	5.38×10^{-4}	–
116-KW-3	107-KW Retention Basin	Liquid	1998	3.02×10^{-1}	–	–	8.19×10^{-11}	–	3.61×10^{-3}	–
116-KE-1	115-KE Condensate Crib	Liquid	1998	–	–	–	–	–	–	–
116-KE-2	1706-KER Waste Crib	Liquid	–	–	–	–	–	–	–	–
116-KW-1	115-KW Condensate Crib	Liquid	1998	2.58×10^{-3}	–	–	–	–	–	–
UPR-100-K-1[b]	100-KE Fuel Storage Basin Leak	Liquid	Unknown	–	–	–	–	–	1.30	–
120-KE-1	183-KE Filter Waste Facility Drywell	Liquid/ Solid	N/A	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–37a. Map 3: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
116-N-1	1301-N Liquid Waste Disposal Facility	Liquid	1998	5.29×10^{3}	–	–	1.61×10^{3}	–	–	–
116-N-3	1325-N Liquid Waste Disposal Facility	Liquid	1998	3.23×10^{2}	–	–	1.61×10^{2}	–	–	–
UPR-100-N-3	Spacer Disposal System Transport Line Leak	Liquid	1978	1.00	–	–	8.00×10^{-1}	–	–	–
UPR-100-N-7	Rad Line Leak	Liquid	1985	–	–	–	–	–	8.00×10^{-1}	–
UPR-100-N-35[b]	100-N Fuel Storage Basin Drainage System Leak	Liquid	1986	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–37b. Map 3: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
116-N-1	1301-N Liquid Waste Disposal Facility	Liquid	1998	2.11×10^{3}	–	–	2.72×10^{-7}	–	2.30×10^{1}	–
116-N-3	1325-N Liquid Waste Disposal Facility	Liquid	1998	2.92×10^{2}	–	–	5.49×10^{-2}	–	2.80	–
UPR-100-N-3	Spacer Disposal System Transport Line Leak	Liquid	1978	2.50×10^{-1}	–	–	–	–	4.00×10^{-4}	–
UPR-100-N-7	Rad Line Leak	Liquid	1985	–	–	–	–	–	–	–
UPR-100-N-35[b]	100-N Fuel Storage Basin Drainage System Leak	Liquid	1986	4.00×10^{-1}	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–38a. Map 4: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
116-D-1A	105-D Storage Basin Trenches 1	Liquid	1998	3.87×10^{-1}	–	–	8.68×10^{-2}	–	–	–
116-D-1B	105-D Storage Basin Trenches 2	Liquid	1998	5.52×10^{-2}	–	–	1.16×10^{-1}	–	–	–
116-D-7	107-D Retention Basin	Liquid	1998	2.49×10^{-1}	–	–	1.62×10^{-1}	–	–	–
116-DR-9	107-DR Retention Basin	Liquid	1998	9.39×10^{-3}	–	–	1.43×10^{-1}	–	–	–
100-D-25[b]	107-DR Basin Leaks	Liquid	1998	1.52×10^{-1}	–	–	2.20×10^{-1}	–	–	–
UPR-100-D-4[b]	107-D Basin Leaks	Liquid	1998	4.06×10^{-1}	–	–	1.12×10^{-1}	–	–	–
116-DR-1&2	107-DR Liquid Waste Disposal Trenches	Liquid	1998	1.96×10^{-1}	–	–	2.14×10^{-1}	–	–	–
116-DR-6	1608-DR Liquid Disposal Trench	Liquid	N/A	–	–	–	–	–	–	–
116-DR-7	105-DR Inkwell Crib	Liquid	1986	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–38b. Map 4: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
116-D-1A	105-D Storage Basin Trenches 1	Liquid	1998	7.61×10^{-1}	–	–	4.53×10^{-10}	–	2.00×10^{-2}	–
116-D-1B	105-D Storage Basin Trenches 2	Liquid	1998	3.63×10^{-1}	–	–	1.52×10^{-10}	–	–	–
116-D-7	107-D Retention Basin	Liquid	1998	1.68	–	–	6.17×10^{-7}	–	1.40×10^{-1}	–
116-DR-9	107-DR Retention Basin	Liquid	1998	2.68	–	–	9.32×10^{-8}	–	6.86×10^{-2}	–
100-D-25[b]	107-DR Basin Leaks	Liquid	1998	3.29	–	–	9.85×10^{-10}	–	4.34×10^{-2}	–
UPR-100-D-4[b]	107-D Basin Leaks	Liquid	1998	2.17	–	–	6.72×10^{-8}	–	6.99×10^{-2}	–
116-DR-1&2	107-DR Liquid Waste Disposal Trenches	Liquid	1998	9.37	–	–	7.92×10^{-10}	–	3.49×10^{-2}	–
116-DR-6	1608-DR Liquid Disposal Trench	Liquid	N/A	–	–	–	–	–	–	–
116-DR-7	105-DR Inkwell Crib	Liquid	1986	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–39a. Map 5: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
100-H-33	183-H Solar Evaporation Basins Radionuclide Components	Liquid	N/A	–	–	–	–	–	–	–
116-H-6	183-H Solar Evaporation Basins	Liquid	N/A	Site consolidated with Site WIDS ID 100-H-33						
116-H-1	107-H Liquid Disposal Trench	Liquid	1998	1.35×10^{-2}	–	–	5.32×10^{-1}	–	–	–
116-H-2	1608-H Liquid Waste Disposal Trench	Liquid	1998	–	–	–	–	–	–	–
116-H-4	105-H Pluto Crib	Liquid	N/A	–	–	–	–	–	–	–
116-H-7	107-H Retention Basin	Liquid	1998	4.27×10^{-1}	–	–	5.76×10^{-1}	–	–	–
116-H-3	105-H Dummy Decontamination French Drain	Liquid	1998	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–39b. Map 5: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
100-H-33	183-H Solar Evaporation Basins Radionuclide Components	Liquid	N/A	–	–	–	–	–	–	–
116-H-6	183-H Solar Evaporation Basins	Liquid	N/A	Site consolidated with Site WIDS ID 100-H-33						
116-H-1	107-H Liquid Disposal Trench	Liquid	1998	2.69	–	–	1.99×10^{-7}	–	6.68×10^{-2}	–
116-H-2	1608-H Liquid Waste Disposal Trench	Liquid	1998	–	–	–	–	–	–	–
116-H-4	105-H Pluto Crib	Liquid	N/A	–	–	–	–	–	–	–
116-H-7	107-H Retention Basin	Liquid	1998	6.43	–	–	3.46×10^{-7}	–	2.36×10^{-1}	–
116-H-3	105-H Dummy Decontamination French Drain	Liquid	1998	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–40a. Map 6: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
116-F-1[b]	Lewis Canal	Liquid	1998	8.84×10^{-2}	–	–	3.65×10^{-2}	–	–	–
116-F-2	107-F Liquid Waste Disposal Trench	Liquid	1998	1.64×10^{-1}	–	–	4.92×10^{-2}	–	–	–
116-F-9	Animal Waste Leaching Trench	Liquid	1986	–	–	–	1.96	–	–	–
116-F-3	105-F Storage Basin Trench	Liquid	1998	–	–	–	–	–	–	–
116-F-6	105-F Cooling Water Trench	Liquid	1998	6.35×10^{-1}	–	–	1.22×10^{-1}	–	–	–
116-F-4	105-F Pluto Crib	Liquid	1998	4.70×10^{-3}	–	–	7.52×10^{-1}	–	–	–
116-F-10	105-F Dummy Decontamination French Drain	Liquid	N/A	–	–	–	–	–	–	–
116-F-14	107-F Retention Basin	Liquid	1998	1.96×10^{-1}	–	–	1.19×10^{-1}	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because it emptied directly into the Columbia River.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–40b. Map 6: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
116-F-1[b]	Lewis Canal	Liquid	1998	6.44×10^{-1}	–	–	1.49×10^{-10}	–	6.58×10^{-3}	–
116-F-2	107-F Liquid Waste Disposal Trench	Liquid	1998	5.39×10^{-1}	–	–	1.85×10^{-10}	–	8.18×10^{-3}	–
116-F-9	Animal Waste Leaching Trench	Liquid	1986	9.10×10^{-2}	–	–	–	–	7.00×10^{-3}	–
116-F-3	105-F Storage Basin Trench	Liquid	1998	–	–	–	–	–	–	–
116-F-6	105-F Cooling Water Trench	Liquid	1998	3.86×10^{-1}	–	–	2.22×10^{-10}	–	9.78×10^{-3}	–
116-F-4	105-F Pluto Crib	Liquid	1998	1.11	–	–	3.44×10^{-8}	–	4.19×10^{-2}	–
116-F-10	105-F Dummy Decontamination French Drain	Liquid	N/A	–	–	–	–	–	–	–
116-F-14	107-F Retention Basin	Liquid	1998	1.48	–	–	1.79×10^{-9}	–	7.91×10^{-2}	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because it emptied directly into the Columbia River.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–41a. Map 7: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-N-1	216-N-1 Pond	Liquid	2001	–	–	–	–	–	–	–
216-N-2	216-N-2 Trench	Liquid	2001	4.27×10^{-4}	8.26×10^{-6}	–	4.74×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}
216-N-3	216-N-3 Trench	Liquid	2001	4.27×10^{-4}	8.26×10^{-6}	–	4.74×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}
216-N-4	216-N-4 Pond	Liquid	2001	4.28×10^{-4}	8.27×10^{-6}	–	4.75×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}
216-N-5	216-N-5 Trench	Liquid	2001	4.27×10^{-4}	8.25×10^{-6}	–	4.74×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}
216-N-6	216-N-6 Pond	Liquid	2001	4.28×10^{-4}	8.27×10^{-6}	–	4.75×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}
216-N-7	216-N-7 Trench	Liquid	2001	4.27×10^{-4}	8.25×10^{-6}	–	4.74×10^{-2}	1.94×10^{-5}	1.76×10^{-4}	1.76×10^{-7}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–41b. Map 7: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-N-1	216-N-1 Pond	Liquid	2001	–	–	5.02×10^{-15}	3.90×10^{-4}	4.78×10^{-8}	3.17×10^{-5}	–
216-N-2	216-N-2 Trench	Liquid	2001	3.89×10^{-1}	–	1.05×10^{-14}	1.51×10^{-5}	1.09×10^{-6}	2.22×10^{-4}	6.18×10^{-5}
216-N-3	216-N-3 Trench	Liquid	2001	3.89×10^{-1}	–	1.05×10^{-14}	1.51×10^{-5}	1.09×10^{-6}	2.22×10^{-4}	6.18×10^{-5}
216-N-4	216-N-4 Pond	Liquid	2001	3.90×10^{-1}	–	1.57×10^{-14}	4.02×10^{-4}	1.14×10^{-6}	2.54×10^{-4}	6.18×10^{-5}
216-N-5	216-N-5 Trench	Liquid	2001	3.90×10^{-1}	–	1.05×10^{-14}	1.50×10^{-5}	1.09×10^{-6}	2.22×10^{-4}	6.18×10^{-5}
216-N-6	216-N-6 Pond	Liquid	2001	3.90×10^{-1}	–	1.55×10^{-14}	4.02×10^{-4}	1.14×10^{-6}	2.53×10^{-4}	6.18×10^{-5}
