SECTION

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The four measures of human health impacts considered in this analysis—lifetime risks of developing cancer from radiological and chemical constituents, dose from radiological constituents, and Hazard Index from chemical constituents—are calculated for each year for 10,000 years for each receptor at eight locations (i.e., A, B, S, T and U Barriers, Core Zone Boundary, Columbia River nearshore, and Columbia River surface water). This is a large amount of information that must be summarized to allow interpretation of results. The method chosen is to present dose for the year of maximum dose, risk for the year of maximum risk, and Hazard Index for the year of maximum Hazard Index. This choice is based on regulation of radiological impacts as dose and the observation that peak risk and peak noncarcinogenic impacts expressed as Hazard Index may occur at times other than that of peak dose. The significance of dose impacts is evaluated by comparison against the 100-millirem-per-year all-exposure-modes standard specified for protection of the public and the environment in DOE Order 5400.5. Population doses are compared against total effective dose equivalent from background sources of 365 millirem per year for a member of the population of the United States (NCRP 1987). The significance of noncarcinogenic chemical impacts is evaluated by comparison against a guideline value of unity for Hazard Index. The level of protection provided for the drinking water pathway is evaluated by comparison against the maximum contaminant levels (MCLs) of 40 CFR 141 and other benchmarks presented in Appendix O. In addition, only those radiological and chemical constituents that resulted in a lifetime risk or Hazard Index greater than 1×10^{-10} are presented in the tables in order to reduce the size of the tables.

Impacts related to tank farm operations, retrieval and closure are due to three types of release. The first type of release is the past practice of direct discharge of liquid to cribs and trenches (ditches). The second type of release is due to past activity at the tank farms and includes past leaks from damaged tanks. The third type of release is due to future activities and includes leaks during retrieval of waste from the tanks, and long-term leaching of waste material in tanks and ancillary equipment.

The balance of this section summarizes the potential human health effects due to implementation of each Tank Closure alternative. Seven onsite locations at which an individual may contact groundwater and an offsite location were selected for analysis. The seven onsite locations are the boundaries of tank farm barriers, the Core Zone Boundary, and the Columbia River nearshore. The offsite location is an access point to surface water of the Columbia River, which could be at various points near the site and at population centers downstream of the site. Total offsite population is 5 million people.

Consistent with DOE guidance (DOE Guide 453.1-1), the potential consequences of loss of administrative or institutional control are considered by estimation of impacts on onsite receptors. Because DOE does not anticipate loss of control of the site, these onsite receptors are considered hypothetical and are applied to develop estimates for past and future periods of time.

Four types of receptors are considered. The first type, a drinking-water well user, uses groundwater as a source of drinking water. The second type, a resident farmer, uses groundwater for drinking water consumption and irrigation of crops. Garden size and crop yield are adequate to produce approximately 25 percent of average requirements of crops and animal products. The third type, an American Indian resident farmer, also uses groundwater for drinking water consumption and irrigation of crops. Garden size and crop yield are adequate to produce the entirety of average requirements of crops and animal products. The fourth type, an American Indian hunter-gatherer, is impacted by both groundwater and surface water because he uses surface water for drinking water consumption and consumes wild plant materials, which use groundwater, and game, which use surface water. In subsequent subsections, estimates of impacts are presented in two sets of tables, one set for receptors using groundwater and one set for users of surface water. In order to facilitate presentation, estimates of impact on the American Indian hunter-gatherer are presented in the set of tables for surface-water users. Impacts that depend upon or would be affected by Tank Closure alternatives would be evident after calendar year 2050, the approximate time assumed for placement of engineered caps. However, releases to the vadose zone associated with past practices such as planned discharges to cribs and trenches (ditches) and with leaks

from tanks occurring after calendar year 1940 but before calendar year 2050, may continue to produce impacts into the future. Because of uncertainties in estimates of the time of occurrence of impacts and the perspective that could be added by knowledge of past impacts, estimates of peak impacts are provided for time periods beginning in calendar year 1940 and in calendar year 2050. In addition, a time series of estimates of radiological risk for the drinking-water well user at the Core Zone Boundary is presented to provide a view of the evolution of impacts over the entire period of analysis. Further discussion on these receptors is provided in Section Q.2 of this appendix.

The results of the analysis for drinking-water well users after the year 2050 are summarized in Tables Q–16 through Q–19 for radiological and chemical constituents. Impacts due to ingestion of drinking water under Tank Closure Alternative 1, which assumes catastrophic failure of the tanks, would be higher than the 100-millirem-per-year dose standard at the A and B Barriers and the Core Zone Boundary. For the other Tank Closure alternatives, the results indicate that planned discharges to cribs and trenches (ditches) and past leaks at the B, BX, BY, T, and TX tank farms would be important contributors to radiological and chemical impacts. Under Tank Closure Alternatives 2A, 2B, 3A, 3B, 3C, 4, 5, 6A (Base and Option Cases), 6B (Base and Option Cases), and 6C, doses would be not be greater than the 100-millirem-per-year standard at any location. Under all Tank Closure alternatives, except for Tank Closure Alternative 1, doses estimated for drinking water ingestion are less than 10 millirem per year at the Columbia River nearshore location. For peak impacts occurring prior to calendar year 5000, radiological impacts would be due to hydrogen-3 (tritium), technetium-99 and iodine-129 and chemical impacts would be due to chromium and nitrate. For peak impacts occurring after calendar year 5000, radiological impacts would be due to uranium isotopes and chemical impacts would be due to total uranium.

Table Q–16. Summary of Radiological Dose at Year of Peak Dose for Drinking-Water Well User (millirem per year)

Location	Tank Closure Alternative								
	1	2A	2B, 3A, 3B, 3C, 6C	4	5	6A, Base Case	6A, Option Case	6B, Base Case	6B, Option Case
A Barrier	1.43×10^{2} (2114)	3.60 (2055)	3.27 (2058)	3.28 (2058)	5.46 (4338)	3.03 (2058)	3.03 (2058)	3.21 (2050)	3.21 (2050)
B Barrier	3.69×10^{2} (3837)	6.83×10^{1} (2076)	6.31×10^{1} (2050)	5.92×10^{1} (2050)	4.96×10^{1} (2050)	6.15×10^{1} (2050)	5.61×10^{1} (2057)	6.17×10^{1} (2050)	5.79×10^{1} (2058)
S Barrier	8.33×10^{1} (3238)	6.31 (2050)	6.09 (2050)	4.77×10^{-1} (2060)	6.04 (3931)	6.14 (2050)	6.14 (2050)	5.86 (2050)	5.86 (2050)
T Barrier	3.52×10^{1} (2051)	3.53×10^{1} (2051)	3.55×10^{1} (2050)	3.55×10^{1} (2050)	3.26×10^{1} (2051)	3.53×10^{1} (2051)	3.54×10^{1} (2050)	3.61×10^{1} (2051)	3.61×10^{1} (2051)
U Barrier	3.43×10^{1} (3536)	1.33 (11,763)	1.04 (11,441)	1.02 (11,441)	3.24 (4022)	3.39×10^{-1} (2064)	3.39×10^{-1} (2064)	3.23×10^{-1} (2060)	3.23×10^{-1} (2060)
Core Zone Boundary	7.44×10^{2} (3837)	5.92×10^{1} (2076)	5.42×10^{1} (2050)	5.02×10^{1} (2050)	6.50×10^{1} (4326)	5.14×10^{1} (2050)	4.51×10^{1} (2057)	5.16×10^{1} (2050)	4.79×10^{1} (2058)
Columbia River nearshore	1.19×10^{1} (4106)	4.39×10^{-1} (2406)	4.28×10^{-1} (2541)	3.91×10^{-1} (2480)	1.37 (5017)	3.55×10^{-1} (2520)	3.73×10^{-1} (2502)	3.38×10^{-1} (2214)	3.38×10^{-1} (2304)

Note: Dose for year of peak dose, with calendar year of peak dose in parentheses.

Table Q–17. Summary of Radiological Risk at Year of Peak Radiological Risk for Drinking-Water Well User (unitless)

Location	Tank Closure Alternative								
	1	2A	2B, 3A, 3B, 3C, 6C	4	5	6A, Base Case	6A, Option Case	6B, Base Case	6B, Option Case
A Barrier	4.45×10^{-3} (2114)	1.05×10^{-4} (2055)	9.56×10^{-5} (2058)	9.61×10^{-5} (2058)	1.84×10^{-4} (4338)	8.88×10^{-5} (2058)	8.88×10^{-5} (2058)	9.24×10^{-5} (2050)	9.24×10^{-5} (2050)
B Barrier	1.13×10^{-2} (3837)	2.05×10^{-3} (2076)	1.93×10^{-3} (2050)	1.81×10^{-3} (2050)	1.47×10^{-3} (2050)	1.87×10^{-3} (2050)	1.64×10^{-3} (2057)	1.88×10^{-3} (2050)	1.75×10^{-3} (2058)
S Barrier	2.51×10^{-3} (3238)	1.85×10^{-4} (2050)	1.77×10^{-4} (2050)	1.40×10^{-5} (2060)	2.03×10^{-4} (3931)	1.78×10^{-4} (2050)	1.78×10^{-4} (2050)	1.70×10^{-4} (2050)	1.70×10^{-4} (2050)
T Barrier	1.00×10^{-3} (2051)	1.01×10^{-3} (2051)	1.02×10^{-3} (2050)	1.02×10^{-3} (2050)	9.86×10^{-4} (2050)	1.01×10^{-3} (2051)	1.01×10^{-3} (2051)	1.03×10^{-3} (2051)	1.04×10^{-3} (2051)
U Barrier	9.87×10^{-4} (3536)	3.57×10^{-5} (2096)	1.79×10^{-5} (3499)	1.18×10^{-5} (2060)	1.08×10^{-4} (4022)	9.91×10^{-6} (2064)	9.91×10^{-6} (2064)	9.33×10^{-6} (2060)	9.33×10^{-6} (2060)
Core Zone Boundary	2.26×10^{-2} (3837)	1.80×10^{-3} (2076)	1.66×10^{-3} (2050)	1.54×10^{-3} (2050)	2.18×10^{-3} (4326)	1.58×10^{-3} (2050)	1.35×10^{-3} (2056)	1.59×10^{-3} (2050)	1.46×10^{-3} (2058)
Columbia River nearshore	3.40×10^{-4} (4032)	1.32×10^{-5} (3464)	1.30×10^{-5} (2480)	1.21×10^{-5} (2480)	4.47×10^{-5} (5017)	1.07×10^{-5} (2515)	1.15×10^{-5} (2502)	1.06×10^{-5} (2214)	1.04×10^{-5} (2304)

Note: Radiological risk for year of peak radiological risk, with calendar year of peak radiological risk in parentheses.

Table Q–18. Summary of Hazard Index at Year of Peak Hazard Index for Drinking-Water Well User (unitless)

Location	Tank Closure Alternative								
	1	2A	2B, 3A, 3B, 3C, 6C	4	5	6A, Base Case	6A, Option Case	6B, Base Case	6B, Option Case
A Barrier	4.13 (2119)	3.16×10^{-1} (2070)	1.84×10^{-1} (2057)	1.79×10^{-1} (2057)	4.06×10^{-1} (4094)	8.36×10^{-2} (2050)	8.36×10^{-2} (2050)	7.68×10^{-2} (2050)	7.68×10^{-2} (2050)
B Barrier	6.95×10^{1} (2087)	6.89×10^{1} (2085)	5.79×10^{1} (2050)	5.77×10^{1} (2050)	5.79×10^{1} (2050)	5.77×10^{1} (2050)	6.46×10^{1} (2091)	5.78×10^{1} (2050)	6.37×10^{1} (2087)
S Barrier	1.73×10^{1} (3172)	2.94 (2050)	2.74 (2050)	3.61×10^{-1} (2057)	2.91 (2050)	2.91 (2050)	2.91 (2050)	2.85 (2050)	2.85 (2050)
T Barrier	1.18×10^{1} (2050)	9.90 (2050)	9.63 (2050)	9.63 (2051)	9.77 (2050)	9.56 (2050)	9.64 (2051)	9.65 (2050)	9.58 (2051)
U Barrier	3.42 (3577)	2.60×10^{-1} (2083)	1.18×10^{-1} (11,599)	1.15×10^{-1} (11,599)	4.01×10^{-1} (3869)	1.03×10^{-1} (2050)	1.03×10^{-1} (2050)	9.89×10^{-2} (2050)	9.89×10^{-2} (2050)
Core Zone Boundary	1.31×10^{2} (3524)	3.78×10^{1} (2066)	3.39×10^{1} (2050)	3.36×10^{1} (2050)	3.38×10^{1} (2050)	3.38×10^{1} (2050)	3.67×10^{1} (2056)	3.38×10^{1} (2050)	3.52×10^{1} (2053)
Columbia River nearshore	1.88 (4019)	4.36×10^{-1} (2527)	4.35×10^{-1} (2695)	4.31×10^{-1} (2695)	4.43×10^{-1} (2695)	4.20×10^{-1} (2695)	3.91×10^{-1} (2303)	4.22×10^{-1} (2695)	3.79×10^{-1} (2166)

Note: Hazard Index for year of peak Hazard Index, with calendar year of Hazard Index peak in parentheses.

Table Q–19. Summary of Nonradiological Risk at Year of Peak Nonradiological Risk for Drinking-Water Well User (unitless)

Location	Tank Closure Alternative								
	1	2A	2B, 3A, 3B, 3C, 6C	4	5	6A, Base Case	6A, Option Case	6B, Base Case	6B, Option Case
A Barrier	2.40×10^{-11} (11,777)	1.16×10^{-13} (11,822)	8.57×10^{-14} (11,785)	N/A	4.90×10^{-13} (11,755)	N/A	N/A	N/A	N/A
B Barrier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S Barrier	1.36×10^{-11} (11,797)	N/A	N/A	N/A	3.37×10^{-13} (11,776)	N/A	N/A	N/A	N/A
T Barrier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U Barrier	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Core Zone Boundary	2.99×10^{-11} (11,849)	4.67×10^{-14} (11,833)	3.26×10^{-14} (11,815)	N/A	4.72×10^{-13} (11,848)	N/A	N/A	N/A	N/A
Columbia River nearshore	6.19×10^{-13} (11,876)	1.53×10^{-15} (11,838)	1.07×10^{-15} (11,691)	N/A	7.09×10^{-15} (11,707)	N/A	N/A	N/A	N/A

Note: Nonradiological risk for year of peak radiological risk, with calendar year of peak nonradiological risk in parentheses. The nonradiological risk driver is 2,4,6-trichlorophenol, which is below the 1×10^{-10} cutoff concentration and is therefore not shown in the alternative-specific table.

Key: N/A=not applicable.

Q.3.1.1.1 Tank Closure Alternative 1

Under Tank Closure Alternative 1, the tank farms would be maintained in the current condition indefinitely but, for the purpose of analysis, are assumed to fail after an institutional control period of 100 years. At this time, the salt cake in the single-shell tanks is assumed available for leaching into the vadose zone, and the liquid contents of the double-shell tanks are assumed to be discharged directly to the vadose zone. Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–20 through Q–24. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–25 through Q–32. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–33 through Q–40.

Table Q–20. Tank Closure Alternative 1 Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.86×10^{-3}	3.34×10^{2}	3.17×10^{-3}	2.86×10^{-3}	5.31×10^{2}	5.55×10^{-3}	2.86×10^{-3}	9.76×10^{2}	1.11×10^{-2}
Technetium-99	1.44×10^{-4}	2.52×10^{2}	8.67×10^{-3}	1.44×10^{-4}	6.47×10^{2}	2.84×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.20×10^{-2}
Iodine-129	1.88×10^{-7}	5.35×10^{1}	6.09×10^{-4}	1.88×10^{-7}	6.21×10^{1}	8.22×10^{-4}	1.88×10^{-7}	7.67×10^{1}	1.18×10^{-3}
Total	3.00×10^{-3}	6.39×10^{2}	1.24×10^{-2}	3.00×10^{-3}	1.24×10^{3}	3.48×10^{-2}	3.00×10^{-3}	2.37×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.05×10^{1}	4.81×10^{2}	0.00	5.05×10^{1}	4.82×10^{2}	1.98×10^{-7}	5.05×10^{1}	7.04×10^{2}	9.10×10^{-3}
Nitrate	1.72×10^{4}	3.07×10^{2}	0.00	1.72×10^{4}	4.04×10^{2}	0.00	1.72×10^{4}	7.93×10^{2}	0.00
Total	1.72×10^{4}	7.88×10^{2}	0.00	1.72×10^{4}	8.86×10^{2}	1.98×10^{-7}	1.72×10^{4}	1.50×10^{3}	9.10×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–21. Tank Closure Alternative 1 Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.24×10^{-2}	1.44×10^{3}	1.37×10^{-2}	1.24×10^{-2}	2.30×10^{3}	2.40×10^{-2}	1.24×10^{-2}	4.22×10^{3}	4.78×10^{-2}
Technetium-99	1.28×10^{-7}	2.25×10^{-1}	7.72×10^{-6}	1.28×10^{-7}	5.77×10^{-1}	2.53×10^{-5}	1.28×10^{-7}	1.18	5.53×10^{-5}
Iodine-129	1.11×10^{-9}	3.17×10^{-1}	3.61×10^{-6}	1.11×10^{-9}	3.68×10^{-1}	4.87×10^{-6}	1.11×10^{-9}	4.54×10^{-1}	7.01×10^{-6}
Uranium-238	4.71×10^{-11}	5.84×10^{-3}	6.60×10^{-8}	4.71×10^{-11}	6.06×10^{-3}	7.06×10^{-8}	4.71×10^{-11}	6.50×10^{-3}	7.99×10^{-8}
Total	1.24×10^{-2}	1.44×10^{3}	1.37×10^{-2}	1.24×10^{-2}	2.30×10^{3}	2.40×10^{-2}	1.24×10^{-2}	4.22×10^{3}	4.79×10^{-2}
Year of peak impact	1975	1975	1975	1975	1975	1975	1975	1975	1975
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	9.01	8.58×10^{1}	0.00	9.01	8.59×10^{1}	3.54×10^{-8}	9.01	1.25×10^{2}	1.62×10^{-3}
Nitrate	2.10×10^{3}	3.75×10^{1}	0.00	2.10×10^{3}	4.94×10^{1}	0.00	2.10×10^{3}	9.68×10^{1}	0.00
Total	2.11×10^{3}	1.23×10^{2}	0.00	2.11×10^{3}	1.35×10^{2}	3.54×10^{-8}	2.11×10^{3}	2.22×10^{2}	1.62×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–22. Tank Closure Alternative 1 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.86×10^{-3}	3.34×10^{2}	3.17×10^{-3}	2.86×10^{-3}	5.31×10^{2}	5.55×10^{-3}	2.86×10^{-3}	9.76×10^{2}	1.11×10^{-2}
Technetium-99	1.44×10^{-4}	2.52×10^{2}	8.67×10^{-3}	1.44×10^{-4}	6.47×10^{2}	2.84×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.20×10^{-2}
Iodine-129	1.88×10^{-7}	5.35×10^{1}	6.09×10^{-4}	1.88×10^{-7}	6.21×10^{1}	8.22×10^{-4}	1.88×10^{-7}	7.67×10^{1}	1.18×10^{-3}
Total	3.00×10^{-3}	6.39×10^{2}	1.24×10^{-2}	3.00×10^{-3}	1.24×10^{3}	3.48×10^{-2}	3.00×10^{-3}	2.37×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.87×10^{1}	2.73×10^{2}	0.00	2.87×10^{1}	2.73×10^{2}	1.13×10^{-7}	2.87×10^{1}	4.00×10^{2}	5.17×10^{-3}
Nitrate	1.34×10^{4}	2.39×10^{2}	0.00	1.34×10^{4}	3.14×10^{2}	0.00	1.34×10^{4}	6.16×10^{2}	0.00
Total	1.34×10^{4}	5.12×10^{2}	0.00	1.34×10^{4}	5.88×10^{2}	1.13×10^{-7}	1.34×10^{4}	1.02×10^{3}	5.17×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–23. Tank Closure Alternative 1 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	1.72×10^{-6}	2.01×10^{-1}	1.79×10^{-17}	1.72×10^{-6}	3.20×10^{-1}	3.12×10^{-17}	1.72×10^{-6}	5.89×10^{-1}	6.23×10^{-17}
Technetium-99	2.54×10^{-8}	4.45×10^{-2}	4.78×10^{-6}	2.54×10^{-8}	1.14×10^{-1}	1.57×10^{-5}	2.54×10^{-8}	2.33×10^{-1}	3.42×10^{-5}
Iodine-129	1.77×10^{-11}	5.05×10^{-3}	1.06×10^{-7}	1.77×10^{-11}	5.86×10^{-3}	1.43×10^{-7}	1.77×10^{-11}	7.24×10^{-3}	2.06×10^{-7}
Uranium-238	0.00	0.00	7.68×10^{-10}	0.00	0.00	8.22×10^{-10}	0.00	0.00	9.30×10^{-10}
Total	1.75×10^{-6}	2.51×10^{-1}	4.89×10^{-6}	1.75×10^{-6}	4.40×10^{-1}	1.58×10^{-5}	1.75×10^{-6}	8.29×10^{-1}	3.44×10^{-5}
Year of peak impact	1998	1998	2457	1998	1998	2457	1998	1998	2457
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	3.25×10^{-2}	3.10×10^{-1}	0.00	3.25×10^{-2}	3.10×10^{-1}	1.28×10^{-10}	3.25×10^{-2}	4.53×10^{-1}	5.86×10^{-6}
Nitrate	8.23	1.47×10^{-1}	0.00	8.23	1.94×10^{-1}	0.00	8.23	3.80×10^{-1}	0.00
Uranium	8.11×10^{-7}	7.72×10^{-6}	0.00	8.11×10^{-7}	7.81×10^{-6}	0.00	8.11×10^{-7}	8.08×10^{-6}	0.00
Total	8.26	4.57×10^{-1}	0.00	8.26	5.04×10^{-1}	1.28×10^{-10}	8.26	8.33×10^{-1}	5.86×10^{-6}
Year of peak impact	2408	2408	N/A	2408	2408	2408	2408	2408	2408

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–24. Tank Closure Alternative 1 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.64×10^{-10}	6.76×10^{-5}	7.07×10^{-10}	3.64×10^{-10}	1.26×10^{-4}	1.43×10^{-9}	1.72×10^{-6}	5.44×10^{-1}	6.67×10^{-6}
Technetium-99	2.55×10^{-11}	1.15×10^{-4}	5.03×10^{-9}	2.55×10^{-11}	2.65×10^{-4}	1.25×10^{-8}	2.54×10^{-8}	2.97×10^{-4}	1.61×10^{-8}
Iodine-129	3.11×10^{-14}	1.03×10^{-5}	1.36×10^{-10}	3.11×10^{-14}	1.68×10^{-4}	4.04×10^{-9}	1.77×10^{-11}	8.11×10^{-5}	1.97×10^{-9}
Total	3.89×10^{-10}	1.93×10^{-4}	5.88×10^{-9}	3.89×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.75×10^{-6}	5.44×10^{-1}	6.69×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1998	1998	1998
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	8.64×10^{-6}	8.24×10^{-5}	3.39×10^{-14}	8.64×10^{-6}	1.32×10^{-4}	1.56×10^{-9}	1.44×10^{-2}	3.21×10^{-2}	2.93×10^{-6}
Nitrate	2.23×10^{-3}	7.71×10^{-5}	0.00	2.23×10^{-3}	2.10×10^{-1}	0.00	7.85	7.85×10^{-1}	0.00
Total	2.24×10^{-3}	1.60×10^{-4}	3.39×10^{-14}	2.24×10^{-3}	2.10×10^{-1}	1.56×10^{-9}	7.86	8.17×10^{-1}	2.93×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2408

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

Table Q–25. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.65×10^{-6}	4.27×10^{-1}	4.06×10^{-6}	3.65×10^{-6}	6.79×10^{-1}	7.10×10^{-6}	3.65×10^{-6}	1.25	1.42×10^{-5}
Technetium-99	1.23×10^{-5}	2.16×10^{1}	7.44×10^{-4}	1.23×10^{-5}	5.55×10^{1}	2.44×10^{-3}	1.23×10^{-5}	1.13×10^{2}	5.32×10^{-3}
Iodine-129	2.33×10^{-8}	6.62	7.54×10^{-5}	2.33×10^{-8}	7.69	1.02×10^{-4}	2.33×10^{-8}	9.49	1.47×10^{-4}
Total	1.60×10^{-5}	2.87×10^{1}	8.23×10^{-4}	1.60×10^{-5}	6.39×10^{1}	2.55×10^{-3}	1.60×10^{-5}	1.24×10^{2}	5.48×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	5.85×10^{-2}	5.57×10^{-1}	0.00	5.85×10^{-2}	5.58×10^{-1}	2.30×10^{-10}	5.85×10^{-2}	8.15×10^{-1}	1.05×10^{-5}
Nitrate	4.27	7.63×10^{-2}	0.00	4.27	1.00×10^{-1}	0.00	4.27	1.97×10^{-1}	0.00
Total	4.33	6.34×10^{-1}	0.00	4.33	6.58×10^{-1}	2.30×10^{-10}	4.33	1.01	1.05×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–26. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	6.09×10^{-8}	7.11×10^{-3}	6.76×10^{-8}	6.09×10^{-8}	1.13×10^{-2}	1.18×10^{-7}	6.09×10^{-8}	2.08×10^{-2}	2.36×10^{-7}
Technetium-99	9.11×10^{-6}	1.60×10^{1}	5.48×10^{-4}	9.11×10^{-6}	4.10×10^{1}	1.80×10^{-3}	9.11×10^{-6}	8.35×10^{1}	3.92×10^{-3}
Iodine-129	1.58×10^{-8}	4.51	5.13×10^{-5}	1.58×10^{-8}	5.23	6.92×10^{-5}	1.58×10^{-8}	6.46	9.97×10^{-5}
Total	9.18×10^{-6}	2.05×10^{1}	6.00×10^{-4}	9.18×10^{-6}	4.62×10^{1}	1.87×10^{-3}	9.18×10^{-6}	8.99×10^{1}	4.02×10^{-3}
Year of peak impact	2052	2052	2052	2052	2052	2052	2052	2052	2052
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	1.03×10^{-1}	9.79×10^{-1}	0.00	1.03×10^{-1}	9.80×10^{-1}	4.04×10^{-10}	1.03×10^{-1}	1.43	1.85×10^{-5}
Nitrate	1.56×10^{1}	2.79×10^{-1}	0.00	1.56×10^{1}	3.68×10^{-1}	0.00	1.56×10^{1}	7.22×10^{-1}	0.00
Total	1.57×10^{1}	1.26	0.00	1.57×10^{1}	1.35	4.04×10^{-10}	1.57×10^{1}	2.15	1.85×10^{-5}
Year of peak impact	2051	2051	N/A	2051	2051	2051	2051	2051	2051

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–27. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	3.59×10^{-7}	4.19×10^{-2}	3.98×10^{-7}	3.59×10^{-7}	6.67×10^{-2}	7.62×10^{-7}	3.59×10^{-7}	1.23×10^{-1}	1.52×10^{-6}
Technetium-99	3.97×10^{-6}	6.96	2.39×10^{-4}	3.97×10^{-6}	1.79×10^{1}	7.87×10^{-4}	3.97×10^{-6}	3.64×10^{1}	1.72×10^{-3}
Iodine-129	7.47×10^{-9}	2.13	2.42×10^{-5}	7.47×10^{-9}	2.47	3.15×10^{-5}	7.47×10^{-9}	3.05	4.53×10^{-5}
Total	4.34×10^{-6}	9.13	2.64×10^{-4}	4.34×10^{-6}	2.04×10^{1}	8.19×10^{-4}	4.34×10^{-6}	3.96×10^{1}	1.76×10^{-3}
Year of peak impact	2023	2023	2023	2023	2023	2022	2023	2023	2022
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	4.19×10^{-1}	3.99	0.00	4.19×10^{-1}	3.99	1.65×10^{-9}	4.19×10^{-1}	5.84	7.55×10^{-5}
Nitrate	1.13×10^{1}	2.02×10^{-1}	0.00	1.13×10^{1}	2.66×10^{-1}	0.00	1.13×10^{1}	5.22×10^{-1}	0.00
Total	1.17×10^{1}	4.19	0.00	1.17×10^{1}	4.26	1.65×10^{-9}	1.17×10^{1}	6.36	7.55×10^{-5}
Year of peak impact	2030	2030	N/A	2030	2030	2030	2030	2030	2030

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–28. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.21×10^{-6}	3.75×10^{-1}	3.56×10^{-6}	3.21×10^{-6}	5.97×10^{-1}	5.00×10^{-6}	3.21×10^{-6}	1.10	9.98×10^{-6}
Technetium-99	2.31×10^{-5}	4.04×10^{1}	1.39×10^{-3}	2.31×10^{-5}	1.04×10^{2}	4.57×10^{-3}	2.31×10^{-5}	2.11×10^{2}	9.97×10^{-3}
Iodine-129	4.51×10^{-8}	1.28×10^{1}	1.46×10^{-4}	4.51×10^{-8}	1.49×10^{1}	1.90×10^{-4}	4.51×10^{-8}	1.84×10^{1}	2.73×10^{-4}
Total	2.63×10^{-5}	5.36×10^{1}	1.54×10^{-3}	2.63×10^{-5}	1.19×10^{2}	4.76×10^{-3}	2.63×10^{-5}	2.31×10^{2}	1.02×10^{-2}
Year of peak impact	2027	2027	2027	2027	2027	2029	2027	2027	2029
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	5.39×10^{-1}	5.13	0.00	5.39×10^{-1}	5.14	2.12×10^{-9}	5.34×10^{-1}	7.44	9.70×10^{-5}
Nitrate	3.80×10^{1}	6.78×10^{-1}	0.00	3.80×10^{1}	8.93×10^{-1}	0.00	3.93×10^{1}	1.81	0.00
Total	3.85×10^{1}	5.81	0.00	3.85×10^{1}	6.03	2.12×10^{-9}	3.98×10^{1}	9.26	9.70×10^{-5}
Year of peak impact	2025	2025	N/A	2025	2025	2025	2028	2028	2025

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–29. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	0.00	0.00	0.00	1.07×10^{-8}	5.53×10^{-9}	1.89×10^{-3}	2.14×10^{-8}
Technetium-99	0.00	0.00	0.00	0.00	0.00	3.03×10^{-5}	1.53×10^{-7}	1.40	6.60×10^{-5}
Iodine-129	0.00	0.00	0.00	0.00	0.00	1.10×10^{-6}	2.52×10^{-10}	1.03×10^{-1}	1.59×10^{-6}
Uranium-238	7.95×10^{-9}	9.86×10^{-1}	1.11×10^{-5}	7.95×10^{-9}	1.02	0.00	0.00	0.00	0.00
Total	7.95×10^{-9}	9.86×10^{-1}	1.11×10^{-5}	7.95×10^{-9}	1.02	3.14×10^{-5}	1.59×10^{-7}	1.51	6.76×10^{-5}
Year of peak impact	11,759	11,759	11,759	11,759	11,759	2065	2065	2065	2065
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	1.35×10^{-2}	1.28×10^{-1}	0.00	1.35×10^{-2}	1.28×10^{-1}	5.29×10^{-11}	1.35×10^{-2}	1.88×10^{-1}	2.42×10^{-6}
Nitrate	5.96×10^{-1}	1.06×10^{-2}	0.00	5.96×10^{-1}	1.40×10^{-2}	0.00	5.96×10^{-1}	2.75×10^{-2}	0.00
Total	6.09×10^{-1}	1.39×10^{-1}	0.00	6.09×10^{-1}	1.42×10^{-1}	5.29×10^{-11}	6.09×10^{-1}	2.15×10^{-1}	2.42×10^{-6}
Year of peak impact	2020	2020	N/A	2020	2020	2020	2020	2020	2020

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–30. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks at the Core Zone Boundary

	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Radiological Constituent	**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)**
Hydrogen-3 (tritium)	3.37×10^{-14}	3.94×10^{-9}	3.74×10^{-14}	3.37×10^{-14}	6.26×10^{-9}	6.55×10^{-14}	3.37×10^{-14}	1.15×10^{-8}	1.31×10^{-13}
Technetium-99	5.47×10^{-6}	9.59	3.30×10^{-4}	5.47×10^{-6}	2.46×10^{1}	1.08×10^{-3}	5.47×10^{-6}	5.01×10^{1}	2.36×10^{-3}
Iodine-129	8.45×10^{-9}	2.41	2.74×10^{-5}	8.45×10^{-9}	2.79	3.70×10^{-5}	8.45×10^{-9}	3.45	5.32×10^{-5}
Total	5.48×10^{-6}	1.20×10^{1}	3.57×10^{-4}	5.48×10^{-6}	2.74×10^{1}	1.12×10^{-3}	5.48×10^{-6}	5.36×10^{1}	2.41×10^{-3}
Year of peak impact	2310	2310	2310	2310	2310	2310	2310	2310	2310
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	4.49×10^{-1}	4.28	0.00	4.49×10^{-1}	4.28	1.76×10^{-9}	4.49×10^{-1}	6.26	8.09×10^{-5}
Nitrate	1.50×10^{1}	2.68×10^{-1}	0.00	1.50×10^{1}	3.53×10^{-1}	0.00	1.50×10^{1}	6.92×10^{-1}	0.00
Total	1.54×10^{1}	4.55	0.00	1.54×10^{1}	4.63	1.76×10^{-9}	1.54×10^{1}	6.95	8.09×10^{-5}
Year of peak impact	2271	2271	N/A	2271	2271	2271	2271	2271	2271

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–31. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	4.34×10^{-13}	5.07×10^{-8}	4.82×10^{-13}	4.34×10^{-13}	8.06×10^{-8}	8.42×10^{-13}	4.34×10^{-13}	1.48×10^{-7}	1.68×10^{-12}
Technetium-99	1.46×10^{-7}	2.55×10^{-1}	8.78×10^{-6}	1.46×10^{-7}	6.56×10^{-1}	2.88×10^{-5}	1.46×10^{-7}	1.34	6.28×10^{-5}
Iodine-129	2.07×10^{-10}	5.90×10^{-2}	6.72×10^{-7}	2.07×10^{-10}	6.85×10^{-2}	9.07×10^{-7}	2.07×10^{-10}	8.46×10^{-2}	1.31×10^{-6}
Total	1.46×10^{-7}	3.14×10^{-1}	9.45×10^{-6}	1.46×10^{-7}	7.24×10^{-1}	2.97×10^{-5}	1.46×10^{-7}	1.42	6.41×10^{-5}
Year of peak impact	2211	2211	2211	2211	2211	2211	2211	2211	2211
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	4.00×10^{-3}	3.81×10^{-2}	0.00	4.00×10^{-3}	3.81×10^{-2}	1.60×10^{-11}	4.00×10^{-3}	5.57×10^{-2}	7.34×10^{-7}
Nitrate	2.14×10^{-1}	3.83×10^{-3}	0.00	2.14×10^{-1}	5.04×10^{-3}	0.00	2.14×10^{-1}	9.88×10^{-3}	0.00
Total	2.18×10^{-1}	4.19×10^{-2}	0.00	2.18×10^{-1}	4.32×10^{-2}	1.60×10^{-11}	2.18×10^{-1}	6.56×10^{-2}	7.34×10^{-7}
Year of peak impact	2171	2171	N/A	2171	2171	2137	2171	2171	2137

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–32. Tank Closure Alternative 1 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.06×10^{-15}	1.97×10^{-10}	2.06×10^{-15}	1.33×10^{-15}	4.59×10^{-10}	5.20×10^{-15}	1.73×10^{-19}	4.24×10^{-14}	1.68×10^{-12}
Technetium-99	6.40×10^{-12}	2.88×10^{-5}	1.26×10^{-9}	6.32×10^{-12}	6.57×10^{-5}	3.11×10^{-9}	3.39×10^{-9}	3.70×10^{-5}	8.84×10^{-8}
Iodine-129	1.19×10^{-14}	3.95×10^{-6}	5.24×10^{-11}	1.23×10^{-14}	6.66×10^{-5}	1.60×10^{-9}	7.32×10^{-12}	1.10×10^{-5}	1.03×10^{-8}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	7.63×10^{-10}	7.59×10^{-3}	0.00
Total	6.41×10^{-12}	3.27×10^{-5}	1.32×10^{-9}	6.34×10^{-12}	1.32×10^{-4}	4.72×10^{-9}	4.16×10^{-9}	7.64×10^{-3}	9.87×10^{-8}
Year of peak impact	2144	2144	2144	2140	2140	2140	11,573	11,573	2211
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	1.91×10^{-7}	1.82×10^{-6}	7.48×10^{-16}	1.67×10^{-7}	2.55×10^{-6}	3.43×10^{-11}	4.00×10^{-3}	8.84×10^{-3}	3.67×10^{-7}
Nitrate	9.62×10^{-6}	3.32×10^{-7}	0.00	1.12×10^{-5}	1.05×10^{-3}	0.00	2.14×10^{-1}	9.75×10^{-3}	0.00
Total	9.81×10^{-6}	2.15×10^{-6}	7.48×10^{-16}	1.13×10^{-5}	1.05×10^{-3}	3.43×10^{-11}	2.18×10^{-1}	1.86×10^{-2}	3.67×10^{-7}
Year of peak impact	2172	2172	2172	2151	2151	2172	2171	2171	2137