216-N-7	216-N-7 Trench	Liquid	2001	3.90×10^{-1}	–	1.05×10^{-14}	1.51×10^{-5}	1.09×10^{-6}	2.22×10^{-4}	6.18×10^{-5}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–42a. Map 8: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-A-25	216-A-25 Gable Mountain Pond	Liquid	2001	8.75×10^{2}	3.49×10^{1}	–	1.83×10^{2}	3.26×10^{-1}	1.71	1.40×10^{-2}
UPR-200-E-34	UPR-200-E-34	Liquid	N/A	Site consolidated with Site WIDS ID 216-A-25						
600-118	600-118 Ditch	Liquid	N/A	Site consolidated with Site WIDS ID 216-A-25						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–42b. Map 8: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-A-25	216-A-25 Gable Mountain Pond	Liquid	2001	7.26×10^{3}	–	4.91×10^{-9}	9.23	1.17×10^{-1}	3.76×10^{1}	2.84
UPR-200-E-34	UPR-200-E-34	Liquid	N/A	Site consolidated with Site WIDS ID 216-A-25						
600-118	600-118 Ditch	Liquid	N/A	Site consolidated with Site WIDS ID 216-A-25						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–43a. Map 9: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-S-5	216-S-5 Crib	Liquid	2001	3.30	1.08×10^{-3}	–	3.14×10^{1}	3.11×10^{-3}	2.59×10^{-2}	3.15×10^{-5}
216-S-6	216-S-6 Crib	Liquid	2001	3.55	9.23×10^{-5}	–	5.83	2.37×10^{-3}	1.60×10^{-2}	2.80×10^{-3}
216-S-10D[b]	216-S-10D Ditch	Liquid	1998	–	–	–	8.67×10^{-1}	–	–	–
216-S-10P	216-S-10P Pond	Liquid	2001	1.05	2.55	–	8.28×10^{-1}	1.83×10^{-3}	1.15×10^{-2}	1.81×10^{-5}
216-S-11	216-S-11P Pond	Liquid	1998	–	–	–	6.57×10^{-1}	2.24×10^{-5}	9.95×10^{-5}	–
216-S-16D[b]	216-S-16D Ditch	Liquid	N/A	–	–	–	–	–	–	–
216-S-16P	216-S-16P Pond	Liquid	2001	2.60	8.47×10^{-4}	–	1.37	3.75×10^{-3}	2.88×10^{-2}	3.50×10^{-5}
216-S-17	216-S-17 Pond	Liquid	2001	7.31×10^{-1}	1.62×10^{-3}	–	7.13	4.65×10^{-3}	2.95×10^{-2}	4.71×10^{-5}
UPR-200-W-47	UPR-200-W-47	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-16P						
UPR-200-W-59	UPR-200-W-59	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-16P						
UPR-200-W-34	UPR-200-W-34	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-10D						
218-W-1	218-W-1 Burial Ground	Solid	1986	–	–	–	3.88	–	–	–
218-W-2	218-W-2 Burial Ground	Solid	1986	–	–	–	9.70	–	–	–
218-W-4B	218-W-4B Burial Ground	Solid	1995	5.23×10^{4}	1.14×10^{1}	–	1.48×10^{4}	–	–	5.00×10^{-1}
218-W-4C	218-W-4C Burial Ground	Solid	1995	3.29×10^{4}	2.63	2.00×10^{-4}	7.33×10^{3}	5.70×10^{-4}	1.64×10^{1}	1.46×10^{-3}
218-W-5	218-W-5 Burial Ground	Solid	1995	5.82×10^{4}	5.33	5.42×10^{-2}	1.05×10^{5}	1.03×10^{-3}	1.42×10^{2}	3.66×10^{-2}
218-W-3AE	218-W-3AE Burial Ground	Solid	1995	7.03×10^{4}	1.46×10^{1}	6.24×10^{-2}	8.65×10^{4}	7.84	3.50×10^{1}	4.46×10^{-4}
218-W-3A	218-W-3A Burial Ground	Solid	1995	1.35×10^{5}	2.91×10^{2}	1.25×10^{-4}	9.85×10^{4}	1.83×10^{-5}	2.54×10^{-1}	1.44×10^{-2}
Z Plant BP	Z Plant Burning Pit	Solid	N/A	Site consolidated with Site WIDS ID 218-W-4C						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–43b. Map 9: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-S-5	216-S-5 Crib	Liquid	2001	5.63×10^{1}	–	1.89×10^{-14}	7.42×10^{-1}	1.37×10^{-4}	1.73×10^{-2}	1.02×10^{-2}
216-S-6	216-S-6 Crib	Liquid	2001	1.13×10^{1}	–	3.26×10^{-12}	5.77×10^{-1}	1.74×10^{-3}	2.98×10^{-1}	5.49×10^{-2}
216-S-10D[b]	216-S-10D Ditch	Liquid	1998	1.02	–	2.52×10^{-14}	6.91×10^{-11}	–	8.17×10^{-3}	1.87×10^{-2}
216-S-10P	216-S-10P Pond	Liquid	2001	3.76×10^{1}	–	2.56×10^{-10}	4.15×10^{-1}	4.60×10^{-2}	1.97×10^{1}	5.31×10^{1}
216-S-11	216-S-11 Pond	Liquid	1998	6.65×10^{-1}	–	2.57×10^{-15}	–	–	–	–
216-S-16D[b]	216-S-16D Ditch	Liquid	N/A	–	–	–	–	–	–	–
216-S-16P	216-S-16P Pond	Liquid	2001	7.07×10^{1}	–	2.96×10^{-14}	4.44×10^{-1}	1.37×10^{-4}	6.14×10^{-3}	6.68×10^{-3}
216-S-17	216-S-17 Pond	Liquid	2001	8.41×10^{-1}	–	2.81×10^{-14}	2.39×10^{-3}	2.07×10^{-4}	8.55×10^{-3}	8.08×10^{-3}
UPR-200-W-47	UPR-200-W-47	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-16P						
UPR-200-W-59	UPR-200-W-59	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-16P						
UPR-200-W-34	UPR-200-W-34	Liquid	N/A	Site consolidated with Site WIDS ID 216-S-10D						
218-W-1	218-W-1 Burial Ground	Solid	1986	4.15	–	–	2.35×10^{-2}	–	6.82×10^{3}	–
218-W-2	218-W-2 Burial Ground	Solid	1986	1.04×10^{1}	–	–	4.69×10^{-1}	–	9.13×10^{3}	–
218-W-4B	218-W-4B Burial Ground	Solid	1995	1.63×10^{4}	–	–	–	–	–	–
218-W-4C	218-W-4C Burial Ground	Solid	1995	5.75×10^{4}	–	–	7.28×10^{1}	8.26×10^{-3}	1.73×10^{4}	1.61×10^{4}
218-W-5	218-W-5 Burial Ground	Solid	1995	3.25×10^{3}	–	–	6.54×10^{2}	3.47×10^{-2}	1.46×10^{2}	3.86
218-W-3AE	218-W-3AE Burial Ground	Solid	1995	1.29×10^{5}	–	–	1.85×10^{2}	6.79×10^{-2}	3.69×10^{1}	1.11×10^{2}
218-W-3A	218-W-3A Burial Ground	Solid	1995	2.70×10^{5}	3.39×10^{-3}	–	–	–	–	–
Z Plant BP	Z Plant Burning Pit	Solid	N/A	Site consolidated with Site WIDS ID 218-W-4C						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–44a. Map 9A: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
218-W-3	218-W-3 Burial Ground	Solid	Varies based on time of disposal	–	–	–	1.75×10^{1}	–	–	–
218-W-4A	218-W-4A Burial Ground	Solid	1986	–	–	–	5.84×10^{1}	–	–	–
218-W-2A	218-W-2A Burial Ground	Solid	Varies based on time of disposal	–	–	–	2.98×10^{3}	–	–	–
UPR-200-W-84	UPR-200-W-84	Liquid	UPR-200-W-84	Site consolidated with Site WIDS ID 218-W-3A						
UPR-200-W-134	UPR-200-W-134	Solid	UPR-200-W-134	Site consolidated with Site WIDS ID 218-W-3A						
UPR-200-W-53	UPR-200-W-53	Liquid	UPR-200-W-53	Site consolidated with Site WIDS ID 218-W-2A						
UPR-200-W-72	UPR-200-W-72	Solid	UPR-200-W-72	Site consolidated with Site WIDS ID 218-W-4A						
UPR-200-W-16	UPR-200-W-16	Solid	UPR-200-W-16	Site consolidated with Site WIDS ID 218-W-1						
216-T-4A	216-T-4A Pond	Liquid	2001	1.25×10^{3}	1.11×10^{-4}	–	2.87	2.60×10^{-4}	6.68×10^{-2}	4.36×10^{-4}
216-T-4B	216-T-4B Pond	Liquid	1998	Site consolidated with Site WIDS ID 216-T-4A						
216-T-36	216-T-36 Crib	Liquid	2001	1.24×10^{-3}	1.19×10^{-5}	–	6.16×10^{-1}	2.96×10^{-5}	2.15×10^{-4}	2.98×10^{-4}
216-T-4-2	216-T-4-2 Ditch	Liquid	N/A	Site consolidated with Site WIDS ID 216-T-4A						
UPR-200-W-97	UPR-200-W-97 Unplanned Release	Liquid	2001	5.57×10^{-6}	1.76×10^{-5}	–	1.87×10^{-2}	4.78×10^{-4}	9.49×10^{-6}	–
UPR-200-W-29	UPR-200-W-29 Unplanned Release	Liquid	2001	2.31×10^{-2}	3.06×10^{-4}	–	2.54×10^{-1}	4.67×10^{-3}	7.66×10^{-4}	6.68×10^{-6}
216-T-13	216-T-13 Trench	Liquid	1972	–	–	–	1.00×10^{-1}	–	–	–
216-T-27	216-T-27 Crib	Liquid	2001	8.35×10^{-3}	1.10×10^{-1}	–	4.15	2.00×10^{-4}	1.43×10^{-3}	–
216-TY-201	216-TY-201 Settling Tank	Liquid	N/A	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–44b. Map 9A: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
218-W-3	218-W-3 Burial Ground	Solid	Varies based on time of disposal	1.87×10^{1}	–	–	2.35×10^{1}	–	4.93×10^{3}	–
218-W-4A	218-W-4A Burial Ground	Solid	1986	6.25×10^{1}	–	–	1.32×10^{2}	–	2.57×10^{3}	–
218-W-2A	218-W-2A Burial Ground	Solid	Varies based on time of disposal	3.18×10^{3}	–	–	–	–	–	–
UPR-200-W-84	UPR-200-W-84	Liquid	UPR-200-W-84	Site consolidated with Site WIDS ID 218-W-3A						
UPR-200-W-134	UPR-200-W-134	Solid	UPR-200-W-134	Site consolidated with Site WIDS ID 218-W-3A						
UPR-200-W-53	UPR-200-W-53	Liquid	UPR-200-W-53	Site consolidated with Site WIDS ID 218-W-2A						
UPR-200-W-72	UPR-200-W-72	Solid	UPR-200-W-72	Site consolidated with Site WIDS ID 218-W-4A						
UPR-200-W-16	UPR-200-W-16	Solid	UPR-200-W-16	Site consolidated with Site WIDS ID 218-W-1						
216-T-4A	216-T-4A Pond	Liquid	2001	5.50	–	5.15×10^{-11}	4.12×10^{-1}	1.63×10^{-4}	6.26×10^{-2}	8.30×10^{-4}
216-T-4B	216-T-4B Pond	Liquid	1998	Site consolidated with Site WIDS ID 216-T-4A						
216-T-36	216-T-36 Crib	Liquid	2001	7.26×10^{-1}	–	3.46×10^{-8}	1.32	4.52×10^{-7}	2.28×10^{1}	7.96×10^{-4}
216-T-4-2	216-T-4-2 Ditch	Liquid	N/A	Site consolidated with Site WIDS ID 216-T-4A						
UPR-200-W-97	UPR-200-W-97 Unplanned Release	Liquid	2001	2.18×10^{-2}	–	2.87×10^{-3}	1.04×10^{-5}	3.93×10^{-6}	1.13×10^{-2}	2.76×10^{-4}
UPR-200-W-29	UPR-200-W-29 Unplanned Release	Liquid	2001	1.73	–	1.26×10^{-12}	7.92×10^{-5}	1.76×10^{-5}	2.13×10^{-4}	1.97×10^{-3}
216-T-13	216-T-13 Trench	Liquid	1972	1.00×10^{-1}	–	–	–	–	–	–
216-T-27	216-T-27 Crib	Liquid	2001	4.94	–	2.33×10^{-7}	8.17×10^{-2}	3.33×10^{-3}	1.98	2.20
216-TY-201	216-TY-201 Settling Tank	Liquid	N/A		–	–	–	–	–	

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–45a. Map 9B: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-T-12	216-T-12 Trench	Liquid	2001	7.92×10^{1}	4.04×10^{-4}	–	3.60×10^{-1}	6.18×10^{-3}	8.43×10^{-3}	8.82×10^{-6}
218-W-1A	218-W-1A Burial Ground	Solid	Varies based on time of disposal	–	–	–	9.32×10^{2}	–	–	–
UPR-200-W-26	UPR-200-W-26	Solid		Site consolidated with Site WIDS ID 218-W-1A						
216-T-29	216-T-29 Crib	Liquid	2001	4.57×10^{-5}	8.83×10^{-7}	–	5.07×10^{-3}	2.07×10^{-6}	1.88×10^{-5}	1.88×10^{-8}
216-T-33	216-T-33 Crib	Liquid	2001	7.66×10^{-1}	1.21×10^{-6}	–	6.03×10^{-2}	3.01×10^{-6}	4.13×10^{-3}	2.93×10^{-5}
216-T-34	216-T-34 Crib	Liquid	2001	3.68×10^{-4}	8.66×10^{-2}	–	1.74×10^{-1}	1.11×10^{-5}	7.37×10^{-5}	8.21×10^{-3}
216-T-35	216-T-35 Crib	Liquid	2001	–	1.50×10^{-1}	–	7.13×10^{-3}	–	–	–
216-T-1	216-T-1 Ditch (221-T Ditch)	Liquid	2001	4.23×10^{-2}	6.27×10^{-4}	–	2.70	1.06×10^{-4}	9.66×10^{-4}	9.63×10^{-7}
216-T-2	216-T-2 Reverse Well	Liquid	2001	7.14×10^{-3}	1.38×10^{-4}	–	7.92×10^{-1}	3.24×10^{-4}	2.94×10^{-3}	2.94×10^{-6}
216-T-3	216-T-3 Reverse Well	Liquid	2001	2.02×10^{-5}	4.14×10^{-3}	–	1.70	3.57×10^{-2}	9.57×10^{-4}	4.24×10^{-7}
216-T-6	216-T-6 Cribs	Liquid	2001	2.13×10^{-4}	1.48×10^{-2}	–	1.40×10^{1}	4.01×10^{-1}	7.87×10^{-3}	3.49×10^{-6}
216-T-8	216-T-8 Crib	Liquid	2001	4.38×10^{-4}	7.87×10^{-5}	–	1.52×10^{1}	2.80×10^{-6}	1.94×10^{-4}	2.17×10^{-7}
200-W-45	200-W-45 Sand Filter	Solid	1994	–	–	–	2.90×10^{1}	–	–	–
200-W-20	2706-T Equipment Decontamination Building	Solid	1994	–	–	–	1.50×10^{1}	–	–	–
200-W-20	T Plant Complex (including 221-T)	Solid	1994	–	6.66×10^{1}	–	1.66×10^{4}	–	4.03×10^{1}	1.40×10^{1}
224-T	224-T Canyon	Liquid/ Solid	2003	–	–	–		–	–	–
200-W-9	200-W-9 Unplanned Release	Liquid	2001	1.61×10^{-4}	3.12×10^{-6}	–	1.79×10^{-2}	7.33×10^{-6}	6.66×10^{-5}	6.64×10^{-8}
UPR-200-W-2[b]	UPR-200-W-2 Unplanned Release	Liquid	2001	1.43×10^{-1}	3.80×10^{-3}	–	3.04×10^{1}	4.73×10^{-5}	8.43×10^{-2}	3.72×10^{-5}
UPR-200-W-21	UPR-200-W-21	Liquid	2001	2.87×10^{-1}	4.77×10^{-3}	–	2.75×10^{1}	7.08×10^{-5}	1.28×10^{-1}	1.46×10^{-4}
UPR-200-W-38	UPR-200-W-38 Unplanned Release	Liquid	2001	1.99×10^{-1}	3.31×10^{-3}	–	1.91×10^{1}	4.89×10^{-5}	8.87×10^{-2}	1.01×10^{-4}
UPR-200-W-98[b]	UPR-200-W-98 Unplanned Release	Liquid	2001	3.84×10^{-3}	1.03×10^{-4}	–	8.14×10^{-1}	1.26×10^{-6}	2.27×10^{-3}	1.01×10^{-6}
UPR-200-W-102	UPR-200-W-102 Unplanned Release	Liquid	2001	3.98×10^{-7}	1.65×10^{-5}	–	2.96×10^{-3}	–	1.51×10^{-6}	–
TRUSAF	TRUSAF (in 224-T Canyon)	Liquid/ Solid	1985	–	–	–	2.20×10^{1}	–	–	–
241-T-361	241-T-361 Settling Tank	Liquid/ Solid	Unknown	–	–	–	8.72×10^{2}	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–45b. Map 9B: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-T-12	216-T-12 Trench	Liquid	2001	2.29	–	1.67×10^{-12}	1.46×10^{-1}	2.42×10^{-5}	2.47×10^{-3}	2.60×10^{-3}
218-W-1A	218-W-1A Burial Ground	Solid	Varies based on time of disposal	9.97×10^{2}	-	–	3.02×10^{-1}	–	1.45×10^{2}	–
UPR-200-W-26	UPR-200-W-26	Solid		Site consolidated with Site WIDS ID 218-W-1A						
216-T-29	216-T-29 Crib	Liquid	2001	4.17×10^{-2}	–	1.12×10^{-15}	1.29×10^{-6}	1.16×10^{-7}	2.37×10^{-5}	6.60×10^{-6}
216-T-33	216-T-33 Crib	Liquid	2001	7.34×10^{-2}	–	3.37×10^{-9}	1.57×10^{-1}	4.95×10^{-8}	2.24	7.86×10^{-5}
216-T-34	216-T-34 Crib	Liquid	2001	3.08×10^{-1}	–	9.51×10^{-9}	3.73×10^{-1}	1.21×10^{-3}	6.99	1.81
216-T-35	216-T-35 Crib	Liquid	2001	7.71×10^{-2}	–	9.44×10^{-12}	2.39×10^{-2}	2.10×10^{-3}	1.19	3.14
216-T-1	216-T-1 Ditch (221-T Ditch)	Liquid	2001	2.42	–	9.30×10^{-14}	1.53×10^{-4}	2.04×10^{-5}	7.17×10^{-3}	3.56×10^{-4}
216-T-2	216-T-2 Reverse Well	Liquid	2001	6.51	–	1.74×10^{-13}	2.02×10^{-4}	1.82×10^{-5}	3.70×10^{-3}	1.03×10^{-3}
216-T-3	216-T-3 Reverse Well	Liquid	2001	1.95	–	2.82×10^{-10}	1.36×10^{-3}	3.35×10^{-3}	1.77×10^{1}	7.26×10^{-2}
216-T-6	216-T-6 Cribs	Liquid	2001	1.60×10^{1}	–	2.78×10^{-10}	1.41×10^{-2}	3.31×10^{-3}	1.61×10^{1}	7.17×10^{-2}
216-T-8	216-T-8 Crib	Liquid	2001	4.41×10^{-1}	–	4.47×10^{-15}	3.21×10^{-2}	1.12×10^{-6}	1.22×10^{-3}	7.64×10^{-5}
200-W-45	200-W-45 Sand Filter	Solid	1994	3.30×10^{1}	–	–	–	–	4.10	–
200-W-20	2706-T Equipment Decontamination Building	Solid	1994	1.50×10^{1}	–	–	–	–	2.50	1.50×10^{-1}
200-W-20	T Plant Complex (including 221-T)	Solid	1994	5.24×10^{4}	–	–	1.26×10^{1}	–	7.49×10^{1}	5.49×10^{1}
224-T	224-T Canyon	Liquid/ Solid	2003	–	–	–	–	–	1.70	1.86×10^{1}
200-W-9	200-W-9 Unplanned Release	Liquid	2001	1.47×10^{-1}	–	3.95×10^{-15}	4.57×10^{-6}	4.11×10^{-7}	8.38×10^{-5}	2.34×10^{-5}
UPR-200-W-2[b]	UPR-200-W-2 Unplanned Release	Liquid	2001	1.72×10^{2}	–	1.72×10^{-12}	7.91×10^{-3}	4.77×10^{-4}	5.30×10^{-2}	1.03×10^{-2}
UPR-200-W-21	UPR-200-W-21	Liquid	2001	2.92×10^{2}	–	2.28×10^{-12}	7.12×10^{-3}	7.35×10^{-4}	6.49×10^{-2}	5.14×10^{-2}
UPR-200-W-38	UPR-200-W-38 Unplanned Release	Liquid	2001	2.03×10^{2}	–	1.59×10^{-12}	4.94×10^{-3}	5.09×10^{-4}	4.50×10^{-2}	3.58×10^{-2}
UPR-200-W-98[b]	UPR-200-W-98 Unplanned Release	Liquid	2001	4.59	–	4.61×10^{-14}	2.12×10^{-4}	1.28×10^{-5}	1.41×10^{-3}	2.76×10^{-4}
UPR-200-W-102	UPR-200-W-102 Unplanned Release	Liquid	2001	3.46×10^{-3}	–	1.34×10^{-12}	3.60×10^{-7}	1.84×10^{-5}	4.01	1.29×10^{-3}
TRUSAF	TRUSAF (in 224-T Canyon)	Liquid/ Solid	1985	1.10	–	–	–	–	3.10×10^{1}	5.00
241-T-361	241-T-361 Settling Tank	Liquid/ Solid	Unknown	4.91×10^{3}	–	–	–	–	1.39×10^{4}	1.60×10^{3}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–46a. Map 9C: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-Z-16	216-Z-16 Crib	Liquid	2001	–	–	–	4.39×10^{-5}	1.23×10^{-6}	5.45×10^{-6}	–
231-Z	231-Z Plutonium Isolation Facility	Solid	2003	–	–	–	–	–	–	–
216-Z-4	216-Z-4 Trench	Liquid	2001	–	–	–	2.28×10^{-1}	1.00×10^{-6}	4.47×10^{-6}	–
216-Z-5	216-Z-5 Crib	Liquid	2001	–	–	–	3.69	1.62×10^{-5}	7.21×10^{-5}	–
216-Z-6	216-Z-6 Crib	Liquid	2001	–	–	–	4.86×10^{-1}	2.13×10^{-6}	9.50×10^{-6}	–
216-Z-7	216-Z-7 Crib	Liquid	2001	1.55×10^{-3}	1.50×10^{-5}	–	1.54×10^{2}	7.10×10^{-4}	3.26×10^{-3}	3.71×10^{-3}
216-Z-8	216-Z-8 Trench	Liquid	2001	–	–	–	2.95×10^{-12}	–	–	–
216-Z-9	216-Z-9 Trench	Liquid	2001	–	–	–	5.96×10^{-2}	7.87×10^{-6}	3.50×10^{-5}	–
216-Z-10	216-Z-10 Reverse Well	Liquid	2001	–	–	–	4.78	2.10×10^{-5}	9.33×10^{-5}	–
UPR-200-W-130[b]	UPR-200-W-130	Liquid	2001	–	–	–	1.43×10^{-10}	3.91×10^{-12}	1.76×10^{-11}	–
216-Z-17	216-Z-17 Trench	Liquid	2001	–	–	–	1.58×10^{-5}	4.42×10^{-7}	1.97×10^{-6}	–
216-Z-15	216-Z-15 French Drain	Liquid	2001	–	–	–	1.63×10^{-8}	–	–	–
234-5Z[c]	234-5Z Plutonium Finishing Plant	Solid	N/A	–	–	–	–	–	–	–
2736-Z	2736-Z Plutonium Finishing Plant	Liquid/ Solid	Unknown	–	–	–	–	–	–	–
242-Z	242-Z Americium Recovery Facility	Solid	Unknown	–	–	–	–	–	–	–
216-Z-1D[d]	216-Z-1(D) Ditch	Liquid	1986	–	–	–	–	–	–	–
236-Z	236-Z Plutonium Reclamation Facility	Solid	Unknown	–	–	–	–	–	–	–
216-Z-14	216-Z-14 French Drain	Liquid	2001	–	–	–	1.57×10^{-8}	–	–	–
291-Z	291-Z Exhaust Fan and Compressor House	Solid	N/A	–	–	–	–	–	–	–
UPR-200-W-103	UPR-200-W-103	Liquid	2001	–	–	–	–	–	–	–
241-Z[c]	241-Z Treatment Tank	Liquid	N/A	–	–	–	–	–	–	–
241-Z-361	241-Z-361 Settling Tank	Liquid	N/A	–	–	–	–	–	–	–
216-Z-13	216-Z-13 French Drain	Liquid	2001	–	–	–	1.51×10^{-8}	–	–	–
216-Z-1&2	216-Z-1 & 2 Cribs	Liquid	2001	–	–	–	1.68×10^{-2}	1.07×10^{-6}	4.77×10^{-6}	–
216-Z-3	216-Z-3 Crib	Liquid	2001	–	–	–	3.20×10^{-1}	1.89×10^{-6}	8.39×10^{-6}	–
216-Z-12	216-Z-12 Crib	Liquid	2001	–	–	–	7.05×10^{-1}	4.75×10^{-5}	2.11×10^{-4}	–
216-Z-1A	216-Z-1A Tile Field	Liquid	2001	–	–	–	9.82×10^{-1}	1.60×10^{-5}	7.10×10^{-5}	–
216-Z-18	216-Z-18 Crib	Liquid	2001	–	–	–	5.68×10^{-2}	7.51×10^{-6}	3.33×10^{-5}	–
216-Z-20	216-Z-20 Crib	Liquid	2001	–	–	–	1.94×10^{-7}	–	–	–
216-Z-21	216-Z-21 Seepage Basin	Liquid	2001	–	–	–	4.82×10^{-7}	–	–	–
216-Z-11	216-Z-11 Ditch	Liquid	1986	–	–	–	–	–	–	–
216-U-13	216-U-13 Trench	Liquid	1956	1.78×10^{-5}	1.14×10^{-6}	–	1.74×10^{-1}	6.13×10^{-7}	7.48×10^{-6}	7.73×10^{-9}
216-U-14[d]	216-U-14 Ditch	Liquid	1994	9.52	7.77×10^{-3}	–	7.52×10^{-2}	1.37×10^{-4}	8.21×10^{-4}	8.23×10^{-3}
207-U	207-U Retention Basin	Liquid	2006	–	–	–	–	–	–	–
UPR-200-W-135	UPR-200-W-135 Unplanned Release	Liquid	2001	9.80×10^{-2}	1.63×10^{-3}	–	9.38	2.41×10^{-5}	4.36×10^{-2}	4.97×10^{-5}
UPR-200-W-28	UPR-200-W-28	Liquid	2001	1.42×10^{-2}	5.46×10^{-4}	–	5.72	6.65×10^{-6}	8.62×10^{-3}	1.11×10^{-5}
UPR-200-W-131[b]	UPR-200-W-131	Liquid	2001	9.26×10^{-5}	3.59×10^{-6}	–	3.75×10^{-2}	4.36×10^{-8}	5.64×10^{-5}	7.23×10^{-8}