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

Table Q–33. Tank Closure Alternative 1 Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	4.06×10^{-6}	4.75×10^{-1}	4.51×10^{-6}	4.06×10^{-6}	7.55×10^{-1}	7.89×10^{-6}	4.06×10^{-6}	1.39	1.57×10^{-5}
Technetium-99	7.01×10^{-5}	1.23×10^{2}	4.22×10^{-3}	7.01×10^{-5}	3.15×10^{2}	1.38×10^{-2}	7.01×10^{-5}	6.42×10^{2}	3.02×10^{-2}
Iodine-129	7.12×10^{-8}	2.03×10^{1}	2.31×10^{-4}	7.12×10^{-8}	2.35×10^{1}	3.11×10^{-4}	7.12×10^{-8}	2.90×10^{1}	4.48×10^{-4}
Total	7.42×10^{-5}	1.43×10^{2}	4.45×10^{-3}	7.42×10^{-5}	3.39×10^{2}	1.42×10^{-2}	7.42×10^{-5}	6.72×10^{2}	3.07×10^{-2}
Year of peak impact	2114	2114	2114	2114	2114	2114	2114	2114	2114
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	1.17×10^{-1}	5.57×10^{-1}	0.00	1.17×10^{-1}	6.95×10^{-1}	0.00	1.17×10^{-1}	1.26	0.00
Chromium	2.45×10^{-1}	2.33	0.00	2.45×10^{-1}	2.33	1.12×10^{-9}	2.45×10^{-1}	3.41	5.12×10^{-5}
Nitrate	6.96×10^{1}	1.24	0.00	6.96×10^{1}	1.64	0.00	6.96×10^{1}	3.21	0.00
Total	6.99×10^{1}	4.13	2.40×10^{-11}	6.99×10^{1}	4.66	1.12×10^{-9}	6.99×10^{1}	7.87	5.12×10^{-5}
Year of peak impact	2119	2119	11,777	2119	2119	2114	2119	2119	2114

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

Table Q–34. Tank Closure Alternative 1 Human Health Impacts at the B Barrier 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	1.75×10^{-4}	3.07×10^{2}	1.06×10^{-2}	1.75×10^{-4}	7.89×10^{2}	3.47×10^{-2}	1.75×10^{-4}	1.61×10^{3}	7.56×10^{-2}
Iodine-129	2.15×10^{-7}	6.12×10^{1}	6.96×10^{-4}	2.15×10^{-7}	7.10×10^{1}	9.40×10^{-4}	2.15×10^{-7}	8.77×10^{1}	1.35×10^{-3}
Uranium-238	2.46×10^{-11}	3.05×10^{-3}	3.44×10^{-8}	2.46×10^{-11}	3.16×10^{-3}	3.69×10^{-8}	2.46×10^{-11}	3.39×10^{-3}	4.17×10^{-8}
Total	1.76×10^{-4}	3.69×10^{2}	1.13×10^{-2}	1.76×10^{-4}	8.60×10^{2}	3.56×10^{-2}	1.76×10^{-4}	1.70×10^{3}	7.70×10^{-2}
Year of peak impact	3837	3837	3837	3837	3837	3837	3837	3837	3837
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	4.03	3.84×10^{1}	0.00	4.03	3.84×10^{1}	1.98×10^{-8}	4.03	5.61×10^{1}	9.10×10^{-4}
Nitrate	1.74×10^{3}	3.11×10^{1}	0.00	1.74×10^{3}	4.10×10^{1}	0.00	1.74×10^{3}	8.04×10^{1}	0.00
Total	1.75×10^{3}	6.95×10^{1}	0.00	1.75×10^{3}	7.94×10^{1}	1.98×10^{-8}	1.75×10^{3}	1.37×10^{2}	9.10×10^{-4}
Year of peak impact	2087	2087	N/A	2087	2087	3628	2087	2087	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–35. Tank Closure Alternative 1 Human Health Impacts at the S Barrier 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	3.87×10^{-5}	6.79×10^{1}	2.33×10^{-3}	3.87×10^{-5}	1.74×10^{2}	7.65×10^{-3}	3.87×10^{-5}	3.55×10^{2}	1.67×10^{-2}
Iodine-129	5.42×10^{-8}	1.54×10^{1}	1.76×10^{-4}	5.42×10^{-8}	1.79×10^{1}	2.37×10^{-4}	5.42×10^{-8}	2.21×10^{1}	3.41×10^{-4}
Uranium-238	2.58×10^{-1}	3.20×10^{-3}	3.61×10^{-8}	2.58×10^{-11}	3.32×10^{-3}	3.87×10^{-8}	2.58×10^{-11}	3.56×10^{-3}	4.38×10^{-8}
Total	3.88×10^{-5}	8.33×10^{1}	2.51×10^{-3}	3.88×10^{-5}	1.92×10^{2}	7.89×10^{-3}	3.88×10^{-5}	3.77×10^{2}	1.70×10^{-2}
Year of peak impact	3238	3238	3238	3238	3238	3238	3238	3238	3238
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	1.42×10^{-2}	6.78×10^{-2}	0.00	1.42×10^{-2}	8.47×10^{-2}	0.00	1.42×10^{-2}	1.53×10^{-1}	0.00
Chromium	1.65	1.57×10^{1}	0.00	1.65	1.57×10^{1}	6.49×10^{-9}	1.65	2.30×10^{1}	2.97×10^{-4}
Nitrate	8.48×10^{1}	1.51	0.00	8.48×10^{1}	1.99	0.00	8.48×10^{1}	3.91	0.00
Total uranium	3.59×10^{-5}	3.42×10^{-4}	0.00	3.59×10^{-5}	3.45×10^{-4}	0.00	3.59×10^{-5}	3.57×10^{-4}	0.00
Total	8.65×10^{1}	1.73×10^{1}	1.36×10^{-11}	8.65×10^{1}	1.78×10^{1}	6.49×10^{-9}	8.65×10^{1}	2.71×10^{1}	2.97×10^{-4}
Year of peak impact	3172	3172	11,797	3172	3172	3172	3172	3172	3172

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

Table Q–36. Tank Closure Alternative 1 Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	4.67×10^{-6}	5.45×10^{-1}	5.18×10^{-6}	4.67×10^{-6}	8.68×10^{-1}	9.07×10^{-6}	4.67×10^{-6}	1.60	1.81×10^{-5}
Technetium-99	1.50×10^{-5}	2.62×10^{1}	9.02×10^{-4}	1.50×10^{-5}	6.74×10^{1}	2.96×10^{-3}	1.50×10^{-5}	1.37×10^{2}	6.46×10^{-3}
Iodine-129	2.94×10^{-8}	8.36	9.52×10^{-5}	2.94×10^{-8}	9.70	1.28×10^{-4}	2.94×10^{-8}	1.20×10^{1}	1.85×10^{-4}
Uranium-238	1.07×10^{-10}	1.33×10^{-2}	1.50×10^{-7}	1.07×10^{-10}	1.38×10^{-2}	1.61×10^{-7}	1.07×10^{-10}	1.48×10^{-2}	1.82×10^{-7}
Total	1.97×10^{-5}	3.52×10^{1}	1.00×10^{-3}	1.97×10^{-5}	7.80×10^{1}	3.10×10^{-3}	1.97×10^{-5}	1.51×10^{2}	6.66×10^{-3}
Year of peak impact	2051	2051	2051	2051	2051	2051	2051	2051	2051
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	9.11×10^{-1}	8.68	0.00	8.96×10^{-1}	8.55	3.58×10^{-9}	8.96×10^{-1}	1.25×10^{1}	1.64×10^{-4}
Nitrate	1.73×10^{2}	3.10	0.00	1.81×10^{2}	4.26	0.00	1.81×10^{2}	8.35	0.00
Total uranium	1.78×10^{-4}	1.70×10^{-3}	0.00	1.84×10^{-4}	1.77×10^{-3}	0.00	1.84×10^{-4}	1.83×10^{-3}	0.00
Total	1.74×10^{2}	1.18×10^{1}	0.00	1.82×10^{2}	1.28×10^{1}	3.58×10^{-9}	1.82×10^{2}	2.08×10^{1}	1.64×10^{-4}
Year of peak impact	2050	2050	N/A	2051	2051	2050	2051	2051	2050

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–37. Tank Closure Alternative 1 Human Health Impacts at the U Barrier 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	1.48×10^{-5}	2.60×10^{1}	8.93×10^{-4}	1.48×10^{-5}	6.67×10^{1}	2.93×10^{-3}	1.48×10^{-5}	1.36×10^{2}	6.39×10^{-3}
Iodine-129	2.92×10^{-8}	8.30	9.45×10^{-5}	2.92×10^{-8}	9.64	1.28×10^{-4}	2.92×10^{-8}	1.19×10^{1}	1.84×10^{-4}
Total	1.49×10^{-5}	3.43×10^{1}	9.87×10^{-4}	1.49×10^{-5}	7.63×10^{1}	3.06×10^{-3}	1.49×10^{-5}	1.48×10^{2}	6.57×10^{-3}
Year of peak impact	3536	3536	3536	3536	3536	3536	3536	3536	3536
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	3.04×10^{-1}	2.89	0.00	3.04×10^{-1}	2.90	1.21×10^{-9}	3.04×10^{-1}	4.23	5.56×10^{-5}
Nitrate	2.94×10^{1}	5.26×10^{-1}	0.00	2.94×10^{1}	6.92×10^{-1}	0.00	2.94×10^{1}	1.36	0.00
Total	2.98×10^{1}	3.42	0.00	2.98×10^{1}	3.59	1.21×10^{-9}	2.98×10^{1}	5.59	5.56×10^{-5}
Year of peak impact	3577	3577	N/A	3577	3577	3587	3577	3577	3587

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–38. Tank Closure Alternative 1 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	3.50×10^{-4}	6.13×10^{2}	2.11×10^{-2}	3.50×10^{-4}	1.57×10^{3}	6.91×10^{-2}	3.50×10^{-4}	3.21×10^{3}	1.51×10^{-1}
Iodine-129	4.59×10^{-7}	1.31×10^{2}	1.49×10^{-3}	4.59×10^{-7}	1.52×10^{2}	2.01×10^{-3}	4.59×10^{-7}	1.88×10^{2}	2.89×10^{-3}
Uranium-238	1.85×10^{-10}	2.30×10^{-2}	2.60×10^{-7}	1.85×10^{-10}	2.39×10^{-2}	2.78×10^{-7}	1.85×10^{-10}	2.56×10^{-2}	3.15×10^{-7}
Total	3.50×10^{-4}	7.44×10^{2}	2.26×10^{-2}	3.50×10^{-4}	1.73×10^{3}	7.12×10^{-2}	3.50×10^{-4}	3.40×10^{3}	1.54×10^{-1}
Year of peak impact	3837	3837	3837	3837	3837	3837	3837	3837	3837
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	6.21×10^{-2}	2.96×10^{-1}	0.00	6.21×10^{-2}	3.69×10^{-1}	0.00	6.21×10^{-2}	6.67×10^{-1}	0.00
Chromium	1.22×10^{1}	1.16×10^{2}	0.00	1.22×10^{1}	1.16×10^{2}	4.79×10^{-8}	1.22×10^{1}	1.70×10^{2}	2.20×10^{-3}
Nitrate	8.04×10^{2}	1.44×10^{1}	0.00	8.04×10^{2}	1.89×10^{1}	0.00	8.04×10^{2}	3.71×10^{1}	0.00
Total uranium	2.77×10^{-5}	2.63×10^{-4}	0.00	2.77×10^{-5}	2.66×10^{-4}	0.00	2.77×10^{-5}	2.76×10^{-4}	0.00
Total	8.17×10^{2}	1.31×10^{2}	2.99×10^{-11}	8.17×10^{2}	1.35×10^{2}	4.79×10^{-8}	8.17×10^{2}	2.08×10^{2}	2.20×10^{-3}
Year of peak impact	3524	3524	11,849	3524	3524	3524	3524	3524	3524

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

Table Q–39. Tank Closure Alternative 1 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	5.05×10^{-6}	8.85	3.15×10^{-4}	5.05×10^{-6}	2.27×10^{1}	1.03×10^{-3}	5.23×10^{-6}	4.79×10^{1}	2.25×10^{-3}
Iodine-129	1.05×10^{-8}	3.00	2.52×10^{-5}	1.05×10^{-8}	3.48	3.40×10^{-5}	7.78×10^{-9}	3.17	4.90×10^{-5}
Uranium-238	1.10×10^{-12}	1.36×10^{-4}	1.54×10^{-9}	1.10×10^{-12}	1.42×10^{-4}	1.65×10^{-9}	1.10×10^{-12}	1.52×10^{-4}	1.87×10^{-9}
Total	5.06×10^{-6}	1.19×10^{1}	3.40×10^{-4}	5.06×10^{-6}	2.62×10^{1}	1.07×10^{-3}	5.24×10^{-6}	5.11×10^{1}	2.30×10^{-3}
Year of peak impact	4106	4106	4032	4106	4106	4032	4032	4032	4032
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.89×10^{-3}	1.85×10^{-2}	0.00	3.89×10^{-3}	2.31×10^{-2}	0.00	3.89×10^{-3}	4.17×10^{-2}	0.00
Chromium	1.65×10^{-1}	1.57	0.00	1.65×10^{-1}	1.57	6.47×10^{-10}	1.65×10^{-1}	2.29	2.97×10^{-5}
Nitrate	1.65×10^{1}	2.94×10^{-1}	0.00	1.65×10^{1}	3.88×10^{-1}	0.00	1.65×10^{1}	7.60×10^{-1}	0.00
Total uranium	8.14×10^{-7}	7.75×10^{-6}	0.00	8.14×10^{-7}	7.84×10^{-6}	0.00	8.14×10^{-7}	8.11×10^{-6}	0.00
Total	1.67×10^{1}	1.88	6.19×10^{-13}	1.67×10^{1}	1.98	6.47×10^{-10}	1.67×10^{1}	3.10	2.97×10^{-5}
Year of peak impact	4019	4019	11,876	4019	4019	4019	4019	4019	4019

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

Table Q–40. Tank Closure Alternative 1 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)
Hydrogen-3 (tritium)	2.02×10^{-14}	3.75×10^{-9}	3.92×10^{-14}	6.64×10^{-14}	2.30×10^{-8}	7.92×10^{-14}	2.10×10^{-19}	5.13×10^{-14}	4.55×10^{-18}
Technetium-99	1.35×10^{-10}	6.06×10^{-4}	2.66×10^{-8}	1.30×10^{-10}	1.35×10^{-3}	6.63×10^{-8}	5.05×10^{-6}	5.55×10^{-2}	3.15×10^{-6}
Iodine-129	2.14×10^{-13}	7.09×10^{-5}	9.41×10^{-10}	2.33×10^{-13}	1.26×10^{-3}	2.78×10^{-8}	1.05×10^{-8}	1.76×10^{-2}	3.36×10^{-7}
Uranium-238	1.71×10^{-18}	2.21×10^{-10}	2.57×10^{-15}	5.38×10^{-18}	1.91×10^{-9}	8.61×10^{-15}	1.10×10^{-12}	1.09×10^{-5}	1.38×10^{-10}
Total	1.35×10^{-10}	6.77×10^{-4}	2.76×10^{-8}	1.30×10^{-10}	2.61×10^{-3}	9.42×10^{-8}	5.06×10^{-6}	7.31×10^{-2}	3.49×10^{-6}
Year of peak impact	3467	3467	3467	3516	3516	3467	4106	4106	4032
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	1.60×10^{-7}	9.51×10^{-7}	0.00	1.41×10^{-7}	1.52×10^{-6}	0.00	4.36×10^{-3}	2.59×10^{-2}	0.00
Chromium	3.07×10^{-6}	2.92×10^{-5}	1.24×10^{-14}	2.60×10^{-6}	3.97×10^{-5}	5.68×10^{-10}	9.63×10^{-2}	2.13×10^{-1}	1.48×10^{-5}
Nitrate	3.99×10^{-4}	1.38×10^{-5}	0.00	4.19×10^{-4}	3.94×10^{-2}	0.00	2.35×10^{1}	8.99×10^{-1}	0.00
Total uranium	8.88×10^{-12}	8.55×10^{-11}	0.00	0.00	0.00	0.00	1.63×10^{-6}	7.22×10^{-7}	0.00
Total	4.02×10^{-4}	4.39×10^{-5}	1.24×10^{-14}	4.22×10^{-4}	3.94×10^{-2}	5.68×10^{-10}	2.36×10^{1}	1.14	1.48×10^{-5}
Year of peak impact	3556	3556	3668	3579	3579	3668	3911	3911	4019

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

Due to the large magnitude of the liquid release, transport through the vadose zone is rapid, and impacts exceeding dose standards are estimated for onsite locations. The largest contributor at the year of peak dose is the cribs and trenches (ditches) and the presence of tritium, technetium-99, iodine-129, uranium-238, chromium, nitrates, and total uranium. Due to large dilution in the Columbia River, offsite impacts on individuals are small. Population dose was estimated as 3.39 person-rem per year for the year of maximum impact.

Figure Q–2 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, other sources, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2300 for the Core Zone Boundary and is dominated by technetium-99 and iodine-129. The peak radiological risk resulting from all three sources occurs around the year 3800 and is dominated by technetium-99 and iodine-129. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

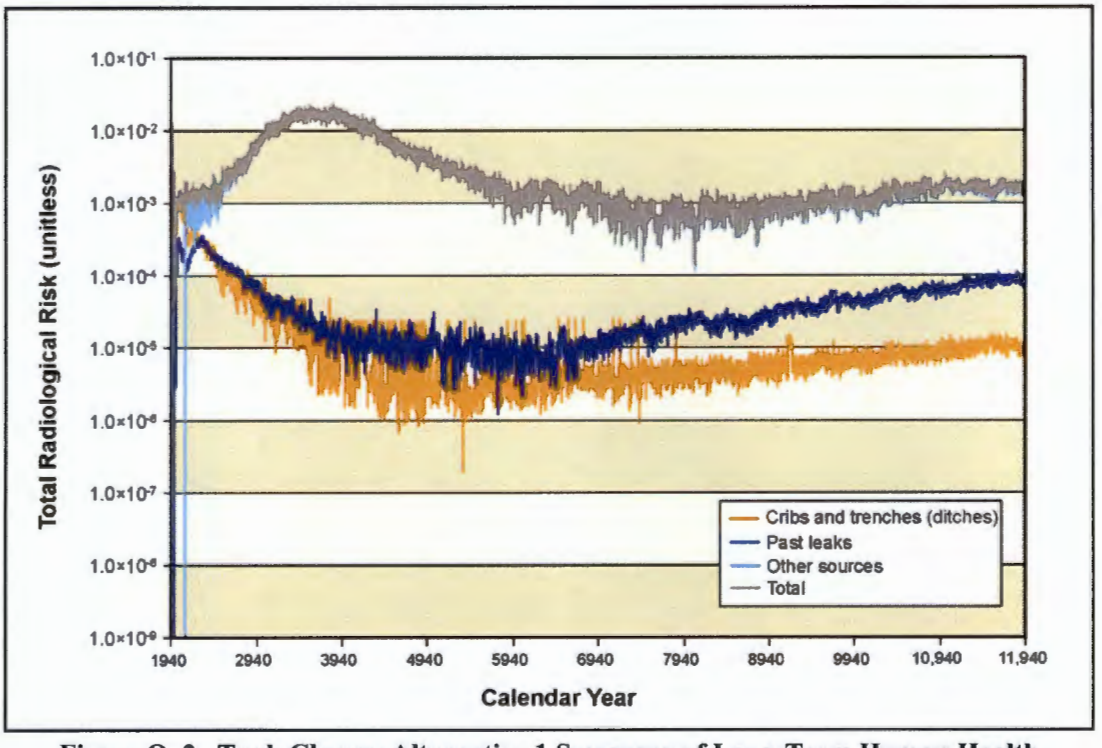

Figure Q–2. Tank Closure Alternative 1 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.2 Tank Closure Alternative 2A

Under Tank Closure Alternative 2A, tank waste would be retrieved to a volume corresponding to 99 percent retrieval, but the residual material in tanks would not be stabilized. After an institutional control period of 100 years, salt cake in the tanks was assumed available for dissolution in infiltrating water.

Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–41 through Q–45. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–46 through Q–53. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–54 through Q–61.

Table Q–41. Tank Closure Alternative 2A Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.96×10^{-3}	3.45×10^{2}	3.28×10^{-3}	2.96×10^{-3}	5.49×10^{2}	5.74×10^{-3}	2.96×10^{-3}	1.01×10^{3}	1.15×10^{-2}
Technetium-99	1.49×10^{-4}	2.60×10^{2}	8.95×10^{-3}	1.49×10^{-4}	6.68×10^{2}	2.93×10^{-2}	1.49×10^{-4}	1.36×10^{3}	6.40×10^{-2}
Iodine-129	1.95×10^{-7}	5.54×10^{1}	6.31×10^{-4}	1.95×10^{-7}	6.43×10^{1}	8.51×10^{-4}	1.95×10^{-7}	7.94×10^{1}	1.23×10^{-3}
Total	3.10×10^{-3}	6.61×10^{2}	1.29×10^{-2}	3.10×10^{-3}	1.28×10^{3}	3.59×10^{-2}	3.10×10^{-3}	2.45×10^{3}	7.67×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	4.59×10^{1}	4.37×10^{2}	0.00	4.59×10^{1}	4.37×10^{2}	1.80×10^{-7}	4.59×10^{1}	6.39×10^{2}	8.27×10^{-3}
Nitrate	1.81×10^{4}	3.23×10^{2}	0.00	1.81×10^{4}	4.26×10^{2}	0.00	1.81×10^{4}	8.35×10^{2}	0.00
Total	1.81×10^{4}	7.60×10^{2}	0.00	1.81×10^{4}	8.63×10^{2}	1.80×10^{-7}	1.81×10^{4}	1.47×10^{3}	8.27×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–42. Tank Closure Alternative 2A Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.23×10^{-2}	1.43×10^{3}	1.36×10^{-2}	1.23×10^{-2}	2.28×10^{3}	2.38×10^{-2}	1.23×10^{-2}	4.19×10^{3}	4.75×10^{-2}
Technetium-99	1.33×10^{-7}	2.33×10^{-1}	8.02×10^{-6}	1.33×10^{-7}	5.99×10^{-1}	2.63×10^{-5}	1.33×10^{-7}	1.22	5.74×10^{-5}
Iodine-129	1.10×10^{-9}	3.13×10^{-1}	3.56×10^{-6}	1.10×10^{-9}	3.63×10^{-1}	4.81×10^{-6}	1.10×10^{-9}	4.49×10^{-1}	6.92×10^{-6}
Uranium-238	6.26×10^{-11}	7.77×10^{-3}	8.77×10^{-8}	6.26×10^{-11}	8.06×10^{-3}	9.40×10^{-8}	6.26×10^{-11}	8.64×10^{-3}	1.06×10^{-7}
Total	1.23×10^{-2}	1.43×10^{3}	1.36×10^{-2}	1.23×10^{-2}	2.28×10^{3}	2.39×10^{-2}	1.23×10^{-2}	4.19×10^{3}	4.76×10^{-2}
Year of peak impact	1975	1975	1975	1975	1975	1975	1975	1975	1975
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	9.12	8.68×10^{1}	0.00	9.12	8.69×10^{1}	3.58×10^{-8}	9.12	1.27×10^{2}	1.64×10^{-3}
Nitrate	2.12×10^{3}	3.78×10^{1}	0.00	2.12×10^{3}	4.97×10^{1}	0.00	2.12×10^{3}	9.76×10^{1}	0.00
Total	2.12×10^{3}	1.25×10^{2}	0.00	2.12×10^{3}	1.37×10^{2}	3.58×10^{-8}	2.12×10^{3}	2.25×10^{2}	1.64×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–43. Tank Closure Alternative 2A Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.96×10^{-3}	3.45×10^{2}	3.28×10^{-3}	2.96×10^{-3}	5.49×10^{2}	5.74×10^{-3}	2.96×10^{-3}	1.01×10^{3}	1.15×10^{-2}
Technetium-99	1.49×10^{-4}	2.60×10^{2}	8.95×10^{-3}	1.49×10^{-4}	6.68×10^{2}	2.93×10^{-2}	1.49×10^{-4}	1.36×10^{3}	6.40×10^{-2}
Iodine-129	1.95×10^{-7}	5.54×10^{1}	6.31×10^{-4}	1.95×10^{-7}	6.43×10^{1}	8.51×10^{-4}	1.95×10^{-7}	7.94×10^{1}	1.23×10^{-3}
Total	3.10×10^{-3}	6.61×10^{2}	1.29×10^{-2}	3.10×10^{-3}	1.28×10^{3}	3.59×10^{-2}	3.10×10^{-3}	2.45×10^{3}	7.67×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.72×10^{1}	2.59×10^{2}	0.00	2.72×10^{1}	2.59×10^{2}	1.07×10^{-7}	2.72×10^{1}	3.79×10^{2}	4.89×10^{-3}
Nitrate	1.35×10^{4}	2.41×10^{2}	0.00	1.35×10^{4}	3.17×10^{2}	0.00	1.35×10^{4}	6.22×10^{2}	0.00
Total	1.35×10^{4}	5.00×10^{2}	0.00	1.35×10^{4}	5.76×10^{2}	1.07×10^{-7}	1.35×10^{4}	1.00×10^{3}	4.89×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–44. Tank Closure Alternative 2A Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	1.38×10^{-6}	1.62×10^{-1}	6.10×10^{-22}	1.38×10^{-6}	2.57×10^{-1}	1.07×10^{-21}	1.38×10^{-6}	4.73×10^{-1}	2.13×10^{-21}
Technetium-99	2.54×10^{-8}	4.46×10^{-2}	4.03×10^{-6}	2.54×10^{-8}	1.14×10^{-1}	1.32×10^{-5}	2.54×10^{-8}	2.33×10^{-1}	2.88×10^{-5}
Iodine-129	3.37×10^{-11}	9.60×10^{-3}	2.08×10^{-7}	3.37×10^{-11}	1.11×10^{-2}	2.80×10^{-7}	3.37×10^{-11}	1.38×10^{-2}	4.03×10^{-7}
Uranium-238	0.00	0.00	7.84×10^{-10}	0.00	0.00	8.40×10^{-10}	0.00	0.00	9.50×10^{-10}
Total	1.41×10^{-6}	2.16×10^{-1}	4.24×10^{-6}	1.41×10^{-6}	3.83×10^{-1}	1.35×10^{-5}	1.41×10^{-6}	7.20×10^{-1}	2.92×10^{-5}
Year of peak impact	1998	1998	2645	1998	1998	2645	1998	1998	2645
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	2.79×10^{-2}	2.66×10^{-1}	0.00	2.79×10^{-2}	2.66×10^{-1}	1.15×10^{-10}	2.79×10^{-2}	3.89×10^{-1}	5.29×10^{-6}
Nitrate	7.34	1.31×10^{-1}	0.00	7.34	1.73×10^{-1}	0.00	7.34	3.39×10^{-1}	0.00
Total uranium	8.28×10^{-7}	7.88×10^{-6}	0.00	8.28×10^{-7}	7.97×10^{-6}	0.00	8.28×10^{-7}	8.25×10^{-6}	0.00
Total	7.37	3.97×10^{-1}	0.00	7.37	4.39×10^{-1}	1.15×10^{-10}	7.37	7.27×10^{-1}	5.29×10^{-6}
Year of peak impact	2527	2527	N/A	2527	2527	2603	2527	2527	2603

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–45. Tank Closure Alternative 2A Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.64×10^{-10}	6.76×10^{-5}	7.06×10^{-10}	3.64×10^{-10}	1.26×10^{-4}	1.43×10^{-9}	1.38×10^{-6}	4.37×10^{-1}	5.36×10^{-6}
Technetium-99	2.44×10^{-11}	1.10×10^{-4}	4.83×10^{-9}	2.44×10^{-11}	2.54×10^{-4}	1.20×10^{-8}	2.54×10^{-8}	2.95×10^{-4}	1.60×10^{-8}
Iodine-129	3.25×10^{-14}	1.08×10^{-5}	1.43×10^{-10}	3.25×10^{-14}	1.76×10^{-4}	4.22×10^{-9}	3.37×10^{-11}	1.01×10^{-4}	2.47×10^{-9}
Total	3.88×10^{-10}	1.88×10^{-4}	5.67×10^{-9}	3.88×10^{-10}	5.55×10^{-4}	1.77×10^{-8}	1.41×10^{-6}	4.37×10^{-1}	5.38×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1998	1998	1998
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	8.88×10^{-6}	8.47×10^{-5}	3.49×10^{-14}	4.34×10^{-6}	6.62×10^{-5}	1.60×10^{-9}	1.49×10^{-2}	3.32×10^{-2}	2.65×10^{-6}
Nitrate	2.17×10^{-3}	7.49×10^{-5}	0.00	2.22×10^{-3}	2.09×10^{-1}	0.00	4.27	6.45×10^{-1}	0.00
Total	2.18×10^{-3}	1.60×10^{-4}	3.49×10^{-14}	2.23×10^{-3}	2.09×10^{-1}	1.60×10^{-9}	4.29	6.78×10^{-1}	2.65×10^{-6}
Year of peak impact	1984	1984	1984	1962	1962	1984	1984	1984	2603

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

Table Q–46. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.53×10^{-6}	4.12×10^{-1}	3.92×10^{-6}	3.53×10^{-6}	6.56×10^{-1}	6.86×10^{-6}	3.53×10^{-6}	1.21	1.37×10^{-5}
Technetium-99	1.19×10^{-5}	2.08×10^{1}	7.16×10^{-4}	1.19×10^{-5}	5.35×10^{1}	2.35×10^{-3}	1.19×10^{-5}	1.09×10^{2}	5.12×10^{-3}
Iodine-129	2.32×10^{-8}	6.61	7.53×10^{-5}	2.32×10^{-8}	7.67	1.02×10^{-4}	2.32×10^{-8}	9.48	1.46×10^{-4}
Total	1.54×10^{-5}	2.79×10^{1}	7.95×10^{-4}	1.54×10^{-5}	6.18×10^{1}	2.46×10^{-3}	1.54×10^{-5}	1.20×10^{2}	5.28×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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^{-2}	5.58×10^{-1}	0.00	5.86×10^{-2}	5.58×10^{-1}	2.30×10^{-10}	5.86×10^{-2}	8.16×10^{-1}	1.05×10^{-5}
Nitrate	4.13	7.37×10^{-2}	0.00	4.13	9.70×10^{-2}	0.00	4.13	1.90×10^{-1}	0.00
Total	4.19	6.31×10^{-1}	0.00	4.19	6.55×10^{-1}	2.30×10^{-10}	4.19	1.01	1.05×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–47. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	7.01×10^{-8}	8.19×10^{-3}	7.78×10^{-8}	7.01×10^{-8}	1.30×10^{-2}	1.36×10^{-7}	7.01×10^{-8}	2.40×10^{-2}	2.72×10^{-7}
Technetium-99	9.47×10^{-6}	1.66×10^{1}	5.71×10^{-4}	9.47×10^{-6}	4.26×10^{1}	1.87×10^{-3}	9.47×10^{-6}	8.68×10^{1}	4.08×10^{-3}
Iodine-129	1.44×10^{-8}	4.11	4.68×10^{-5}	1.44×10^{-8}	4.77	6.32×10^{-5}	1.44×10^{-8}	5.90	9.10×10^{-5}
Total	9.56×10^{-6}	2.07×10^{1}	6.17×10^{-4}	9.56×10^{-6}	4.74×10^{1}	1.93×10^{-3}	9.56×10^{-6}	9.27×10^{1}	4.17×10^{-3}
Year of peak impact	2052	2052	2052	2052	2052	2052	2052	2052	2052
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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)**
1-Butanol	1.94×10^{-8}	5.54×10^{-9}	0.00	1.94×10^{-8}	1.00×10^{-8}	0.00	0.00	0.00	0.00
Chromium	0.00	0.00	0.00	0.00	0.00	3.75×10^{-10}	9.42×10^{-2}	1.31	1.72×10^{-5}
Nitrate	0.00	0.00	0.00	0.00	0.00	0.00	1.85×10^{1}	8.52×10^{-1}	0.00
Total uranium	1.63×10^{-1}	1.55	0.00	1.63×10^{-1}	1.57	0.00	0.00	0.00	0.00
Total	1.63×10^{-1}	1.55	0.00	1.63×10^{-1}	1.57	3.75×10^{-10}	1.86×10^{1}	2.16	1.72×10^{-5}
Year of peak impact	11,836	11,836	N/A	11,836	11,836	2052	2049	2049	2052

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–48. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.45×10^{-7}	2.86×10^{-2}	2.72×10^{-7}	2.45×10^{-7}	4.55×10^{-2}	4.76×10^{-7}	2.45×10^{-7}	8.37×10^{-2}	9.49×10^{-7}
Technetium-99	3.94×10^{-6}	6.91	2.37×10^{-4}	3.94×10^{-6}	1.77×10^{1}	7.79×10^{-4}	3.94×10^{-6}	3.61×10^{1}	1.70×10^{-3}
Iodine-129	7.55×10^{-9}	2.15	2.45×10^{-5}	7.55×10^{-9}	2.49	3.30×10^{-5}	7.55×10^{-9}	3.08	4.75×10^{-5}
Total	4.19×10^{-6}	9.08	2.62×10^{-4}	4.19×10^{-6}	2.03×10^{1}	8.12×10^{-4}	4.19×10^{-6}	3.93×10^{1}	1.75×10^{-3}
Year of peak impact	2028	2028	2028	2028	2028	2028	2028	2028	2028
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	4.07×10^{-1}	3.87	0.00	4.07×10^{-1}	3.88	1.60×10^{-9}	4.07×10^{-1}	5.67	7.33×10^{-5}
Nitrate	1.16×10^{1}	2.07×10^{-1}	0.00	1.16×10^{1}	2.72×10^{-1}	0.00	1.16×10^{1}	5.34×10^{-1}	0.00
Total	1.20×10^{1}	4.08	0.00	1.20×10^{1}	4.15	1.60×10^{-9}	1.20×10^{1}	6.20	7.33×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–49. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.28×10^{-6}	3.83×10^{-1}	3.64×10^{-6}	3.28×10^{-6}	6.09×10^{-1}	6.36×10^{-6}	3.28×10^{-6}	1.12	1.27×10^{-5}
Technetium-99	2.28×10^{-5}	3.99×10^{1}	1.37×10^{-3}	2.28×10^{-5}	1.02×10^{2}	4.50×10^{-3}	2.28×10^{-5}	2.09×10^{2}	9.82×10^{-3}
Iodine-129	4.47×10^{-8}	1.27×10^{1}	1.45×10^{-4}	4.47×10^{-8}	1.48×10^{1}	1.95×10^{-4}	4.47×10^{-8}	1.82×10^{1}	2.81×10^{-4}
Total	2.61×10^{-5}	5.30×10^{1}	1.52×10^{-3}	2.61×10^{-5}	1.18×10^{2}	4.70×10^{-3}	2.61×10^{-5}	2.28×10^{2}	1.01×10^{-2}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	5.29×10^{-1}	5.04	0.00	5.29×10^{-1}	5.04	2.08×10^{-9}	5.28×10^{-1}	7.35	9.53×10^{-5}
Nitrate	3.86×10^{1}	6.89×10^{-1}	0.00	3.86×10^{1}	9.07×10^{-1}	0.00	3.91×10^{1}	1.80	0.00
Total	3.91×10^{1}	5.73	0.00	3.91×10^{1}	5.95	2.08×10^{-9}	3.96×10^{1}	9.15	9.53×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2023	2023	2026

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–50. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	0.00	0.00	0.00	1.37×10^{-8}	7.07×10^{-9}	2.41×10^{-3}	2.74×10^{-8}
Technetium-99	0.00	0.00	0.00	0.00	0.00	3.02×10^{-5}	1.53×10^{-7}	1.40	6.60×10^{-5}
Iodine-129	0.00	0.00	0.00	0.00	0.00	1.17×10^{-6}	2.67×10^{-10}	1.09×10^{-1}	1.68×10^{-6}
Uranium-238	1.00×10^{-8}	1.24	1.40×10^{-5}	1.00×10^{-8}	1.29	0.00	0.00	0.00	0.00
Neptunium-237	4.04×10^{-14}	1.18×10^{-5}	5.47×10^{-11}	4.04×10^{-14}	1.20×10^{-5}	0.00	0.00	0.00	0.00
Total	1.00×10^{-8}	1.24	1.40×10^{-5}	1.00×10^{-8}	1.29	3.14×10^{-5}	1.60×10^{-7}	1.51	6.77×10^{-5}
Year of peak impact	11,763	11,763	11,763	11,763	11,763	2064	2064	2064	2064
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	1.39×10^{-2}	1.32×10^{-1}	0.00	1.39×10^{-2}	1.32×10^{-1}	5.48×10^{-11}	1.39×10^{-2}	1.93×10^{-1}	2.51×10^{-6}
Nitrate	6.89×10^{-1}	1.23×10^{-2}	0.00	6.89×10^{-1}	1.62×10^{-2}	0.00	6.89×10^{-1}	3.18×10^{-2}	0.00
Total	7.03×10^{-1}	1.44×10^{-1}	0.00	7.03×10^{-1}	1.48×10^{-1}	5.48×10^{-11}	7.03×10^{-1}	2.25×10^{-1}	2.51×10^{-6}
Year of peak impact	2029	2029	N/A	2029	2029	2028	2029	2029	2028