Table S–46a. Map 9C: Radionuclide Inventories (curies) *(continued)*

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
200-W PP	200-W PP Powerhouse Pond	Liquid	2001	–	–	–	–	–	–	–
216-T-20	216-T-20 Trench	Liquid	2001	3.03×10^{-1}	9.23×10^{-6}	–	7.64×10^{-2}	3.33×10^{-5}	1.08×10^{-4}	1.52×10^{-7}
232-Z	232-Z Waste Incinerator	Solid	2002	–	–	–	–	–	–	–

a Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

b This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

c This site had inventories that were in the initial list of constituents, but was screened out during final screening described in Section S.3.6.

d This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–46b. Map 9C: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-Z-16	216-Z-16 Crib	Liquid	2001	4.84×10^{-5}	–	9.50×10^{-14}	3.09×10^{-4}	1.06×10^{-2}	3.57	2.75
231-Z	231-Z Plutonium Isolation Facility	Solid	2003	–	–	–	–	–	6.85	–
216-Z-4	216-Z-4 Trench	Liquid	2001	2.35×10^{-1}	–	1.05×10^{-16}	9.53×10^{-6}	1.06×10^{-3}	7.06×10^{-1}	7.60
216-Z-5	216-Z-5 Crib	Liquid	2001	3.79	–	1.67×10^{-15}	1.52×10^{-4}	4.76×10^{-2}	3.16×10^{1}	1.18×10^{3}
216-Z-6	216-Z-6 Crib	Liquid	2001	4.99×10^{-1}	–	2.23×10^{-16}	2.03×10^{-5}	2.34×10^{-3}	1.55	1.87×10^{1}
216-Z-7	216-Z-7 Crib	Liquid	2001	1.58×10^{2}	–	4.27×10^{-8}	1.64	7.78×10^{-1}	5.45×10^{2}	7.35×10^{3}
216-Z-8	216-Z-8 Trench	Liquid	2001	6.81×10^{-12}	–	5.83×10^{-20}	3.21×10^{-9}	1.66×10^{-2}	3.28	6.73×10^{-1}
216-Z-9	216-Z-9 Trench	Liquid	2001	6.22×10^{-2}	–	2.87×10^{-16}	1.70×10^{-5}	9.89	2.18×10^{3}	5.65×10^{2}
216-Z-10	216-Z-10 Reverse Well	Liquid	2001	4.90	–	2.19×10^{-15}	1.99×10^{-4}	2.30×10^{-2}	1.53×10^{1}	1.85×10^{2}
UPR-200-W-130[b]	UPR-200-W-130	Liquid	2001	1.57×10^{-10}	–	3.05×10^{-19}	9.96×10^{-10}	3.44×10^{-8}	1.14×10^{-5}	9.15×10^{-6}
216-Z-17	216-Z-17 Trench	Liquid	2001	1.75×10^{-5}	–	3.43×10^{-14}	1.12×10^{-4}	3.84×10^{-3}	1.29	9.91×10^{-1}
216-Z-15	216-Z-15 French Drain	Liquid	2001	3.75×10^{-8}	–	3.52×10^{-15}	1.53×10^{-5}	1.51×10^{-9}	4.88×10^{-7}	6.26×10^{-8}
234-5Z[c]	234-5Z Plutonium Finishing Plant	Solid	N/A	–	–	–	–	–	–	–
2736-Z	2736-Z Plutonium Finishing Plant	Liquid/ Solid	Unknown	–	–	–	–	–	1.98×10^{2}	1.92×10^{2}
242-Z	242-Z Americium Recovery Facility	Solid	Unknown	–	–	–	–	–	8.57×10^{1}	3.51×10^{3}
216-Z-1D[d]	216-Z-1(D) Ditch	Liquid	1986	–	–	–	–	–	1.74×10^{2}	–
236-Z	236-Z Plutonium Reclamation Facility	Solid	Unknown	–	–	–	–	–	4.72×10^{3}	4.56×10^{3}
216-Z-14	216-Z-14 French Drain	Liquid	2001	3.62×10^{-8}	–	3.53×10^{-15}	1.48×10^{-5}	1.44×10^{-9}	4.72×10^{-7}	6.05×10^{-8}
291-Z	291-Z Exhaust Fan and Compressor House	Solid	N/A	–	–	–	–	–	1.07×10^{1}	1.03×10^{1}
UPR-200-W-103	UPR-200-W-103	Liquid	2001	–	–	7.54×10^{-20}	2.46×10^{-10}	3.87×10^{-3}	1.30	2.42×10^{-1}

Table S–46b. Map 9C: Radionuclide Inventories (curies) *(continued)*

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
241-Z[c]	241-Z Treatment Tank	Liquid	N/A	–	–	–	–	–	–	–
241-Z-361	241-Z-361 Settling Tank	Liquid	N/A	–	–	–	–	–	4.67×10^{3}	–
216-Z-13	216-Z-13 French Drain	Liquid	2001	3.48×10^{-8}	–	3.35×10^{-15}	1.42×10^{-5}	1.38×10^{-9}	4.53×10^{-7}	5.81×10^{-8}
216-Z-1&2	216-Z-1 & 2 Cribs	Liquid	2001	1.07×10^{-2}	–	3.98×10^{-16}	7.13×10^{-6}	4.98×10^{-1}	1.85×10^{2}	1.88×10^{2}
216-Z-3	216-Z-3 Crib	Liquid	2001	3.20×10^{-1}	–	1.56×10^{-16}	1.11×10^{-5}	4.26×10^{-1}	1.35×10^{2}	5.23×10^{3}
216-Z-12	216-Z-12 Crib	Liquid	2001	7.10×10^{-1}	–	4.04×10^{-14}	1.43×10^{-4}	1.08×10^{1}	3.15×10^{3}	8.51×10^{3}
216-Z-1A	216-Z-1A Tile Field	Liquid	2001	1.01	–	9.21×10^{-15}	6.58×10^{-5}	1.23×10^{1}	4.14×10^{3}	3.88×10^{3}
216-Z-18	216-Z-18 Crib	Liquid	2001	5.94×10^{-2}	–	5.48×10^{-15}	1.78×10^{-5}	6.86	2.30×10^{3}	7.55×10^{2}
216-Z-20	216-Z-20 Crib	Liquid	2001	4.47×10^{-7}	–	5.76×10^{-14}	1.88×10^{-4}	8.62×10^{-3}	2.90	5.39×10^{-1}
216-Z-21	216-Z-21 Seepage Basin	Liquid	2001	1.11×10^{-6}	–	1.43×10^{-13}	4.66×10^{-4}	4.48×10^{-8}	1.50×10^{-5}	1.86×10^{-6}
216-Z-11	216-Z-11 Ditch	Liquid	1986	–	–	–	–	–	1.74×10^{2}	–
216-U-13	216-U-13 Trench	Liquid	1956	1.67×10^{-2}	–	3.64×10^{-16}	3.64×10^{-4}	4.53×10^{-8}	2.05×10^{-5}	2.72×10^{-6}
216-U-14[d]	216-U-14 Ditch	Liquid	1994	2.85	–	3.09×10^{-10}	5.71×10^{-2}	1.36×10^{-3}	2.65×10^{-1}	2.32×10^{-3}
207-U	207-U Retention Basin	Liquid	2006	–	–	–	–	–	–	–
UPR-200-W-135	UPR-200-W-135 Unplanned Release	Liquid	2001	9.98×10^{1}	–	7.80×10^{-13}	2.43×10^{-3}	2.51×10^{-4}	2.22×10^{-2}	1.76×10^{-2}
UPR-200-W-28	UPR-200-W-28	Liquid	2001	2.63×10^{1}	–	2.23×10^{-13}	4.84×10^{-5}	6.84×10^{-5}	7.57×10^{-3}	3.79×10^{-3}
UPR-200-W-131[b]	UPR-200-W-131	Liquid	2001	1.73×10^{-1}	–	1.46×10^{-15}	3.16×10^{-7}	4.49×10^{-7}	4.96×10^{-5}	2.47×10^{-5}
200-W PP	200-W PP Powerhouse Pond	Liquid	2001	–	–	–	–	–	–	–
216-T-20	216-T-20 Trench	Liquid	2001	3.19×10^{-1}	–	1.18×10^{-14}	7.24×10^{-7}	9.37×10^{-7}	1.95×10^{-4}	5.27×10^{-5}
232-Z	232-Z Waste Incinerator	Solid	2002	–	–	–	–	–	4.84×10^{1}	3.46

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

[c] This site had inventories that were in the initial list of constituents, but was screened out during final screening described in Section S.3.6.

[d] This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–47a. Map 9D: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-U-10	216-U-10 Pond	Liquid	1994	2.47×10^{2}	2.02×10^{-1}	–	1.96	3.56×10^{-3}	2.13×10^{-2}	2.14×10^{-1}
216-U-3	216-U-3 French Drain	Liquid	1955	2.28×10^{1}	–	–	1.39×10^{-7}	–	5.94×10^{-4}	–
UPR-200-W-104	UPR-200-W-104	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
UPR-200-W-105	UPR-200-W-105	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
UPR-200-W-106	UPR-200-W-106	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
216-S-4	216-S-4 French Drain	Liquid	1956	2.91×10^{1}	–	–	1.81×10^{-7}	–	–	–
216-S-3	216-S-3 Crib	Liquid	2001	1.22×10^{2}	4.06×10^{-4}	–	3.31×10^{-1}	2.28×10^{-3}	1.42×10^{-2}	2.18×10^{-5}
216-S-21	216-S-21 Crib	Liquid	1969	2.54×10^{3}	8.95×10^{-3}	–	6.63	3.38×10^{-2}	2.11×10^{-1}	3.23×10^{-4}
UPR-200-W-107	UPR-200-W-107	Liquid	1957	Site consolidated with Site WIDS ID 216-U-10						
216-S-25	216-S-25 Crib	Liquid	1998	3.62×10^{3}	4.48×10^{-5}	–	4.85×10^{-5}	–	–	–
216-S-1&2	216-S-1 & 216-S-2 Cribs	Liquid	2001	2.54×10^{3}	–	–	9.59×10^{2}	5.87×10^{-1}	2.60	1.36×10^{-1}
216-S-8	216-S-8 Trench	Liquid	2001	–	–	–	–	–	–	–
UPR-200-W-95	UPR-200-W-95	Liquid	2001	1.10×10^{-3}	5.97×10^{-5}	–	9.82×10^{-2}	1.65×10^{-4}	1.05×10^{-3}	1.68×10^{-6}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–47b. Map 9D: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-U-10	216-U-10 Pond	Liquid	1994	7.41×10^{1}	–	8.03×10^{-9}	1.49	1.21	4.00×10^{2}	1.60×10^{2}
216-U-3	216-U-3 French Drain	Liquid	1955	3.42×10^{-7}	–	9.63×10^{-18}	1.17×10^{-2}	2.93×10^{-6}	4.96×10^{-4}	–
UPR-200-W-104	UPR-200-W-104	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
UPR-200-W-105	UPR-200-W-105	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
UPR-200-W-106	UPR-200-W-106	Liquid	Unknown	Site consolidated with Site WIDS ID 216-U-10						
216-S-4	216-S-4 French Drain	Liquid	1956	4.43×10^{-7}	–	1.25×10^{-17}	2.03×10^{-7}	3.80×10^{-6}	6.42×10^{-4}	
216-S-3	216-S-3 Crib	Liquid	2001	4.21×10^{1}	–	9.21×10^{-10}	1.41×10^{-3}	7.21×10^{-5}	3.53×10^{-3}	8.96×10^{-4}
216-S-21	216-S-21 Crib	Liquid	1969	6.28×10^{2}	–	1.36×10^{-8}	9.49×10^{-5}	1.16×10^{-3}	7.33×10^{-2}	1.79×10^{-2}
UPR-200-W-107	UPR-200-W-107	Liquid	1957	Site consolidated with Site WIDS ID 216-U-10						
216-S-25	216-S-25 Crib	Liquid	1998	2.30×10^{-5}		1.19×10^{-13}	4.87×10^{-4}	9.59×10^{-4}	1.71×10^{-1}	1.35×10^{-5}
216-S-1&2	216-S-1 & 216-S-2 Cribs	Liquid	2001	8.27×10^{2}	–	9.19×10^{-11}	1.50	5.14×10^{-1}	8.70×10^{1}	2.45×10^{1}
216-S-8	216-S-8 Trench	Liquid	2001		-	–	2.09×10^{-1}		–	–
UPR-200-W-95	UPR-200-W-95	Liquid	2001	2.97	–	9.57×10^{-16}	8.25×10^{-7}	7.66×10^{-6}	2.41×10^{-4}	2.69×10^{-4}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–48a. Map 9E: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-U-5	216-U-5 Trench	Liquid	1952	–	–	–	–	–	–	–
216-U-6	216-U-6 Trench	Liquid	1952	–	–	–	–	–	–	–
221-U	221-U Process Canyon	Liquid/ Solid	1961	–	–	–	1.00×10^{5}	–	–	–
241-WR-Vault	241-WR Vault	Liquid	1976	–	–	–	6.00×10^{1}	–	–	–
216-U-15	216-U-15 Trench	Liquid	1957	6.38×10^{-5}	1.51×10^{-6}	–	1.13×10^{2}	2.25×10^{-6}	3.52×10^{-2}	3.16×10^{-8}
UPR-200-W-138	UPR-200-W-138	Liquid	1953	2.33×10^{-1}	–	–	–	–	4.43×10^{-4}	–
200-W-44	200-W-44 Sand filter	Solid	Active	–	–	–	7.90×10^{2}	–	–	–
216-U-7	216-U-7 French Drain	Liquid	1957	1.90×10^{-8}	4.36×10^{-10}	–	3.87×10^{-7}	2.20×10^{-9}	1.17×10^{-8}	2.24×10^{-11}
UPR-200-W-101	UPR-200-W-101 Unplanned release	Liquid	1957	7.09×10^{-2}	–	–	–	–	1.34×10^{-4}	–
216-U-4	216-U-4 Reverse Well	Liquid	1955	3.56×10^{-4}	6.99×10^{-6}	–	3.95×10^{-2}	1.61×10^{-5}	1.47×10^{-4}	1.46×10^{-7}
216-U-4A	216-U-4A French Drain	Liquid	1961	5.69×10^{-7}	1.43×10^{-2}	–	7.42×10^{-4}	2.58×10^{-8}	2.35×10^{-7}	2.34×10^{-10}
216-U-1&2	216-U-1&2 Cribs	Liquid	1956	1.13×10^{2}	1.12×10^{-4}	–	1.17	1.36×10^{-6}	7.27	2.27×10^{-6}
241-U-361	241-U-361 Settling Tank	Liquid	1967	–	–	–	7.60×10^{2}	–	–	–
UPR-200-W-39	UPR-200-W-39 Unplanned release	Liquid	1954	6.06×10^{-3}	–	–	–	–	1.14×10^{-5}	–
200-W-42[b]	200-W-42 Process Sewer	Liquid	1988	3.20×10^{-1}	–	–	–	–	–	–
UPR-200-W-163	UPR-200-W-163 Unplanned release	Liquid	1988	9.35×10^{-1}	3.05×10^{-10}	–	1.42×10^{-6}	8.62×10^{-10}	2.27×10^{-3}	2.49×10^{-7}
216-U-16	216-U-16 Crib	Liquid	1985	4.18×10^{3}	9.28×10^{-4}	–	6.71×10^{-8}	–	–	7.53×10^{-8}
216-S-9	216-S-9 Crib	Liquid	2001	1.17×10^{3}	–	–	1.19×10^{2}	2.33×10^{-2}	1.04×10^{-1}	2.95×10^{-2}
216-S-23	216-S-23 Crib	Liquid	2001	4.24×10^{-5}	7.08×10^{-7}	–	1.15×10^{-3}	2.96×10^{-6}	1.86×10^{-5}	2.93×10^{-8}
216-U-8	216-U-8 Crib	Liquid	1960	4.62×10^{3}	6.80×10^{-6}	–	3.25×10^{-2}	1.88×10^{-5}	2.71	4.93×10^{-3}
216-U-12	216-U-12 Crib	Liquid	1972	3.16×10^{3}	7.64×10^{-7}	–	3.00×10^{1}	3.45×10^{-3}	6.78×10^{-1}	1.38×10^{-6}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–48b. Map 9E: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-U-5	216-U-5 Trench	Liquid	1952	–	–	–	4.27×10^{-1}	–	–	–
216-U-6	216-U-6 Trench	Liquid	1952	–	–	–	4.27×10^{-1}	–	–	–
221-U	221-U Process Canyon	Liquid/ Solid	1961	2.42×10^{2}	–	–	–	–	7.20×10^{1}	2.60×10^{1}
241-WR-Vault	241-WR Vault	Liquid	1976	–	–	–	–	–	–	–
216-U-15	216-U-15 Trench	Liquid	1957	5.41×10^{-2}	–	1.03×10^{-11}	6.71×10^{-3}	2.24×10^{-6}	2.59×10^{-4}	1.24×10^{-4}
UPR-200-W-138	UPR-200-W-138	Liquid	1953	–	–	–	8.75×10^{-3}	–	–	–
200-W-44	200-W-44 Sand Filter	Solid	Active	6.80×10^{3}	–	–	–	–	4.10×10^{1}	–
216-U-7	216-U-7 French Drain	Liquid	1957	4.84×10^{-5}	–	1.52×10^{-14}	3.71×10^{-11}	4.72×10^{-11}	1.98×10^{-9}	1.37×10^{-9}
UPR-200-W-101	UPR-200-W-101 Unplanned Release	Liquid	1957	–	–	–	2.63×10^{-3}	–	–	–
216-U-4	216-U-4 Reverse Well	Liquid	1955	3.25×10^{-1}	–	1.93×10^{-14}	1.01×10^{-5}	1.03×10^{-6}	1.87×10^{-4}	5.42×10^{-5}
216-U-4A	216-U-4A French Drain	Liquid	1961	7.85×10^{-3}	–	6.96×10^{-13}	2.16×10^{-3}	2.95×10^{-4}	1.10×10^{-1}	2.99×10^{-1}
216-U-1&2	216-U-1&2 Cribs	Liquid	1956	1.81	–	2.07×10^{-9}	2.67	4.26×10^{-4}	4.74×10^{-2}	2.34×10^{-2}
241-U-361	241-U-361 Settling Tank	Liquid	1967	1.37×10^{3}	–	–	–	–	–	–
UPR-200-W-39	UPR-200-W-39 Unplanned Release	Liquid	1954	–	–	–	2.25×10^{-4}	–	–	–
200-W-42[b]	200-W-42 Process Sewer	Liquid	1988	–	–	1.63×10^{-16}	3.63×10^{-7}	1.11×10^{-9}	3.73×10^{-7}	–
UPR-200-W-163	UPR-200-W-163 Unplanned Release	Liquid	1988	3.03×10^{-6}	–	2.06×10^{-17}	1.50×10^{-2}	8.57×10^{-10}	1.31×10^{-7}	2.07×10^{-9}
216-U-16	216-U-16 Crib	Liquid	1985	8.55×10^{-5}	–	9.83×10^{-14}	1.05×10^{-4}	3.65×10^{-7}	1.13×10^{-4}	2.96×10^{-5}
216-S-9	216-S-9 Crib	Liquid	2001	6.04×10^{1}	–	1.01×10^{-10}	2.28×10^{-1}	2.01×10^{-2}	3.57	3.29×10^{-2}
216-S-23	216-S-23 Crib	Liquid	2001	5.88×10^{-2}	–	2.37×10^{-17}	1.13×10^{-8}	8.53×10^{-8}	3.10×10^{-6}	3.39×10^{-6}
216-U-8	216-U-8 Crib	Liquid	1960	5.12×10^{-2}	–	1.38×10^{-12}	1.72×10^{1}	5.63×10^{-5}	8.57×10^{-3}	4.66×10^{-5}
216-U-12	216-U-12 Crib	Liquid	1972	6.96×10^{1}	–	3.54×10^{-4}	4.48	1.68×10^{-5}	4.75×10^{-3}	1.37×10^{-8}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was consolidated with another site for purposes of modeling.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–49a. Map 9F: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-S-19	216-S-19 Pond	Liquid	2001	2.30×10^{-1}	3.42×10^{-3}	–	1.63×10^{-4}	–	–	–
216-S-14	216-S-14 Trench	Liquid	2001	–	–	–	–	–	–	–
216-S-7	216-S-7 Crib	Liquid	2001	8.38×10^{3}	–	–	1.47×10^{3}	5.59×10^{-1}	2.48	3.51×10^{-1}
UPR-200-W-32[b]	UPR-200-W-32	Liquid	2001	7.69×10^{-3}	–	–	–	–	1.56×10^{-5}	–
216-S-13	216-S-13 Crib	Liquid	2001	4.31×10^{1}	1.86×10^{-4}	–	4.20×10^{-1}	6.47×10^{-2}	4.40×10^{-1}	–
216-S-12	216-S-12 Trench	Liquid	2001	1.06×10^{-1}	1.62×10^{-7}	–	1.39	8.53×10^{-4}	3.77×10^{-3}	4.03×10^{-4}