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–51. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	8.64×10^{-248}	1.01×10^{-242}	2.78×10^{-13}	2.50×10^{-13}	4.65×10^{-8}	4.86×10^{-13}	2.50×10^{-13}	8.54×10^{-8}	9.68×10^{-13}
Carbon-14	2.24×10^{-16}	3.59×10^{-10}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Technetium-99	7.53×10^{-9}	1.32×10^{-2}	3.03×10^{-4}	5.03×10^{-6}	2.26×10^{1}	9.94×10^{-4}	5.03×10^{-6}	4.61×10^{1}	2.17×10^{-3}
Iodine-129	8.60×10^{-11}	2.45×10^{-2}	2.67×10^{-5}	8.25×10^{-9}	2.73	3.61×10^{-5}	8.25×10^{-9}	3.37	5.20×10^{-5}
Uranium-238	1.10×10^{-7}	1.37×10^{1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Neptunium-237	1.76×10^{-15}	5.13×10^{-7}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.18×10^{-7}	1.37×10^{1}	3.30×10^{-4}	5.04×10^{-6}	2.54×10^{1}	1.03×10^{-3}	5.04×10^{-6}	4.95×10^{1}	2.22×10^{-3}
Year of peak impact	11,837	11,837	2275	2275	2275	2275	2275	2275	2275
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	4.97×10^{-1}	4.73	0.00	4.97×10^{-1}	4.74	1.95×10^{-9}	4.97×10^{-1}	6.92	8.95×10^{-5}
Nitrate	1.24×10^{1}	2.21×10^{-1}	0.00	1.24×10^{1}	2.90×10^{-1}	0.00	1.24×10^{1}	5.70×10^{-1}	0.00
Total	1.29×10^{1}	4.95	0.00	1.29×10^{1}	5.03	1.95×10^{-9}	1.29×10^{1}	7.49	8.95×10^{-5}
Year of peak impact	2277	2277	N/A	2277	2277	2277	2277	2277	2277

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–52. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks 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	1.43×10^{-7}	2.51×10^{-1}	8.63×10^{-6}	1.43×10^{-7}	6.44×10^{-1}	2.83×10^{-5}	1.43×10^{-7}	1.31	6.17×10^{-5}
Iodine-129	1.99×10^{-10}	5.66×10^{-2}	6.44×10^{-7}	1.99×10^{-10}	6.57×10^{-2}	8.69×10^{-7}	1.99×10^{-10}	8.11×10^{-2}	1.25×10^{-6}
Total	1.43×10^{-7}	3.08×10^{-1}	9.27×10^{-6}	1.43×10^{-7}	7.10×10^{-1}	2.92×10^{-5}	1.43×10^{-7}	1.39	6.30×10^{-5}
Year of peak impact	2406	2406	2406	2406	2406	2406	2406	2406	2406
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	4.10×10^{-3}	3.91×10^{-2}	0.00	3.92×10^{-3}	3.73×10^{-2}	1.61×10^{-11}	3.92×10^{-3}	5.46×10^{-2}	7.39×10^{-7}
Nitrate	1.15×10^{-1}	2.06×10^{-3}	0.00	2.11×10^{-1}	4.96×10^{-3}	0.00	2.11×10^{-1}	9.74×10^{-3}	0.00
Total	1.20×10^{-1}	4.11×10^{-2}	0.00	2.15×10^{-1}	4.23×10^{-2}	1.61×10^{-11}	2.15×10^{-1}	6.43×10^{-2}	7.39×10^{-7}
Year of peak impact	2500	2500	N/A	2504	2504	2500	2504	2504	2500

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–53. Tank Closure Alternative 2A Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	9.37×10^{-16}	1.74×10^{-10}	1.82×10^{-15}	1.10×10^{-15}	3.82×10^{-10}	3.68×10^{-15}	0.00	0.00	1.78×10^{-19}
Technetium-99	6.39×10^{-12}	2.87×10^{-5}	1.26×10^{-9}	6.27×10^{-12}	6.52×10^{-5}	3.14×10^{-9}	2.39×10^{-9}	2.60×10^{-5}	6.50×10^{-9}
Iodine-129	1.26×10^{-14}	4.16×10^{-6}	5.52×10^{-11}	1.30×10^{-14}	7.00×10^{-5}	1.63×10^{-9}	6.98×10^{-13}	1.20×10^{-6}	7.21×10^{-10}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	1.07×10^{-9}	1.06×10^{-2}	1.31×10^{-7}
Neptunium-237	0.00	0.00	0.00	0.00	0.00	0.00	4.81×10^{-17}	1.52×10^{-9}	0.00
Total	6.40×10^{-12}	3.29×10^{-5}	1.32×10^{-9}	6.28×10^{-12}	1.35×10^{-4}	4.78×10^{-9}	3.45×10^{-9}	1.06×10^{-2}	1.38×10^{-7}
Year of peak impact	2144	2144	2144	2140	2140	2144	11,336	11,336	9679
	Resident Farmer			American Indian Resident Farmer			American Indian Hunter-Gatherer		
Chemical Constituent	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	1.97×10^{-7}	1.88×10^{-6}	7.74×10^{-16}	1.52×10^{-7}	2.32×10^{-6}	3.55×10^{-11}	2.49×10^{-3}	5.50×10^{-3}	3.70×10^{-7}
Nitrate	1.11×10^{-5}	3.85×10^{-7}	0.00	1.14×10^{-5}	1.07×10^{-3}	0.00	2.72×10^{-1}	1.16×10^{-2}	0.00
Total	1.13×10^{-5}	2.26×10^{-6}	7.74×10^{-16}	1.16×10^{-5}	1.08×10^{-3}	3.55×10^{-11}	2.74×10^{-1}	1.71×10^{-2}	3.70×10^{-7}
Year of peak impact	2177	2177	2177	2145	2145	2177	2211	2211	2500

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

Table Q–54. Tank Closure Alternative 2A Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	2.01×10^{-8}	2.35×10^{-3}	2.23×10^{-8}	2.01×10^{-8}	3.74×10^{-3}	3.91×10^{-8}	2.01×10^{-8}	6.87×10^{-3}	7.79×10^{-8}
Technetium-99	1.59×10^{-6}	2.78	9.55×10^{-5}	1.59×10^{-6}	7.14	3.13×10^{-4}	1.59×10^{-6}	1.45×10^{1}	6.84×10^{-4}
Iodine-129	2.89×10^{-9}	8.21×10^{-1}	9.35×10^{-6}	2.89×10^{-9}	9.53×10^{-1}	1.26×10^{-5}	2.89×10^{-9}	1.18	1.82×10^{-5}
Total	1.61×10^{-6}	3.60	1.05×10^{-4}	1.61×10^{-6}	8.09	3.26×10^{-4}	1.61×10^{-6}	1.57×10^{1}	7.02×10^{-4}
Year of peak impact	2055	2055	2055	2055	2055	2055	2055	2055	2055
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	1.20×10^{-2}	1.15×10^{-1}	0.00	1.20×10^{-2}	1.15×10^{-1}	4.73×10^{-11}	1.20×10^{-2}	1.68×10^{-1}	2.17×10^{-6}
Nitrate	1.13×10^{1}	2.01×10^{-1}	0.00	1.13×10^{1}	2.65×10^{-1}	0.00	1.13×10^{1}	5.20×10^{-1}	0.00
Total	1.13×10^{1}	3.16×10^{-1}	1.16×10^{-13}	1.13×10^{1}	3.80×10^{-1}	4.73×10^{-11}	1.13×10^{1}	6.87×10^{-1}	2.17×10^{-6}
Year of peak impact	2070	2070	11,822	2070	2070	2070	2070	2070	2070

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

Table Q–55. Tank Closure Alternative 2A Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	2.10×10^{-7}	2.45×10^{-2}	2.33×10^{-7}	2.10×10^{-7}	3.90×10^{-2}	4.08×10^{-7}	2.10×10^{-7}	7.17×10^{-2}	8.13×10^{-7}
Technetium-99	3.17×10^{-5}	5.55×10^{1}	1.91×10^{-3}	3.17×10^{-5}	1.42×10^{2}	6.25×10^{-3}	3.17×10^{-5}	2.90×10^{2}	1.36×10^{-2}
Iodine-129	4.49×10^{-8}	1.28×10^{1}	1.45×10^{-4}	4.49×10^{-8}	1.48×10^{1}	1.96×10^{-4}	4.49×10^{-8}	1.83×10^{1}	2.83×10^{-4}
Total	3.19×10^{-5}	6.83×10^{1}	2.05×10^{-3}	3.19×10^{-5}	1.57×10^{2}	6.45×10^{-3}	3.19×10^{-5}	3.08×10^{2}	1.39×10^{-2}
Year of peak impact	2076	2076	2076	2076	2076	2076	2076	2076	2076
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	4.26	4.06×10^{1}	0.00	4.26	4.06×10^{1}	1.67×10^{-8}	4.26	5.94×10^{1}	7.68×10^{-4}
Nitrate	1.58×10^{3}	2.82×10^{1}	0.00	1.58×10^{3}	3.72×10^{1}	0.00	1.58×10^{3}	7.30×10^{1}	0.00
Total	1.59×10^{3}	6.89×10^{1}	0.00	1.59×10^{3}	7.78×10^{1}	1.67×10^{-8}	1.59×10^{3}	1.32×10^{2}	7.68×10^{-4}
Year of peak impact	2085	2085	N/A	2085	2085	2085	2085	2085	2085

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–56. Tank Closure Alternative 2A Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	5.10×10^{-8}	5.95×10^{-3}	5.66×10^{-8}	5.10×10^{-8}	9.48×10^{-3}	9.90×10^{-8}	5.10×10^{-8}	1.74×10^{-2}	1.97×10^{-7}
Technetium-99	2.82×10^{-6}	4.94	1.70×10^{-4}	2.82×10^{-6}	1.27×10^{1}	5.57×10^{-4}	2.82×10^{-6}	2.58×10^{1}	1.22×10^{-3}
Iodine-129	4.80×10^{-9}	1.37	1.56×10^{-5}	4.80×10^{-9}	1.59	2.10×10^{-5}	4.80×10^{-9}	1.96	3.02×10^{-5}
Total	2.88×10^{-6}	6.31	1.85×10^{-4}	2.88×10^{-6}	1.43×10^{1}	5.78×10^{-4}	2.88×10^{-6}	2.78×10^{1}	1.25×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.90×10^{-1}	2.76	0.00	2.90×10^{-1}	2.77	1.14×10^{-9}	2.90×10^{-1}	4.04	5.23×10^{-5}
Nitrate	9.71	1.73×10^{-1}	0.00	9.71	2.28×10^{-1}	0.00	9.71	4.48×10^{-1}	0.00
Total	1.00×10^{1}	2.94	0.00	1.00×10^{1}	2.99	1.14×10^{-9}	1.00×10^{1}	4.49	5.23×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–57. Tank Closure Alternative 2A Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	3.06×10^{-6}	3.58×10^{-1}	3.40×10^{-6}	3.06×10^{-6}	5.69×10^{-1}	5.95×10^{-6}	3.06×10^{-6}	1.05	1.19×10^{-5}
Technetium-99	1.50×10^{-5}	2.63×10^{1}	9.06×10^{-4}	1.50×10^{-5}	6.76×10^{1}	2.97×10^{-3}	1.50×10^{-5}	1.38×10^{2}	6.48×10^{-3}
Iodine-129	3.03×10^{-8}	8.62	9.81×10^{-5}	3.03×10^{-8}	1.00×10^{1}	1.32×10^{-4}	3.03×10^{-8}	1.24×10^{1}	1.91×10^{-4}
Uranium-238	1.10×10^{-10}	1.36×10^{-2}	1.54×10^{-7}	1.10×10^{-10}	1.41×10^{-2}	1.64×10^{-7}	1.10×10^{-10}	1.51×10^{-2}	1.86×10^{-7}
Total	1.81×10^{-5}	3.53×10^{1}	1.01×10^{-3}	1.81×10^{-5}	7.82×10^{1}	3.11×10^{-3}	1.81×10^{-5}	1.51×10^{2}	6.68×10^{-3}
Year of peak impact	2051	2051	2051	2051	2051	2051	2051	2051	2051
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	8.00×10^{-1}	7.62	0.00	8.00×10^{-1}	7.63	3.14×10^{-9}	8.00×10^{-1}	1.11×10^{1}	1.44×10^{-4}
Nitrate	1.28×10^{2}	2.28	0.00	1.28×10^{2}	3.00	0.00	1.28×10^{2}	5.90	0.00
Total uranium	1.60×10^{-4}	1.52×10^{-3}	0.00	1.60×10^{-4}	1.54×10^{-3}	0.00	1.60×10^{-4}	1.59×10^{-3}	0.00
Total	1.29×10^{2}	9.90	0.00	1.29×10^{2}	1.06×10^{1}	3.14×10^{-9}	1.29×10^{2}	1.70×10^{1}	1.44×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–58. Tank Closure Alternative 2A Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	4.05×10^{-9}	3.65×10^{-9}	6.78×10^{-4}	7.08×10^{-9}	3.65×10^{-9}	1.25×10^{-3}	1.41×10^{-8}
Technetium-99	0.00	0.00	3.29×10^{-5}	5.46×10^{-7}	2.46	1.08×10^{-4}	5.46×10^{-7}	5.00	2.35×10^{-4}
Iodine-129	0.00	0.00	2.83×10^{-6}	8.74×10^{-10}	2.89×10^{-1}	3.82×10^{-6}	8.74×10^{-10}	3.57×10^{-1}	5.51×10^{-6}
Uranium-238	1.07×10^{-8}	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Neptunium-237	4.04×10^{-14}	1.18×10^{-5}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.07×10^{-8}	1.33	3.57×10^{-5}	5.50×10^{-7}	2.74	1.12×10^{-4}	5.50×10^{-7}	5.36	2.41×10^{-4}
Year of peak impact	11,763	11,763	2096	2096	2096	2096	2096	2096	2096
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	1.64×10^{-2}	1.57×10^{-1}	0.00	1.64×10^{-2}	1.57×10^{-1}	6.66×10^{-11}	1.64×10^{-2}	2.29×10^{-1}	3.05×10^{-6}
Nitrate	5.80	1.03×10^{-1}	0.00	5.80	1.36×10^{-1}	0.00	5.80	2.67×10^{-1}	0.00
Total	5.81	2.60×10^{-1}	0.00	5.81	2.93×10^{-1}	6.66×10^{-11}	5.81	4.96×10^{-1}	3.05×10^{-6}
Year of peak impact	2083	2083	N/A	2083	2083	2086	2083	2083	2086

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–59. Tank Closure Alternative 2A 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)
Hydrogen-3 (tritium)	5.75×10^{-7}	6.72×10^{-2}	6.39×10^{-7}	5.75×10^{-7}	1.07×10^{-1}	1.12×10^{-6}	5.75×10^{-7}	1.97×10^{-1}	2.23×10^{-6}
Technetium-99	2.78×10^{-5}	4.88×10^{1}	1.68×10^{-3}	2.78×10^{-5}	1.25×10^{2}	5.50×10^{-3}	2.78×10^{-5}	2.55×10^{2}	1.20×10^{-2}
Iodine-129	3.65×10^{-8}	1.04×10^{1}	1.18×10^{-4}	3.65×10^{-8}	1.21×10^{1}	1.60×10^{-4}	3.65×10^{-8}	1.49×10^{1}	2.30×10^{-4}
Uranium-238	5.59×10^{-13}	6.93×10^{-5}	7.83×10^{-10}	5.59×10^{-13}	7.20×10^{-5}	8.39×10^{-10}	5.59×10^{-13}	7.71×10^{-5}	9.49×10^{-10}
Total	2.84×10^{-5}	5.92×10^{1}	1.80×10^{-3}	2.84×10^{-5}	1.37×10^{2}	5.66×10^{-3}	2.84×10^{-5}	2.70×10^{2}	1.22×10^{-2}
Year of peak impact	2076	2076	2076	2076	2076	2076	2076	2076	2076
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	1.96	1.87×10^{1}	0.00	1.96	1.87×10^{1}	7.69×10^{-9}	1.96	2.73×10^{1}	3.53×10^{-4}
Nitrate	1.07×10^{3}	1.91×10^{1}	0.00	1.07×10^{3}	2.52×10^{1}	0.00	1.07×10^{3}	4.94×10^{1}	0.00
Total	1.07×10^{3}	3.78×10^{1}	4.67×10^{-14}	1.07×10^{3}	4.38×10^{1}	7.69×10^{-9}	1.07×10^{3}	7.67×10^{1}	3.53×10^{-4}
Year of peak impact	2066	2066	11,833	2066	2066	2066	2066	2066	2066

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

Table Q–60. Tank Closure Alternative 2A 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	2.02×10^{-7}	3.54×10^{-1}	1.23×10^{-5}	2.04×10^{-7}	9.17×10^{-1}	4.03×10^{-5}	2.04×10^{-7}	1.87	8.79×10^{-5}
Iodine-129	2.99×10^{-10}	8.52×10^{-2}	9.00×10^{-7}	2.78×10^{-10}	9.18×10^{-2}	1.22×10^{-6}	2.78×10^{-10}	1.13×10^{-1}	1.75×10^{-6}
Uranium-238	5.59×10^{-13}	6.94×10^{-5}	7.86×10^{-10}	5.61×10^{-13}	7.22×10^{-5}	8.42×10^{-10}	5.61×10^{-13}	7.74×10^{-5}	9.52×10^{-10}
Total	2.02×10^{-7}	4.39×10^{-1}	1.32×10^{-5}	2.04×10^{-7}	1.01	4.15×10^{-5}	2.04×10^{-7}	1.98	8.96×10^{-5}
Year of peak impact	2406	2406	3464	3464	3464	3464	3464	3464	3464
	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Chemical Constituent	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	3.15×10^{-2}	3.00×10^{-1}	0.00	3.15×10^{-2}	3.01×10^{-1}	1.26×10^{-10}	3.15×10^{-2}	4.39×10^{-1}	5.78×10^{-6}
Nitrate	7.62	1.36×10^{-1}	0.00	7.62	1.79×10^{-1}	0.00	7.62	3.52×10^{-1}	0.00
Total uranium	8.28×10^{-7}	7.88×10^{-6}	0.00	8.28×10^{-7}	7.97×10^{-6}	0.00	8.28×10^{-7}	8.25×10^{-6}	0.00
Total	7.65	4.36×10^{-1}	1.53×10^{-15}	7.65	4.80×10^{-1}	1.26×10^{-10}	7.65	7.91×10^{-1}	5.78×10^{-6}
Year of peak impact	2527	2527	11,838	2527	2527	2603	2527	2527	2603

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

Table Q–61. Tank Closure Alternative 2A 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)
Hydrogen-3 (tritium)	7.09×10^{-14}	1.32×10^{-8}	1.38×10^{-13}	1.23×10^{-13}	4.26×10^{-8}	6.24×10^{-13}	1.35×10^{-7}	4.27×10^{-2}	5.24×10^{-7}
Technetium-99	8.61×10^{-12}	3.87×10^{-5}	1.70×10^{-9}	8.18×10^{-12}	8.50×10^{-5}	4.22×10^{-9}	6.26×10^{-8}	7.03×10^{-4}	3.84×10^{-8}
Iodine-129	1.49×10^{-14}	4.92×10^{-6}	6.53×10^{-11}	1.61×10^{-14}	8.68×10^{-5}	1.97×10^{-9}	5.12×10^{-11}	1.42×10^{-4}	3.46×10^{-9}
Total	8.70×10^{-12}	4.37×10^{-5}	1.77×10^{-9}	8.32×10^{-12}	1.72×10^{-4}	6.19×10^{-9}	1.98×10^{-7}	4.36×10^{-2}	5.66×10^{-7}
Year of peak impact	2162	2162	2162	2140	2140	2149	2050	2050	2050
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	9.69×10^{-7}	9.24×10^{-6}	3.91×10^{-15}	9.69×10^{-7}	1.48×10^{-5}	1.79×10^{-10}	2.10×10^{-2}	4.64×10^{-2}	2.89×10^{-6}
Nitrate	3.11×10^{-4}	1.07×10^{-5}	0.00	3.11×10^{-4}	2.93×10^{-2}	0.00	9.10	3.53×10^{-1}	0.00
Total	3.12×10^{-4}	2.00×10^{-5}	3.91×10^{-15}	3.12×10^{-4}	2.93×10^{-2}	1.79×10^{-10}	9.12	3.99×10^{-1}	2.89×10^{-6}
Year of peak impact	2052	2052	2061	2052	2052	2061	2400	2400	2603

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

The dose standard would be exceeded at the B Barrier, T Barrier, and Core Zone Boundary for the drinking-water well user, resident farmer, and American Indian resident farmer due to the presence of tritium, technetium-99, and iodine-129 released from the cribs and trenches (ditches), but would not be exceeded at the other locations. For the drinking-water well user, resident farmer, and American Indian resident farmer, the Hazard Index guideline would be exceeded at the B Barrier, T Barrier, and Core Zone Boundary primarily due to release of chromium and nitrate from the cribs and trenches (ditches).

The dose standard would be exceeded at the A Barrier for the American Indian resident farmer and at the T Barrier for the resident farmer and American Indian resident farmer due to the presence of tritium, technetium-99, and iodine-129 released in past leaks. The Hazard Index would be exceeded for the drinking-water well user, resident farmer, and American Indian resident farmer at the B Barrier, S Barrier, T Barrier, and the Core Zone Boundary primarily due to release of chromium and nitrate from past leaks. The Hazard Index guideline would be exceeded for the American Indian resident farmer at the A Barrier primarily due to chromium and nitrate. The Hazard Index guideline would be exceeded for the American Indian resident farmer at the T Barrier (primarily due to the release of nitrate) from past leaks.

After the year 2050, the dose standard would be exceeded at the B Barrier and Core Zone Boundary for the resident farmer and American Indian resident farmer due to the presence of tritium, technetium-99, and iodine-129 and the dose standard would be exceeded at the T Barrier for the American Indian resident farmer due to the presence of tritium, technetium-99, iodine-129, and uranium-238. The Hazard Index guideline would be exceeded at the B Barrier, S Barrier, T Barrier, and Core Zone Boundary for the drinking-water well user, resident farmer, and the American Indian resident farmer primarily due to chromium, nitrate, and total uranium. Population dose was estimated as 2.18×10^{-1} person-rem per year for the year of maximum impact.

Figure Q–3 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, other sources, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2300 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from all three sources occurs around the year 2070 and is dominated by tritium, technetium-99, iodine-129, and uranium-238. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

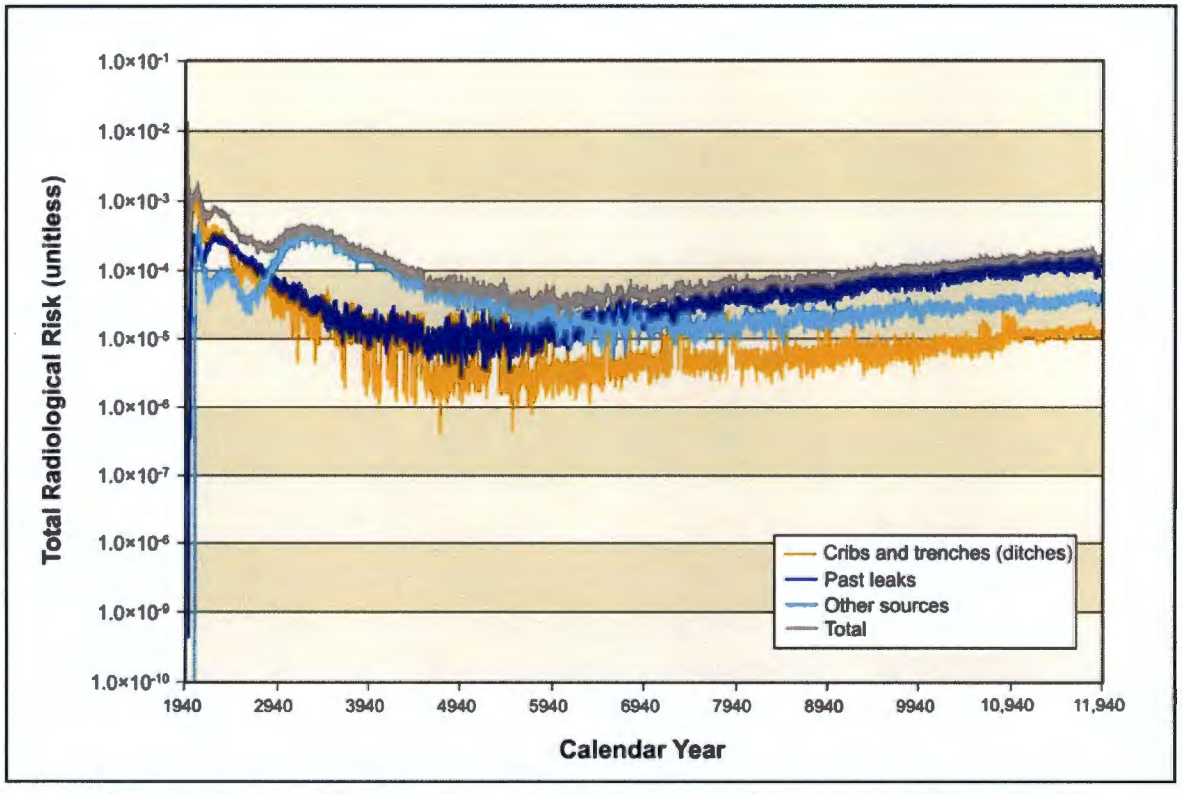

Figure Q–3. Tank Closure Alternative 2A Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.3 Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C

Activities under Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C would be similar to those of Tank Closure Alternative 2A, except that residual material in tanks would be stabilized in place. Soil would be removed down to 4.6 meters (15 feet) for the BX and SX tank farms and replaced with clean soils from onsite sources. The tank farms and six sets of adjacent cribs and trenches (ditches) would be covered with an engineered modified Resource Conservation and Recovery Act (RCRA) Subtitle C barrier.

Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–62 through Q–66. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–67 through Q–74. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–75 through Q–82.

The risk and hazard drivers are: tritium, technetium-99, and iodine-129, uranium-238, chromium, nitrate, and total uranium. Impacts would be slightly less than under Alternative 2A, and standards would be exceeded, as under Alternative 2A. Population dose was estimated as 1.95×10^{-1} person-rem per year for the year of maximum impact.

Table Q–62. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.08×10^{1}	4.84×10^{2}	0.00	5.08×10^{1}	4.85×10^{2}	2.00×10^{-7}	5.08×10^{1}	7.08×10^{2}	9.16×10^{-3}
Nitrate	1.74×10^{4}	3.11×10^{2}	0.00	1.74×10^{4}	4.10×10^{2}	0.00	1.74×10^{4}	8.03×10^{2}	0.00
Total	1.75×10^{4}	7.95×10^{2}	0.00	1.75×10^{4}	8.94×10^{2}	2.00×10^{-7}	1.75×10^{4}	1.51×10^{3}	9.16×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–63. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.84×10^{-2}
Technetium-99	1.35×10^{-7}	2.36×10^{-1}	8.12×10^{-6}	1.35×10^{-7}	6.07×10^{-1}	2.66×10^{-5}	1.35×10^{-7}	1.24	5.81×10^{-5}
Iodine-129	1.14×10^{-9}	3.25×10^{-1}	3.71×10^{-6}	1.14×10^{-9}	3.78×10^{-1}	5.00×10^{-6}	1.14×10^{-9}	4.67×10^{-1}	7.20×10^{-6}
Uranium-238	1.18×10^{-11}	1.46×10^{-3}	1.65×10^{-8}	1.18×10^{-11}	1.52×10^{-3}	1.77×10^{-8}	1.18×10^{-11}	1.62×10^{-3}	2.00×10^{-8}
Total	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.85×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.32	8.88×10^{1}	0.00	9.32	8.89×10^{1}	3.66×10^{-8}	9.32	1.30×10^{2}	1.68×10^{-3}
Nitrate	2.11×10^{3}	3.77×10^{1}	0.00	2.11×10^{3}	4.97×10^{1}	0.00	2.11×10^{3}	9.74×10^{1}	0.00
Total	2.12×10^{3}	1.27×10^{2}	0.00	2.12×10^{3}	1.39×10^{2}	3.66×10^{-8}	2.12×10^{3}	2.27×10^{2}	1.68×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–64. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.80×10^{1}	2.67×10^{2}	0.00	2.80×10^{1}	2.67×10^{2}	1.10×10^{-7}	2.80×10^{1}	3.91×10^{2}	5.05×10^{-3}
Nitrate	1.29×10^{4}	2.30×10^{2}	0.00	1.29×10^{4}	3.03×10^{2}	0.00	1.29×10^{4}	5.95×10^{2}	0.00
Total	1.29×10^{4}	4.97×10^{2}	0.00	1.29×10^{4}	5.70×10^{2}	1.10×10^{-7}	1.29×10^{4}	9.85×10^{2}	5.05×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–65. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.46×10^{-7}	4.04×10^{-2}	3.84×10^{-7}	3.46×10^{-7}	6.43×10^{-2}	6.72×10^{-7}	3.46×10^{-7}	1.18×10^{-1}	1.34×10^{-6}
Technetium-99	8.94×10^{-8}	1.57×10^{-1}	5.38×10^{-6}	8.94×10^{-8}	4.02×10^{-1}	1.77×10^{-5}	8.94×10^{-8}	8.19×10^{-1}	3.85×10^{-5}
Iodine-129	3.88×10^{-11}	1.10×10^{-2}	1.26×10^{-7}	3.88×10^{-11}	1.28×10^{-2}	1.70×10^{-7}	3.88×10^{-11}	1.58×10^{-2}	2.44×10^{-7}
Total	4.35×10^{-7}	2.08×10^{-1}	5.89×10^{-6}	4.35×10^{-7}	4.79×10^{-1}	1.85×10^{-5}	4.35×10^{-7}	9.53×10^{-1}	4.01×10^{-5}
Year of peak impact	2025	2025	2025	2025	2025	2025	2025	2025	2025
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	3.14×10^{-2}	2.99×10^{-1}	0.00	3.14×10^{-2}	2.99×10^{-1}	1.23×10^{-10}	3.14×10^{-2}	4.37×10^{-1}	5.66×10^{-6}
Nitrate	5.75	1.03×10^{-1}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.78	4.02×10^{-1}	0.00	5.78	4.35×10^{-1}	1.23×10^{-10}	5.78	7.03×10^{-1}	5.66×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–66. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.62×10^{-5}	6.92×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.28×10^{-6}	4.04×10^{-1}	4.96×10^{-6}
Technetium-99	2.53×10^{-11}	1.14×10^{-4}	4.99×10^{-9}	2.53×10^{-11}	2.63×10^{-4}	1.24×10^{-8}	2.55×10^{-8}	2.99×10^{-4}	1.62×10^{-8}
Iodine-129	3.20×10^{-14}	1.06×10^{-5}	1.41×10^{-10}	3.20×10^{-14}	1.73×10^{-4}	4.16×10^{-9}	3.57×10^{-11}	1.09×10^{-4}	2.65×10^{-9}
Total	3.82×10^{-10}	1.91×10^{-4}	5.83×10^{-9}	3.82×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.31×10^{-6}	4.04×10^{-1}	4.97×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1994	1994	1994
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	8.95×10^{-6}	8.53×10^{-5}	3.52×10^{-14}	8.95×10^{-6}	1.37×10^{-4}	1.61×10^{-9}	2.24×10^{-2}	4.97×10^{-2}	2.83×10^{-6}
Nitrate	2.24×10^{-3}	7.74×10^{-5}	0.00	2.24×10^{-3}	2.11×10^{-1}	0.00	4.36	6.64×10^{-1}	0.00
Total	2.25×10^{-3}	1.63×10^{-4}	3.52×10^{-14}	2.25×10^{-3}	2.11×10^{-1}	1.61×10^{-9}	4.38	7.14×10^{-1}	2.83×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2695

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

Table Q–67. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.63×10^{-6}	4.24×10^{-1}	4.03×10^{-6}	3.63×10^{-6}	6.75×10^{-1}	7.06×10^{-6}	3.63×10^{-6}	1.24	1.41×10^{-5}
Technetium-99	1.16×10^{-5}	2.03×10^{1}	6.99×10^{-4}	1.16×10^{-5}	5.22×10^{1}	2.29×10^{-3}	1.16×10^{-5}	1.06×10^{2}	5.00×10^{-3}
Iodine-129	2.36×10^{-8}	6.72	7.65×10^{-5}	2.36×10^{-8}	7.80	1.03×10^{-4}	2.36×10^{-8}	9.64	1.49×10^{-4}
Total	1.53×10^{-5}	2.75×10^{1}	7.79×10^{-4}	1.53×10^{-5}	6.07×10^{1}	2.40×10^{-3}	1.53×10^{-5}	1.17×10^{2}	5.16×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	6.06×10^{-2}	5.77×10^{-1}	0.00	6.06×10^{-2}	5.78×10^{-1}	2.38×10^{-10}	6.06×10^{-2}	8.45×10^{-1}	1.09×10^{-5}
Nitrate	4.17	7.45×10^{-2}	0.00	4.17	9.81×10^{-2}	0.00	4.17	1.92×10^{-1}	0.00
Total	4.23	6.52×10^{-1}	0.00	4.23	6.76×10^{-1}	2.38×10^{-10}	4.23	1.04	1.09×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–68. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	6.96×10^{-8}	8.13×10^{-3}	7.73×10^{-8}	6.96×10^{-8}	1.29×10^{-2}	1.35×10^{-7}	6.96×10^{-8}	2.38×10^{-2}	2.70×10^{-7}
Technetium-99	8.42×10^{-6}	1.47×10^{1}	5.07×10^{-4}	8.42×10^{-6}	3.79×10^{1}	1.66×10^{-3}	8.42×10^{-6}	7.71×10^{1}	3.63×10^{-3}
Iodine-129	1.55×10^{-8}	4.40	5.01×10^{-5}	1.55×10^{-8}	5.11	6.77×10^{-5}	1.55×10^{-8}	6.31	9.74×10^{-5}
Total	8.50×10^{-6}	1.92×10^{1}	5.57×10^{-4}	8.50×10^{-6}	4.30×10^{1}	1.73×10^{-3}	8.50×10^{-6}	8.35×10^{1}	3.72×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	9.57×10^{-2}	9.12×10^{-1}	0.00	9.57×10^{-2}	9.13×10^{-1}	3.76×10^{-10}	9.57×10^{-2}	1.33	1.72×10^{-5}
Nitrate	1.75×10^{1}	3.13×10^{-1}	0.00	1.75×10^{1}	4.12×10^{-1}	0.00	1.75×10^{1}	8.08×10^{-1}	0.00
Total	1.76×10^{1}	1.22	0.00	1.76×10^{1}	1.32	3.76×10^{-10}	1.76×10^{1}	2.14	1.72×10^{-5}
Year of peak impact	2047	2047	N/A	2047	2047	2047	2047	2047	2047

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–69. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	3.52×10^{-7}	4.11×10^{-2}	3.91×10^{-7}	3.52×10^{-7}	6.54×10^{-2}	6.84×10^{-7}	3.52×10^{-7}	1.20×10^{-1}	1.36×10^{-6}
Technetium-99	4.10×10^{-6}	7.18	2.47×10^{-4}	4.10×10^{-6}	1.84×10^{1}	8.09×10^{-4}	4.10×10^{-6}	3.75×10^{1}	1.77×10^{-3}
Iodine-129	7.73×10^{-9}	2.20	2.50×10^{-5}	7.73×10^{-9}	2.55	3.38×10^{-5}	7.73×10^{-9}	3.15	4.87×10^{-5}
Total	4.46×10^{-6}	9.42	2.72×10^{-4}	4.46×10^{-6}	2.10×10^{1}	8.44×10^{-4}	4.46×10^{-6}	4.08×10^{1}	1.82×10^{-3}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	4.13×10^{-1}	3.93	0.00	4.13×10^{-1}	3.94	1.62×10^{-9}	4.13×10^{-1}	5.75	7.44×10^{-5}
Nitrate	1.21×10^{1}	2.16×10^{-1}	0.00	1.21×10^{1}	2.84×10^{-1}	0.00	1.21×10^{1}	5.58×10^{-1}	0.00
Total	1.25×10^{1}	4.15	0.00	1.25×10^{1}	4.22	1.62×10^{-9}	1.25×10^{1}	6.31	7.44×10^{-5}
Year of peak impact	2030	2030	N/A	2030	2030	2030	2030	2030	2030