200-W-22	200-W-22 Unplanned Release	Liquid	2001	9.02×10^{-4}	–	–	–	–	2.13×10^{-6}	–
233-S	233-S Plutonium Concentration Facility	Solid	2003	–	–	–	–	–	–	–
200-W-69	200-W-69 Lab Complex (includes 222-S Lab, 222-S DMWSA, 219-S, 222-SA, 296-S-21, 296-S-16, 296-S-23, 296-S-13)	Liquid/ Solid	2002	–	–	–	1.80×10^{3}	–	–	–
UPR-200-W-61	UPR-200-W-61	Liquid	2001	2.29×10^{-2}	1.25×10^{-3}	–	2.06	3.48×10^{-3}	2.20×10^{-2}	3.53×10^{-5}
202-S	202-S (REDOX)	Solid	1997	–	–	–	9.84×10^{3}	–	–	–
291-S	291-S Sand Filter	Solid	1998	–	–	–	8.00×10^{3}	–	–	–
216-S-20	216-S-20 Crib	Liquid	2001	1.53×10^{-1}	2.69	–	7.46×10^{1}	3.60×10^{-3}	2.57×10^{-2}	8.15×10^{-3}
216-S-22	216-S-22 Crib	Liquid	2001	2.23	2.04×10^{-9}	–	3.31×10^{-6}	8.54×10^{-9}	5.38×10^{-8}	6.39×10^{-6}
216-S-26	216-S-26 Crib	Liquid	2001	3.87×10^{-2}	5.77×10^{-4}	–	2.74×10^{-5}	–	–	–
218-W-7	218-W-7 Burial Ground (222-S Vault)	Solid	1986	–	–	–	7.82×10^{-1}	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; REDOX=Reduction-Oxidation (Facility); Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–49b. Map 9F: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-S-19	216-S-19 Pond	Liquid	2001	1.76×10^{-3}	–	2.19×10^{-13}	5.38×10^{-4}	1.26×10^{-6}	3.74×10^{-4}	1.03×10^{-3}
216-S-14	216-S-14 Trench	Liquid	2001	–	–	–	4.96×10^{-5}	–	–	–
216-S-7	216-S-7 Crib	Liquid	2001	9.79×10^{2}	–	7.63×10^{-10}	2.59	4.87×10^{-1}	8.36×10^{1}	1.68×10^{1}
UPR-200-W-32[b]	UPR-200-W-32	Liquid	2001	–	–	–	1.93×10^{-4}	–	–	–
216-S-13	216-S-13 Crib	Liquid	2001	1.45×10^{2}	–	3.80×10^{-13}	2.08×10^{-3}	1.24×10^{-2}	8.63×10^{-1}	9.36×10^{-1}
216-S-12	216-S-12 Trench	Liquid	2001	1.22	–	1.35×10^{-13}	2.16×10^{-3}	7.47×10^{-4}	1.27×10^{-1}	3.54×10^{-2}
200-W-22	200-W-22 Unplanned Release	Liquid	2001	–	–	–	1.87×10^{-5}	–	–	–
233-S	233-S Plutonium Concentration Facility	Solid	2003	–	–	–	–	2.10×10^{-3}	7.58	3.70
200-W-69	200-W-69 Lab Complex (includes 222-S Lab, 222-S DMWSA, 219-S, 222-SA, 296-S-21, 296-S-16, 296-S-23, 296-S-13)	Liquid/ Solid	2002	6.33×10^{2}	–	–	–	–	1.83×10^{1}	1.35×10^{1}
UPR-200-W-61	UPR-200-W-61	Liquid	2001	6.25×10^{1}	–	2.02×10^{-14}	1.74×10^{-5}	1.61×10^{-4}	5.08×10^{-3}	5.58×10^{-3}
202-S	202-S (REDOX)	Solid	1997	–	–	–	–	–	1.64×10^{3}	–
291-S	291-S Sand Filter	Solid	1998	–	–	–	–	–	3.40×10^{2}	–
216-S-20	216-S-20 Crib	Liquid	2001	8.90×10^{1}	–	4.18×10^{-6}	5.59×10^{-1}	1.20×10^{-1}	2.26×10^{1}	5.62×10^{1}
216-S-22	216-S-22 Crib	Liquid	2001	1.70×10^{-6}	–	6.85×10^{-20}	3.27×10^{-11}	2.46×10^{-10}	8.93×10^{-9}	9.77×10^{-9}
216-S-26	216-S-26 Crib	Liquid	2001	2.96×10^{-4}	–	9.07×10^{-14}	9.67×10^{-5}	2.05×10^{-7}	6.33×10^{-5}	1.76×10^{-4}
218-W-7	218-W-7 Burial Ground (222-S Vault)	Solid	1986	8.36×10^{1}	–	–	2.30×10^{-4}	–	5.08×10^{-2}	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; REDOX=Reduction-Oxidation (Facility); Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–50a. Map 10: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
600-148	Environmental Restoration Disposal Facility	Solid	–	1.50×10^{4}	1.20×10^{2}	6.01	3.70	–	2.01×10^{-1}	–
N/A	US Ecology	Solid	–	8.60×10^{5}	5.09×10^{3}	4.76	4.98×10^{4}	–	5.51×10^{1}	5.98
216-W-LWC	216-W-LWC Crib	Liquid	2001	4.40×10^{5}	–	–	1.92×10^{-1}	–	–	5.08×10^{-2}
216-U-17	216-U-17 Crib	Liquid	1989	1.86×10^{2}	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; N/A=not applicable; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–50b. Map 10: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
600-148	Environmental Restoration Disposal Facility	Solid	–	3.70	–	1.40×10^{-1}	5.40×10^{1}	–	9.16	2.71
N/A	US Ecology	Solid	–	1.21×10^{5}	–	1.22×10^{1}	1.82×10^{3}	–	6.46×10^{3}	4.67×10^{2}
216-W-LWC	216-W-LWC Crib	Liquid	2001	2.59×10^{-1}	–	1.95×10^{-12}	2.37×10^{-3}	9.23×10^{-4}	3.19×10^{-1}	1.34×10^{-2}
216-U-17	216-U-17 Crib	Liquid	1989	–	–	1.92×10^{-13}	2.05×10^{-4}	6.52×10^{-7}	2.01×10^{-4}	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; N/A=not applicable; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–51a. Map 11: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
218-E-10	218-E-10 Trench	Solid	Varies based on time of disposal	8.00×10^{-8}	–	3.96×10^{-4}	8.53×10^{5}	–	5.07×10^{-3}	–
UPR-200-E-23	UPR-200-E-23	Solid	–	Site consolidated with Site WIDS ID 218-E-10						
UPR-200-E-24	UPR-200-E-24	Solid	–	Site consolidated with Site WIDS ID 218-E-10						
216-B-50	216-B-50 Crib	Liquid	2001	1.26×10^{2}	3.04×10^{-3}	–	1.52	1.23×10^{-2}	6.60×10^{-2}	9.34×10^{-5}
216-B-57	216-B-57 Crib	Liquid	2001	1.95×10^{2}	9.10×10^{-3}	–	3.55	3.69×10^{-2}	1.97×10^{-1}	2.80×10^{-4}
UPR-200-E-9	UPR-200-E-9	Liquid	2001	2.55×10^{-1}	9.89×10^{-3}	–	1.03×10^{2}	1.20×10^{-4}	1.55×10^{-1}	1.99×10^{-4}
216-B-11A & B	216-B-11A & B	Liquid	2001	1.59×10^{1}	2.77×10^{-4}	–	3.04	9.97×10^{-4}	3.25×10^{-3}	4.54×10^{-6}
216-B-51	216-B-51 French Drain	Liquid	2001	6.24×10^{-3}	2.42×10^{-4}	–	2.66×10^{-2}	2.93×10^{-6}	3.80×10^{-3}	4.87×10^{-6}
218-E-5	218-E-5 Burial Ground	Solid	1986	–	–	–	1.46×10^{2}	–	–	–
218-E-5A	218-E-5A Burial Ground	Solid	1986	–	–	–	3.20×10^{2}	–	–	–
218-E-2	218-E-2 Burial Ground	Solid	1986	–	–	–	4.85×10^{2}	–	–	–
UPR-200-E-79	UPR-200-E-79 Unplanned Release	Liquid	2001	1.82×10^{-2}	1.07×10^{-3}	–	8.82	3.84×10^{-3}	1.25×10^{-2}	1.75×10^{-5}
UPR-200-E-78	UPR-200-E-78 Unplanned Release	Liquid	2001	5.03×10^{-5}	2.18×10^{-5}	–	1.50×10^{1}	1.60×10^{-4}	8.42×10^{-4}	5.05×10^{-8}
218-E-4	218-E-4 Burial Ground	Solid	1986	–	–	–	1.94×10^{-1}	–	–	–
216-B-5	216-B-5 Reverse Well	Liquid	2001	1.07×10^{-4}	1.11×10^{-2}	–	7.55	1.99×10^{-1}	4.25×10^{-3}	1.88×10^{-6}
216-B-9	216-B-9 Crib	Liquid	2001	1.68×10^{-3}	1.10×10^{-2}	–	1.07×10^{1}	2.89×10^{-1}	5.74×10^{-3}	1.32×10^{-6}
216-B-59	216-B-59 Trench	Liquid	2001	7.06×10^{-8}	1.35×10^{-8}	–	8.76×10^{-8}	9.61×10^{-8}	5.15×10^{-7}	3.04×10^{-10}
241-B-361	241-B-361 Settling Tank	Liquid	Unknown	–	–	–	3.06×10^{3}	–	–	–
UPR-200-E-7	UPR-200-E-7 Unplanned Release	Liquid	2001	1.60×10^{-6}	5.36×10^{-6}	–	5.39×10^{-3}	1.37×10^{-4}	2.75×10^{-6}	–
221-B	221-B B Plant/Canyon	Solid	1997	–	–	–	1.15×10^{5}	–	–	–
200-E-28	200-E-28 UPR	Liquid	2001	–	–	–	1.49×10^{-2}	–	–	–
200-E-97	200-E-97 French Drain	Liquid	2001	4.16×10^{-5}	8.05×10^{-7}	–	9.62×10^{-3}	1.89×10^{-6}	1.72×10^{-5}	1.71×10^{-8}
200-E-98[b]	200-E-98 French Drain	Liquid	2001	3.47×10^{-5}	6.71×10^{-7}	–	7.98×10^{-3}	1.57×10^{-6}	1.43×10^{-5}	1.43×10^{-8}
WESF	WESF (Building 225-B)	Solid	2005	–	–	–	4.97×10^{5}	–	–	–
216-B-62	216-B-62 Crib	Liquid	2001	3.57×10^{-1}	6.47×10^{-2}	–	8.25×10^{1}	4.59×10^{-1}	2.39	1.29×10^{-3}
216-B-12	216-B-12 Crib	Liquid	2001	2.34×10^{3}	9.54×10^{-3}	–	1.20×10^{2}	3.37×10^{-2}	1.65	1.55×10^{-4}
216-B-55	216-B-55 Crib	Liquid	2001	1.77×10^{-4}	3.40×10^{-5}	–	2.20×10^{-4}	2.41×10^{-4}	1.29×10^{-3}	7.63×10^{-7}
212-B	212-B Cask Loading Station	Solid	1997	–	–	–	1.00×10^{3}	–	–	–
216-B-60	216-B-60 Crib	Liquid	2001	4.60×10^{-6}	4.51×10^{-8}	–	2.28×10^{-3}	1.14×10^{-7}	8.14×10^{-7}	1.11×10^{-5}
UPR-200-E-84	UPR-200-E-84 Unplanned Release	Liquid	2001	6.72×10^{-2}	3.94×10^{-8}	–	1.20×10^{-4}	2.30×10^{-7}	1.21×10^{-6}	3.80×10^{-6}
224-B	224-B Plutonium Concentration Facility	Solid	1985	–	–	–	–	–	–	–
UPR-200-E-87	UPR-200-E-87 Unplanned Release	Liquid	2001	4.59×10^{-9}	1.03×10^{-5}	–	1.65×10^{-3}	–	9.29×10^{-7}	4.11×10^{-10}
UPR-200-E-1[b]	UPR-200-E-1 Unplanned Release	Liquid	2001	5.90×10^{-2}	1.95×10^{-3}	–	5.54	1.96×10^{-2}	3.13×10^{-3}	1.54×10^{-6}
UPR-200-E-3[b]	UPR-200-E-3 Unplanned Release	Liquid	2001	2.02×10^{-3}	2.68×10^{-5}	–	2.21×10^{-2}	4.08×10^{-4}	6.68×10^{-5}	5.82×10^{-7}
UPR-200-E-85	UPR-200-E-85 Unplanned Release	Liquid	2001	4.92×10^{-2}	9.40×10^{-3}	–	6.24	6.68×10^{-2}	3.57×10^{-1}	2.09×10^{-4}
216-B-4	216-B-4 Reverse Well	Liquid	2001	1.19×10^{-5}	2.30×10^{-7}	–	1.32×10^{-3}	5.39×10^{-7}	4.90×10^{-6}	4.89×10^{-9}