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–70. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.31×10^{-6}	3.87×10^{-1}	2.93×10^{-6}	3.31×10^{-6}	6.16×10^{-1}	5.12×10^{-6}	3.31×10^{-6}	1.13	1.02×10^{-5}
Technetium-99	2.26×10^{-5}	3.96×10^{1}	1.36×10^{-3}	2.26×10^{-5}	1.02×10^{2}	4.47×10^{-3}	2.26×10^{-5}	2.07×10^{2}	9.75×10^{-3}
Iodine-129	4.48×10^{-8}	1.27×10^{1}	1.44×10^{-4}	4.48×10^{-8}	1.48×10^{1}	1.94×10^{-4}	4.48×10^{-8}	1.83×10^{1}	2.79×10^{-4}
Total	2.59×10^{-5}	5.27×10^{1}	1.51×10^{-3}	2.59×10^{-5}	1.17×10^{2}	4.67×10^{-3}	2.59×10^{-5}	2.26×10^{2}	1.00×10^{-2}
Year of peak impact	2027	2027	2029	2027	2027	2029	2027	2027	2029
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	5.28×10^{-1}	5.03	0.00	5.28×10^{1}	5.04	2.07×10^{-9}	5.28×10^{-1}	7.36	9.52×10^{-5}
Nitrate	4.01×10^{1}	7.16×10^{-1}	0.00	4.01×10^{1}	9.42×10^{-1}	0.00	4.01×10^{1}	1.85	0.00
Total	4.06×10^{1}	5.75	0.00	4.06×10^{1}	5.98	2.07×10^{-9}	4.06×10^{1}	9.21	9.52×10^{-5}
Year of peak impact	2027	2027	N/A	2027	2027	2027	2027	2027	2027

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–71. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	0.00	0.00	0.00	2.37×10^{-8}	1.22×10^{-8}	4.17×10^{-3}	4.73×10^{-8}
Technetium-99	0.00	0.00	0.00	0.00	0.00	2.84×10^{-5}	1.44×10^{-7}	1.32	6.20×10^{-5}
Iodine-129	0.00	0.00	0.00	0.00	0.00	1.20×10^{-6}	2.74×10^{-10}	1.12×10^{-1}	1.72×10^{-6}
Uranium-238	7.98×10^{-9}	9.90×10^{-1}	1.12×10^{-5}	7.98×10^{-9}	1.03	0.00	0.00	0.00	0.00
Total	7.98×10^{-9}	9.90×10^{-1}	1.12×10^{-5}	7.98×10^{-9}	1.03	2.97×10^{-5}	1.56×10^{-7}	1.44	6.38×10^{-5}
Year of peak impact	11,441	11,441	11,441	11,441	11,441	2050	2050	2050	2050
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	1.35×10^{-2}	1.29×10^{-1}	0.00	1.35×10^{-2}	1.29×10^{-1}	5.31×10^{-11}	1.35×10^{-2}	1.88×10^{-1}	2.44×10^{-6}
Nitrate	6.05×10^{-1}	1.08×10^{-2}	0.00	6.05×10^{-1}	1.42×10^{-2}	0.00	6.05×10^{-1}	2.79×10^{-2}	0.00
Total	6.18×10^{-1}	1.40×10^{-1}	0.00	6.18×10^{-1}	1.43×10^{-1}	5.31×10^{-11}	6.18×10^{-1}	2.16×10^{-1}	2.44×10^{-6}
Year of peak impact	2028	2028	N/A	2028	2028	2028	2028	2028	2028

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–72. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.42×10^{-7}	1.66×10^{-2}	1.58×10^{-7}	1.42×10^{-7}	2.65×10^{-2}	2.76×10^{-7}	1.42×10^{-7}	4.86×10^{-2}	5.51×10^{-7}
Technetium-99	4.86×10^{-6}	8.51	2.93×10^{-4}	4.86×10^{-6}	2.19×10^{1}	9.60×10^{-4}	4.86×10^{-6}	4.45×10^{1}	2.09×10^{-3}
Iodine-129	8.83×10^{-9}	2.51	2.86×10^{-5}	8.83×10^{-9}	2.92	3.86×10^{-5}	8.83×10^{-9}	3.60	5.56×10^{-5}
Total	5.01×10^{-6}	1.10×10^{1}	3.21×10^{-4}	5.01×10^{-6}	2.48×10^{1}	9.99×10^{-4}	5.01×10^{-6}	4.82×10^{1}	2.15×10^{-3}
Year of peak impact	2034	2034	2034	2034	2034	2034	2034	2034	2034
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	4.03×10^{-1}	3.84	0.00	4.03×10^{-1}	3.84	1.58×10^{-9}	4.03×10^{-1}	5.62	7.26×10^{-5}
Nitrate	1.09×10^{1}	1.95×10^{-1}	0.00	1.09×10^{1}	2.57×10^{-1}	0.00	1.09×10^{1}	5.05×10^{-1}	0.00
Total	1.13×10^{1}	4.03	0.00	1.13×10^{1}	4.10	1.58×10^{-9}	1.13×10^{1}	6.12	7.26×10^{-5}
Year of peak impact	2258	2258	N/A	2258	2258	2258	2258	2258	2258

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–73. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks 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	1.40×10^{-7}	2.46×10^{-1}	8.46×10^{-6}	1.40×10^{-7}	6.32×10^{-1}	2.77×10^{-5}	1.40×10^{-7}	1.29	6.05×10^{-5}
Iodine-129	1.29×10^{-10}	3.66×10^{-2}	4.17×10^{-7}	1.29×10^{-10}	4.25×10^{-2}	5.63×10^{-7}	1.29×10^{-10}	5.25×10^{-2}	8.10×10^{-7}
Total	1.41×10^{-7}	2.83×10^{-1}	8.87×10^{-6}	1.41×10^{-7}	6.74×10^{-1}	2.83×10^{-5}	1.41×10^{-7}	1.34	6.13×10^{-5}
Year of peak impact	2480	2480	2480	2480	2480	2480	2480	2480	2480
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	4.00×10^{-3}	3.81×10^{-2}	0.00	4.00×10^{-3}	3.82×10^{-2}	1.57×10^{-11}	4.00×10^{-3}	5.58×10^{-2}	7.21×10^{-7}
Nitrate	2.23×10^{-1}	3.98×10^{-3}	0.00	2.23×10^{-1}	5.24×10^{-3}	0.00	2.23×10^{-1}	1.03×10^{-2}	0.00
Total	2.27×10^{-1}	4.21×10^{-2}	0.00	2.27×10^{-1}	4.34×10^{-2}	1.57×10^{-11}	2.27×10^{-1}	6.61×10^{-2}	7.21×10^{-7}
Year of peak impact	2190	2190	N/A	2190	2190	2190	2190	2190	2190

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–74. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	7.16×10^{-16}	1.33×10^{-10}	1.39×10^{-15}	1.89×10^{-15}	6.54×10^{-10}	3.72×10^{-15}	2.96×10^{-233}	9.35×10^{-228}	3.74×10^{-17}
Technetium-99	6.22×10^{-12}	2.80×10^{-5}	1.23×10^{-9}	5.80×10^{-12}	6.03×10^{-5}	3.00×10^{-9}	1.02×10^{-8}	1.10×10^{-4}	8.44×10^{-8}
Iodine-129	1.08×10^{-14}	3.58×10^{-6}	4.74×10^{-11}	1.20×10^{-14}	6.46×10^{-5}	1.48×10^{-9}	1.52×10^{-12}	2.62×10^{-6}	5.70×10^{-9}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	6.66×10^{-10}	6.63×10^{-3}	0.00
Total	6.23×10^{-12}	3.15×10^{-5}	1.28×10^{-9}	5.81×10^{-12}	1.25×10^{-4}	4.48×10^{-9}	1.08×10^{-8}	6.74×10^{-3}	9.01×10^{-8}
Year of peak impact	2148	2148	2148	2133	2133	2145	11,147	11,147	2480
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	1.82×10^{-7}	1.73×10^{-6}	7.23×10^{-16}	1.69×10^{-7}	2.58×10^{-6}	3.32×10^{-11}	4.00×10^{-3}	8.84×10^{-3}	3.61×10^{-7}
Nitrate	9.69×10^{-6}	3.35×10^{-7}	0.00	1.08×10^{-5}	1.02×10^{-3}	0.00	2.23×10^{-1}	1.00×10^{-2}	0.00
Total	9.88×10^{-6}	2.07×10^{-6}	7.23×10^{-16}	1.10×10^{-5}	1.02×10^{-3}	3.32×10^{-11}	2.27×10^{-1}	1.89×10^{-2}	3.61×10^{-7}
Year of peak impact	2182	2182	2186	2157	2157	2186	2190	2190	2190

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

Table Q–75. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	1.22×10^{-8}	1.42×10^{-3}	1.35×10^{-8}	1.22×10^{-8}	2.26×10^{-3}	2.36×10^{-8}	1.22×10^{-8}	4.16×10^{-3}	4.71×10^{-8}
Technetium-99	1.45×10^{-6}	2.54	8.72×10^{-5}	1.45×10^{-6}	6.52	2.86×10^{-4}	1.45×10^{-6}	1.33×10^{1}	6.24×10^{-4}
Iodine-129	2.56×10^{-9}	7.30×10^{-1}	8.31×10^{-6}	2.56×10^{-9}	8.47×10^{-1}	1.12×10^{-5}	2.56×10^{-9}	1.05	1.62×10^{-5}
Total	1.46×10^{-6}	3.27	9.56×10^{-5}	1.46×10^{-6}	7.37	2.97×10^{-4}	1.46×10^{-6}	1.43×10^{1}	6.40×10^{-4}
Year of peak impact	2058	2058	2058	2058	2058	2058	2058	2058	2058
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	8.74×10^{-3}	8.32×10^{-2}	0.00	8.74×10^{-3}	8.33×10^{-2}	3.43×10^{-11}	8.74×10^{-3}	1.22×10^{-1}	1.57×10^{-6}
Nitrate	5.65	1.01×10^{-1}	0.00	5.65	1.33×10^{-1}	0.00	5.65	2.61×10^{-1}	0.00
Total	5.66	1.84×10^{-1}	8.57×10^{-14}	5.66	2.16×10^{-1}	3.43×10^{-11}	5.66	3.82×10^{-1}	1.57×10^{-6}
Year of peak impact	2057	2057	11,785	2057	2057	2057	2057	2057	2057

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

Table Q–76. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	4.42×10^{-7}	5.16×10^{-2}	4.91×10^{-7}	4.42×10^{-7}	8.21×10^{-2}	8.58×10^{-7}	4.42×10^{-7}	1.51×10^{-1}	1.71×10^{-6}
Technetium-99	3.00×10^{-5}	5.25×10^{1}	1.80×10^{-3}	3.00×10^{-5}	1.35×10^{2}	5.92×10^{-3}	3.00×10^{-5}	2.75×10^{2}	1.29×10^{-2}
Iodine-129	3.70×10^{-8}	1.05×10^{1}	1.20×10^{-4}	3.70×10^{-8}	1.22×10^{1}	1.62×10^{-4}	3.70×10^{-8}	1.51×10^{1}	2.33×10^{-4}
Total	3.04×10^{-5}	6.31×10^{1}	1.93×10^{-3}	3.04×10^{-5}	1.47×10^{2}	6.08×10^{-3}	3.04×10^{-5}	2.90×10^{2}	1.31×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	3.19	3.04×10^{1}	0.00	3.19	3.04×10^{1}	1.27×10^{-8}	3.19	4.45×10^{1}	5.82×10^{-4}
Nitrate	1.54×10^{3}	2.75×10^{1}	0.00	1.54×10^{3}	3.63×10^{1}	0.00	1.54×10^{3}	7.11×10^{1}	0.00
Total	1.55×10^{3}	5.79×10^{1}	0.00	1.55×10^{3}	6.67×10^{1}	1.27×10^{-8}	1.55×10^{3}	1.16×10^{2}	5.82×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2055	2050	2050	2055

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

Table Q–77. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	5.21×10^{-8}	6.08×10^{-3}	5.78×10^{-8}	5.21×10^{-8}	9.68×10^{-3}	1.01×10^{-7}	5.21×10^{-8}	1.78×10^{-2}	2.02×10^{-7}
Technetium-99	2.66×10^{-6}	4.66	1.60×10^{-4}	2.66×10^{-6}	1.20×10^{1}	5.26×10^{-4}	2.66×10^{-6}	2.44×10^{1}	1.15×10^{-3}
Iodine-129	5.00×10^{-9}	1.42	1.62×10^{-5}	5.00×10^{-9}	1.65	2.19×10^{-5}	5.00×10^{-9}	2.04	3.15×10^{-5}
Total	2.72×10^{-6}	6.09	1.77×10^{-4}	2.72×10^{-6}	1.36×10^{1}	5.48×10^{-4}	2.72×10^{-6}	2.64×10^{1}	1.18×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.71×10^{-1}	2.58	0.00	2.71×10^{-1}	2.59	1.07×10^{-9}	2.71×10^{-1}	3.78	4.89×10^{-5}
Nitrate	8.95	1.60×10^{-1}	0.00	8.95	2.11×10^{-1}	0.00	8.95	4.13×10^{-1}	0.00
Total	9.23	2.74	0.00	9.23	2.80	1.07×10^{-9}	9.23	4.19	4.89×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–78. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	3.10×10^{-6}	3.62×10^{-1}	3.44×10^{-6}	3.10×10^{-6}	5.76×10^{-1}	6.02×10^{-6}	3.10×10^{-6}	1.06	1.20×10^{-5}
Technetium-99	1.52×10^{-5}	2.67×10^{1}	9.17×10^{-4}	1.52×10^{-5}	6.85×10^{1}	3.01×10^{-3}	1.52×10^{-5}	1.39×10^{2}	6.56×10^{-3}
Iodine-129	2.96×10^{-8}	8.44	9.61×10^{-5}	2.96×10^{-8}	9.79	1.30×10^{-4}	2.96×10^{-8}	1.21×10^{1}	1.87×10^{-4}
Uranium-238	1.54×10^{-10}	1.91×10^{-2}	2.16×10^{-7}	1.54×10^{-10}	1.99×10^{-2}	2.31×10^{-7}	1.54×10^{-10}	2.13×10^{-2}	2.62×10^{-7}
Total	1.83×10^{-5}	3.55×10^{1}	1.02×10^{-3}	1.83×10^{-5}	7.89×10^{1}	3.14×10^{-3}	1.83×10^{-5}	1.53×10^{2}	6.76×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	7.68×10^{-1}	7.32	0.00	7.63×10^{-1}	7.28	3.02×10^{-9}	7.63×10^{-1}	1.06×10^{1}	1.38×10^{-4}
Nitrate	1.29×10^{2}	2.31	0.00	1.32×10^{2}	3.09	0.00	1.32×10^{2}	6.07	0.00
Total uranium	1.85×10^{-4}	1.76×10^{-3}	0.00	1.73×10^{-4}	1.66×10^{-3}	0.00	1.73×10^{-4}	1.72×10^{-3}	0.00
Total	1.30×10^{2}	9.63	0.00	1.32×10^{2}	1.04×10^{1}	3.02×10^{-9}	1.32×10^{2}	1.67×10^{1}	1.38×10^{-4}
Year of peak impact	2050	2050	N/A	2051	2051	2050	2051	2051	2050

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–79. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Human Health Impacts at the U Barrier 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	0.00	0.00	1.71×10^{-5}	2.84×10^{-7}	1.28	5.60×10^{-5}	2.84×10^{-7}	2.60	1.22×10^{-4}
Iodine-129	7.66×10^{-12}	2.18×10^{-3}	8.62×10^{-7}	2.66×10^{-10}	8.79×10^{-2}	1.16×10^{-6}	2.66×10^{-10}	1.09×10^{-1}	1.67×10^{-6}
Uranium-238	8.38×10^{-9}	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	8.39×10^{-9}	1.04	1.79×10^{-5}	2.84×10^{-7}	1.36	5.72×10^{-5}	2.84×10^{-7}	2.71	1.24×10^{-4}
Year of peak impact	11,441	11,441	3499	3499	3499	3499	3499	3499	3499
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	0.00	0.00	0.00	0.00	0.00	3.91×10^{-11}	8.64×10^{-3}	1.20×10^{-1}	1.79×10^{-6}
Nitrate	0.00	0.00	0.00	0.00	0.00	0.00	1.37	6.33×10^{-2}	0.00
Total uranium	1.24×10^{-2}	1.18×10^{-1}	0.00	1.24×10^{-2}	1.19×10^{-1}	0.00	0.00	0.00	0.00
Total	1.24×10^{-2}	1.18×10^{-1}	0.00	1.24×10^{-2}	1.19×10^{-1}	3.91×10^{-11}	1.38	1.84×10^{-1}	1.79×10^{-6}
Year of peak impact	11,599	11,599	N/A	11,599	11,599	2050	2060	2060	2050

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–80. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C 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)
Hydrogen-3 (tritium)	2.12×10^{-6}	2.48×10^{-1}	2.36×10^{-6}	2.12×10^{-6}	3.95×10^{-1}	4.12×10^{-6}	2.12×10^{-6}	7.25×10^{-1}	8.22×10^{-6}
Technetium-99	2.59×10^{-5}	4.54×10^{1}	1.56×10^{-3}	2.59×10^{-5}	1.16×10^{2}	5.11×10^{-3}	2.59×10^{-5}	2.37×10^{2}	1.12×10^{-2}
Iodine-129	3.00×10^{-8}	8.55	9.73×10^{-5}	3.00×10^{-8}	9.92	1.31×10^{-4}	3.00×10^{-8}	1.23×10^{1}	1.89×10^{-4}
Total	2.80×10^{-5}	5.42×10^{1}	1.66×10^{-3}	2.80×10^{-5}	1.27×10^{2}	5.25×10^{-3}	2.80×10^{-5}	2.50×10^{2}	1.14×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	1.67	1.59×10^{1}	0.00	1.67	1.59×10^{1}	6.55×10^{-9}	1.67	2.32×10^{1}	3.00×10^{-4}
Nitrate	1.01×10^{3}	1.80×10^{1}	0.00	1.01×10^{3}	2.38×10^{1}	0.00	1.01×10^{3}	4.66×10^{1}	0.00
Total	1.01×10^{3}	3.39×10^{1}	3.26×10^{-14}	1.01×10^{3}	3.96×10^{1}	6.55×10^{-9}	1.01×10^{3}	6.98×10^{1}	3.00×10^{-4}
Year of peak impact	2050	2050	11,815	2050	2050	2050	2050	2050	2050

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

Table Q–81. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C 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	2.01×10^{-7}	3.53×10^{-1}	1.23×10^{-5}	2.01×10^{-7}	9.06×10^{-1}	4.04×10^{-5}	2.05×10^{-7}	1.87	8.81×10^{-5}
Iodine-129	2.62×10^{-10}	7.46×10^{-2}	7.11×10^{-7}	2.62×10^{-10}	8.66×10^{-2}	9.60×10^{-7}	2.19×10^{-10}	8.96×10^{-2}	1.38×10^{-6}
Uranium-238	5.36×10^{-13}	6.65×10^{-5}	7.50×10^{-10}	5.36×10^{-13}	6.90×10^{-5}	8.04×10^{-10}	5.35×10^{-13}	7.39×10^{-5}	9.09×10^{-10}
Total	2.02×10^{-7}	4.28×10^{-1}	1.30×10^{-5}	2.02×10^{-7}	9.93×10^{-1}	4.14×10^{-5}	2.05×10^{-7}	1.96	8.95×10^{-5}
Year of peak impact	2541	2541	2480	2541	2541	2480	2480	2480	2480
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	3.43×10^{-2}	3.26×10^{-1}	0.00	3.43×10^{-2}	3.27×10^{-1}	1.35×10^{-10}	3.43×10^{-2}	4.77×10^{-1}	6.17×10^{-6}
Nitrate	6.10	1.09×10^{-1}	0.00	6.10	1.43×10^{-1}	0.00	6.10	2.81×10^{-1}	0.00
Total	6.13	4.35×10^{-1}	1.07×10^{-15}	6.13	4.70×10^{-1}	1.35×10^{-10}	6.13	7.58×10^{-1}	6.17×10^{-6}
Year of peak impact	2695	2695	11,691	2695	2695	2695	2695	2695	2695

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

Table Q–82. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C 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)
Hydrogen-3 (tritium)	5.70×10^{-14}	1.06×10^{-8}	1.11×10^{-13}	5.70×10^{-14}	1.97×10^{-8}	2.24×10^{-13}	1.78×10^{-7}	5.61×10^{-2}	6.89×10^{-7}
Technetium-99	7.64×10^{-12}	3.44×10^{-5}	1.51×10^{-9}	7.64×10^{-12}	7.94×10^{-5}	3.76×10^{-9}	5.08×10^{-8}	5.74×10^{-4}	3.13×10^{-8}
Iodine-129	1.38×10^{-14}	4.56×10^{-6}	6.04×10^{-11}	1.38×10^{-14}	7.43×10^{-5}	1.79×10^{-9}	7.22×10^{-11}	1.75×10^{-4}	4.28×10^{-9}
Total	7.71×10^{-12}	3.89×10^{-5}	1.57×10^{-9}	7.71×10^{-12}	1.54×10^{-4}	5.55×10^{-9}	2.29×10^{-7}	5.69×10^{-2}	7.24×10^{-7}
Year of peak impact	2145	2145	2145	2145	2145	2145	2050	2050	2050
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	9.41×10^{-7}	8.97×10^{-6}	3.96×10^{-15}	9.41×10^{-7}	1.44×10^{-5}	1.82×10^{-10}	2.33×10^{-2}	5.15×10^{-2}	3.09×10^{-6}
Nitrate	2.94×10^{-4}	1.02×10^{-5}	0.00	2.94×10^{-4}	2.77×10^{-2}	0.00	8.58	3.32×10^{-1}	0.00
Total uranium	0.00	0.00	0.00	0.00	0.00	0.00	4.20×10^{-12}	1.14×10^{-10}	0.00
Total	2.95×10^{-4}	1.91×10^{-5}	3.96×10^{-15}	2.95×10^{-4}	2.77×10^{-2}	1.82×10^{-10}	8.60	3.84×10^{-1}	3.09×10^{-6}
Year of peak impact	2067	2067	2066	2067	2067	2066	2450	2450	2695

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

Figure Q–4 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, other sources, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2030 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from all three sources occurs around the year 2050 and is dominated by tritium, technetium-99, and iodine-129. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

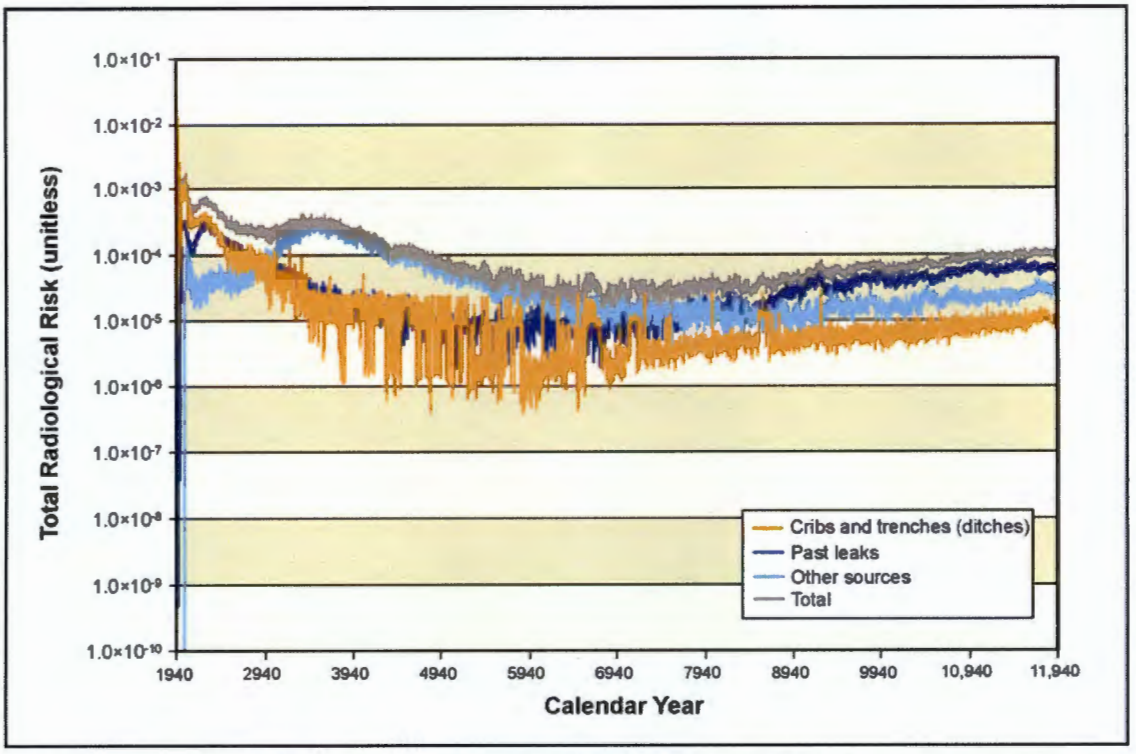

Figure Q–4. Tank Closure Alternatives 2B, 3A, 3B, 3C, and 6C Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.4 Tank Closure Alternative 4

Under Tank Closure Alternative 4, tank waste would be retrieved to a volume corresponding to 99.9 percent retrieval. Except for the BX and SX tank farms, residual material in tanks would be stabilized in place and the tank farms and adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. The BX and SX tank farms would be clean closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column.

Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–83 through Q–87. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–88 through Q–95. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–96 through Q–103.

Table Q–83. Tank Closure Alternative 4 Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.08×10^{1}	4.84×10^{2}	0.00	5.08×10^{1}	4.85×10^{2}	2.00×10^{-7}	5.08×10^{1}	7.08×10^{2}	9.16×10^{-3}
Nitrate	1.74×10^{4}	3.11×10^{2}	0.00	1.74×10^{4}	4.10×10^{2}	0.00	1.74×10^{4}	8.03×10^{2}	0.00
Total	1.75×10^{4}	7.95×10^{2}	0.00	1.75×10^{4}	8.94×10^{2}	2.00×10^{-7}	1.75×10^{4}	1.51×10^{3}	9.16×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–84. Tank Closure Alternative 4 Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.84×10^{-2}
Technetium-99	1.35×10^{-7}	2.36×10^{-1}	8.12×10^{-6}	1.35×10^{-7}	6.07×10^{-1}	2.66×10^{-5}	1.35×10^{-7}	1.24	5.81×10^{-5}
Iodine-129	1.14×10^{-9}	3.25×10^{-1}	3.71×10^{-6}	1.14×10^{-9}	3.78×10^{-1}	5.00×10^{-6}	1.14×10^{-9}	4.67×10^{-1}	7.20×10^{-6}
Uranium-238	1.18×10^{-11}	1.46×10^{-3}	1.65×10^{-8}	1.18×10^{-11}	1.52×10^{-3}	1.77×10^{-8}	1.18×10^{-11}	1.62×10^{-3}	2.00×10^{-8}
Total	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.85×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.32	8.88×10^{1}	0.00	9.32	8.89×10^{1}	3.66×10^{-8}	9.32	1.30×10^{2}	1.68×10^{-3}
Nitrate	2.11×10^{3}	3.77×10^{1}	0.00	2.11×10^{3}	4.97×10^{1}	0.00	2.11×10^{3}	9.74×10^{1}	0.00
Total	2.12×10^{3}	1.27×10^{2}	0.00	2.12×10^{3}	1.39×10^{2}	3.66×10^{-8}	2.12×10^{3}	2.27×10^{2}	1.68×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–85. Tank Closure Alternative 4 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.80×10^{1}	2.67×10^{2}	0.00	2.80×10^{1}	2.67×10^{2}	1.10×10^{-7}	2.80×10^{1}	3.91×10^{2}	5.05×10^{-3}
Nitrate	1.29×10^{4}	2.30×10^{2}	0.00	1.29×10^{4}	3.03×10^{2}	0.00	1.29×10^{4}	5.95×10^{2}	0.00
Total	1.29×10^{4}	4.97×10^{2}	0.00	1.29×10^{4}	5.70×10^{2}	1.10×10^{-7}	1.29×10^{4}	9.85×10^{2}	5.05×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–86. Tank Closure Alternative 4 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.46×10^{-7}	4.04×10^{-2}	3.84×10^{-7}	3.46×10^{-7}	6.43×10^{-2}	6.72×10^{-7}	3.46×10^{-7}	1.18×10^{-1}	1.34×10^{-6}
Technetium-99	8.94×10^{-8}	1.57×10^{-1}	5.38×10^{-6}	8.94×10^{-8}	4.02×10^{-1}	1.77×10^{-5}	8.94×10^{-8}	8.19×10^{-1}	3.85×10^{-5}
Iodine-129	3.88×10^{-11}	1.10×10^{-2}	1.26×10^{-7}	3.88×10^{-11}	1.28×10^{-2}	1.70×10^{-7}	3.88×10^{-11}	1.58×10^{-2}	2.44×10^{-7}
Total	4.35×10^{-7}	2.08×10^{-1}	5.89×10^{-6}	4.35×10^{-7}	4.79×10^{-1}	1.85×10^{-5}	4.35×10^{-7}	9.53×10^{-1}	4.01×10^{-5}
Year of peak impact	2025	2025	2025	2025	2025	2025	2025	2025	2025
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	3.14×10^{-2}	2.99×10^{-1}	0.00	3.14×10^{-2}	2.99×10^{-1}	1.23×10^{-10}	3.14×10^{-2}	4.37×10^{-1}	5.66×10^{-6}
Nitrate	5.75	1.03×10^{-1}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.78	4.02×10^{-1}	0.00	5.78	4.35×10^{-1}	1.23×10^{-10}	5.78	7.03×10^{-1}	5.66×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–87. Tank Closure Alternative 4 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.62×10^{-5}	6.92×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.28×10^{-6}	4.04×10^{-1}	4.96×10^{-6}
Technetium-99	2.53×10^{-11}	1.14×10^{-4}	4.99×10^{-9}	2.53×10^{-11}	2.63×10^{-4}	1.24×10^{-8}	2.55×10^{-8}	2.99×10^{-4}	1.62×10^{-8}
Iodine-129	3.20×10^{-14}	1.06×10^{-5}	1.41×10^{-10}	3.20×10^{-14}	1.73×10^{-4}	4.16×10^{-9}	3.57×10^{-11}	1.09×10^{-4}	2.65×10^{-9}
Total	3.82×10^{-10}	1.91×10^{-4}	5.83×10^{-9}	3.82×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.31×10^{-6}	4.04×10^{-1}	4.97×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1994	1994	1994
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	8.95×10^{-6}	8.53×10^{-5}	3.52×10^{-14}	8.95×10^{-6}	1.37×10^{-4}	1.61×10^{-9}	2.24×10^{-2}	4.97×10^{-2}	2.83×10^{-6}
Nitrate	2.24×10^{-3}	7.74×10^{-5}	0.00	2.24×10^{-3}	2.11×10^{-1}	0.00	4.36	6.64×10^{-1}	0.00
Total	2.25×10^{-3}	1.63×10^{-4}	3.52×10^{-14}	2.25×10^{-3}	2.11×10^{-1}	1.61×10^{-9}	4.38	7.14×10^{-1}	2.83×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2695

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

Table Q–88. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.63×10^{-6}	4.24×10^{-1}	4.03×10^{-6}	3.63×10^{-6}	6.75×10^{-1}	7.06×10^{-6}	3.63×10^{-6}	1.24	1.41×10^{-5}
Technetium-99	1.16×10^{-5}	2.03×10^{1}	6.99×10^{-4}	1.16×10^{-5}	5.22×10^{1}	2.29×10^{-3}	1.16×10^{-5}	1.06×10^{2}	5.00×10^{-3}
Iodine-129	2.36×10^{-8}	6.72	7.65×10^{-5}	2.36×10^{-8}	7.80	1.03×10^{-4}	2.36×10^{-8}	9.64	1.49×10^{-4}
Total	1.53×10^{-5}	2.75×10^{1}	7.79×10^{-4}	1.53×10^{-5}	6.07×10^{1}	2.40×10^{-3}	1.53×10^{-5}	1.17×10^{2}	5.16×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	6.06×10^{-2}	5.77×10^{-1}	0.00	6.06×10^{-2}	5.78×10^{-1}	2.38×10^{-10}	6.06×10^{-2}	8.45×10^{-1}	1.09×10^{-5}
Nitrate	4.17	7.45×10^{-2}	0.00	4.17	9.81×10^{-2}	0.00	4.17	1.92×10^{-1}	0.00
Total	4.23	6.52×10^{-1}	0.00	4.23	6.76×10^{-1}	2.38×10^{-10}	4.23	1.04	1.09×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–89. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	7.77×10^{-8}	9.08×10^{-3}	8.63×10^{-8}	7.77×10^{-8}	1.44×10^{-2}	1.51×10^{-7}	7.77×10^{-8}	2.66×10^{-2}	3.01×10^{-7}
Technetium-99	7.66×10^{-6}	1.34×10^{1}	4.61×10^{-4}	7.66×10^{-6}	3.44×10^{1}	1.51×10^{-3}	7.66×10^{-6}	7.02×10^{1}	3.30×10^{-3}
Iodine-129	1.41×10^{-8}	4.02	4.58×10^{-5}	1.41×10^{-8}	4.67	6.18×10^{-5}	1.41×10^{-8}	5.76	8.89×10^{-5}
Total	7.75×10^{-6}	1.74×10^{1}	5.07×10^{-4}	7.75×10^{-6}	3.91×10^{1}	1.57×10^{-3}	7.75×10^{-6}	7.60×10^{1}	3.39×10^{-3}
Year of peak impact	2044	2044	2044	2044	2044	2044	2044	2044	2044
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	8.62×10^{-2}	8.21×10^{-1}	0.00	8.62×10^{-2}	8.22×10^{-1}	3.39×10^{-10}	8.02×10^{-2}	1.12	1.55×10^{-5}
Nitrate	1.51×10^{1}	2.70×10^{-1}	0.00	1.51×10^{1}	3.55×10^{-1}	0.00	1.75×10^{1}	8.06×10^{-1}	0.00
Total	1.52×10^{1}	1.09	0.00	1.52×10^{1}	1.18	3.39×10^{-10}	1.76×10^{1}	1.92	1.55×10^{-5}
Year of peak impact	2043	2043	N/A	2043	2043	2043	2038	2038	2043

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–90. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	3.60×10^{-7}	4.21×10^{-2}	4.23×10^{-7}	3.60×10^{-7}	6.70×10^{-2}	7.40×10^{-7}	3.81×10^{-7}	1.30×10^{-1}	1.48×10^{-6}
Technetium-99	3.81×10^{-6}	6.67	2.31×10^{-4}	3.81×10^{-6}	1.71×10^{1}	7.58×10^{-4}	3.84×10^{-6}	3.52×10^{1}	1.65×10^{-3}
Iodine-129	7.75×10^{-9}	2.21	2.35×10^{-5}	7.75×10^{-9}	2.56	3.18×10^{-5}	7.26×10^{-9}	2.96	4.57×10^{-5}
Total	4.17×10^{-6}	8.92	2.55×10^{-4}	4.17×10^{-6}	1.98×10^{1}	7.90×10^{-4}	4.22×10^{-6}	3.83×10^{1}	1.70×10^{-3}
Year of peak impact	2026	2026	2022	2026	2026	2022	2022	2022	2022
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	3.97×10^{-1}	3.78	0.00	3.97×10^{-1}	3.78	1.56×10^{-9}	3.97×10^{-1}	5.53	7.15×10^{-5}
Nitrate	1.20×10^{1}	2.14×10^{-1}	0.00	1.20×10^{1}	2.81×10^{-1}	0.00	1.20×10^{1}	5.52×10^{-1}	0.00
Total	1.24×10^{1}	3.99	0.00	1.24×10^{1}	4.06	1.56×10^{-9}	1.24×10^{1}	6.08	7.15×10^{-5}
Year of peak impact	2030	2030	N/A	2030	2030	2030	2030	2030	2030

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–91. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.31×10^{-6}	3.87×10^{-1}	2.93×10^{-6}	3.31×10^{-6}	6.16×10^{-1}	5.12×10^{-6}	3.31×10^{-6}	1.13	1.02×10^{-5}
Technetium-99	2.26×10^{-5}	3.96×10^{1}	1.36×10^{-3}	2.26×10^{-5}	1.02×10^{2}	4.47×10^{-3}	2.26×10^{-5}	2.07×10^{2}	9.75×10^{-3}
Iodine-129	4.48×10^{-8}	1.27×10^{1}	1.44×10^{-4}	4.48×10^{-8}	1.48×10^{1}	1.94×10^{-4}	4.48×10^{-8}	1.83×10^{1}	2.79×10^{-4}
Total	2.59×10^{-5}	5.27×10^{1}	1.51×10^{-3}	2.59×10^{-5}	1.17×10^{2}	4.67×10^{-3}	2.59×10^{-5}	2.26×10^{2}	1.00×10^{-2}
Year of peak impact	2027	2027	2029	2027	2027	2029	2027	2027	2029
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	5.28×10^{-1}	5.03	0.00	5.28×10^{-1}	5.04	2.07×10^{-9}	5.28×10^{-1}	7.36	9.52×10^{-5}
Nitrate	4.01×10^{1}	7.16×10^{-1}	0.00	4.01×10^{1}	9.42×10^{-1}	0.00	4.01×10^{1}	1.85	0.00
Total	4.06×10^{1}	5.75	0.00	4.06×10^{1}	5.98	2.07×10^{-9}	4.06×10^{1}	9.21	9.52×10^{-5}
Year of peak impact	2027	2027	N/A	2027	2027	2027	2027	2027	2027

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–92. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	0.00	0.00	0.00	2.37×10^{-8}	1.22×10^{-8}	4.17×10^{-3}	4.73×10^{-8}
Technetium-99	0.00	0.00	0.00	0.00	0.00	2.84×10^{-5}	1.44×10^{-7}	1.32	6.20×10^{-5}
Iodine-129	0.00	0.00	0.00	0.00	0.00	1.20×10^{-6}	2.74×10^{-10}	1.12×10^{-1}	1.72×10^{-6}
Uranium-238	7.98×10^{-9}	9.90×10^{-1}	1.12×10^{-5}	7.98×10^{-9}	1.03	0.00	0.00	0.00	0.00
Total	7.98×10^{-9}	9.90×10^{-1}	1.12×10^{-5}	7.98×10^{-9}	1.03	2.97×10^{-5}	1.56×10^{-7}	1.44	6.38×10^{-5}
Year of peak impact	11,441	11,441	11,441	11,441	11,441	2050	2050	2050	2050
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	1.35×10^{-2}	1.29×10^{-1}	0.00	1.35×10^{-2}	1.29×10^{-1}	5.31×10^{-11}	1.35×10^{-2}	1.88×10^{-1}	2.44×10^{-6}
Nitrate	6.05×10^{-1}	1.08×10^{-2}	0.00	6.05×10^{-1}	1.42×10^{-2}	0.00	6.05×10^{-1}	2.79×10^{-2}	0.00
Total	6.18×10^{-1}	1.40×10^{-1}	0.00	6.18×10^{-1}	1.43×10^{-1}	5.31×10^{-11}	6.18×10^{-1}	2.16×10^{-1}	2.44×10^{-6}
Year of peak impact	2028	2028	N/A	2028	2028	2028	2028	2028	2028

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–93. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.42×10^{-7}	1.66×10^{-2}	1.58×10^{-7}	1.42×10^{-7}	2.64×10^{-2}	2.76×10^{-7}	1.42×10^{-7}	4.86×10^{-2}	5.51×10^{-7}
Technetium-99	4.95×10^{-6}	8.67	2.98×10^{-4}	4.95×10^{-6}	2.23×10^{1}	9.78×10^{-4}	4.95×10^{-6}	4.54×10^{1}	2.13×10^{-3}
Iodine-129	8.68×10^{-9}	2.47	2.81×10^{-5}	8.68×10^{-9}	2.87	3.80×10^{-5}	8.68×10^{-9}	3.54	5.47×10^{-5}
Total	5.10×10^{-6}	1.12×10^{1}	3.26×10^{-4}	5.10×10^{-6}	2.52×10^{1}	1.02×10^{-3}	5.10×10^{-6}	4.90×10^{1}	2.19×10^{-3}
Year of peak impact	2034	2034	2034	2034	2034	2034	2034	2034	2034
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	2.55×10^{-1}	2.43	0.00	2.55×10^{-1}	2.43	1.00×10^{-9}	2.55×10^{-1}	3.55	4.59×10^{-5}
Nitrate	7.52	1.34×10^{-1}	0.00	7.52	1.77×10^{-1}	0.00	7.52	3.47×10^{-1}	0.00
Total	7.77	2.56	0.00	7.77	2.61	1.00×10^{-9}	7.77	3.90	4.59×10^{-5}
Year of peak impact	2197	2197	N/A	2197	2197	2197	2197	2197	2197

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–94. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	6.68×10^{-12}	7.80×10^{-7}	7.42×10^{-12}	6.68×10^{-12}	1.24×10^{-6}	1.91×10^{-19}	9.81×10^{-20}	3.35×10^{-14}	3.80×10^{-19}
Technetium-99	1.30×10^{-7}	2.28×10^{-1}	7.85×10^{-6}	1.30×10^{-7}	5.86×10^{-1}	2.63×10^{-5}	1.33×10^{-7}	1.22	5.73×10^{-5}
Iodine-129	1.77×10^{-10}	5.04×10^{-2}	5.74×10^{-7}	1.77×10^{-10}	5.85×10^{-2}	5.31×10^{-7}	1.21×10^{-10}	4.95×10^{-2}	7.64×10^{-7}
Total	1.31×10^{-7}	2.79×10^{-1}	8.42×10^{-6}	1.31×10^{-7}	6.45×10^{-1}	2.68×10^{-5}	1.33×10^{-7}	1.27	5.81×10^{-5}
Year of peak impact	2165	2165	2165	2165	2165	2480	2480	2480	2480
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	3.31×10^{-3}	3.16×10^{-2}	0.00	3.31×10^{-3}	3.16×10^{-2}	1.30×10^{-11}	3.31×10^{-3}	4.62×10^{-2}	5.97×10^{-7}
Nitrate	1.66×10^{-1}	2.96×10^{-3}	0.00	1.66×10^{-1}	3.90×10^{-3}	0.00	1.66×10^{-1}	7.65×10^{-3}	0.00
Total	1.69×10^{-1}	3.45×10^{-2}	0.00	1.69×10^{-1}	3.55×10^{-2}	1.30×10^{-11}	1.69×10^{-1}	5.38×10^{-2}	5.97×10^{-7}
Year of peak impact	2382	2382	N/A	2382	2382	2382	2382	2382	2382

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–95. Tank Closure Alternative 4 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	7.15×10^{-16}	1.33×10^{-10}	1.39×10^{-15}	3.12×10^{-15}	1.08×10^{-9}	2.12×10^{-14}	1.63×10^{-19}	4.00×10^{-14}	2.59×10^{-11}
Technetium-99	6.07×10^{-12}	2.73×10^{-5}	1.20×10^{-9}	5.92×10^{-12}	6.15×10^{-5}	2.95×10^{-9}	6.44×10^{-9}	7.00×10^{-5}	7.95×10^{-8}
Iodine-129	1.06×10^{-14}	3.52×10^{-6}	4.67×10^{-11}	1.15×10^{-14}	6.20×10^{-5}	1.46×10^{-9}	1.93×10^{-12}	3.13×10^{-6}	9.37×10^{-9}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	6.13×10^{-10}	6.10×10^{-3}	0.00
Total	6.08×10^{-12}	3.08×10^{-5}	1.25×10^{-9}	5.93×10^{-12}	1.23×10^{-4}	4.41×10^{-9}	7.05×10^{-9}	6.17×10^{-3}	8.89×10^{-8}
Year of peak impact	2148	2148	2148	2121	2121	2113	11,147	11,147	2165
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	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^{-7}	1.51×10^{-6}	6.26×10^{-16}	1.47×10^{-7}	2.24×10^{-6}	2.87×10^{-11}	2.75×10^{-3}	6.08×10^{-3}	2.99×10^{-7}
Nitrate	9.76×10^{-6}	3.37×10^{-7}	0.00	1.04×10^{-5}	9.77×10^{-4}	0.00	2.16×10^{-1}	9.57×10^{-3}	0.00
Total	9.92×10^{-6}	1.85×10^{-6}	6.26×10^{-16}	1.05×10^{-5}	9.79×10^{-4}	2.87×10^{-11}	2.18×10^{-1}	1.56×10^{-2}	2.99×10^{-7}
Year of peak impact	2154	2154	2145	2148	2148	2145	2190	2190	2382

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

Table Q–96. Tank Closure Alternative 4 Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	1.22×10^{-8}	1.42×10^{-3}	1.35×10^{-8}	1.22×10^{-8}	2.26×10^{-3}	2.36×10^{-8}	1.22×10^{-8}	4.16×10^{-3}	4.71×10^{-8}
Technetium-99	1.46×10^{-6}	2.55	8.78×10^{-5}	1.46×10^{-6}	6.55	2.88×10^{-4}	1.46×10^{-6}	1.34×10^{1}	6.28×10^{-4}
Iodine-129	2.56×10^{-9}	7.29×10^{-1}	8.30×10^{-6}	2.56×10^{-9}	8.47×10^{-1}	1.12×10^{-5}	2.56×10^{-9}	1.05	1.61×10^{-5}
Total	1.47×10^{-6}	3.28	9.61×10^{-5}	1.47×10^{-6}	7.40	2.99×10^{-4}	1.47×10^{-6}	1.44×10^{1}	6.44×10^{-4}
Year of peak impact	2058	2058	2058	2058	2058	2058	2058	2058	2058
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	8.84×10^{-3}	8.42×10^{-2}	0.00	8.84×10^{-3}	8.43×10^{-2}	3.47×10^{-11}	8.21×10^{-3}	1.14×10^{-1}	1.59×10^{-6}
Nitrate	5.29	9.45×10^{-2}	0.00	5.29	1.24×10^{-1}	0.00	5.53	2.55×10^{-1}	0.00
Total	5.30	1.79×10^{-1}	0.00	5.30	2.09×10^{-1}	3.47×10^{-11}	5.54	3.70×10^{-1}	1.59×10^{-6}
Year of peak impact	2057	2057	N/A	2057	2057	2057	2056	2056	2057

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–97. Tank Closure Alternative 4 Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	4.33×10^{-7}	5.06×10^{-2}	4.81×10^{-7}	4.33×10^{-7}	8.05×10^{-2}	8.41×10^{-7}	4.33×10^{-7}	1.48×10^{-1}	1.68×10^{-6}
Technetium-99	2.82×10^{-5}	4.93×10^{1}	1.70×10^{-3}	2.82×10^{-5}	1.27×10^{2}	5.56×10^{-3}	2.82×10^{-5}	2.58×10^{2}	1.21×10^{-2}
Iodine-129	3.43×10^{-8}	9.78	1.11×10^{-4}	3.43×10^{-8}	1.14×10^{1}	1.50×10^{-4}	3.43×10^{-8}	1.40×10^{1}	2.16×10^{-4}
Total	2.86×10^{-5}	5.92×10^{1}	1.81×10^{-3}	2.86×10^{-5}	1.38×10^{2}	5.71×10^{-3}	2.86×10^{-5}	2.72×10^{2}	1.24×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	3.17	3.02×10^{1}	0.00	3.17	3.02×10^{1}	1.26×10^{-8}	3.17	4.42×10^{1}	5.80×10^{-4}
Nitrate	1.54×10^{3}	2.75×10^{1}	0.00	1.54×10^{3}	3.61×10^{1}	0.00	1.54×10^{3}	7.09×10^{1}	0.00
Total	1.54×10^{3}	5.77×10^{1}	0.00	1.54×10^{3}	6.64×10^{1}	1.26×10^{-8}	1.54×10^{3}	1.15×10^{2}	5.80×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2055	2050	2050	2055

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–98. Tank Closure Alternative 4 Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	3.80×10^{-9}	4.44×10^{-4}	4.22×10^{-9}	3.80×10^{-9}	7.07×10^{-4}	7.39×10^{-9}	3.80×10^{-9}	1.30×10^{-3}	1.47×10^{-8}
Technetium-99	2.14×10^{-7}	3.74×10^{-1}	1.29×10^{-5}	2.14×10^{-7}	9.61×10^{-1}	4.22×10^{-5}	2.14×10^{-7}	1.96	9.20×10^{-5}
Iodine-129	3.58×10^{-10}	1.02×10^{-1}	1.16×10^{-6}	3.58×10^{-10}	1.18×10^{-1}	1.57×10^{-6}	3.58×10^{-10}	1.46×10^{-1}	2.25×10^{-6}
Total	2.18×10^{-7}	4.77×10^{-1}	1.40×10^{-5}	2.18×10^{-7}	1.08	4.38×10^{-5}	2.18×10^{-7}	2.10	9.43×10^{-5}
Year of peak impact	2060	2060	2060	2060	2060	2060	2060	2060	2060
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	3.56×10^{-2}	3.39×10^{-1}	0.00	3.56×10^{-2}	3.39×10^{-1}	1.40×10^{-10}	3.56×10^{-2}	4.95×10^{-1}	6.41×10^{-6}
Nitrate	1.24	2.21×10^{-2}	0.00	1.24	2.91×10^{-2}	0.00	1.24	5.71×10^{-2}	0.00
Total	1.27	3.61×10^{-1}	0.00	1.27	3.68×10^{-1}	1.40×10^{-10}	1.27	5.52×10^{-1}	6.41×10^{-6}
Year of peak impact	2057	2057	N/A	2057	2057	2057	2057	2057	2057

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–99. Tank Closure Alternative 4 Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	3.10×10^{-6}	3.62×10^{-1}	3.44×10^{-6}	3.10×10^{-6}	5.76×10^{-1}	6.02×10^{-6}	3.10×10^{-6}	1.06	1.20×10^{-5}
Technetium-99	1.52×10^{-5}	2.67×10^{1}	9.18×10^{-4}	1.52×10^{-5}	6.86×10^{1}	3.01×10^{-3}	1.52×10^{-5}	1.40×10^{2}	6.57×10^{-3}
Iodine-129	2.96×10^{-8}	8.43	9.60×10^{-5}	2.96×10^{-8}	9.79	1.30×10^{-4}	2.96×10^{-8}	1.21×10^{1}	1.87×10^{-4}
Uranium-238	1.54×10^{-10}	1.91×10^{-2}	2.16×10^{-7}	1.54×10^{-10}	1.99×10^{-2}	2.31×10^{-7}	1.54×10^{-10}	2.13×10^{-2}	2.62×10^{-7}
Total	1.84×10^{-5}	3.55×10^{1}	1.02×10^{-3}	1.84×10^{-5}	7.90×10^{1}	3.15×10^{-3}	1.84×10^{-5}	1.53×10^{2}	6.77×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	7.64×10^{-1}	7.28	0.00	7.64×10^{-1}	7.28	3.02×10^{-9}	7.64×10^{-1}	1.06×10^{1}	1.38×10^{-4}
Nitrate	1.32×10^{2}	2.35	0.00	1.32×10^{2}	3.09	0.00	1.32×10^{2}	6.07	0.00
Total uranium	1.73×10^{-4}	1.64×10^{-3}	0.00	1.73×10^{-4}	1.66×10^{-3}	0.00	1.73×10^{-4}	1.72×10^{-3}	0.00
Total	1.32×10^{2}	9.63	0.00	1.32×10^{2}	1.04×10^{1}	3.02×10^{-9}	1.32×10^{2}	1.67×10^{1}	1.38×10^{-4}
Year of peak impact	2051	2051	N/A	2051	2051	2050	2051	2051	2050

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–100. Tank Closure Alternative 4 Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	9.73×10^{-9}	0.00	0.00	1.70×10^{-8}	8.76×10^{-9}	2.99×10^{-3}	3.39×10^{-8}
Technetium-99	0.00	0.00	1.08×10^{-5}	0.00	0.00	3.55×10^{-5}	1.80×10^{-7}	1.65	7.75×10^{-5}
Iodine-129	0.00	0.00	9.26×10^{-7}	0.00	0.00	1.25×10^{-6}	2.86×10^{-10}	1.17×10^{-1}	1.80×10^{-6}
Uranium-238	8.22×10^{-9}	1.02	0.00	8.22×10^{-9}	1.06	0.00	0.00	0.00	0.00
Total	8.22×10^{-9}	1.02	1.18×10^{-5}	8.22×10^{-9}	1.06	3.68×10^{-5}	1.89×10^{-7}	1.77	7.93×10^{-5}
Year of peak impact	11,441	11,441	2060	11,441	11,441	2060	2060	2060	2060
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	0.00	0.00	0.00	9.57×10^{-3}	9.12×10^{-2}	3.87×10^{-11}	9.57×10^{-3}	1.33×10^{-1}	1.78×10^{-6}
Nitrate	0.00	0.00	0.00	1.13	2.66×10^{-2}	0.00	1.13	5.21×10^{-2}	0.00
Total uranium	1.20×10^{-2}	1.15×10^{-1}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.20×10^{-2}	1.15×10^{-1}	0.00	1.14	1.18×10^{-1}	3.87×10^{-11}	1.14	1.85×10^{-1}	1.78×10^{-6}
Year of peak impact	11,599	11,599	N/A	2059	2059	2050	2059	2059	2050

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–101. Tank Closure Alternative 4 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)
Hydrogen-3 (tritium)	2.11×10^{-6}	2.47×10^{-1}	2.35×10^{-6}	2.11×10^{-6}	3.93×10^{-1}	4.11×10^{-6}	2.11×10^{-6}	7.22×10^{-1}	8.19×10^{-6}
Technetium-99	2.41×10^{-5}	4.21×10^{1}	1.45×10^{-3}	2.41×10^{-5}	1.08×10^{2}	4.75×10^{-3}	2.41×10^{-5}	2.20×10^{2}	1.04×10^{-2}
Iodine-129	2.73×10^{-8}	7.77	8.85×10^{-5}	2.73×10^{-8}	9.02	1.19×10^{-4}	2.73×10^{-8}	1.11×10^{1}	1.72×10^{-4}
Total	2.62×10^{-5}	5.02×10^{1}	1.54×10^{-3}	2.62×10^{-5}	1.18×10^{2}	4.88×10^{-3}	2.62×10^{-5}	2.32×10^{2}	1.05×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	1.65	1.57×10^{1}	0.00	1.65	1.57×10^{1}	6.47×10^{-9}	1.65	2.29×10^{1}	2.97×10^{-4}
Nitrate	1.01×10^{3}	1.80×10^{1}	0.00	1.01×10^{3}	2.36×10^{1}	0.00	1.01×10^{3}	4.64×10^{1}	0.00
Total	1.01×10^{3}	3.36×10^{1}	0.00	1.01×10^{3}	3.93×10^{1}	6.47×10^{-9}	1.01×10^{3}	6.93×10^{1}	2.97×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–102. Tank Closure Alternative 4 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	1.91×10^{-7}	3.34×10^{-1}	1.15×10^{-5}	1.91×10^{-7}	8.57×10^{-1}	3.76×10^{-5}	1.91×10^{-7}	1.75	8.21×10^{-5}
Iodine-129	2.02×10^{-10}	5.76×10^{-2}	6.55×10^{-7}	2.02×10^{-10}	6.68×10^{-2}	8.84×10^{-7}	2.02×10^{-10}	8.25×10^{-2}	1.27×10^{-6}
Uranium-238	5.35×10^{-13}	6.64×10^{-5}	7.50×10^{-10}	5.35×10^{-13}	6.90×10^{-5}	8.04×10^{-10}	5.35×10^{-13}	7.39×10^{-5}	9.09×10^{-10}
Total	1.91×10^{-7}	3.91×10^{-1}	1.21×10^{-5}	1.91×10^{-7}	9.24×10^{-1}	3.85×10^{-5}	1.91×10^{-7}	1.83	8.34×10^{-5}
Year of peak impact	2480	2480	2480	2480	2480	2480	2480	2480	2480
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	3.39×10^{-2}	3.22×10^{-1}	0.00	3.39×10^{-2}	3.23×10^{-1}	1.33×10^{-10}	3.39×10^{-2}	4.72×10^{-1}	6.10×10^{-6}
Nitrate	6.06	1.08×10^{-1}	0.00	6.06	1.42×10^{-1}	0.00	6.06	2.79×10^{-1}	0.00
Total	6.09	4.31×10^{-1}	0.00	6.09	4.65×10^{-1}	1.33×10^{-10}	6.09	7.51×10^{-1}	6.10×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–103. Tank Closure Alternative 4 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)
Hydrogen-3 (tritium)	3.66×10^{-13}	6.81×10^{-8}	7.12×10^{-13}	5.70×10^{-14}	1.97×10^{-8}	1.44×10^{-12}	1.78×10^{-7}	5.61×10^{-2}	6.89×10^{-7}
Technetium-99	7.53×10^{-12}	3.39×10^{-5}	1.49×10^{-9}	7.47×10^{-12}	7.76×10^{-5}	3.71×10^{-9}	5.03×10^{-8}	5.68×10^{-4}	3.10×10^{-8}
Iodine-129	1.37×10^{-14}	4.53×10^{-6}	6.01×10^{-11}	1.38×10^{-14}	7.47×10^{-5}	1.78×10^{-9}	7.30×10^{-11}	1.76×10^{-4}	4.30×10^{-9}
Total	7.91×10^{-12}	3.85×10^{-5}	1.55×10^{-9}	7.54×10^{-12}	1.52×10^{-4}	5.49×10^{-9}	2.28×10^{-7}	5.69×10^{-2}	7.24×10^{-7}
Year of peak impact	2121	2121	2121	2145	2145	2121	2050	2050	2050
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	9.41×10^{-7}	8.97×10^{-6}	3.96×10^{-15}	9.41×10^{-7}	1.44×10^{-5}	1.81×10^{-10}	2.27×10^{-2}	5.02×10^{-2}	3.05×10^{-6}
Nitrate	2.94×10^{-4}	1.02×10^{-5}	0.00	2.94×10^{-4}	2.77×10^{-2}	0.00	8.49	3.29×10^{-1}	0.00
Total uranium	0.00	0.00	0.00	0.00	0.00	0.00	4.20×10^{-12}	1.14×10^{-10}	0.00
Total	2.95×10^{-4}	1.91×10^{-5}	3.96×10^{-15}	2.95×10^{-4}	2.77×10^{-2}	1.81×10^{-10}	8.51	3.79×10^{-1}	3.05×10^{-6}
Year of peak impact	2067	2067	2066	2067	2067	2066	2450	2450	2695

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

Similar to Alternatives 2A, 2B, 3A, 3B, and 3C, the risk and hazard drivers are: tritium, technetium-99, and iodine-129, uranium-238, chromium, nitrate, and total uranium. The dose standard and Hazardous Index guidelines would be exceeded at the same locations and for the same receptors as under Alternative 2A, 2B, 3A, 3B, and 3C for releases from cribs and trenches (ditches). The dose standard would be exceeded at the same locations and for the same receptors as under Alternative 2A, 2B, 3A, 3B, and 3C for releases from past leaks with slightly less impacts at the B Barrier, S Barrier, and Core Zone Boundary as a result of clean closure at the two tank farms located within the B and S Barriers. Impacts would be slightly less than under Alternative 2B, 3A, 3B, 3C, and 6C as a result of the combination of cribs and trenches (ditches), past leaks, and other sources with the exception of the S Barrier where no exceedances were identified. Overall the Population dose was estimated as 1.92×10^{-1} person-rem per year for the year of maximum impact.

Figure Q–5 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, other sources, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2030 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from all three sources occurs around the year 2050 and is dominated by tritium, technetium-99, and iodine-129. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

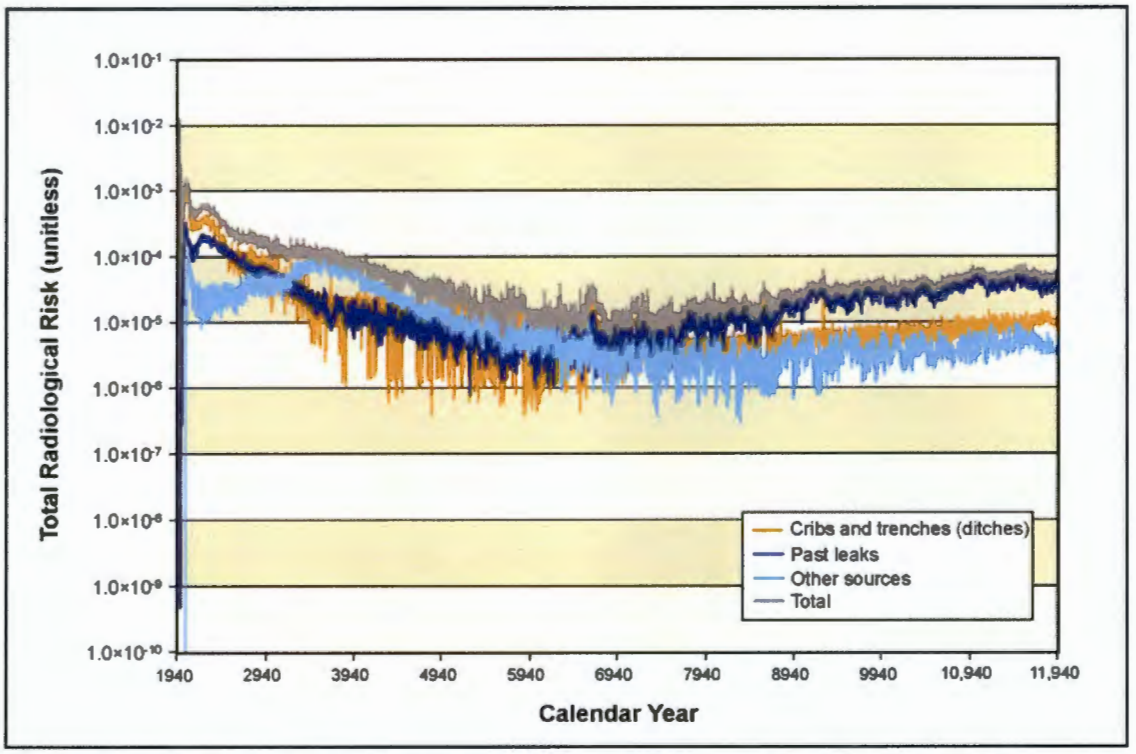

Figure Q–5. Tank Closure Alternative 4 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.5 Tank Closure Alternative 5

Under Tank Closure Alternative 5, tank waste would be retrieved to a volume corresponding to 90 percent retrieval, residual material in tanks would be stabilized in place, and the tank farms and adjacent cribs and trenches (ditches) would be covered with a Hanford barrier. Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–104 through Q–108. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–109 through Q–116. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–117 through Q–124.

The dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternative 2A, 2B, 3A, 3B, 3C, and 4 for releases from cribs and trenches (ditches). The dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternative 2A, 2B, 3A, 3B, and 3C, but slightly higher than these alternatives. Impacts would occur at a later date than under Alternative 2B, 3A, 3B, 3C, and 6C for onsite locations as a result of the combination of cribs and trenches (ditches), past leaks, and other sources. This may be due to the Hanford barrier. However, exceedances at the offsite locations are higher. Population dose was estimated as 3.39×10^{-1} person-rem per year for the year of maximum impact.

Table Q–104. Tank Closure Alternative 5 Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.08×10^{1}	4.84×10^{2}	0.00	5.08×10^{1}	4.85×10^{2}	2.00×10^{-7}	5.08×10^{1}	7.08×10^{2}	9.16×10^{-3}
Nitrate	1.74×10^{4}	3.11×10^{2}	0.00	1.74×10^{4}	4.10×10^{2}	0.00	1.74×10^{4}	8.03×10^{2}	0.00
Total	1.75×10^{4}	7.95×10^{2}	0.00	1.75×10^{4}	8.94×10^{2}	2.00×10^{-7}	1.75×10^{4}	1.51×10^{3}	9.16×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–105. Tank Closure Alternative 5 Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.84×10^{-2}
Technetium-99	1.35×10^{-7}	2.36×10^{-1}	8.12×10^{-6}	1.35×10^{-7}	6.07×10^{-1}	2.66×10^{-5}	1.35×10^{-7}	1.24	5.81×10^{-5}
Iodine-129	1.14×10^{-9}	3.25×10^{-1}	3.71×10^{-6}	1.14×10^{-9}	3.78×10^{-1}	5.00×10^{-6}	1.14×10^{-9}	4.67×10^{-1}	7.20×10^{-6}
Uranium-238	1.18×10^{-11}	1.46×10^{-3}	1.65×10^{-8}	1.18×10^{-11}	1.52×10^{-3}	1.77×10^{-8}	1.18×10^{-11}	1.62×10^{-3}	2.00×10^{-8}
Total	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.85×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.32	8.88×10^{1}	0.00	9.32	8.89×10^{1}	3.66×10^{-8}	9.32	1.30×10^{2}	1.68×10^{-3}
Nitrate	2.11×10^{3}	3.77×10^{1}	0.00	2.11×10^{3}	4.97×10^{1}	0.00	2.11×10^{3}	9.74×10^{1}	0.00
Total	2.12×10^{3}	1.27×10^{2}	0.00	2.12×10^{3}	1.39×10^{2}	3.66×10^{-8}	2.12×10^{3}	2.27×10^{2}	1.68×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–106. Tank Closure Alternative 5 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.80×10^{1}	2.67×10^{2}	0.00	2.80×10^{1}	2.67×10^{2}	1.10×10^{-7}	2.80×10^{1}	3.91×10^{2}	5.05×10^{-3}
Nitrate	1.29×10^{4}	2.30×10^{2}	0.00	1.29×10^{4}	3.03×10^{2}	0.00	1.29×10^{4}	5.95×10^{2}	0.00
Total	1.29×10^{4}	4.97×10^{2}	0.00	1.29×10^{4}	5.70×10^{2}	1.10×10^{-7}	1.29×10^{4}	9.85×10^{2}	5.05×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–107. Tank Closure Alternative 5 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.46×10^{-7}	4.04×10^{-2}	3.84×10^{-7}	3.46×10^{-7}	6.43×10^{-2}	6.72×10^{-7}	3.46×10^{-7}	1.18×10^{-1}	1.34×10^{-6}
Technetium-99	8.94×10^{-8}	1.57×10^{-1}	5.38×10^{-6}	8.94×10^{-8}	4.02×10^{-1}	1.77×10^{-5}	8.94×10^{-8}	8.19×10^{-1}	3.85×10^{-5}
Iodine-129	3.88×10^{-11}	1.10×10^{-2}	1.26×10^{-7}	3.88×10^{-11}	1.28×10^{-2}	1.70×10^{-7}	3.88×10^{-11}	1.58×10^{-2}	2.44×10^{-7}
Total	4.35×10^{-7}	2.08×10^{-1}	5.89×10^{-6}	4.35×10^{-7}	4.79×10^{-1}	1.85×10^{-5}	4.35×10^{-7}	9.53×10^{-1}	4.01×10^{-5}
Year of peak impact	2025	2025	2025	2025	2025	2025	2025	2025	2025
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.14×10^{-2}	2.99×10^{-1}	0.00	3.14×10^{-2}	2.99×10^{-1}	1.23×10^{-10}	3.14×10^{-2}	4.37×10^{-1}	5.66×10^{-6}
Nitrate	5.75	1.03×10^{-1}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.78	4.02×10^{-1}	0.00	5.78	4.35×10^{-1}	1.23×10^{-10}	5.78	7.03×10^{-1}	5.66×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–108. Tank Closure Alternative 5 Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.62×10^{-5}	6.92×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.28×10^{-6}	4.04×10^{-1}	4.96×10^{-6}
Technetium-99	2.53×10^{-11}	1.14×10^{-4}	4.99×10^{-9}	2.53×10^{-11}	2.63×10^{-4}	1.24×10^{-8}	2.55×10^{-8}	2.99×10^{-4}	1.62×10^{-8}
Iodine-129	3.20×10^{-14}	1.06×10^{-5}	1.41×10^{-10}	3.20×10^{-14}	1.73×10^{-4}	4.16×10^{-9}	3.57×10^{-11}	1.09×10^{-4}	2.65×10^{-9}
Total	3.82×10^{-10}	1.91×10^{-4}	5.83×10^{-9}	3.82×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.31×10^{-6}	4.04×10^{-1}	4.97×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1994	1994	1994
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	8.95×10^{-6}	8.53×10^{-5}	3.52×10^{-14}	8.95×10^{-6}	1.37×10^{-4}	1.61×10^{-9}	2.24×10^{-2}	4.97×10^{-2}	2.83×10^{-6}
Nitrate	2.24×10^{-3}	7.74×10^{-5}	0.00	2.24×10^{-3}	2.11×10^{-1}	0.00	4.36	6.64×10^{-1}	0.00
Total	2.25×10^{-3}	1.63×10^{-4}	3.52×10^{-14}	2.25×10^{-3}	2.11×10^{-1}	1.61×10^{-9}	4.38	7.14×10^{-1}	2.83×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2695

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

Table Q–109. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.63×10^{-6}	4.24×10^{-1}	4.03×10^{-6}	3.63×10^{-6}	6.75×10^{-1}	7.06×10^{-6}	3.63×10^{-6}	1.24	1.41×10^{-5}
Technetium-99	1.24×10^{-5}	2.16×10^{1}	7.44×10^{-4}	1.24×10^{-5}	5.56×10^{1}	2.44×10^{-3}	1.24×10^{-5}	1.13×10^{2}	5.32×10^{-3}
Iodine-129	2.32×10^{-8}	6.61	7.52×10^{-5}	2.32×10^{-8}	7.67	1.02×10^{-4}	2.32×10^{-8}	9.47	1.46×10^{-4}
Total	1.60×10^{-5}	2.87×10^{1}	8.23×10^{-4}	1.60×10^{-5}	6.39×10^{1}	2.55×10^{-3}	1.60×10^{-5}	1.24×10^{2}	5.48×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	6.23×10^{-2}	5.93×10^{-1}	0.00	6.23×10^{-2}	5.94×10^{-1}	2.45×10^{-10}	6.23×10^{-2}	8.67×10^{-1}	1.12×10^{-5}
Nitrate	4.17	7.45×10^{-2}	0.00	4.17	9.81×10^{-2}	0.00	4.17	1.92×10^{-1}	0.00
Total	4.23	6.67×10^{-1}	0.00	4.23	6.92×10^{-1}	2.45×10^{-10}	4.23	1.06	1.12×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–110. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	6.96×10^{-8}	8.13×10^{-3}	7.73×10^{-8}	6.96×10^{-8}	1.29×10^{-2}	1.35×10^{-7}	6.96×10^{-8}	2.38×10^{-2}	2.70×10^{-7}
Technetium-99	2.05×10^{-6}	3.58	1.23×10^{-4}	2.05×10^{-6}	9.20	4.04×10^{-4}	2.05×10^{-6}	1.88×10^{1}	8.82×10^{-4}
Iodine-129	1.53×10^{-8}	4.35	4.95×10^{-5}	1.53×10^{-8}	5.05	6.69×10^{-5}	1.53×10^{-8}	6.24	9.63×10^{-5}
Total	2.13×10^{-6}	7.95	1.73×10^{-4}	2.13×10^{-6}	1.43×10^{1}	4.71×10^{-4}	2.13×10^{-6}	2.50×10^{1}	9.78×10^{-4}
Year of peak impact	2048	2048	2048	2048	2048	2048	2048	2048	2048
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	9.34×10^{-2}	8.89×10^{-1}	0.00	9.34×10^{-2}	8.90×10^{-1}	3.81×10^{-10}	9.34×10^{-2}	1.30	1.75×10^{-5}
Nitrate	1.91×10^{1}	3.40×10^{-1}	0.00	1.91×10^{1}	4.48×10^{-1}	0.00	1.91×10^{1}	8.79×10^{-1}	0.00
Total	1.91×10^{1}	1.23	0.00	1.91×10^{1}	1.34	3.81×10^{-10}	1.91×10^{1}	2.18	1.75×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2051	2050	2050	2051