Table S–51a. Map 11: Radionuclide Inventories (curies) *(continued)*

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-B-6	216-B-6 Reverse Well	Liquid	2001	7.12×10^{-3}	1.38×10^{-4}	–	7.91×10^{-1}	3.23×10^{-4}	2.94×10^{-3}	2.93×10^{-6}
200-E-30	200-E-30 Sand Filter (291-B Sand Filter)	Solid	1994	–	–	–	3.00×10^{3}	–	–	–
200-E-55	200-E-55 French Drain	Liquid	2001	4.08×10^{-5}	7.88×10^{-7}	–	9.51×10^{-3}	1.85×10^{-6}	1.68×10^{-5}	1.68×10^{-8}
200-E-95	200-E-95 French Drain	Liquid	2001	4.16×10^{-5}	8.05×10^{-7}	–	9.28×10^{-3}	1.89×10^{-6}	1.72×10^{-5}	1.71×10^{-8}
216-B-10A	216-B-10A Crib	Liquid	2001	6.37×10^{-2}	2.29×10^{-4}	–	1.32	5.38×10^{-4}	5.35×10^{-3}	4.87×10^{-6}
216-B-10B	216-B-10B Crib	Liquid	2001	5.11×10^{-8}	1.17×10^{-9}	–	1.04×10^{-6}	5.90×10^{-9}	3.13×10^{-8}	1.64×10^{-5}
UPR-200-E-77	UPR-200-E-77 Unplanned Release	Liquid	2001	4.03×10^{-4}	1.08×10^{-5}	–	8.62×10^{-2}	1.33×10^{-7}	2.38×10^{-4}	1.05×10^{-7}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–51b. Map 11: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
218-E-10	218-E-10 Trench	Solid	Varies based on time of disposal	1.02×10^{6}	–	–	1.10×10^{-1}	1.05×10^{-3}	3.94×10^{-3}	1.45×10^{-3}
UPR-200-E-23	UPR-200-E-23	Solid	–	Site consolidated with Site WIDS ID 218-E-10						
UPR-200-E-24	UPR-200-E-24	Solid	–	Site consolidated with Site WIDS ID 218-E-10						
216-B-50	216-B-50 Crib	Liquid	2001	5.49×10^{1}	–	7.43×10^{-8}	8.59×10^{-5}	2.61×10^{-4}	2.17×10^{-2}	2.24×10^{-3}
216-B-57	216-B-57 Crib	Liquid	2001	1.64×10^{2}	–	2.23×10^{-7}	2.38×10^{-4}	6.30×10^{-4}	3.65×10^{-2}	6.73×10^{-3}
UPR-200-E-9	UPR-200-E-9	Liquid	2001	4.77×10^{2}	–	4.03×10^{-12}	8.72×10^{-4}	1.23×10^{-3}	1.37×10^{-1}	6.81×10^{-2}
216-B-11A & B	216-B-11A & B	Liquid	2001	9.66	–	3.54×10^{-13}	2.85×10^{-5}	3.04×10^{-5}	7.39×10^{-3}	1.58×10^{-3}
216-B-51	216-B-51 French Drain	Liquid	2001	3.51×10^{-2}	–	9.84×10^{-14}	2.10×10^{-5}	3.01×10^{-5}	8.81×10^{-4}	1.67×10^{-3}
218-E-5	218-E-5 Burial Ground	Solid	1986	1.56×10^{2}	–	–	4.02×10^{-2}	–	4.50×10^{1}	–
218-E-5A	218-E-5A Burial Ground	Solid	1986	3.43×10^{2}	–	–	4.02×10^{-2}	–	1.00×10^{2}	–
218-E-2	218-E-2 Burial Ground	Solid	1986	5.19×10^{2}	–	–	–	–	5.80×10^{1}	–
UPR-200-E-79	UPR-200-E-79 Unplanned Release	Liquid	2001	3.68×10^{1}	–	1.36×10^{-12}	8.07×10^{-5}	1.08×10^{-4}	2.25×10^{-2}	6.07×10^{-3}
UPR-200-E-78	UPR-200-E-78 Unplanned Release	Liquid	2001	3.39	–	8.26×10^{-16}	3.25×10^{-6}	3.58×10^{-6}	1.12×10^{-3}	4.38×10^{-2}
218-E-4	218-E-4 Burial Ground	Solid	1986	2.08×10^{-1}	–	–	3.40×10^{-4}	–	7.25×10^{-1}	–
216-B-5	216-B-5 Reverse Well	Liquid	2001	8.67	–	4.81×10^{-10}	7.13×10^{-3}	5.71×10^{-3}	3.97×10^{1}	1.24×10^{-1}
216-B-9	216-B-9 Crib	Liquid	2001	1.24×10^{1}	–	2.12×10^{-10}	8.34×10^{-3}	2.73×10^{-3}	8.80	1.33×10^{-1}

Table S–51b. Map 11: Radionuclide Inventories (curies) *(continued)*

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-B-59	216-B-59 Trench	Liquid	2001	5.71×10^{-5}	–	5.39×10^{-14}	1.36×10^{-10}	1.68×10^{-9}	2.25×10^{-8}	2.56×10^{-8}
241-B-361	241-B-361 Settling Tank	Liquid	unknown	1.87×10^{2}	–	–	–	–	1.53×10^{2}	–
UPR-200-E-7	UPR-200-E-7 Unplanned Release	Liquid	2001	6.28×10^{-3}	–	1.10×10^{-13}	2.97×10^{-6}	1.51×10^{-6}	3.22×10^{-3}	1.06×10^{-4}
221-B	221-B B Plant/Canyon	Solid	1997	2.37×10^{5}	–	–	–	–	2.10	–
200-E-28	200-E-28 UPR	Liquid	2001	1.75×10^{-3}	–	1.71×10^{-16}	1.83×10^{-7}	1.13×10^{-7}	3.48×10^{-5}	–
200-E-97	200-E-97 French Drain	Liquid	2001	3.86×10^{-2}	–	1.05×10^{-15}	1.23×10^{-6}	1.47×10^{-7}	3.33×10^{-5}	6.02×10^{-6}
200-E-98[b]	200-E-98 French Drain	Liquid	2001	3.21×10^{-2}	–	8.72×10^{-16}	1.03×10^{-6}	1.22×10^{-7}	2.77×10^{-5}	5.01×10^{-6}
WESF	WESF (Building 225-B)	Solid	2005	1.72×10^{5}	–	–	–	–	–	–
216-B-62	216-B-62 Crib	Liquid	2001	9.67×10^{3}	–	3.30×10^{-7}	8.43×10^{-4}	9.95×10^{-3}	2.06×10^{-1}	2.24×10^{-1}
216-B-12	216-B-12 Crib	Liquid	2001	3.26×10^{2}	–	2.93×10^{-11}	1.02×10^{1}	9.93×10^{-4}	2.15×10^{-1}	5.36×10^{-2}
216-B-55	216-B-55 Crib	Liquid	2001	1.43×10^{-1}	–	1.35×10^{-10}	3.41×10^{-7}	4.21×10^{-6}	5.64×10^{-5}	6.43×10^{-5}
212-B	212-B Cask Loading Station	Solid	1997	1.00×10^{2}	–	–	–	–	–	–
216-B-60	216-B-60 Crib	Liquid	2001	2.79×10^{-3}	–	1.27×10^{-10}	4.87×10^{-3}	1.74×10^{-9}	8.44×10^{-2}	2.93×10^{-6}
UPR-200-E-84	UPR-200-E-84 Unplanned Release	Liquid	2001	4.58×10^{-5}	–	1.51×10^{-15}	5.26×10^{-7}	5.17×10^{-6}	1.54×10^{-4}	1.69×10^{-4}
224-B	224-B Plutonium Concentration Facility	Solid	1985	–	–	–	–	–	8.85×10^{1}	1.14×10^{1}
UPR-200-E-87	UPR-200-E-87 Unplanned Release	Liquid	2001	1.89×10^{-3}	–	9.40×10^{-13}	3.65×10^{-7}	1.12×10^{-5}	2.75	2.41×10^{-4}
UPR-200-E-1[b]	UPR-200-E-1 Unplanned Release	Liquid	2001	6.36	–	5.86×10^{-12}	4.28×10^{-4}	7.09×10^{-5}	1.15×10^{-1}	2.12×10^{-3}
UPR-200-E-3[b]	UPR-200-E-3 Unplanned Release	Liquid	2001	1.51×10^{-1}	–	1.09×10^{-13}	6.91×10^{-6}	1.54×10^{-6}	1.86×10^{-5}	1.71×10^{-4}
UPR-200-E-85	UPR-200-E-85 Unplanned Release	Liquid	2001	3.73×10^{1}	–	3.81×10^{-8}	9.39×10^{-5}	1.15×10^{-3}	1.55×10^{-2}	1.70×10^{-2}
216-B-4	216-B-4 Reverse Well	Liquid	2001	1.08×10^{-2}	–	2.90×10^{-16}	3.36×10^{-7}	3.02×10^{-8}	6.16×10^{-6}	1.72×10^{-6}
216-B-6	216-B-6 Reverse Well	Liquid	2001	6.50	–	1.74×10^{-13}	2.02×10^{-4}	1.81×10^{-5}	3.69×10^{-3}	1.03×10^{-3}
200-E-30	200-E-30 Sand Filter (291-B Sand Filter)	Solid	1994	2.00×10^{3}	–	–	–	–	1.93	
200-E-55	200-E-55 French Drain	Liquid	2001	3.78×10^{-2}	–	1.03×10^{-15}	1.21×10^{-6}	1.45×10^{-7}	3.28×10^{-5}	5.89×10^{-6}
200-E-95	200-E-95 French Drain	Liquid	2001	3.85×10^{-2}	–	1.04×10^{-15}	1.23×10^{-6}	1.44×10^{-7}	3.25×10^{-5}	6.01×10^{-6}
216-B-10A	216-B-10A Crib	Liquid	2001	1.08×10^{1}	–	2.89×10^{-13}	3.26×10^{-3}	3.02×10^{-5}	6.15×10^{-3}	1.71×10^{-3}
216-B-10B	216-B-10B Crib	Liquid	2001	1.30×10^{-4}	–	4.09×10^{-14}	9.95×10^{-11}	1.27×10^{-10}	5.32×10^{-9}	3.69×10^{-9}
UPR-200-E-77	UPR-200-E-77 Unplanned Release	Liquid	2001	4.84×10^{-1}	–	4.85×10^{-15}	2.24×10^{-5}	1.34×10^{-6}	1.49×10^{-4}	2.91×10^{-5}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–52a. Map 12: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
218-E-12B	218-E-12B Burial Ground	Solid	Varies based on time of disposal	1.12×10^{3}	1.31×10^{2}	9.70×10^{-3}	2.69×10^{4}	5.61×10^{-1}	8.08×10^{-1}	2.94×10^{-3}
218-E-12A	218-E-12A Burial Ground	Solid	1986	–	–	–	1.72×10^{1}	–	–	–
216-B-63	216-B-63 Ditch	Liquid	2001	1.30×10^{2}	3.36×10^{-2}	–	6.91×10^{-1}	1.86×10^{-5}	1.66×10^{-2}	5.89×10^{-8}
216-B-2-2	216-B-2-2 Ditch	Liquid	1986	Site consolidated with Site WIDS ID 216-B-3						
216-B-2-1	216-B-2-1 Ditch	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-138	UPR-200-E-138 Unplanned Release	Liquid	–	Site consolidated with Site WIDS ID 216-B-3						
218-E-8	218-E-8 Burial Ground	Solid	1986	–	–	–	1.94×10^{-1}	–	–	–
218-E-1	218-E-1 Burial Ground	Solid	1986	–	–	–	1.94	–	–	–
216-B-3	216-B-3 Pond	Liquid	2001	2.01×10^{4}	9.90×10^{1}	–	1.34×10^{2}	4.42×10^{-2}	3.20×10^{-1}	3.20×10^{-3}
216-B-3A Pond / 216-B-3A RAD	216-B-3A Pond / 216-B-3A RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
216-B-3B Pond / 216-B-3B-RAD	216-B-3B Pond / 216-B-3B-RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
216-B-3C Pond / 216-B-3C RAD	216-B-3C Pond / 216-B-3C RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-14	UPR-200-E-14 Unplanned Release	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-34	UPR-200-E-34	Liquid	1994	Site consolidated with Site WIDS ID 216-A-25						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–52b. Map 12: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
218-E-12B	218-E-12B Burial Ground	Solid	Varies based on time of disposal	2.69×10^{4}	–	–	4.59×10^{-2}	3.99×10^{-6}	3.13×10^{-1}	1.91
218-E-12A	218-E-12A Burial Ground	Solid	1986	1.84×10^{1}	–	–	3.32×10^{-1}	–	6.48×10^{2}	–
216-B-63	216-B-63 Ditch	Liquid	2001	9.33×10^{-2}	–	1.24×10^{-11}	1.20×10^{-1}	1.04×10^{-4}	1.95×10^{-2}	4.38×10^{2}
216-B-2-2	216-B-2-2 Ditch	Liquid	1986	Site consolidated with Site WIDS ID 216-B-3						
216-B-2-1	216-B-2-1 Ditch	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-138	UPR-200-E-138 Unplanned Release	Liquid	–	Site consolidated with Site WIDS ID 216-B-3						
218-E-8	218-E-8 Burial Ground	Solid	1986	2.08×10^{-1}	–	–	6.70×10^{-4}	–	1.45	–
218-E-1	218-E-1 Burial Ground	Solid	1986	2.08	–	–	1.34×10^{-1}	–	6.53×10^{1}	–
216-B-3	216-B-3 Pond	Liquid	2001	4.26×10^{2}	–	1.63×10^{-8}	2.22	8.66×10^{-2}	2.43×10^{1}	1.19×10^{1}
216-B-3A Pond / 216-B-3A RAD	216-B-3A Pond / 216-B-3A RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
216-B-3B Pond / 216-B-3B-RAD	216-B-3B Pond / 216-B-3B-RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
216-B-3C Pond / 216-B-3C RAD	216-B-3C Pond / 216-B-3C RAD	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-14	UPR-200-E-14 Unplanned Release	Liquid	1994	Site consolidated with Site WIDS ID 216-B-3						
UPR-200-E-34	UPR-200-E-34	Liquid	1994	Site consolidated with Site WIDS ID 216-A-25						