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–111. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.54×10^{-7}	2.97×10^{-2}	2.82×10^{-7}	2.54×10^{-7}	4.72×10^{-2}	4.94×10^{-7}	2.54×10^{-7}	8.68×10^{-2}	9.84×10^{-7}
Technetium-99	4.05×10^{-6}	7.10	2.44×10^{-4}	4.05×10^{-6}	1.82×10^{1}	8.01×10^{-4}	4.05×10^{-6}	3.71×10^{1}	1.75×10^{-3}
Iodine-129	7.58×10^{-9}	2.16	2.46×10^{-5}	7.58×10^{-9}	2.51	3.32×10^{-5}	7.58×10^{-9}	3.09	4.77×10^{-5}
Total	4.31×10^{-6}	9.29	2.69×10^{-4}	4.31×10^{-6}	2.08×10^{1}	8.34×10^{-4}	4.31×10^{-6}	4.03×10^{1}	1.80×10^{-3}
Year of peak impact	2030	2030	2030	2030	2030	2030	2030	2030	2030
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	4.21×10^{-1}	4.01	0.00	4.21×10^{-1}	4.02	1.65×10^{-9}	4.21×10^{-1}	5.87	7.59×10^{-5}
Nitrate	1.06×10^{1}	1.89×10^{-1}	0.00	1.06×10^{1}	2.49×10^{-1}	0.00	1.06×10^{1}	4.88×10^{-1}	0.00
Total	1.10×10^{1}	4.20	0.00	1.10×10^{1}	4.26	1.65×10^{-9}	1.10×10^{1}	6.36	7.59×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–112. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.31×10^{-6}	3.87×10^{-1}	3.68×10^{-6}	3.31×10^{-6}	6.16×10^{-1}	6.43×10^{-6}	3.31×10^{-6}	1.13	1.28×10^{-5}
Technetium-99	2.36×10^{-5}	4.13×10^{1}	1.42×10^{-3}	2.36×10^{-5}	1.06×10^{2}	4.66×10^{-3}	2.36×10^{-5}	2.16×10^{2}	1.02×10^{-2}
Iodine-129	2.06×10^{-8}	5.87	6.69×10^{-5}	2.06×10^{-8}	6.82	9.03×10^{-5}	2.06×10^{-8}	8.42	1.30×10^{-4}
Total	2.69×10^{-5}	4.76×10^{1}	1.49×10^{-3}	2.69×10^{-5}	1.14×10^{2}	4.76×10^{-3}	2.69×10^{-5}	2.26×10^{2}	1.03×10^{-2}
Year of peak impact	2027	2027	2027	2027	2027	2027	2027	2027	2027
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	5.27×10^{-1}	5.02	0.00	5.27×10^{-1}	5.02	2.07×10^{-9}	5.27×10^{-1}	7.34	9.49×10^{-5}
Nitrate	4.03×10^{1}	7.20×10^{-1}	0.00	4.03×10^{1}	9.48×10^{-1}	0.00	4.03×10^{1}	1.86	0.00
Total	4.08×10^{1}	5.74	0.00	4.08×10^{1}	5.97	2.07×10^{-9}	4.08×10^{1}	9.20	9.49×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–113. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	0.00	0.00	0.00	0.00	0.00	2.84×10^{-8}	1.63×10^{-8}	5.58×10^{-3}	5.66×10^{-8}
Technetium-99	0.00	0.00	0.00	0.00	0.00	2.89×10^{-5}	1.45×10^{-7}	1.33	6.31×10^{-5}
Iodine-129	0.00	0.00	0.00	0.00	0.00	1.09×10^{-6}	2.77×10^{-10}	1.13×10^{-1}	1.57×10^{-6}
Uranium-238	7.97×10^{-9}	9.89×10^{-1}	1.12×10^{-5}	7.97×10^{-9}	1.03	0.00	0.00	0.00	0.00
Total	7.97×10^{-9}	9.89×10^{-1}	1.12×10^{-5}	7.97×10^{-9}	1.03	3.00×10^{-5}	1.62×10^{-7}	1.45	6.47×10^{-5}
Year of peak impact	11,750	11,750	11,750	11,750	11,750	2048	2047	2047	2048
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	1.38×10^{-2}	1.31×10^{-1}	0.00	1.38×10^{-2}	1.31×10^{-1}	5.40×10^{-11}	1.38×10^{-2}	1.92×10^{-1}	2.48×10^{-6}
Nitrate	6.02×10^{-1}	1.08×10^{-2}	0.00	6.02×10^{-1}	1.42×10^{-2}	0.00	6.02×10^{-1}	2.78×10^{-2}	0.00
Total	6.16×10^{-1}	1.42×10^{-1}	0.00	6.16×10^{-1}	1.45×10^{-1}	5.40×10^{-11}	6.16×10^{-1}	2.19×10^{-1}	2.48×10^{-6}
Year of peak impact	2025	2025	N/A	2025	2025	2025	2025	2025	2025

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–114. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks at the Core Zone Boundary

	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Radiological Constituent	**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)**
Hydrogen-3 (tritium)	2.27×10^{-7}	2.65×10^{-2}	1.57×10^{-12}	1.41×10^{-12}	2.62×10^{-7}	2.74×10^{-12}	1.41×10^{-12}	4.82×10^{-7}	5.47×10^{-12}
Technetium-99	4.94×10^{-6}	8.66	3.05×10^{-4}	5.07×10^{-6}	2.28×10^{1}	1.00×10^{-3}	5.07×10^{-6}	4.65×10^{1}	2.19×10^{-3}
Iodine-129	8.46×10^{-9}	2.41	2.28×10^{-5}	7.03×10^{-9}	2.32	3.08×10^{-5}	7.03×10^{-9}	2.87	4.43×10^{-5}
Total	5.18×10^{-6}	1.11×10^{1}	3.28×10^{-4}	5.08×10^{-6}	2.51×10^{1}	1.03×10^{-3}	5.08×10^{-6}	4.93×10^{1}	2.23×10^{-3}
Year of peak impact	2023	2023	2247	2247	2247	2247	2247	2247	2247
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	4.52×10^{-1}	4.30	0.00	4.52×10^{-1}	4.31	1.77×10^{-9}	4.52×10^{-1}	6.29	8.14×10^{-5}
Nitrate	1.07×10^{1}	1.91×10^{-1}	0.00	1.07×10^{1}	2.52×10^{-1}	0.00	1.07×10^{1}	4.94×10^{-1}	0.00
Total	1.12×10^{1}	4.49	0.00	1.12×10^{1}	4.56	1.77×10^{-9}	1.12×10^{1}	6.79	8.14×10^{-5}
Year of peak impact	2244	2244	N/A	2244	2244	2244	2244	2244	2244

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–115. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.07×10^{-11}	1.25×10^{-6}	3.15×10^{-11}	2.84×10^{-11}	5.28×10^{-6}	5.52×10^{-11}	2.84×10^{-11}	9.71×10^{-6}	1.10×10^{-10}
Technetium-99	1.17×10^{-7}	2.04×10^{-1}	7.31×10^{-6}	1.21×10^{-7}	5.46×10^{-1}	2.40×10^{-5}	1.21×10^{-7}	1.11	5.23×10^{-5}
Iodine-129	1.86×10^{-10}	5.29×10^{-2}	5.06×10^{-7}	1.56×10^{-10}	5.16×10^{-2}	6.83×10^{-7}	1.56×10^{-10}	6.37×10^{-2}	9.83×10^{-7}
Total	1.17×10^{-7}	2.57×10^{-1}	7.81×10^{-6}	1.21×10^{-7}	5.97×10^{-1}	2.46×10^{-5}	1.21×10^{-7}	1.18	5.33×10^{-5}
Year of peak impact	2171	2171	2153	2153	2153	2153	2153	2153	2153
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	4.51×10^{-3}	4.30×10^{-2}	0.00	4.51×10^{-3}	4.30×10^{-2}	1.77×10^{-11}	4.51×10^{-3}	6.28×10^{-2}	8.13×10^{-7}
Nitrate	1.82×10^{-1}	3.25×10^{-3}	0.00	1.82×10^{-1}	4.28×10^{-3}	0.00	1.82×10^{-1}	8.40×10^{-3}	0.00
Total	1.87×10^{-1}	4.62×10^{-2}	0.00	1.87×10^{-1}	4.73×10^{-2}	1.77×10^{-11}	1.87×10^{-1}	7.12×10^{-2}	8.13×10^{-7}
Year of peak impact	2182	2182	N/A	2182	2182	2503	2182	2182	2503

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–116. Tank Closure Alternative 5 Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.97×10^{-15}	3.67×10^{-10}	3.83×10^{-15}	7.75×10^{-16}	2.68×10^{-10}	3.04×10^{-15}	0.00	0.00	0.00
Technetium-99	6.42×10^{-12}	2.89×10^{-5}	1.27×10^{-9}	6.34×10^{-12}	6.59×10^{-5}	3.12×10^{-9}	1.58×10^{-8}	1.72×10^{-4}	9.47×10^{-9}
Iodine-129	1.08×10^{-14}	3.58×10^{-6}	4.75×10^{-11}	1.15×10^{-14}	6.22×10^{-5}	1.50×10^{-9}	2.09×10^{-12}	3.16×10^{-6}	7.76×10^{-11}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	6.20×10^{-10}	6.17×10^{-3}	7.80×10^{-8}
Total	6.44×10^{-12}	3.25×10^{-5}	1.32×10^{-9}	6.35×10^{-12}	1.28×10^{-4}	4.62×10^{-9}	1.65×10^{-8}	6.35×10^{-3}	8.75×10^{-8}
Year of peak impact	2134	2134	2134	2146	2146	2146	11,594	11,594	11,594
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	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	1.83×10^{-7}	1.74×10^{-6}	7.17×10^{-16}	1.70×10^{-7}	2.60×10^{-6}	3.29×10^{-11}	3.18×10^{-3}	7.03×10^{-3}	4.06×10^{-7}
Nitrate	8.71×10^{-6}	3.01×10^{-7}	0.00	1.08×10^{-5}	1.02×10^{-3}	0.00	2.78×10^{-1}	1.18×10^{-2}	0.00
Total	8.90×10^{-6}	2.04×10^{-6}	7.17×10^{-16}	1.10×10^{-5}	1.02×10^{-3}	3.29×10^{-11}	2.81×10^{-1}	1.89×10^{-2}	4.06×10^{-7}
Year of peak impact	2175	2175	2175	2163	2163	2175	2196	2196	2503

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

Table Q–117. Tank Closure Alternative 5 Human Health Impacts at the A Barrier 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	3.04×10^{-6}	5.32	1.83×10^{-4}	3.04×10^{-6}	1.37×10^{1}	6.00×10^{-4}	3.04×10^{-6}	2.78×10^{1}	1.31×10^{-3}
Iodine-129	4.79×10^{-10}	1.36×10^{-1}	1.55×10^{-6}	4.79×10^{-10}	1.58×10^{-1}	2.09×10^{-6}	4.79×10^{-10}	1.95×10^{-1}	3.02×10^{-6}
Total	3.04×10^{-6}	5.46	1.84×10^{-4}	3.04×10^{-6}	1.38×10^{1}	6.02×10^{-4}	3.04×10^{-6}	2.80×10^{1}	1.31×10^{-3}
Year of peak impact	4338	4338	4338	4338	4338	4338	4338	4338	4338
	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Chemical Constituent	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	6.50×10^{-3}	3.10×10^{-2}	0.00	6.50×10^{-3}	3.86×10^{-2}	0.00	6.50×10^{-3}	6.98×10^{-2}	0.00
Chromium	2.90×10^{-2}	2.76×10^{-1}	0.00	2.90×10^{-2}	2.77×10^{-1}	1.14×10^{-10}	2.90×10^{-2}	4.04×10^{-1}	5.23×10^{-6}
Nitrate	5.52	9.85×10^{-2}	0.00	5.52	1.30×10^{-1}	0.00	5.52	2.55×10^{-1}	0.00
Total	5.55	4.06×10^{-1}	4.90×10^{-13}	5.55	4.45×10^{-1}	1.14×10^{-10}	5.55	7.28×10^{-1}	5.23×10^{-6}
Year of peak impact	4094	4094	11,755	4094	4094	4094	4094	4094	4094

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

Table Q–118. Tank Closure Alternative 5 Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	4.45×10^{-7}	5.20×10^{-2}	4.94×10^{-7}	4.45×10^{-7}	8.27×10^{-2}	8.64×10^{-7}	4.45×10^{-7}	1.52×10^{-1}	1.72×10^{-6}
Technetium-99	2.25×10^{-5}	3.95×10^{1}	1.36×10^{-3}	2.25×10^{-5}	1.01×10^{2}	4.45×10^{-3}	2.25×10^{-5}	2.06×10^{2}	9.71×10^{-3}
Iodine-129	3.55×10^{-8}	1.01×10^{1}	1.15×10^{-4}	3.55×10^{-8}	1.17×10^{1}	1.55×10^{-4}	3.55×10^{-8}	1.45×10^{1}	2.24×10^{-4}
Total	2.30×10^{-5}	4.96×10^{1}	1.47×10^{-3}	2.30×10^{-5}	1.13×10^{2}	4.61×10^{-3}	2.30×10^{-5}	2.21×10^{2}	9.93×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	3.18	3.03×10^{1}	0.00	3.18	3.03×10^{1}	1.26×10^{-8}	3.18	4.43×10^{1}	5.77×10^{-4}
Nitrate	1.54×10^{3}	2.76×10^{1}	0.00	1.54×10^{3}	3.63×10^{1}	0.00	1.54×10^{3}	7.12×10^{1}	0.00
Total	1.55×10^{3}	5.79×10^{1}	0.00	1.55×10^{3}	6.66×10^{1}	1.26×10^{-8}	1.55×10^{3}	1.16×10^{2}	5.77×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2055	2050	2050	2055

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–119. Tank Closure Alternative 5 Human Health Impacts at the S Barrier 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	3.34×10^{-6}	5.85	2.01×10^{-4}	3.34×10^{-6}	1.50×10^{1}	6.59×10^{-4}	3.34×10^{-6}	3.06×10^{1}	1.44×10^{-3}
Iodine-129	6.93×10^{-10}	1.97×10^{-1}	2.25×10^{-6}	6.93×10^{-10}	2.29×10^{-1}	3.03×10^{-6}	6.93×10^{-10}	2.83×10^{-1}	4.37×10^{-6}
Total	3.34×10^{-6}	6.04	2.03×10^{-4}	3.34×10^{-6}	1.52×10^{1}	6.62×10^{-4}	3.34×10^{-6}	3.09×10^{1}	1.44×10^{-3}
Year of peak impact	3931	3931	3931	3931	3931	3931	3931	3931	3931
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	2.89×10^{-1}	2.75	0.00	2.89×10^{-1}	2.76	1.14×10^{-9}	2.89×10^{-1}	4.03	5.21×10^{-5}
Nitrate	8.72	1.56×10^{-1}	0.00	8.72	2.05×10^{-1}	0.00	8.72	4.02×10^{-1}	0.00
Total	9.00	2.91	3.37×10^{-13}	9.00	2.96	1.14×10^{-9}	9.00	4.43	5.21×10^{-5}
Year of peak impact	2050	2050	11,776	2050	2050	2050	2050	2050	2050

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

Table Q–120. Tank Closure Alternative 5 Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	5.14×10^{-6}	6.00×10^{-1}	3.44×10^{-6}	3.10×10^{-6}	5.76×10^{-1}	6.02×10^{-6}	3.10×10^{-6}	1.06	1.20×10^{-5}
Technetium-99	1.52×10^{-5}	2.66×10^{1}	9.23×10^{-4}	1.53×10^{-5}	6.89×10^{1}	3.03×10^{-3}	1.53×10^{-5}	1.40×10^{2}	6.60×10^{-3}
Iodine-129	1.89×10^{-8}	5.39	5.94×10^{-5}	1.83×10^{-8}	6.05	8.01×10^{-5}	1.83×10^{-8}	7.48	1.15×10^{-4}
Uranium-238	1.62×10^{-10}	2.01×10^{-2}	2.16×10^{-7}	1.54×10^{-10}	1.99×10^{-2}	2.31×10^{-7}	1.54×10^{-10}	2.13×10^{-2}	2.62×10^{-7}
Total	2.03×10^{-5}	3.26×10^{1}	9.86×10^{-4}	1.84×10^{-5}	7.56×10^{1}	3.11×10^{-3}	1.84×10^{-5}	1.49×10^{2}	6.73×10^{-3}
Year of peak impact	2051	2051	2050	2050	2050	2050	2050	2050	2050
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	7.82×10^{-1}	7.45	0.00	7.82×10^{-1}	7.45	3.07×10^{-9}	7.82×10^{-1}	1.09×10^{1}	1.41×10^{-4}
Nitrate	1.30×10^{2}	2.33	0.00	1.30×10^{2}	3.06	0.00	1.30×10^{2}	6.01	0.00
Total uranium	1.85×10^{-4}	1.76×10^{-3}	0.00	1.85×10^{-4}	1.78×10^{-3}	0.00	1.85×10^{-4}	1.85×10^{-3}	0.00
Total	1.31×10^{2}	9.77	0.00	1.31×10^{2}	1.05×10^{1}	3.07×10^{-9}	1.31×10^{2}	1.69×10^{1}	1.41×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–121. Tank Closure Alternative 5 Human Health Impacts at the U Barrier 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	1.78×10^{-6}	3.11	1.07×10^{-4}	1.78×10^{-6}	7.99	3.51×10^{-4}	1.78×10^{-6}	1.63×10^{1}	7.65×10^{-4}
Iodine-129	4.34×10^{-10}	1.23×10^{-1}	1.41×10^{-6}	4.34×10^{-10}	1.43×10^{-1}	1.90×10^{-6}	4.34×10^{-10}	1.77×10^{-1}	2.73×10^{-6}
Total	1.78×10^{-6}	3.24	1.08×10^{-4}	1.78×10^{-6}	8.13	3.53×10^{-4}	1.78×10^{-6}	1.65×10^{1}	7.68×10^{-4}
Year of peak impact	4022	4022	4022	4022	4022	4022	4022	4022	4022
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.48×10^{-2}	3.31×10^{-1}	0.00	3.48×10^{-2}	3.32×10^{-1}	1.41×10^{-10}	3.48×10^{-2}	4.84×10^{-1}	6.45×10^{-6}
Nitrate	3.90	6.96×10^{-2}	0.00	3.90	9.17×10^{-2}	0.00	3.90	1.80×10^{-1}	0.00
Total	3.93	4.01×10^{-1}	0.00	3.93	4.23×10^{-1}	1.41×10^{-10}	3.93	6.64×10^{-1}	6.45×10^{-6}
Year of peak impact	3869	3869	N/A	3869	3869	3847	3869	3869	3847

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–122. Tank Closure Alternative 5 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	3.57×10^{-5}	6.26×10^{1}	2.15×10^{-3}	3.57×10^{-5}	1.61×10^{2}	7.06×10^{-3}	3.57×10^{-5}	3.28×10^{2}	1.54×10^{-2}
Iodine-129	8.48×10^{-9}	2.41	2.75×10^{-5}	8.48×10^{-9}	2.80	3.71×10^{-5}	8.48×10^{-9}	3.46	5.34×10^{-5}
Uranium-238	1.14×10^{-11}	1.42×10^{-3}	1.60×10^{-8}	1.14×10^{-11}	1.47×10^{-3}	1.71×10^{-8}	1.14×10^{-11}	1.58×10^{-3}	1.94×10^{-8}
Total	3.58×10^{-5}	6.50×10^{1}	2.18×10^{-3}	3.58×10^{-5}	1.64×10^{2}	7.10×10^{-3}	3.58×10^{-5}	3.31×10^{2}	1.55×10^{-2}
Year of peak impact	4326	4326	4326	4326	4326	4326	4326	4326	4326
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	1.65	1.57×10^{1}	0.00	1.65	1.58×10^{1}	6.79×10^{-9}	1.65	2.30×10^{1}	3.11×10^{-4}
Nitrate	1.01×10^{3}	1.80×10^{1}	0.00	1.01×10^{3}	2.38×10^{1}	0.00	1.01×10^{3}	4.66×10^{1}	0.00
Total	1.01×10^{3}	3.38×10^{1}	4.72×10^{-13}	1.01×10^{3}	3.95×10^{1}	6.79×10^{-9}	1.01×10^{3}	6.96×10^{1}	3.11×10^{-4}
Year of peak impact	2050	2050	11,848	2050	2050	3891	2050	2050	3891

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

Table Q–123. Tank Closure Alternative 5 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	7.24×10^{-7}	1.27	4.36×10^{-5}	7.24×10^{-7}	3.26	1.43×10^{-4}	7.24×10^{-7}	6.64	3.12×10^{-4}
Iodine-129	3.43×10^{-10}	9.78×10^{-2}	1.11×10^{-6}	3.43×10^{-10}	1.14×10^{-1}	1.50×10^{-6}	3.43×10^{-10}	1.40×10^{-1}	2.16×10^{-6}
Uranium-238	5.38×10^{-13}	6.68×10^{-5}	7.54×10^{-10}	5.38×10^{-13}	6.93×10^{-5}	8.08×10^{-10}	5.38×10^{-13}	7.43×10^{-5}	9.14×10^{-10}
Total	7.25×10^{-7}	1.37	4.47×10^{-5}	7.25×10^{-7}	3.37	1.45×10^{-4}	7.25×10^{-7}	6.78	3.14×10^{-4}
Year of peak impact	5017	5017	5017	5017	5017	5017	5017	5017	5017
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	3.48×10^{-2}	3.31×10^{-1}	0.00	3.48×10^{-2}	3.31×10^{-1}	1.37×10^{-10}	3.48×10^{-2}	4.84×10^{-1}	6.26×10^{-6}
Nitrate	6.28	1.12×10^{-1}	0.00	6.28	1.48×10^{-1}	0.00	6.28	2.90×10^{-1}	0.00
Total	6.31	4.43×10^{-1}	7.09×10^{-15}	6.31	4.79×10^{-1}	1.37×10^{-10}	6.31	7.74×10^{-1}	6.26×10^{-6}
Year of peak impact	2695	2695	11,707	2695	2695	2695	2695	2695	2695

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

Table Q–124. Tank Closure Alternative 5 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)
Hydrogen-3 (tritium)	6.83×10^{-18}	1.27×10^{-12}	1.33×10^{-17}	6.83×10^{-18}	2.36×10^{-12}	2.68×10^{-17}	1.78×10^{-7}	5.61×10^{-2}	6.89×10^{-7}
Technetium-99	1.48×10^{-11}	6.67×10^{-5}	2.93×10^{-9}	1.48×10^{-11}	1.54×10^{-4}	7.30×10^{-9}	4.47×10^{-8}	5.06×10^{-4}	2.76×10^{-8}
Iodine-129	3.28×10^{-15}	1.09×10^{-6}	1.44×10^{-11}	3.28×10^{-15}	1.77×10^{-5}	4.26×10^{-10}	5.93×10^{-11}	1.57×10^{-4}	3.83×10^{-9}
Uranium-238	5.39×10^{-18}	6.94×10^{-10}	8.09×10^{-15}	5.39×10^{-18}	1.92×10^{-9}	2.71×10^{-14}	0.00	0.00	0.00
Total	1.48×10^{-11}	6.78×10^{-5}	2.94×10^{-9}	1.48×10^{-11}	1.72×10^{-4}	7.73×10^{-9}	2.23×10^{-7}	5.68×10^{-2}	7.20×10^{-7}
Year of peak impact	4635	4635	4635	4635	4635	4635	2050	2050	2050
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	9.45×10^{-7}	9.01×10^{-6}	3.97×10^{-15}	9.45×10^{-7}	1.44×10^{-5}	1.82×10^{-10}	2.54×10^{-2}	5.60×10^{-2}	3.13×10^{-6}
Nitrate	2.94×10^{-4}	1.02×10^{-5}	0.00	2.94×10^{-4}	2.76×10^{-2}	0.00	8.75	3.38×10^{-1}	0.00
Total uranium	0.00	0.00	0.00	0.00	0.00	0.00	4.20×10^{-12}	1.14×10^{-10}	0.00
Total	2.95×10^{-4}	1.92×10^{-5}	3.97×10^{-15}	2.95×10^{-4}	2.77×10^{-2}	1.82×10^{-10}	8.77	3.94×10^{-1}	3.13×10^{-6}
Year of peak impact	2067	2067	2074	2067	2067	2074	2450	2450	2695

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

Figure Q–6 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, other sources, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2250 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from all three sources occurs around the year 4320 and is dominated by technetium-99, iodine-129, and uranium-238. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

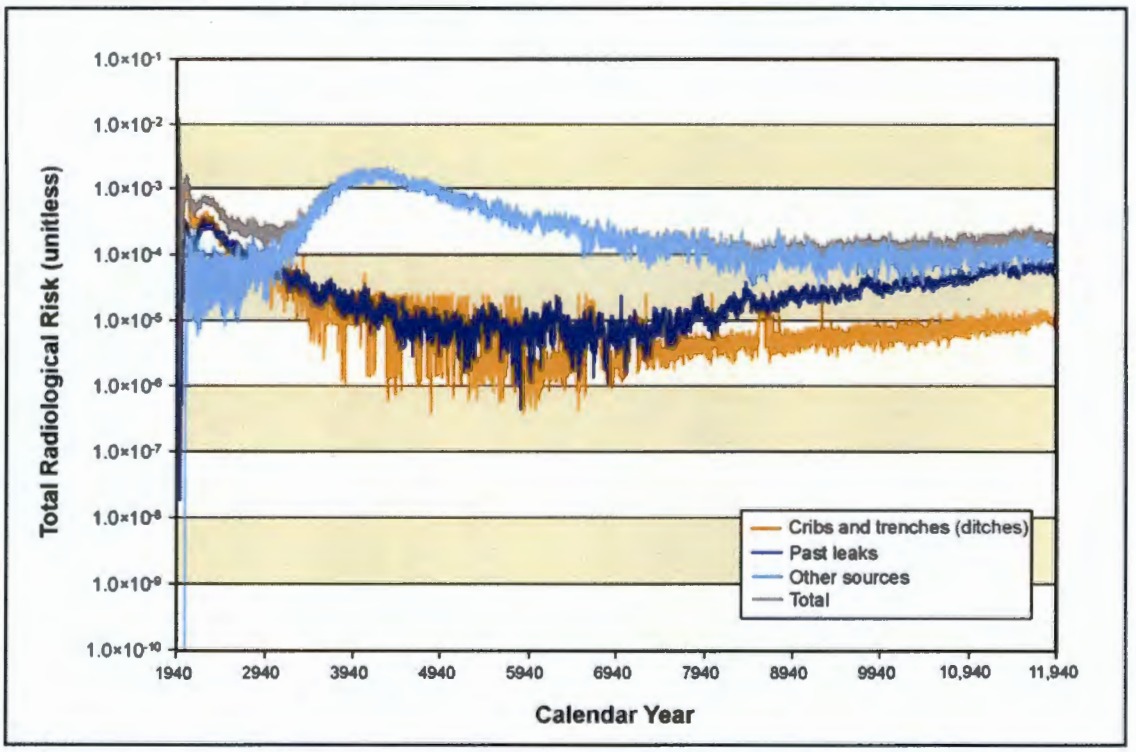

Figure Q–6. Tank Closure Alternative 5 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.6 Tank Closure Alternative 6A, Base and Option Cases

Under Tank Closure Alternative 6A, Base Case, tank waste would be retrieved to a volume corresponding to 99.9 percent retrieval, all tanks farms would be clean closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. The adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier. Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–125 through Q–129. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–130 through Q–137. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–138 through Q–145.

Table Q–125. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.08×10^{1}	4.84×10^{2}	0.00	5.08×10^{1}	4.85×10^{2}	2.00×10^{-7}	5.08×10^{1}	7.08×10^{2}	9.16×10^{-3}
Nitrate	1.74×10^{4}	3.11×10^{2}	0.00	1.74×10^{4}	4.10×10^{2}	0.00	1.74×10^{4}	8.03×10^{2}	0.00
Total	1.75×10^{4}	7.95×10^{2}	0.00	1.75×10^{4}	8.94×10^{2}	2.00×10^{-7}	1.75×10^{4}	1.51×10^{3}	9.16×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–126. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.84×10^{-2}
Technetium-99	1.35×10^{-7}	2.36×10^{-1}	8.12×10^{-6}	1.35×10^{-7}	6.07×10^{-1}	2.66×10^{-5}	1.35×10^{-7}	1.24	5.81×10^{-5}
Iodine-129	1.14×10^{-9}	3.25×10^{-1}	3.71×10^{-6}	1.14×10^{-9}	3.78×10^{-1}	5.00×10^{-6}	1.14×10^{-9}	4.67×10^{-1}	7.20×10^{-6}
Uranium-238	1.18×10^{-11}	1.46×10^{-3}	1.65×10^{-8}	1.18×10^{-11}	1.52×10^{-3}	1.77×10^{-8}	1.18×10^{-11}	1.62×10^{-3}	2.00×10^{-8}
Total	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.85×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.32	8.88×10^{1}	0.00	9.32	8.89×10^{1}	3.66×10^{-8}	9.32	1.30×10^{2}	1.68×10^{-3}
Nitrate	2.11×10^{3}	3.77×10^{1}	0.00	2.11×10^{3}	4.97×10^{1}	0.00	2.11×10^{3}	9.74×10^{1}	0.00
Total	2.12×10^{3}	1.27×10^{2}	0.00	2.12×10^{3}	1.39×10^{2}	3.66×10^{-8}	2.12×10^{3}	2.27×10^{2}	1.68×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–127. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.80×10^{1}	2.67×10^{2}	0.00	2.80×10^{1}	2.67×10^{2}	1.10×10^{-7}	2.80×10^{1}	3.91×10^{2}	5.05×10^{-3}
Nitrate	1.29×10^{4}	2.30×10^{2}	0.00	1.29×10^{4}	3.03×10^{2}	0.00	1.29×10^{4}	5.95×10^{2}	0.00
Total	1.29×10^{4}	4.97×10^{2}	0.00	1.29×10^{4}	5.70×10^{2}	1.10×10^{-7}	1.29×10^{4}	9.85×10^{2}	5.05×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–128. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.46×10^{-7}	4.04×10^{-2}	3.84×10^{-7}	3.46×10^{-7}	6.43×10^{-2}	6.72×10^{-7}	3.46×10^{-7}	1.18×10^{-1}	1.34×10^{-6}
Technetium-99	8.94×10^{-8}	1.57×10^{-1}	5.38×10^{-6}	8.94×10^{-8}	4.02×10^{-1}	1.77×10^{-5}	8.94×10^{-8}	8.19×10^{-1}	3.85×10^{-5}
Iodine-129	3.88×10^{-11}	1.10×10^{-2}	1.26×10^{-7}	3.88×10^{-11}	1.28×10^{-2}	1.70×10^{-7}	3.88×10^{-11}	1.58×10^{-2}	2.44×10^{-7}
Total	4.35×10^{-7}	2.08×10^{-1}	5.89×10^{-6}	4.35×10^{-7}	4.79×10^{-1}	1.85×10^{-5}	4.35×10^{-7}	9.53×10^{-1}	4.01×10^{-5}
Year of peak impact	2025	2025	2025	2025	2025	2025	2025	2025	2025
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.14×10^{-2}	2.99×10^{-1}	0.00	3.14×10^{-2}	2.99×10^{-1}	1.23×10^{-10}	3.14×10^{-2}	4.37×10^{-1}	5.66×10^{-6}
Nitrate	5.75	1.03×10^{-1}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.78	4.02×10^{-1}	0.00	5.78	4.35×10^{-1}	1.23×10^{-10}	5.78	7.03×10^{-1}	5.66×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–129. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.62×10^{-5}	6.92×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.28×10^{-6}	4.04×10^{-1}	4.96×10^{-6}
Technetium-99	2.53×10^{-11}	1.14×10^{-4}	4.99×10^{-9}	2.53×10^{-11}	2.63×10^{-4}	1.24×10^{-8}	2.55×10^{-8}	2.99×10^{-4}	1.62×10^{-8}
Iodine-129	3.20×10^{-14}	1.06×10^{-5}	1.41×10^{-10}	3.20×10^{-14}	1.73×10^{-4}	4.16×10^{-9}	3.57×10^{-11}	1.09×10^{-4}	2.65×10^{-9}
Total	3.82×10^{-10}	1.91×10^{-4}	5.83×10^{-9}	3.82×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.31×10^{-6}	4.04×10^{-1}	4.97×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1994	1994	1994
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	8.95×10^{-6}	8.53×10^{-5}	3.52×10^{-14}	8.95×10^{-6}	1.37×10^{-4}	1.61×10^{-9}	2.24×10^{-2}	4.97×10^{-2}	2.83×10^{-6}
Nitrate	2.24×10^{-3}	7.74×10^{-5}	0.00	2.24×10^{-3}	2.11×10^{-1}	0.00	4.36	6.64×10^{-1}	0.00
Total	2.25×10^{-3}	1.63×10^{-4}	3.52×10^{-14}	2.25×10^{-3}	2.11×10^{-1}	1.61×10^{-9}	4.38	7.14×10^{-1}	2.83×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2695

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

Table Q–130. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.58×10^{-6}	4.18×10^{-1}	3.97×10^{-6}	3.58×10^{-6}	6.65×10^{-1}	6.95×10^{-6}	3.58×10^{-6}	1.22	1.39×10^{-5}
Technetium-99	1.20×10^{-5}	2.09×10^{1}	7.20×10^{-4}	1.20×10^{-5}	5.38×10^{1}	2.36×10^{-3}	1.20×10^{-5}	1.10×10^{2}	5.15×10^{-3}
Iodine-129	2.33×10^{-8}	6.62	7.54×10^{-5}	2.33×10^{-8}	7.69	1.02×10^{-4}	2.33×10^{-8}	9.49	1.46×10^{-4}
Total	1.56×10^{-5}	2.80×10^{1}	7.99×10^{-4}	1.56×10^{-5}	6.21×10^{1}	2.47×10^{-3}	1.56×10^{-5}	1.20×10^{2}	5.31×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	6.08×10^{-2}	5.80×10^{-1}	0.00	6.08×10^{-2}	5.80×10^{-1}	2.39×10^{-10}	6.08×10^{-2}	8.48×10^{-1}	1.10×10^{-5}
Nitrate	4.33	7.74×10^{-2}	0.00	4.33	1.02×10^{-1}	0.00	4.33	2.00×10^{-1}	0.00
Total	4.40	6.57×10^{-1}	0.00	4.40	6.82×10^{-1}	2.39×10^{-10}	4.40	1.05	1.10×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–131. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	6.87×10^{-8}	8.02×10^{-3}	7.63×10^{-8}	6.87×10^{-8}	1.28×10^{-2}	1.33×10^{-7}	6.87×10^{-8}	2.35×10^{-2}	2.66×10^{-7}
Technetium-99	8.32×10^{-6}	1.46×10^{1}	5.01×10^{-4}	8.32×10^{-6}	3.74×10^{1}	1.64×10^{-3}	8.32×10^{-6}	7.63×10^{1}	3.59×10^{-3}
Iodine-129	1.69×10^{-8}	4.80	5.47×10^{-5}	1.69×10^{-8}	5.58	7.38×10^{-5}	1.69×10^{-8}	6.89	1.06×10^{-4}
Total	8.41×10^{-6}	1.94×10^{1}	5.56×10^{-4}	8.41×10^{-6}	4.30×10^{1}	1.72×10^{-3}	8.41×10^{-6}	8.32×10^{1}	3.69×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	9.02×10^{-2}	8.59×10^{-1}	0.00	9.02×10^{-2}	8.60×10^{-1}	3.64×10^{-10}	9.02×10^{-2}	1.26	1.67×10^{-5}
Nitrate	1.79×10^{1}	3.20×10^{-1}	0.00	1.79×10^{1}	4.22×10^{-1}	0.00	1.79×10^{1}	8.28×10^{-1}	0.00
Total	1.80×10^{1}	1.18	0.00	1.80×10^{1}	1.28	3.64×10^{-10}	1.80×10^{1}	2.08	1.67×10^{-5}
Year of peak impact	2047	2047	N/A	2047	2047	2048	2047	2047	2048

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–132. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.93×10^{-7}	3.42×10^{-2}	3.25×10^{-7}	2.93×10^{-7}	5.45×10^{-2}	5.69×10^{-7}	2.93×10^{-7}	1.00×10^{-1}	1.13×10^{-6}
Technetium-99	3.96×10^{-6}	6.94	2.39×10^{-4}	3.96×10^{-6}	1.78×10^{1}	7.83×10^{-4}	3.96×10^{-6}	3.63×10^{1}	1.71×10^{-3}
Iodine-129	7.95×10^{-9}	2.26	2.58×10^{-5}	7.95×10^{-9}	2.63	3.48×10^{-5}	7.95×10^{-9}	3.25	5.01×10^{-5}
Total	4.26×10^{-6}	9.24	2.65×10^{-4}	4.26×10^{-6}	2.05×10^{1}	8.18×10^{-4}	4.26×10^{-6}	3.97×10^{1}	1.76×10^{-3}
Year of peak impact	2027	2027	2027	2027	2027	2027	2027	2027	2027
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	3.97×10^{-1}	3.79	0.00	3.97×10^{-1}	3.79	1.56×10^{-9}	3.97×10^{-1}	5.54	7.16×10^{-5}
Nitrate	1.12×10^{1}	2.00×10^{-1}	0.00	1.12×10^{1}	2.64×10^{-1}	0.00	1.12×10^{1}	5.17×10^{-1}	0.00
Total	1.16×10^{1}	3.99	0.00	1.16×10^{1}	4.05	1.56×10^{-9}	1.16×10^{1}	6.05	7.16×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–133. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.20×10^{-6}	3.74×10^{-1}	3.56×10^{-6}	3.20×10^{-6}	5.95×10^{-1}	6.22×10^{-6}	3.20×10^{-6}	1.09	1.24×10^{-5}
Technetium-99	2.28×10^{-5}	3.99×10^{1}	1.37×10^{-3}	2.28×10^{-5}	1.02×10^{2}	4.50×10^{-3}	2.28×10^{-5}	2.09×10^{2}	9.81×10^{-3}
Iodine-129	4.29×10^{-8}	1.22×10^{1}	1.39×10^{-4}	4.29×10^{-8}	1.42×10^{1}	1.88×10^{-4}	4.29×10^{-8}	1.75×10^{1}	2.70×10^{-4}
Total	2.60×10^{-5}	5.25×10^{1}	1.51×10^{-3}	2.60×10^{-5}	1.17×10^{2}	4.69×10^{-3}	2.60×10^{-5}	2.27×10^{2}	1.01×10^{-2}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	5.33×10^{-1}	5.07	0.00	5.33×10^{-1}	5.08	2.09×10^{-9}	5.33×10^{-1}	7.42	9.59×10^{-5}
Nitrate	3.94×10^{1}	7.04×10^{-1}	0.00	3.94×10^{1}	9.27×10^{-1}	0.00	3.94×10^{1}	1.82	0.00
Total	4.00×10^{1}	5.78	0.00	4.00×10^{1}	6.00	2.09×10^{-9}	4.00×10^{1}	9.24	9.59×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–134. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	5.33×10^{-9}	6.23×10^{-4}	5.92×10^{-9}	5.33×10^{-9}	9.92×10^{-4}	1.04×10^{-8}	5.33×10^{-9}	1.82×10^{-3}	2.07×10^{-8}
Technetium-99	1.50×10^{-7}	2.63×10^{-1}	9.05×10^{-6}	1.50×10^{-7}	6.76×10^{-1}	2.97×10^{-5}	1.50×10^{-7}	1.38	6.48×10^{-5}
Iodine-129	2.65×10^{-10}	7.53×10^{-2}	8.58×10^{-7}	2.65×10^{-10}	8.74×10^{-2}	1.16×10^{-6}	2.65×10^{-10}	1.08×10^{-1}	1.67×10^{-6}
Total	1.56×10^{-7}	3.39×10^{-1}	9.91×10^{-6}	1.56×10^{-7}	7.64×10^{-1}	3.09×10^{-5}	1.56×10^{-7}	1.49	6.64×10^{-5}
Year of peak impact	2064	2064	2064	2064	2064	2064	2064	2064	2064
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	1.30×10^{-2}	1.24×10^{-1}	0.00	1.30×10^{-2}	1.24×10^{-1}	5.15×10^{-11}	1.30×10^{-2}	1.82×10^{-1}	2.36×10^{-6}
Nitrate	6.84×10^{-1}	1.22×10^{-2}	0.00	6.84×10^{-1}	1.61×10^{-2}	0.00	6.84×10^{-1}	3.15×10^{-2}	0.00
Total	6.97×10^{-1}	1.36×10^{-1}	0.00	6.97×10^{-1}	1.40×10^{-1}	5.15×10^{-11}	6.97×10^{-1}	2.13×10^{-1}	2.36×10^{-6}
Year of peak impact	2026	2026	N/A	2026	2026	2024	2026	2026	2024

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–135. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	7.06×10^{-13}	8.25×10^{-8}	9.04×10^{-14}	8.14×10^{-14}	1.51×10^{-8}	1.58×10^{-13}	8.14×10^{-14}	2.78×10^{-8}	3.15×10^{-13}
Technetium-99	4.76×10^{-6}	8.33	2.96×10^{-4}	4.92×10^{-6}	2.21×10^{1}	9.71×10^{-4}	4.92×10^{-6}	4.51×10^{1}	2.12×10^{-3}
Iodine-129	9.31×10^{-9}	2.65	2.48×10^{-5}	7.65×10^{-9}	2.53	3.34×10^{-5}	7.65×10^{-9}	3.12	4.82×10^{-5}
Total	4.76×10^{-6}	1.10×10^{1}	3.21×10^{-4}	4.92×10^{-6}	2.46×10^{1}	1.00×10^{-3}	4.92×10^{-6}	4.82×10^{1}	2.17×10^{-3}
Year of peak impact	2257	2257	2292	2292	2292	2292	2292	2292	2292
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	4.01×10^{-1}	3.82	0.00	4.01×10^{-1}	3.83	1.58×10^{-9}	4.01×10^{-1}	5.59	7.23×10^{-5}
Nitrate	1.22×10^{1}	2.18×10^{-1}	0.00	1.22×10^{1}	2.87×10^{-1}	0.00	1.22×10^{1}	5.63×10^{-1}	0.00
Total uranium	2.50×10^{-10}	2.39×10^{-9}	0.00	2.50×10^{-10}	2.41×10^{-9}	0.00	2.50×10^{-10}	2.50×10^{-9}	0.00
Total	1.26×10^{1}	4.04	0.00	1.26×10^{1}	4.11	1.58×10^{-9}	1.26×10^{1}	6.15	7.23×10^{-5}
Year of peak impact	2251	2251	N/A	2251	2251	2251	2251	2251	2251

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–136. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks 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	1.47×10^{-7}	2.57×10^{-1}	8.85×10^{-6}	1.47×10^{-7}	6.61×10^{-1}	2.90×10^{-5}	1.47×10^{-7}	1.35	6.33×10^{-5}
Iodine-129	1.63×10^{-10}	4.63×10^{-2}	5.27×10^{-7}	1.63×10^{-10}	5.37×10^{-2}	7.12×10^{-7}	1.63×10^{-10}	6.64×10^{-2}	1.02×10^{-6}
Total	1.47×10^{-7}	3.04×10^{-1}	9.37×10^{-6}	1.47×10^{-7}	7.15×10^{-1}	2.97×10^{-5}	1.47×10^{-7}	1.41	6.43×10^{-5}
Year of peak impact	2502	2502	2502	2502	2502	2502	2502	2502	2502
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	4.04×10^{-3}	3.85×10^{-2}	0.00	4.04×10^{-3}	3.85×10^{-2}	1.59×10^{-11}	4.04×10^{-3}	5.63×10^{-2}	7.27×10^{-7}
Nitrate	1.83×10^{-1}	3.27×10^{-3}	0.00	1.83×10^{-1}	4.30×10^{-3}	0.00	1.83×10^{-1}	8.44×10^{-3}	0.00
Total	1.87×10^{-1}	4.17×10^{-2}	0.00	1.87×10^{-1}	4.28×10^{-2}	1.59×10^{-11}	1.87×10^{-1}	6.47×10^{-2}	7.27×10^{-7}
Year of peak impact	2413	2413	N/A	2413	2413	2413	2413	2413	2413

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–137. Tank Closure Alternative 6A, Base Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.84×10^{-15}	3.43×10^{-10}	3.58×10^{-15}	1.84×10^{-15}	6.38×10^{-10}	7.24×10^{-15}	7.37×10^{-12}	2.32×10^{-6}	4.60×10^{-17}
Technetium-99	6.67×10^{-12}	3.00×10^{-5}	1.32×10^{-9}	6.67×10^{-12}	6.93×10^{-5}	3.28×10^{-9}	1.36×10^{-7}	1.52×10^{-3}	8.82×10^{-8}
Iodine-129	1.19×10^{-14}	3.93×10^{-6}	5.21×10^{-11}	1.19×10^{-14}	6.41×10^{-5}	1.54×10^{-9}	1.48×10^{-10}	3.64×10^{-4}	6.63×10^{-9}
Total	6.68×10^{-12}	3.39×10^{-5}	1.37×10^{-9}	6.68×10^{-12}	1.33×10^{-4}	4.83×10^{-9}	1.36×10^{-7}	1.89×10^{-3}	9.48×10^{-8}
Year of peak impact	2134	2134	2134	2134	2134	2134	2153	2153	2502
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	1.96×10^{-07}	1.86×10^{-06}	7.68×10^{-16}	1.74×10^{-7}	2.65×10^{-6}	3.52×10^{-11}	4.04×10^{-3}	8.91×10^{-3}	3.64×10^{-7}
Nitrate	1.03×10^{-5}	3.55×10^{-7}	0.00	1.13×10^{-5}	1.06×10^{-3}	0.00	1.83×10^{-1}	7.28×10^{-3}	0.00
Total	1.05×10^{-5}	2.22×10^{-6}	7.68×10^{-16}	1.15×10^{-5}	1.06×10^{-3}	3.52×10^{-11}	1.87×10^{-1}	1.62×10^{-2}	3.64×10^{-7}
Year of peak impact	2168	2168	2168	2187	2187	2168	2413	2413	2413

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

Table Q–138. Tank Closure Alternative 6A, Base Case, Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	1.39×10^{-8}	1.62×10^{-3}	1.54×10^{-8}	1.39×10^{-8}	2.58×10^{-3}	3.81×10^{-8}	1.39×10^{-8}	4.74×10^{-3}	7.59×10^{-8}
Technetium-99	1.35×10^{-6}	2.36	8.12×10^{-5}	1.35×10^{-6}	6.06	2.67×10^{-4}	1.35×10^{-6}	1.24×10^{1}	5.83×10^{-4}
Iodine-129	2.36×10^{-9}	6.71×10^{-1}	7.64×10^{-6}	2.36×10^{-9}	7.79×10^{-1}	9.93×10^{-6}	2.36×10^{-9}	9.62×10^{-1}	1.43×10^{-5}
Total	1.36×10^{-6}	3.03	8.88×10^{-5}	1.36×10^{-6}	6.85	2.77×10^{-4}	1.36×10^{-6}	1.33×10^{1}	5.97×10^{-4}
Year of peak impact	2058	2058	2058	2058	2058	2056	2058	2058	2056
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	7.92×10^{-3}	7.54×10^{-2}	0.00	7.92×10^{-3}	7.55×10^{-2}	3.11×10^{-11}	7.92×10^{-3}	1.10×10^{-1}	1.43×10^{-6}
Nitrate	4.62×10^{-1}	8.24×10^{-3}	0.00	4.62×10^{-1}	1.09×10^{-2}	0.00	4.62×10^{-1}	2.13×10^{-2}	0.00
Total	4.70×10^{-1}	8.36×10^{-2}	0.00	4.70×10^{-1}	8.63×10^{-2}	3.11×10^{-11}	4.70×10^{-1}	1.32×10^{-1}	1.43×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–139. Tank Closure Alternative 6A, Base Case, Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	4.02×10^{-7}	4.70×10^{-2}	4.47×10^{-7}	4.02×10^{-7}	7.48×10^{-2}	7.82×10^{-7}	4.02×10^{-7}	1.38×10^{-1}	1.56×10^{-6}
Technetium-99	2.90×10^{-5}	5.09×10^{1}	1.75×10^{-3}	2.90×10^{-5}	1.31×10^{2}	5.74×10^{-3}	2.90×10^{-5}	2.66×10^{2}	1.25×10^{-2}
Iodine-129	3.69×10^{-8}	1.05×10^{1}	1.20×10^{-4}	3.69×10^{-8}	1.22×10^{1}	1.62×10^{-4}	3.69×10^{-8}	1.51×10^{1}	2.33×10^{-4}
Total	2.95×10^{-5}	6.15×10^{1}	1.87×10^{-3}	2.95×10^{-5}	1.43×10^{2}	5.90×10^{-3}	2.95×10^{-5}	2.81×10^{2}	1.28×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	3.18	3.02×10^{1}	0.00	3.18	3.03×10^{1}	1.25×10^{-8}	3.18	4.42×10^{1}	5.72×10^{-4}
Nitrate	1.54×10^{3}	2.75×10^{1}	0.00	1.54×10^{3}	3.62×10^{1}	0.00	1.54×10^{3}	7.11×10^{1}	0.00
Total	1.54×10^{3}	5.77×10^{1}	0.00	1.54×10^{3}	6.65×10^{1}	1.25×10^{-8}	1.54×10^{3}	1.15×10^{2}	5.72×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–140. Tank Closure Alternative 6A, Base Case, Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	5.10×10^{-8}	5.96×10^{-3}	5.67×10^{-8}	5.10×10^{-8}	9.49×10^{-3}	9.92×10^{-8}	5.10×10^{-8}	1.74×10^{-2}	1.98×10^{-7}
Technetium-99	2.68×10^{-6}	4.69	1.61×10^{-4}	2.68×10^{-6}	1.21×10^{1}	5.29×10^{-4}	2.68×10^{-6}	2.46×10^{1}	1.15×10^{-3}
Iodine-129	5.07×10^{-9}	1.44	1.64×10^{-5}	5.07×10^{-9}	1.67	2.22×10^{-5}	5.07×10^{-9}	2.07	3.19×10^{-5}
Total	2.74×10^{-6}	6.14	1.78×10^{-4}	2.74×10^{-6}	1.37×10^{1}	5.52×10^{-4}	2.74×10^{-6}	2.66×10^{1}	1.19×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.89×10^{-1}	2.75	0.00	2.89×10^{-1}	2.76	1.14×10^{-9}	2.89×10^{-1}	4.03	5.21×10^{-5}
Nitrate	8.55	1.53×10^{-1}	0.00	8.55	2.01×10^{-1}	0.00	8.55	3.94×10^{-1}	0.00
Total	8.84	2.91	0.00	8.84	2.96	1.14×10^{-9}	8.84	4.42	5.21×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–141. Tank Closure Alternative 6A, Base Case, Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	5.16×10^{-6}	6.03×10^{-1}	5.73×10^{-6}	5.16×10^{-6}	9.59×10^{-1}	1.00×10^{-5}	5.16×10^{-6}	1.76	2.00×10^{-5}
Technetium-99	1.52×10^{-5}	2.66×10^{1}	9.15×10^{-4}	1.52×10^{-5}	6.84×10^{1}	3.00×10^{-3}	1.52×10^{-5}	1.39×10^{2}	6.55×10^{-3}
Iodine-129	2.85×10^{-8}	8.10	9.22×10^{-5}	2.85×10^{-8}	9.40	1.24×10^{-4}	2.85×10^{-8}	1.16×10^{1}	1.79×10^{-4}
Uranium-238	1.62×10^{-10}	2.01×10^{-2}	2.27×10^{-7}	1.62×10^{-10}	2.08×10^{-2}	2.43×10^{-7}	1.62×10^{-10}	2.23×10^{-2}	2.75×10^{-7}
Total	2.04×10^{-5}	3.53×10^{1}	1.01×10^{-3}	2.04×10^{-5}	7.87×10^{1}	3.14×10^{-3}	2.04×10^{-5}	1.53×10^{2}	6.75×10^{-3}
Year of peak impact	2051	2051	2051	2051	2051	2051	2051	2051	2051
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	7.61×10^{-1}	7.24	0.00	7.61×10^{-1}	7.25	2.99×10^{-9}	7.61×10^{-1}	1.06×10^{1}	1.37×10^{-4}
Nitrate	1.30×10^{2}	2.32	0.00	1.30×10^{2}	3.05	0.00	1.30×10^{2}	5.99	0.00
Total uranium	1.85×10^{-4}	1.76×10^{-3}	0.00	1.85×10^{-4}	1.78×10^{-3}	0.00	1.85×10^{-4}	1.85×10^{-3}	0.00
Total	1.31×10^{2}	9.56	0.00	1.31×10^{2}	1.03×10^{1}	2.99×10^{-9}	1.31×10^{2}	1.66×10^{1}	1.37×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–142. Tank Closure Alternative 6A, Base Case, Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	5.33×10^{-9}	6.23×10^{-4}	5.92×10^{-9}	5.33×10^{-9}	9.92×10^{-4}	1.04×10^{-8}	5.33×10^{-9}	1.82×10^{-3}	2.07×10^{-8}
Technetium-99	1.50×10^{-7}	2.63×10^{-1}	9.05×10^{-6}	1.50×10^{-7}	6.76×10^{-1}	2.97×10^{-5}	1.50×10^{-7}	1.38	6.48×10^{-5}
Iodine-129	2.65×10^{-10}	7.53×10^{-2}	8.58×10^{-7}	2.65×10^{-10}	8.74×10^{-2}	1.16×10^{-6}	2.65×10^{-10}	1.08×10^{-1}	1.67×10^{-6}
Total	1.56×10^{-7}	3.39×10^{-1}	9.91×10^{-6}	1.56×10^{-7}	7.64×10^{-1}	3.09×10^{-5}	1.56×10^{-7}	1.49	6.64×10^{-5}
Year of peak impact	2064	2064	2064	2064	2064	2064	2064	2064	2064
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	9.63×10^{-3}	9.17×10^{-2}	0.00	9.63×10^{-3}	9.18×10^{-2}	3.78×10^{-11}	9.63×10^{-3}	1.34×10^{-1}	1.73×10^{-6}
Nitrate	6.28×10^{-1}	1.12×10^{-2}	0.00	6.28×10^{-1}	1.48×10^{-2}	0.00	6.28×10^{-1}	2.89×10^{-2}	0.00
Total	6.37×10^{-1}	1.03×10^{-1}	0.00	6.37×10^{-1}	1.07×10^{-1}	3.78×10^{-11}	6.37×10^{-1}	1.63×10^{-1}	1.73×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–143. Tank Closure Alternative 6A, 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)
Hydrogen-3 (tritium)	2.08×10^{-6}	2.43×10^{-1}	2.31×10^{-6}	2.08×10^{-6}	3.87×10^{-1}	4.04×10^{-6}	2.08×10^{-6}	7.11×10^{-1}	8.06×10^{-6}
Technetium-99	2.47×10^{-5}	4.32×10^{1}	1.49×10^{-3}	2.47×10^{-5}	1.11×10^{2}	4.87×10^{-3}	2.47×10^{-5}	2.26×10^{2}	1.06×10^{-2}
Iodine-129	2.80×10^{-8}	7.96	9.07×10^{-5}	2.80×10^{-8}	9.24	1.22×10^{-4}	2.80×10^{-8}	1.14×10^{1}	1.76×10^{-4}
Total	2.68×10^{-5}	5.14×10^{1}	1.58×10^{-3}	2.68×10^{-5}	1.21×10^{2}	5.00×10^{-3}	2.68×10^{-5}	2.38×10^{2}	1.08×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	1.58×10^{1}	0.00	1.66	1.58×10^{1}	6.52×10^{-9}	1.66	2.31×10^{1}	2.99×10^{-4}
Nitrate	1.01×10^{3}	1.80×10^{1}	0.00	1.01×10^{3}	2.37×10^{1}	0.00	1.01×10^{3}	4.65×10^{1}	0.00
Total	1.01×10^{3}	3.38×10^{1}	0.00	1.01×10^{3}	3.95×10^{1}	6.52×10^{-9}	1.01×10^{3}	6.97×10^{1}	2.99×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–144. Tank Closure Alternative 6A, 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	1.63×10^{-7}	2.85×10^{-1}	1.02×10^{-5}	1.69×10^{-7}	7.60×10^{-1}	3.34×10^{-5}	1.69×10^{-7}	1.55	7.28×10^{-5}
Iodine-129	2.44×10^{-10}	6.96×10^{-2}	5.51×10^{-7}	1.70×10^{-10}	5.62×10^{-2}	7.44×10^{-7}	1.70×10^{-10}	6.94×10^{-2}	1.07×10^{-6}
Uranium-238	5.36×10^{-13}	6.65×10^{-5}	7.51×10^{-10}	5.36×10^{-13}	6.90×10^{-5}	8.04×10^{-10}	5.36×10^{-13}	7.39×10^{-5}	9.09×10^{-10}
Total	1.63×10^{-7}	3.55×10^{-1}	1.07×10^{-5}	1.69×10^{-7}	8.16×10^{-1}	3.41×10^{-5}	1.69×10^{-7}	1.62	7.39×10^{-5}
Year of peak impact	2520	2520	2515	2515	2515	2515	2515	2515	2515
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	3.31×10^{-2}	3.15×10^{-1}	0.00	3.31×10^{-2}	3.16×10^{-1}	1.30×10^{-10}	3.31×10^{-2}	4.61×10^{-1}	5.97×10^{-6}
Nitrate	5.88	1.05×10^{-1}	0.00	5.88	1.38×10^{-1}	0.00	5.88	2.71×10^{-1}	0.00
Total uranium	4.42×10^{-11}	4.21×10^{-10}	0.00	4.42×10^{-11}	4.26×10^{-10}	0.00	4.42×10^{-11}	4.41×10^{-10}	0.00
Total	5.92	4.20×10^{-1}	0.00	5.92	4.54×10^{-1}	1.30×10^{-10}	5.92	7.33×10^{-1}	5.97×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–145. Tank Closure Alternative 6A, 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)
Hydrogen-3 (tritium)	2.17×10^{-13}	4.03×10^{-8}	4.21×10^{-13}	2.17×10^{-13}	7.50×10^{-8}	8.51×10^{-13}	1.78×10^{-7}	5.61×10^{-2}	6.89×10^{-7}
Technetium-99	8.17×10^{-12}	3.67×10^{-5}	1.61×10^{-9}	8.17×10^{-12}	8.49×10^{-5}	4.02×10^{-9}	4.69×10^{-8}	5.30×10^{-4}	2.89×10^{-8}
Iodine-129	1.38×10^{-14}	4.58×10^{-6}	6.08×10^{-11}	1.38×10^{-14}	7.48×10^{-5}	1.80×10^{-9}	7.36×10^{-11}	1.79×10^{-4}	4.36×10^{-9}
Total	8.40×10^{-12}	4.14×10^{-5}	1.67×10^{-9}	8.40×10^{-12}	1.60×10^{-4}	5.82×10^{-9}	2.25×10^{-7}	5.68×10^{-2}	7.22×10^{-7}
Year of peak impact	2134	2134	2134	2134	2134	2134	2050	2050	2050
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	9.51×10^{-7}	9.07×10^{-6}	3.96×10^{-15}	9.51×10^{-7}	1.45×10^{-5}	1.82×10^{-10}	2.28×10^{-2}	5.03×10^{-2}	2.98×10^{-6}
Nitrate	2.94×10^{-4}	1.02×10^{-5}	0.00	2.94×10^{-4}	2.77×10^{-2}	0.00	8.41	3.26×10^{-1}	0.00
Total uranium	0.00	0.00	0.00	0.00	0.00	0.00	8.13×10^{-12}	1.16×10^{-10}	0.00
Total	2.95×10^{-4}	1.92×10^{-5}	3.96×10^{-15}	2.95×10^{-4}	2.77×10^{-2}	1.82×10^{-10}	8.43	3.76×10^{-1}	2.98×10^{-6}
Year of peak impact	2067	2067	2066	2067	2067	2066	2450	2450	2695

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

The dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternative 2A, 2B, 3A, 3B, 3C, 4, and 5 for releases from cribs and trenches (ditches). The dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternative 2B, 3A, 3B, 3C, and 4 for releases from past leaks. Impacts would be slightly higher than under Alternative 2B, 3A, 3B, 3C, and 6C for onsite locations as a result of the combination of cribs and trenches (ditches), past leaks, and other sources. However, after the year 2940 the impacts drop significantly as a result of tank farm removal and clean closure activities. Population dose was estimated as 2.07×10^{-1} person-rem per year for the year of maximum impact.

Figure Q–7 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2290 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from the two sources occurs around the year 2050 and is dominated by technetium-99, iodine-129, and uranium-238. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

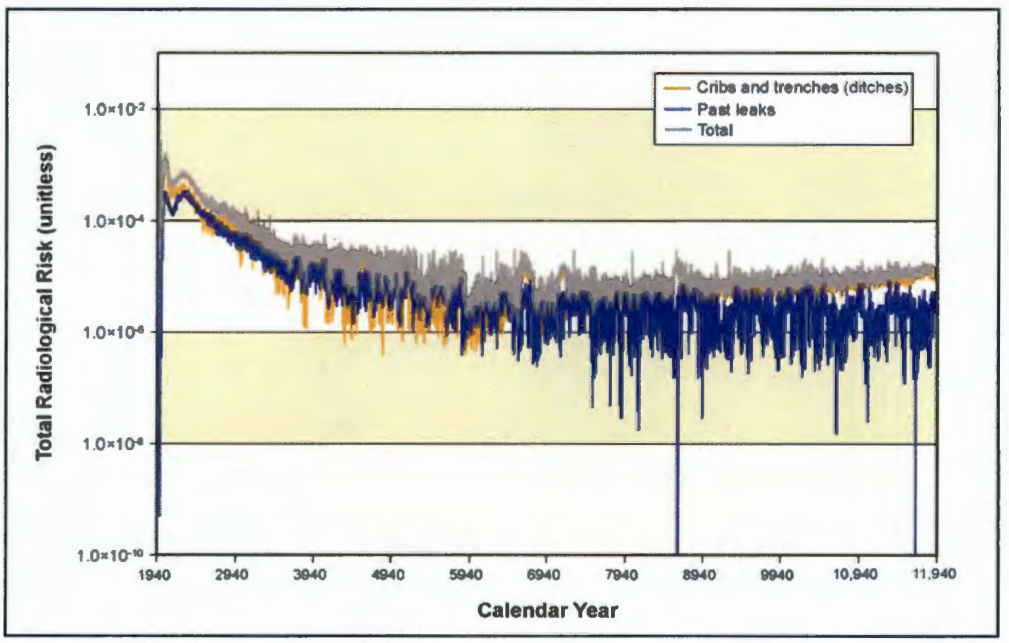

Figure Q–7. Tank Closure Alternative 6A, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Under Tank Closure Alternative 6A, Option Case, tank waste would be retrieved to a volume corresponding to 99.9 percent retrieval, all tanks farms would be clean closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base. Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column. In addition, the adjacent cribs and trenches (ditches) would be clean closed. Potential human health impacts of this alternative related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–146 through Q–150. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–151 through Q–158. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–159 through Q–166.

Table Q–146. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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	2.84×10^{-3}	3.31×10^{2}	3.15×10^{-3}	2.84×10^{-3}	5.27×10^{2}	5.51×10^{-3}	2.84×10^{-3}	9.69×10^{2}	1.10×10^{-2}
Iodine-129	1.45×10^{-4}	2.53×10^{2}	8.70×10^{-3}	1.45×10^{-4}	6.50×10^{2}	2.86×10^{-2}	1.45×10^{-4}	1.32×10^{3}	6.23×10^{-2}
Uranium-238	1.88×10^{-7}	5.36×10^{1}	6.10×10^{-4}	1.88×10^{-7}	6.22×10^{1}	8.24×10^{-4}	1.88×10^{-7}	7.69×10^{1}	1.19×10^{-3}
Total	2.98×10^{-3}	6.38×10^{2}	1.25×10^{-2}	2.98×10^{-3}	1.24×10^{3}	3.49×10^{-2}	2.98×10^{-3}	2.37×10^{3}	7.45×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.10×10^{1}	4.85×10^{2}	0.00	5.10×10^{1}	4.86×10^{2}	2.00×10^{-7}	5.10×10^{1}	7.10×10^{2}	9.18×10^{-3}
Nitrate	1.73×10^{4}	3.09×10^{2}	0.00	1.73×10^{4}	4.07×10^{2}	0.00	1.73×10^{4}	7.99×10^{2}	0.00
Total uranium	6.36×10^{-8}	6.06×10^{-7}	0.00	6.36×10^{-8}	6.13×10^{-7}	0.00	6.36×10^{-8}	6.34×10^{-7}	0.00
Total	1.74×10^{4}	7.95×10^{2}	0.00	1.74×10^{4}	8.93×10^{2}	2.00×10^{-7}	1.74×10^{4}	1.51×10^{3}	9.18×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–147. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.24×10^{-2}	1.44×10^{3}	1.37×10^{-2}	1.24×10^{-2}	2.30×10^{3}	2.40×10^{-2}	1.24×10^{-2}	4.22×10^{3}	4.78×10^{-2}
Technetium-99	1.30×10^{-7}	2.27×10^{-1}	7.81×10^{-6}	1.30×10^{-7}	5.84×10^{-1}	2.56×10^{-5}	1.30×10^{-7}	1.19	5.59×10^{-5}
Iodine-129	1.16×10^{-9}	3.31×10^{-1}	3.77×10^{-6}	1.16×10^{-9}	3.85×10^{-1}	5.09×10^{-6}	1.16×10^{-9}	4.75×10^{-1}	7.33×10^{-6}
Uranium-238	7.51×10^{-10}	9.32×10^{-2}	1.05×10^{-6}	7.51×10^{-10}	9.67×10^{-2}	1.13×10^{-6}	7.51×10^{-10}	1.04×10^{-1}	1.28×10^{-6}
Total	1.24×10^{-2}	1.44×10^{3}	1.37×10^{-2}	1.24×10^{-2}	2.30×10^{3}	2.40×10^{-2}	1.24×10^{-2}	4.22×10^{3}	4.79×10^{-2}
Year of peak impact	1975	1975	1975	1975	1975	1975	1975	1975	1975
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	8.86	8.44×10^{1}	0.00	8.86	8.45×10^{1}	3.48×10^{-8}	8.86	1.23×10^{2}	1.60×10^{-3}
Nitrate	2.10×10^{3}	3.75×10^{1}	0.00	2.10×10^{3}	4.93×10^{1}	0.00	2.10×10^{3}	9.67×10^{1}	0.00
Total	2.11×10^{3}	1.22×10^{2}	0.00	2.11×10^{3}	1.34×10^{2}	3.48×10^{-8}	2.11×10^{3}	2.20×10^{2}	1.60×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–148. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.84×10^{-3}	3.31×10^{2}	3.15×10^{-3}	2.84×10^{-3}	5.27×10^{2}	5.51×10^{-3}	2.84×10^{-3}	9.69×10^{2}	1.10×10^{-2}
Technetium-99	1.45×10^{-4}	2.53×10^{2}	8.70×10^{-3}	1.45×10^{-4}	6.50×10^{2}	2.86×10^{-2}	1.45×10^{-4}	1.32×10^{3}	6.23×10^{-2}
Iodine-129	1.88×10^{-7}	5.36×10^{1}	6.10×10^{-4}	1.88×10^{-7}	6.22×10^{1}	8.24×10^{-4}	1.88×10^{-7}	7.69×10^{1}	1.19×10^{-3}
Total	2.98×10^{-3}	6.38×10^{2}	1.25×10^{-2}	2.98×10^{-3}	1.24×10^{3}	3.49×10^{-2}	2.98×10^{-3}	2.37×10^{3}	7.45×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.84×10^{1}	2.70×10^{2}	0.00	2.84×10^{1}	2.71×10^{2}	1.11×10^{-7}	2.84×10^{1}	3.95×10^{2}	5.11×10^{-3}
Nitrate	1.34×10^{4}	2.39×10^{2}	0.00	1.34×10^{4}	3.14×10^{2}	0.00	1.34×10^{4}	6.17×10^{2}	0.00
Total	1.34×10^{4}	5.09×10^{2}	0.00	1.34×10^{4}	5.85×10^{2}	1.11×10^{-7}	1.34×10^{4}	1.01×10^{3}	5.11×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–149. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	1.27×10^{-6}	1.48×10^{-1}	6.71×10^{-7}	6.04×10^{-7}	1.12×10^{-1}	1.17×10^{-6}	6.04×10^{-7}	2.07×10^{-1}	2.34×10^{-6}
Technetium-99	2.21×10^{-8}	3.86×10^{-2}	3.98×10^{-6}	6.61×10^{-8}	2.97×10^{-1}	1.31×10^{-5}	6.61×10^{-8}	6.06×10^{-1}	2.85×10^{-5}
Iodine-129	4.29×10^{-11}	1.22×10^{-2}	1.03×10^{-7}	3.18×10^{-11}	1.05×10^{-2}	1.39×10^{-7}	3.18×10^{-11}	1.30×10^{-2}	2.00×10^{-7}
Uranium-238	3.97×10^{-15}	4.92×10^{-7}	5.56×10^{-12}	3.97×10^{-15}	5.11×10^{-7}	5.96×10^{-12}	3.97×10^{-15}	5.48×10^{-7}	6.74×10^{-12}
Total	1.29×10^{-6}	1.99×10^{-1}	4.76×10^{-6}	6.71×10^{-7}	4.20×10^{-1}	1.44×10^{-5}	6.71×10^{-7}	8.26×10^{-1}	3.10×10^{-5}
Year of peak impact	2016	2016	2027	2027	2027	2027	2027	2027	2027
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	2.46×10^{-2}	2.34×10^{-1}	0.00	2.46×10^{-2}	2.35×10^{-1}	1.02×10^{-10}	2.46×10^{-2}	3.43×10^{-1}	4.69×10^{-6}
Nitrate	7.39	1.32×10^{-1}	0.00	7.39	1.74×10^{-1}	0.00	7.39	3.41×10^{-1}	0.00
Total uranium	3.00×10^{-7}	2.86×10^{-6}	0.00	3.00×10^{-7}	2.89×10^{-6}	0.00	3.00×10^{-7}	2.99×10^{-6}	0.00
Total	7.41	3.66×10^{-1}	0.00	7.41	4.08×10^{-1}	1.02×10^{-10}	7.41	6.84×10^{-1}	4.69×10^{-6}
Year of peak impact	2303	2303	N/A	2303	2303	2256	2303	2303	2256

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–150. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.61×10^{-5}	6.91×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.27×10^{-6}	4.00×10^{-1}	4.91×10^{-6}
Technetium-99	2.49×10^{-11}	1.12×10^{-4}	4.92×10^{-9}	2.49×10^{-11}	2.59×10^{-4}	1.23×10^{-8}	2.21×10^{-8}	2.57×10^{-4}	1.39×10^{-8}
Iodine-129	3.19×10^{-14}	1.06×10^{-5}	1.40×10^{-10}	3.19×10^{-14}	1.72×10^{-4}	4.14×10^{-9}	4.29×10^{-11}	1.11×10^{-4}	2.71×10^{-9}
Uranium-238	0.00	0.00	0.00	0.00	0.00	0.00	3.97×10^{-15}	3.96×10^{-8}	5.01×10^{-13}
Total	3.80×10^{-10}	1.89×10^{-4}	5.75×10^{-9}	3.80×10^{-10}	5.54×10^{-4}	1.78×10^{-8}	1.29×10^{-6}	4.00×10^{-1}	4.92×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	2016	2016	2016
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	8.68×10^{-6}	8.27×10^{-5}	3.41×10^{-14}	4.38×10^{-6}	6.69×10^{-5}	1.56×10^{-9}	1.10×10^{-2}	2.44×10^{-2}	2.34×10^{-6}
Nitrate	2.22×10^{-3}	7.67×10^{-5}	0.00	2.27×10^{-3}	2.13×10^{-1}	0.00	3.92	6.44×10^{-1}	0.00
Total	2.23×10^{-3}	1.59×10^{-4}	3.41×10^{-14}	2.27×10^{-3}	2.13×10^{-1}	1.56×10^{-9}	3.94	6.69×10^{-1}	2.34×10^{-6}
Year of peak impact	1984	1984	1984	1962	1962	1984	1984	1984	2256

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

Table Q–151. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.58×10^{-6}	4.18×10^{-1}	3.97×10^{-6}	3.58×10^{-6}	6.65×10^{-1}	6.95×10^{-6}	3.58×10^{-6}	1.22	1.39×10^{-5}
Technetium-99	1.20×10^{-5}	2.09×10^{1}	7.20×10^{-4}	1.20×10^{-5}	5.38×10^{1}	2.36×10^{-3}	1.20×10^{-5}	1.10×10^{2}	5.15×10^{-3}
Iodine-129	2.33×10^{-8}	6.62	7.54×10^{-5}	2.33×10^{-8}	7.69	1.02×10^{-4}	2.33×10^{-8}	9.49	1.46×10^{-4}
Total	1.56×10^{-5}	2.80×10^{1}	7.99×10^{-4}	1.56×10^{-5}	6.21×10^{1}	2.47×10^{-3}	1.56×10^{-5}	1.20×10^{2}	5.31×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	6.08×10^{-2}	5.80×10^{-1}	0.00	6.08×10^{-2}	5.80×10^{-1}	2.39×10^{-10}	6.08×10^{-2}	8.48×10^{-1}	1.10×10^{-5}
Nitrate	4.33	7.74×10^{-2}	0.00	4.33	1.02×10^{-1}	0.00	4.33	2.00×10^{-1}	0.00
Total	4.40	6.57×10^{-1}	0.00	4.40	6.82×10^{-1}	2.39×10^{-10}	4.40	1.05	1.10×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–152. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	6.87×10^{-8}	8.02×10^{-3}	7.63×10^{-8}	6.87×10^{-8}	1.28×10^{-2}	1.33×10^{-7}	6.87×10^{-8}	2.35×10^{-2}	2.66×10^{-7}
Technetium-99	8.32×10^{-6}	1.46×10^{1}	5.01×10^{-4}	8.32×10^{-6}	3.74×10^{1}	1.64×10^{-3}	8.32×10^{-6}	7.63×10^{1}	3.59×10^{-3}
Iodine-129	1.69×10^{-8}	4.80	5.47×10^{-5}	1.69×10^{-8}	5.58	7.38×10^{-5}	1.69×10^{-8}	6.89	1.06×10^{-4}
Total	8.41×10^{-6}	1.94×10^{1}	5.56×10^{-4}	8.41×10^{-6}	4.30×10^{1}	1.72×10^{-3}	8.41×10^{-6}	8.32×10^{1}	3.69×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	9.02×10^{-2}	8.59×10^{-1}	0.00	9.02×10^{-2}	8.60×10^{-1}	3.64×10^{-10}	9.02×10^{-2}	1.26	1.67×10^{-5}
Nitrate	1.79×10^{1}	3.20×10^{-1}	0.00	1.79×10^{1}	4.22×10^{-1}	0.00	1.79×10^{1}	8.28×10^{-1}	0.00
Total	1.80×10^{1}	1.18	0.00	1.80×10^{1}	1.28	3.64×10^{-10}	1.80×10^{1}	2.08	1.67×10^{-5}
Year of peak impact	2047	2047	N/A	2047	2047	2048	2047	2047	2048