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–53a. Map 12A: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
216-C-9	216-C-9 Swamp	Liquid	2001	8.28×10^{-3}	2.44×10^{-4}	–	1.31	1.89×10^{-4}	1.01×10^{-3}	5.97×10^{-7}
218-C-9	218-C-9 Burial Ground	Solid	Varies based on time of disposal	–	–	–	1.27×10^{1}	–	–	–
UPR-200-E-141[b]	UPR-200-E-141	Liquid	2001	6.50×10^{-3}	–	–	–	–	2.77×10^{-5}	–
200-E-56[b]	200-E-56 Unplanned Release	Liquid	2001	2.47×10^{-2}	1.07×10^{-2}	–	7.38×10^{3}	7.87×10^{-2}	4.13×10^{-1}	2.47×10^{-5}
201-C	201-C Process Building	Liquid/ Solid	1988	–	–	–	9.00×10^{3}	–	–	–
216-C-1	216-C-1 Hot Semi Work Crib	Liquid	2001	1.95×10^{-4}	7.11×10^{-5}	–	4.88×10^{1}	5.22×10^{-4}	2.74×10^{-3}	7.70×10^{-6}
216-C-3	216-C-3 Hot Semi Work Crib	Liquid	2001	7.92×10^{1}	1.42×10^{-5}	–	9.78	1.04×10^{-4}	6.96×10^{-4}	3.27×10^{-8}
216-C-4	216-C-4 Hot Semi Work Crib	Liquid	2001	1.68×10^{-4}	1.22×10^{-5}	–	7.40	1.56×10^{-4}	8.05×10^{-4}	4.95×10^{-8}
216-C-5	216-C-5 Hot Semi Work Crib	Liquid	2001	–	–	–	–	–	–	–
216-C-6	216-C-6 Hot Semi Work Crib	Liquid	2001	1.25×10^{1}	3.29×10^{-5}	–	2.07×10^{1}	5.70×10^{-4}	2.84×10^{-3}	1.33×10^{-7}
216-C-10	216-C-10 Hot Semi Work Crib	Liquid	2001	6.54×10^{-5}	2.83×10^{-5}	–	1.96×10^{1}	2.08×10^{-4}	1.09×10^{-3}	6.55×10^{-8}
216-C-2	216-C-2 Semi Works Reverse Well	Liquid	2001	–	–	–	8.00×10^{-2}	–	–	–
200-E-57[b]	200-E-57 Unplanned Release	Liquid	2001	3.71×10^{-2}	1.60×10^{-2}	–	1.11×10^{4}	1.18×10^{-1}	6.21×10^{-1}	3.71×10^{-5}
241-CX-72	241-CX-72 Storage Tank and Vault	Liquid/ Solid	1986	–	–	–	–	–	–	–
291-C-1	291-C-1 Burial Ground	Solid	Varies based on time of disposal	–	–	–	–	–	–	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.

Table S–53b. Map 12A: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	Cs-137	Gd-152	Th-232	U-238 (U-233, U-234, U-235, U-238)	Np-237	Pu-239 (Pu-239, Pu-240)	Am-241
216-C-9	216-C-9 Swamp	Liquid	2001	2.67×10^{-1}	–	1.06×10^{-10}	3.30×10^{-5}	1.93×10^{-5}	2.97×10^{-3}	2.99×10^{-4}
218-C-9	218-C-9 Burial Ground	Solid	Varies based on time of disposal	7.50	–	–	–	–	–	–
UPR-200-E-141[b]	UPR-200-E-141	Liquid	2001	–	–	–	1.22×10^{-4}	–	–	–
200-E-56[b]	200-E-56 Unplanned Release	Liquid	2001	1.66×10^{3}	–	4.04×10^{-13}	1.59×10^{-3}	1.75×10^{-3}	5.48×10^{-1}	2.14×10^{1}
201-C	201-C Process Building	Liquid/ Solid	1988	–	–	–	–	–	4.90	2.00×10^{-1}
216-C-1	216-C-1 Hot Semi Work Crib	Liquid	2001	1.10×10^{1}	–	8.76×10^{-10}	6.42×10^{-1}	1.16×10^{-5}	5.99×10^{-1}	1.42×10^{-1}
216-C-3	216-C-3 Hot Semi Work Crib	Liquid	2001	2.20	–	9.09×10^{-15}	3.06×10^{-3}	3.25×10^{-6}	8.83×10^{-4}	2.84×10^{-2}
216-C-4	216-C-4 Hot Semi Work Crib	Liquid	2001	5.08×10^{-4}	–	2.08×10^{-15}	2.24×10^{-6}	2.51×10^{-6}	7.50×10^{-4}	7.68×10^{-3}
216-C-5	216-C-5 Hot Semi Work Crib	Liquid	2001	–	–	–	1.40×10^{-2}	–	–	–
216-C-6	216-C-6 Hot Semi Work Crib	Liquid	2001	3.88×10^{-1}	–	6.56×10^{-13}	1.47×10^{-3}	1.36×10^{-4}	2.49×10^{-2}	2.10×10^{-2}
216-C-10	216-C-10 Hot Semi Work Crib	Liquid	2001	4.40	–	1.12×10^{-15}	4.45×10^{-6}	4.84×10^{-6}	1.50×10^{-3}	5.67×10^{-2}
216-C-2	216-C-2 Semi Works Reverse Well	Liquid	2001	9.43×10^{-3}	–	3.70×10^{-16}	8.85×10^{-7}	6.72×10^{-7}	1.87×10^{-4}	–
200-E-57[b]	200-E-57 Unplanned Release	Liquid	2001	2.49×10^{3}	–	6.07×10^{-13}	2.39×10^{-3}	2.62×10^{-3}	8.22×10^{-1}	3.22×10^{1}
241-CX-72	241-CX-72 Storage Tank and Vault	Liquid/ Solid	1986	–	–	–	–	–	3.00	–
291-C-1	291-C-1 Burial Ground	Solid	Varies based on time of disposal	–	–	–	–	–	1.00×10^{2}	–

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

[b] This site was not modeled because not all the information needed to prepare model input files was available and assumptions could not be made.

Note: Dash (–) means no data found or inventory is estimated to be 0 or below detectable levels.

Key: Am=americium; Cs=cesium; Gd=gadolinium; ID=identifier; Np=neptunium; Pu=plutonium; Th=thorium; U=uranium; WIDS=Waste Information Data System.

Source: SAIC 2006.

Table S–54a. Map 12B: Radionuclide Inventories (curies)

WIDS ID/ Building Number	Common Site Name	Source Type	Decay Date[a]	H-3	C-14	K-40	Sr-90	Zr-93	Tc-99	I-129
UPR-200-E-86	UPR-200-E-86	Liquid	2001	7.21×10^{-1}	1.31×10^{-1}	–	1.69×10^{2}	9.34×10^{-1}	4.92	2.61×10^{-3}
216-A-40	216-A-40 Trench	Liquid	2001	1.40×10^{-7}	2.69×10^{-8}	–	1.73×10^{-7}	1.91×10^{-7}	1.02×10^{-6}	6.04×10^{-10}
216-A-41	216-A-41 Crib	Liquid	2001	1.04×10^{-1}	8.93×10^{-9}	–	7.44×10^{-6}	9.43×10^{-8}	4.93×10^{-7}	1.68×10^{-6}
216-A-9	216-A-9 Crib	Liquid	2001	8.07×10^{2}	1.17	–	6.81	3.21×10^{-4}	2.30×10^{-3}	1.22×10^{-3}
216-A-3	216-A-3 Crib	Liquid	2001	4.13×10^{1}	4.04×10^{-7}	–	2.08×10^{-2}	1.01×10^{-6}	2.73×10^{-1}	–
216-A-39	216-A-39 Crib	Liquid	2001	2.36×10^{-4}	5.96×10^{-5}	–	4.96×10^{-2}	6.46×10^{-4}	3.39×10^{-3}	2.04×10^{-7}
216-A-18	216-A-18 Trench	Liquid	2001	–	–	–	–	–	–	–
216-A-1	216-A-1 Crib	Liquid	2001	–	–	–	–	–	–	–
216-A-7	216-A-7 Crib	Liquid	2001	2.33×10^{-1}	3.15×10^{-3}	–	1.02×10^{1}	3.54×10^{-1}	6.39×10^{-2}	4.19×10^{-5}
UPR-200-E-145	UPR-200-E-145	Liquid	2001	1.95×10^{-1}	–	–	–	–	8.31×10^{-4}	–
216-A-16	216-A-16 French Drain	Liquid	2001	3.32×10^{-7}	7.60×10^{-9}	–	6.75×10^{-6}	3.83×10^{-8}	2.03×10^{-7}	3.90×10^{-10}
216-A-17	216-A-17 French Drain	Liquid	2001	1.63×10^{-7}	3.73×10^{-9}	–	3.32×10^{-6}	1.89×10^{-8}	1.00×10^{-7}	1.92×10^{-10}
242-A	242-A Evaporator	Liquid	1998	–	–	–	2.18×10^{4}	–	–	–
216-A-22	216-A-22 Crib (French Drain)	Liquid	2001	7.97×10^{-2}	9.13×10^{-9}	–	5.63×10^{-10}	–	4.89×10^{-4}	1.29×10^{-10}
216-A-28	216-A-28 French Drain	Liquid	2001	3.66×10^{-1}	–	–	–	–	2.48×10^{-3}	–
216-A-32	216-A-32 Crib	Liquid	2001	1.09×10^{-8}	2.49×10^{-10}	–	2.22×10^{-7}	1.26×10^{-9}	6.67×10^{-9}	1.28×10^{-11}
200-E-78	200-E-78 Reverse Well	Liquid	2001	–	7.17×10^{-7}	–	4.42×10^{-8}	–	–	1.01×10^{-8}

[a] Date of determination of the inventories reflected in this table. For purposes of groundwater modeling (see Appendix N), these concentrations were adjusted (i.e., increased) to account for decay from the date of radionuclide release.

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Key: C=carbon; H=hydrogen; I=iodine; ID=identifier; K=potassium; Sr=strontium; Tc=technetium; WIDS=Waste Information Data System; Zr=zirconium.

Source: SAIC 2006.