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–153. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.93×10^{-7}	3.42×10^{-2}	3.25×10^{-7}	2.93×10^{-7}	5.45×10^{-2}	5.69×10^{-7}	2.93×10^{-7}	1.00×10^{-1}	1.13×10^{-6}
Technetium-99	3.96×10^{-6}	6.94	2.39×10^{-4}	3.96×10^{-6}	1.78×10^{1}	7.83×10^{-4}	3.96×10^{-6}	3.63×10^{1}	1.71×10^{-3}
Iodine-129	7.95×10^{-9}	2.26	2.58×10^{-5}	7.95×10^{-9}	2.63	3.48×10^{-5}	7.95×10^{-9}	3.25	5.01×10^{-5}
Total	4.26×10^{-6}	9.24	2.65×10^{-4}	4.26×10^{-6}	2.05×10^{1}	8.18×10^{-4}	4.26×10^{-6}	3.97×10^{1}	1.76×10^{-3}
Year of peak impact	2027	2027	2027	2027	2027	2027	2027	2027	2027
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	3.97×10^{-1}	3.79	0.00	3.97×10^{-1}	3.79	1.56×10^{-9}	3.97×10^{-1}	5.54	7.16×10^{-5}
Nitrate	1.12×10^{1}	2.00×10^{-1}	0.00	1.12×10^{1}	2.64×10^{-1}	0.00	1.12×10^{1}	5.17×10^{-1}	0.00
Total	1.16×10^{1}	3.99	0.00	1.16×10^{1}	4.05	1.56×10^{-9}	1.16×10^{1}	6.05	7.16×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–154. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.20×10^{-6}	3.74×10^{-1}	3.56×10^{-6}	3.20×10^{-6}	5.95×10^{-1}	6.22×10^{-6}	3.20×10^{-6}	1.09	1.24×10^{-5}
Technetium-99	2.28×10^{-5}	3.99×10^{1}	1.37×10^{-3}	2.28×10^{-5}	1.02×10^{2}	4.50×10^{-3}	2.28×10^{-5}	2.09×10^{2}	9.81×10^{-3}
Iodine-129	4.29×10^{-8}	1.22×10^{1}	1.39×10^{-4}	4.29×10^{-8}	1.42×10^{1}	1.88×10^{-4}	4.29×10^{-8}	1.75×10^{1}	2.70×10^{-4}
Total	2.60×10^{-5}	5.25×10^{1}	1.51×10^{-3}	2.60×10^{-5}	1.17×10^{2}	4.69×10^{-3}	2.60×10^{-5}	2.27×10^{2}	1.01×10^{-2}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	5.33×10^{-1}	5.07	0.00	5.33×10^{-1}	5.08	2.09×10^{-9}	5.33×10^{-1}	7.42	9.59×10^{-5}
Nitrate	3.94×10^{1}	7.04×10^{-1}	0.00	3.94×10^{1}	9.27×10^{-1}	0.00	3.94×10^{1}	1.82	0.00
Total	4.00×10^{1}	5.78	0.00	4.00×10^{1}	6.00	2.09×10^{-9}	4.00×10^{1}	9.24	9.59×10^{-5}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–155. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	5.33×10^{-9}	6.23×10^{-4}	5.92×10^{-9}	5.33×10^{-9}	9.92×10^{-4}	1.04×10^{-8}	5.33×10^{-9}	1.82×10^{-3}	2.07×10^{-8}
Technetium-99	1.50×10^{-7}	2.63×10^{-1}	9.05×10^{-6}	1.50×10^{-7}	6.76×10^{-1}	2.97×10^{-5}	1.50×10^{-7}	1.38	6.48×10^{-5}
Iodine-129	2.65×10^{-10}	7.53×10^{-2}	8.58×10^{-7}	2.65×10^{-10}	8.74×10^{-2}	1.16×10^{-6}	2.65×10^{-10}	1.08×10^{-1}	1.67×10^{-6}
Total	1.56×10^{-7}	3.39×10^{-1}	9.91×10^{-6}	1.56×10^{-7}	7.64×10^{-1}	3.09×10^{-5}	1.56×10^{-7}	1.49	6.64×10^{-5}
Year of peak impact	2064	2064	2064	2064	2064	2064	2064	2064	2064
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	1.30×10^{-2}	1.24×10^{-1}	0.00	1.30×10^{-2}	1.24×10^{-1}	5.15×10^{-11}	1.30×10^{-2}	1.82×10^{-1}	2.36×10^{-6}
Nitrate	6.84×10^{-1}	1.22×10^{-2}	0.00	6.84×10^{-1}	1.61×10^{-2}	0.00	6.84×10^{-1}	3.15×10^{-2}	0.00
Total	6.97×10^{-1}	1.36×10^{-1}	0.00	6.97×10^{-1}	1.40×10^{-1}	5.15×10^{-11}	6.97×10^{-1}	2.13×10^{-1}	2.36×10^{-6}
Year of peak impact	2026	2026	N/A	2026	2026	2024	2026	2026	2024

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–156. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	7.06×10^{-13}	8.25×10^{-8}	9.04×10^{-14}	8.14×10^{-14}	1.51×10^{-8}	1.58×10^{-13}	8.14×10^{-14}	2.78×10^{-8}	3.15×10^{-13}
Technetium-99	4.76×10^{-6}	8.33	2.96×10^{-4}	4.92×10^{-6}	2.21×10^{1}	9.71×10^{-4}	4.92×10^{-6}	4.51×10^{1}	2.12×10^{-3}
Iodine-129	9.31×10^{-9}	2.65	2.48×10^{-5}	7.65×10^{-9}	2.53	3.34×10^{-5}	7.65×10^{-9}	3.12	4.82×10^{-5}
Total	4.76×10^{-6}	1.10×10^{1}	3.21×10^{-4}	4.92×10^{-6}	2.46×10^{1}	1.00×10^{-3}	4.92×10^{-6}	4.82×10^{1}	2.17×10^{-3}
Year of peak impact	2257	2257	2292	2292	2292	2292	2292	2292	2292
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	4.01×10^{-1}	3.82	0.00	4.01×10^{-1}	3.83	1.58×10^{-9}	4.01×10^{-1}	5.59	7.23×10^{-5}
Nitrate	1.22×10^{1}	2.18×10^{-1}	0.00	1.22×10^{1}	2.87×10^{-1}	0.00	1.22×10^{1}	5.63×10^{-1}	0.00
Total uranium	2.50×10^{-10}	2.39×10^{-9}	0.00	2.50×10^{-10}	2.41×10^{-9}	0.00	2.50×10^{-10}	2.50×10^{-9}	0.00
Total	1.26×10^{1}	4.04	0.00	1.26×10^{1}	4.11	1.58×10^{-9}	1.26×10^{1}	6.15	7.23×10^{-5}
Year of peak impact	2251	2251	N/A	2251	2251	2251	2251	2251	2251

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–157. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks 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	1.47×10^{-7}	2.57×10^{-1}	8.85×10^{-6}	1.47×10^{-7}	6.61×10^{-1}	2.90×10^{-5}	1.47×10^{-7}	1.35	6.33×10^{-5}
Iodine-129	1.63×10^{-10}	4.63×10^{-2}	5.27×10^{-7}	1.63×10^{-10}	5.37×10^{-2}	7.12×10^{-7}	1.63×10^{-10}	6.64×10^{-2}	1.02×10^{-6}
Total	1.47×10^{-7}	3.04×10^{-1}	9.37×10^{-6}	1.47×10^{-7}	7.15×10^{-1}	2.97×10^{-5}	1.47×10^{-7}	1.41	6.43×10^{-5}
Year of peak impact	2502	2502	2502	2502	2502	2502	2502	2502	2502
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	4.04×10^{-3}	3.85×10^{-2}	0.00	4.04×10^{-3}	3.85×10^{-2}	1.59×10^{-11}	4.04×10^{-3}	5.63×10^{-2}	7.27×10^{-7}
Nitrate	1.83×10^{-1}	3.27×10^{-3}	0.00	1.83×10^{-1}	4.30×10^{-3}	0.00	1.83×10^{-1}	8.44×10^{-3}	0.00
Total	1.87×10^{-1}	4.17×10^{-2}	0.00	1.87×10^{-1}	4.28×10^{-2}	1.59×10^{-11}	1.87×10^{-1}	6.47×10^{-2}	7.27×10^{-7}
Year of peak impact	2413	2413	N/A	2413	2413	2413	2413	2413	2413

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–158. Tank Closure Alternative 6A, Option Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.84×10^{-15}	3.43×10^{-10}	3.58×10^{-15}	1.84×10^{-15}	6.38×10^{-10}	7.24×10^{-15}	7.37×10^{-12}	2.32×10^{-6}	4.60×10^{-17}
Technetium-99	6.67×10^{-12}	3.00×10^{-5}	1.32×10^{-9}	6.67×10^{-12}	6.93×10^{-5}	3.28×10^{-9}	1.36×10^{-7}	1.52×10^{-3}	8.82×10^{-8}
Iodine-129	1.19×10^{-14}	3.93×10^{-6}	5.21×10^{-11}	1.19×10^{-14}	6.41×10^{-5}	1.54×10^{-9}	1.48×10^{-10}	3.64×10^{-4}	6.63×10^{-9}
Total	6.68×10^{-12}	3.39×10^{-5}	1.37×10^{-9}	6.68×10^{-12}	1.33×10^{-4}	4.83×10^{-9}	1.36×10^{-7}	1.89×10^{-3}	9.48×10^{-8}
Year of peak impact	2134	2134	2134	2134	2134	2134	2153	2153	2502
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	1.96×10^{-7}	1.86×10^{-6}	7.68×10^{-16}	1.74×10^{-7}	2.65×10^{-6}	3.52×10^{-11}	4.04×10^{-3}	8.91×10^{-3}	3.64×10^{-7}
Nitrate	1.03×10^{-5}	3.55×10^{-7}	0.00	1.13×10^{-5}	1.06×10^{-3}	0.00	1.83×10^{-1}	7.28×10^{-3}	0.00
Total	1.05×10^{-5}	2.22×10^{-6}	7.68×10^{-16}	1.15×10^{-5}	1.06×10^{-3}	3.52×10^{-11}	1.87×10^{-1}	1.62×10^{-2}	3.64×10^{-7}
Year of peak impact	2168	2168	2168	2187	2187	2168	2413	2413	2413

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

Table Q–159. Tank Closure Alternative 6A, Option Case, Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	1.39×10^{-8}	1.62×10^{-3}	1.54×10^{-8}	1.39×10^{-8}	2.58×10^{-3}	3.81×10^{-8}	1.39×10^{-8}	4.74×10^{-3}	7.59×10^{-8}
Technetium-99	1.35×10^{-6}	2.36	8.12×10^{-5}	1.35×10^{-6}	6.06	2.67×10^{-4}	1.35×10^{-6}	1.24×10^{1}	5.83×10^{-4}
Iodine-129	2.36×10^{-9}	6.71×10^{-1}	7.64×10^{-6}	2.36×10^{-9}	7.79×10^{-1}	9.93×10^{-6}	2.36×10^{-9}	9.62×10^{-1}	1.43×10^{-5}
Total	1.36×10^{-6}	3.03	8.88×10^{-5}	1.36×10^{-6}	6.85	2.77×10^{-4}	1.36×10^{-6}	1.33×10^{1}	5.97×10^{-4}
Year of peak impact	2058	2058	2058	2058	2058	2056	2058	2058	2056
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	7.92×10^{-3}	7.54×10^{-2}	0.00	7.92×10^{-3}	7.55×10^{-2}	3.11×10^{-11}	7.92×10^{-3}	1.10×10^{-1}	1.43×10^{-6}
Nitrate	4.62×10^{-1}	8.24×10^{-3}	0.00	4.62×10^{-1}	1.09×10^{-2}	0.00	4.62×10^{-1}	2.13×10^{-2}	0.00
Total	4.70×10^{-1}	8.36×10^{-2}	0.00	4.70×10^{-1}	8.63×10^{-2}	3.11×10^{-11}	4.70×10^{-1}	1.32×10^{-1}	1.43×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–160. Tank Closure Alternative 6A, Option Case, Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	3.20×10^{-7}	3.74×10^{-2}	3.56×10^{-7}	3.20×10^{-7}	5.95×10^{-2}	9.44×10^{-6}	3.20×10^{-7}	1.09×10^{-1}	1.88×10^{-5}
Technetium-99	2.48×10^{-5}	4.34×10^{1}	1.49×10^{-3}	2.48×10^{-5}	1.11×10^{2}	4.94×10^{-3}	2.48×10^{-5}	2.27×10^{2}	1.08×10^{-2}
Iodine-129	4.47×10^{-8}	1.27×10^{1}	1.45×10^{-4}	4.47×10^{-8}	1.48×10^{1}	1.38×10^{-4}	4.47×10^{-8}	1.83×10^{1}	1.98×10^{-4}
Uranium-238	5.60×10^{-12}	6.95×10^{-4}	7.85×10^{-9}	5.60×10^{-12}	7.21×10^{-4}	9.04×10^{-9}	5.60×10^{-12}	7.73×10^{-4}	1.02×10^{-8}
Total	2.51×10^{-5}	5.61×10^{1}	1.64×10^{-3}	2.51×10^{-5}	1.26×10^{2}	5.09×10^{-3}	2.51×10^{-5}	2.45×10^{2}	1.10×10^{-2}
Year of peak impact	2057	2057	2057	2057	2057	2055	2057	2057	2055
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	3.76	3.58×10^{1}	0.00	3.76	3.58×10^{1}	1.49×10^{-8}	3.76	5.23×10^{1}	6.82×10^{-4}
Nitrate	1.62×10^{3}	2.88×10^{1}	0.00	1.62×10^{3}	3.80×10^{1}	0.00	1.62×10^{3}	7.45×10^{1}	0.00
Total uranium	7.01×10^{-6}	6.68×10^{-5}	0.00	7.01×10^{-6}	6.75×10^{-5}	0.00	7.01×10^{-6}	6.99×10^{-5}	0.00
Total	1.62×10^{3}	6.46×10^{1}	0.00	1.62×10^{3}	7.38×10^{1}	1.49×10^{-8}	1.62×10^{3}	1.27×10^{2}	6.82×10^{-4}
Year of peak impact	2091	2091	N/A	2091	2091	2088	2091	2091	2088

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–161. Tank Closure Alternative 6A, Option Case, Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	5.10×10^{-8}	5.96×10^{-3}	5.67×10^{-8}	5.10×10^{-8}	9.49×10^{-3}	9.92×10^{-8}	5.10×10^{-8}	1.74×10^{-2}	1.98×10^{-7}
Technetium-99	2.68×10^{-6}	4.69	1.61×10^{-4}	2.68×10^{-6}	1.21×10^{1}	5.29×10^{-4}	2.68×10^{-6}	2.46×10^{1}	1.15×10^{-3}
Iodine-129	5.07×10^{-9}	1.44	1.64×10^{-5}	5.07×10^{-9}	1.67	2.22×10^{-5}	5.07×10^{-9}	2.07	3.19×10^{-5}
Total	2.74×10^{-6}	6.14	1.78×10^{-4}	2.74×10^{-6}	1.37×10^{1}	5.52×10^{-4}	2.74×10^{-6}	2.66×10^{1}	1.19×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.89×10^{-1}	2.75	0.00	2.89×10^{-1}	2.76	1.14×10^{-9}	2.89×10^{-1}	4.03	5.21×10^{-5}
Nitrate	8.55	1.53×10^{-1}	0.00	8.55	2.01×10^{-1}	0.00	8.55	3.94×10^{-1}	0.00
Total	8.84	2.91	0.00	8.84	2.96	1.14×10^{-9}	8.84	4.42	5.21×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–162. Tank Closure Alternative 6A, Option Case, Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	5.19×10^{-6}	6.06×10^{-1}	5.54×10^{-7}	4.99×10^{-7}	9.27×10^{-2}	9.69×10^{-7}	4.99×10^{-7}	1.70×10^{-1}	1.93×10^{-6}
Technetium-99	1.48×10^{-5}	2.60×10^{1}	9.15×10^{-4}	1.52×10^{-5}	6.84×10^{1}	3.00×10^{-3}	1.52×10^{-5}	1.39×10^{2}	6.55×10^{-3}
Iodine-129	3.09×10^{-8}	8.80	9.23×10^{-5}	2.85×10^{-8}	9.41	1.25×10^{-4}	2.85×10^{-8}	1.16×10^{1}	1.79×10^{-4}
Uranium-238	1.36×10^{-10}	1.68×10^{-2}	1.85×10^{-7}	1.32×10^{-10}	1.70×10^{-2}	1.98×10^{-7}	1.32×10^{-10}	1.82×10^{-2}	2.24×10^{-7}
Total	2.00×10^{-5}	3.54×10^{1}	1.01×10^{-3}	1.57×10^{-5}	7.79×10^{1}	3.13×10^{-3}	1.57×10^{-5}	1.51×10^{2}	6.73×10^{-3}
Year of peak impact	2050	2050	2051	2051	2051	2051	2051	2051	2051
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	7.72×10^{-1}	7.35	0.00	7.72×10^{-1}	7.36	3.03×10^{-9}	7.72×10^{-1}	1.08×10^{1}	1.39×10^{-4}
Nitrate	1.28×10^{2}	2.29	0.00	1.28×10^{2}	3.01	0.00	1.28×10^{2}	5.91	0.00
Total uranium	1.96×10^{-4}	1.86×10^{-3}	0.00	1.96×10^{-4}	1.88×10^{-3}	0.00	1.96×10^{-4}	1.95×10^{-3}	0.00
Total	1.29×10^{2}	9.64	0.00	1.29×10^{2}	1.04×10^{1}	3.03×10^{-9}	1.29×10^{2}	1.67×10^{1}	1.39×10^{-4}
Year of peak impact	2051	2051	N/A	2051	2051	2051	2051	2051	2051

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–163. Tank Closure Alternative 6A, Option Case, Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	5.33×10^{-9}	6.23×10^{-4}	5.92×10^{-9}	5.33×10^{-9}	9.92×10^{-4}	1.04×10^{-8}	5.33×10^{-9}	1.82×10^{-3}	2.07×10^{-8}
Technetium-99	1.50×10^{-7}	2.63×10^{-1}	9.05×10^{-6}	1.50×10^{-7}	6.76×10^{-1}	2.97×10^{-5}	1.50×10^{-7}	1.38	6.48×10^{-5}
Iodine-129	2.65×10^{-10}	7.53×10^{-2}	8.58×10^{-7}	2.65×10^{-10}	8.74×10^{-2}	1.16×10^{-6}	2.65×10^{-10}	1.08×10^{-1}	1.67×10^{-6}
Total	1.56×10^{-7}	3.39×10^{-1}	9.91×10^{-6}	1.56×10^{-7}	7.64×10^{-1}	3.09×10^{-5}	1.56×10^{-7}	1.49	6.64×10^{-5}
Year of peak impact	2064	2064	2064	2064	2064	2064	2064	2064	2064
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	9.63×10^{-3}	9.17×10^{-2}	0.00	9.63×10^{-3}	9.18×10^{-2}	3.78×10^{-11}	9.63×10^{-3}	1.34×10^{-1}	1.73×10^{-6}
Nitrate	6.28×10^{-1}	1.12×10^{-2}	0.00	6.28×10^{-1}	1.48×10^{-2}	0.00	6.28×10^{-1}	2.89×10^{-2}	0.00
Total	6.37×10^{-1}	1.03×10^{-1}	0.00	6.37×10^{-1}	1.07×10^{-1}	3.78×10^{-11}	6.37×10^{-1}	1.63×10^{-1}	1.73×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–164. Tank Closure Alternative 6A, 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)
Hydrogen-3 (tritium)	1.33×10^{-6}	1.55×10^{-1}	8.70×10^{-7}	7.84×10^{-7}	1.46×10^{-1}	1.52×10^{-6}	7.84×10^{-7}	2.68×10^{-1}	3.04×10^{-6}
Technetium-99	1.99×10^{-5}	3.49×10^{1}	1.26×10^{-3}	2.10×10^{-5}	9.44×10^{1}	4.14×10^{-3}	2.10×10^{-5}	1.92×10^{2}	9.04×10^{-3}
Iodine-129	3.52×10^{-8}	1.00×10^{1}	8.88×10^{-5}	2.74×10^{-8}	9.06	1.20×10^{-4}	2.74×10^{-8}	1.12×10^{1}	1.73×10^{-4}
Uranium-238	5.60×10^{-12}	6.95×10^{-4}	7.41×10^{-9}	5.29×10^{-12}	6.81×10^{-4}	7.93×10^{-9}	5.29×10^{-12}	7.29×10^{-4}	8.98×10^{-9}
Total	2.13×10^{-5}	4.51×10^{1}	1.35×10^{-3}	2.18×10^{-5}	1.04×10^{2}	4.27×10^{-3}	2.18×10^{-5}	2.04×10^{2}	9.21×10^{-3}
Year of peak impact	2057	2057	2056	2056	2056	2056	2056	2056	2056
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	1.63	1.55×10^{1}	0.00	1.63	1.56×10^{1}	6.53×10^{-9}	1.63	2.27×10^{1}	3.00×10^{-4}
Nitrate	1.18×10^{3}	2.11×10^{1}	0.00	1.18×10^{3}	2.78×10^{1}	0.00	1.18×10^{3}	5.46×10^{1}	0.00
Total uranium	9.72×10^{-6}	9.26×10^{-5}	0.00	9.72×10^{-6}	9.36×10^{-5}	0.00	9.72×10^{-6}	9.69×10^{-5}	0.00
Total	1.19×10^{3}	3.67×10^{1}	0.00	1.19×10^{3}	4.34×10^{1}	6.53×10^{-9}	1.19×10^{3}	7.74×10^{1}	3.00×10^{-4}
Year of peak impact	2056	2056	N/A	2056	2056	2051	2056	2056	2051

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–165. Tank Closure Alternative 6A, 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	1.81×10^{-7}	3.18×10^{-1}	1.09×10^{-5}	1.81×10^{-7}	8.16×10^{-1}	3.58×10^{-5}	1.81×10^{-7}	1.66	7.82×10^{-5}
Iodine-129	1.93×10^{-10}	5.50×10^{-2}	6.27×10^{-7}	1.93×10^{-10}	6.39×10^{-2}	8.46×10^{-7}	1.93×10^{-10}	7.89×10^{-2}	1.22×10^{-6}
Uranium-238	2.23×10^{-13}	2.76×10^{-5}	3.12×10^{-10}	2.23×10^{-13}	2.87×10^{-5}	3.34×10^{-10}	2.23×10^{-13}	3.07×10^{-5}	3.78×10^{-10}
Total	1.82×10^{-7}	3.73×10^{-1}	1.15×10^{-5}	1.82×10^{-7}	8.80×10^{-1}	3.67×10^{-5}	1.82×10^{-7}	1.74	7.94×10^{-5}
Year of peak impact	2502	2502	2502	2502	2502	2502	2502	2502	2502
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	2.70×10^{-2}	2.57×10^{-1}	0.00	2.70×10^{-2}	2.57×10^{-1}	1.13×10^{-10}	2.70×10^{-2}	3.76×10^{-1}	5.19×10^{-6}
Nitrate	7.52	1.34×10^{-1}	0.00	7.52	1.77×10^{-1}	0.00	7.52	3.47×10^{-1}	0.00
Total uranium	3.00×10^{-7}	2.86×10^{-6}	0.00	3.00×10^{-7}	2.89×10^{-6}	0.00	3.00×10^{-7}	2.99×10^{-6}	0.00
Total	7.55	3.91×10^{-1}	0.00	7.55	4.34×10^{-1}	1.13×10^{-10}	7.55	7.23×10^{-1}	5.19×10^{-6}
Year of peak impact	2303	2303	N/A	2303	2303	2256	2303	2303	2256

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–166. Tank Closure Alternative 6A, 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)
Hydrogen-3 (tritium)	1.31×10^{-13}	2.43×10^{-8}	2.54×10^{-13}	1.92×10^{-13}	6.63×10^{-8}	5.13×10^{-13}	1.70×10^{-7}	5.35×10^{-2}	6.57×10^{-7}
Technetium-99	8.07×10^{-12}	3.63×10^{-5}	1.60×10^{-9}	7.67×10^{-12}	7.97×10^{-5}	3.98×10^{-9}	4.37×10^{-8}	5.01×10^{-4}	2.72×10^{-8}
Iodine-129	1.39×10^{-14}	4.59×10^{-6}	6.08×10^{-11}	1.47×10^{-14}	7.94×10^{-5}	1.80×10^{-9}	9.41×10^{-11}	2.24×10^{-4}	5.47×10^{-9}
Uranium-238	7.55×10^{-20}	9.73×10^{-12}	1.13×10^{-16}	5.87×10^{-20}	2.09×10^{-11}	3.79×10^{-16}	3.97×10^{-15}	3.97×10^{-8}	5.02×10^{-13}
Total	8.22×10^{-12}	4.09×10^{-5}	1.66×10^{-9}	7.87×10^{-12}	1.59×10^{-4}	5.78×10^{-9}	2.13×10^{-7}	5.42×10^{-2}	6.89×10^{-7}
Year of peak impact	2134	2134	2134	2121	2121	2134	2057	2057	2057
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	1.06×10^{-6}	1.01×10^{-5}	4.17×10^{-15}	9.21×10^{-7}	1.41×10^{-5}	1.91×10^{-10}	2.70×10^{-2}	5.96×10^{-2}	2.60×10^{-6}
Nitrate	2.86×10^{-4}	9.89×10^{-6}	0.00	2.87×10^{-4}	2.70×10^{-2}	0.00	7.52	2.93×10^{-1}	0.00
Total uranium	3.89×10^{-13}	3.74×10^{-12}	0.00	3.39×10^{-13}	4.51×10^{-12}	0.00	3.00×10^{-7}	1.33×10^{-7}	0.00
Total	2.88×10^{-4}	2.00×10^{-5}	4.17×10^{-15}	2.88×10^{-4}	2.70×10^{-2}	1.91×10^{-10}	7.55	3.52×10^{-1}	2.60×10^{-6}
Year of peak impact	2052	2052	2052	2050	2050	2052	2303	2303	2256

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

The dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternatives 2A, 2B, 3A, 3B, 3C, 4, 5, and 6A, Base Case, for releases from cribs and trenches (ditches). Similar to Alternative 6A, Base Case, the dose standard and Hazard Index guideline would be exceeded at the same locations and for the same receptors as under Alternatives 2A, 2B, 3A, 3B, and 3C, but slightly higher than these alternatives. Impacts would be slightly higher than under Alternatives 2B, 3A, 3B, 3C, and 6C for onsite locations as a result of the combination of cribs and trenches (ditches), past leaks, and other sources. However, after the year 2940 the impacts drop significantly as a result of tank farm removal. Population dose was estimated as 2.05×10^{-1} person-rem per year for the year of maximum impact.

Figure Q–8 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2290 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from the two sources occurs around the year 2056 and is dominated by technetium-99, iodine-129, and uranium-238. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

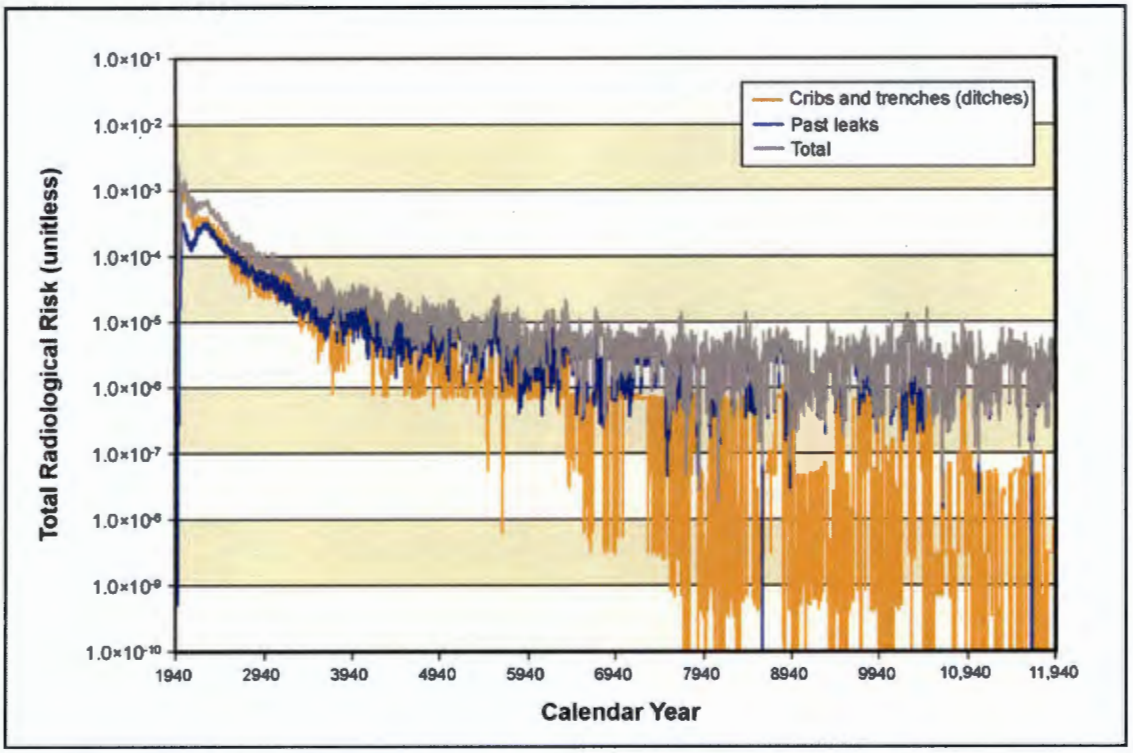

Figure Q–8. Tank Closure Alternative 6A, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.7 Tank Closure Alternative 6B, Base and Option Cases

Tank Closure Alternative 6B, Base and Option Cases, resembles Tank Closure Alternative 6A, Base and Option Cases, except that waste retrieval and processing would proceed at a faster rate and closure would occur at an earlier date. All tank farms would be clean closed and for the Base Case, the adjacent cribs and trenches (ditches) would be covered with an engineered modified RCRA Subtitle C barrier and for the Option Case, the adjacent cribs and trenches (ditches) would be clean closed.

Potential human health impacts of Alternative 6B, Base Case, related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–167 through Q–171. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–172 through Q–179. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–180 through Q–187. Impacts would be similar to Alternative 6A, and standards would be exceeded, as under Alternative 6A. Population dose was estimated as 2.04×10^{-1} person-rem per year for the year of maximum impact.

Table Q–167. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.08×10^{1}	4.84×10^{2}	0.00	5.08×10^{1}	4.85×10^{2}	2.00×10^{-7}	5.08×10^{1}	7.08×10^{2}	9.16×10^{-3}
Nitrate	1.74×10^{4}	3.11×10^{2}	0.00	1.74×10^{4}	4.10×10^{2}	0.00	1.74×10^{4}	8.03×10^{2}	0.00
Total	1.75×10^{4}	7.95×10^{2}	0.00	1.75×10^{4}	8.94×10^{2}	2.00×10^{-7}	1.75×10^{4}	1.51×10^{3}	9.16×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–168. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.84×10^{-2}
Technetium-99	1.35×10^{-7}	2.36×10^{-1}	8.12×10^{-6}	1.35×10^{-7}	6.07×10^{-1}	2.66×10^{-5}	1.35×10^{-7}	1.24	5.81×10^{-5}
Iodine-129	1.14×10^{-9}	3.25×10^{-1}	3.71×10^{-6}	1.14×10^{-9}	3.78×10^{-1}	5.00×10^{-6}	1.14×10^{-9}	4.67×10^{-1}	7.20×10^{-6}
Uranium-238	1.18×10^{-11}	1.46×10^{-3}	1.65×10^{-8}	1.18×10^{-11}	1.52×10^{-3}	1.77×10^{-8}	1.18×10^{-11}	1.62×10^{-3}	2.00×10^{-8}
Total	1.25×10^{-2}	1.46×10^{3}	1.39×10^{-2}	1.25×10^{-2}	2.32×10^{3}	2.43×10^{-2}	1.25×10^{-2}	4.27×10^{3}	4.85×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.32	8.88×10^{1}	0.00	9.32	8.89×10^{1}	3.66×10^{-8}	9.32	1.30×10^{2}	1.68×10^{-3}
Nitrate	2.11×10^{3}	3.77×10^{1}	0.00	2.11×10^{3}	4.97×10^{1}	0.00	2.11×10^{3}	9.74×10^{1}	0.00
Total	2.12×10^{3}	1.27×10^{2}	0.00	2.12×10^{3}	1.39×10^{2}	3.66×10^{-8}	2.12×10^{3}	2.27×10^{2}	1.68×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–169. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	2.82×10^{-3}	3.30×10^{2}	3.13×10^{-3}	2.82×10^{-3}	5.25×10^{2}	5.48×10^{-3}	2.82×10^{-3}	9.65×10^{2}	1.09×10^{-2}
Technetium-99	1.44×10^{-4}	2.53×10^{2}	8.68×10^{-3}	1.44×10^{-4}	6.49×10^{2}	2.85×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.21×10^{-2}
Iodine-129	1.87×10^{-7}	5.32×10^{1}	6.06×10^{-4}	1.87×10^{-7}	6.18×10^{1}	8.18×10^{-4}	1.87×10^{-7}	7.63×10^{1}	1.18×10^{-3}
Total	2.97×10^{-3}	6.36×10^{2}	1.24×10^{-2}	2.97×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.97×10^{-3}	2.36×10^{3}	7.43×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	2.80×10^{1}	2.67×10^{2}	0.00	2.80×10^{1}	2.67×10^{2}	1.10×10^{-7}	2.80×10^{1}	3.91×10^{2}	5.05×10^{-3}
Nitrate	1.29×10^{4}	2.30×10^{2}	0.00	1.29×10^{4}	3.03×10^{2}	0.00	1.29×10^{4}	5.95×10^{2}	0.00
Total	1.29×10^{4}	4.97×10^{2}	0.00	1.29×10^{4}	5.70×10^{2}	1.10×10^{-7}	1.29×10^{4}	9.85×10^{2}	5.05×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–170. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.46×10^{-7}	4.04×10^{-2}	3.84×10^{-7}	3.46×10^{-7}	6.43×10^{-2}	6.72×10^{-7}	3.46×10^{-7}	1.18×10^{-1}	1.34×10^{-6}
Technetium-99	8.94×10^{-8}	1.57×10^{-1}	5.38×10^{-6}	8.94×10^{-8}	4.02×10^{-1}	1.77×10^{-5}	8.94×10^{-8}	8.19×10^{-1}	3.85×10^{-5}
Iodine-129	3.88×10^{-11}	1.10×10^{-2}	1.26×10^{-7}	3.88×10^{-11}	1.28×10^{-2}	1.70×10^{-7}	3.88×10^{-11}	1.58×10^{-2}	2.44×10^{-7}
Total	4.35×10^{-7}	2.08×10^{-1}	5.89×10^{-6}	4.35×10^{-7}	4.79×10^{-1}	1.85×10^{-5}	4.35×10^{-7}	9.53×10^{-1}	4.01×10^{-5}
Year of peak impact	2025	2025	2025	2025	2025	2025	2025	2025	2025
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.14×10^{-2}	2.99×10^{-1}	0.00	3.14×10^{-2}	2.99×10^{-1}	1.23×10^{-10}	3.14×10^{-2}	4.37×10^{-1}	5.66×10^{-6}
Nitrate	5.75	1.03×10^{-1}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.78	4.02×10^{-1}	0.00	5.78	4.35×10^{-1}	1.23×10^{-10}	5.78	7.03×10^{-1}	5.66×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–171. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.56×10^{-10}	6.62×10^{-5}	6.92×10^{-10}	3.56×10^{-10}	1.23×10^{-4}	1.40×10^{-9}	1.28×10^{-6}	4.04×10^{-1}	4.96×10^{-6}
Technetium-99	2.53×10^{-11}	1.14×10^{-4}	4.99×10^{-9}	2.53×10^{-11}	2.63×10^{-4}	1.24×10^{-8}	2.55×10^{-8}	2.99×10^{-4}	1.62×10^{-8}
Iodine-129	3.20×10^{-14}	1.06×10^{-5}	1.41×10^{-10}	3.20×10^{-14}	1.73×10^{-4}	4.16×10^{-9}	3.57×10^{-11}	1.09×10^{-4}	2.65×10^{-9}
Total	3.82×10^{-10}	1.91×10^{-4}	5.83×10^{-9}	3.82×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.31×10^{-6}	4.04×10^{-1}	4.97×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1994	1994	1994
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	8.95×10^{-6}	8.53×10^{-5}	3.52×10^{-14}	8.95×10^{-6}	1.37×10^{-4}	1.61×10^{-9}	2.24×10^{-2}	4.97×10^{-2}	2.83×10^{-6}
Nitrate	2.24×10^{-3}	7.74×10^{-5}	0.00	2.24×10^{-3}	2.11×10^{-1}	0.00	4.36	6.64×10^{-1}	0.00
Total	2.25×10^{-3}	1.63×10^{-4}	3.52×10^{-14}	2.25×10^{-3}	2.11×10^{-1}	1.61×10^{-9}	4.38	7.14×10^{-1}	2.83×10^{-6}
Year of peak impact	1984	1984	1984	1984	1984	1984	1984	1984	2695

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

Table Q–172. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.61×10^{-6}	4.22×10^{-1}	4.01×10^{-6}	3.61×10^{-6}	6.71×10^{-1}	7.01×10^{-6}	3.61×10^{-6}	1.23	1.40×10^{-5}
Technetium-99	1.24×10^{-5}	2.17×10^{1}	7.46×10^{-4}	1.24×10^{-5}	5.57×10^{1}	2.45×10^{-3}	1.24×10^{-5}	1.13×10^{2}	5.34×10^{-3}
Iodine-129	2.39×10^{-8}	6.79	7.73×10^{-5}	2.39×10^{-8}	7.88	1.04×10^{-4}	2.39×10^{-8}	9.74	1.50×10^{-4}
Total	1.60×10^{-5}	2.89×10^{1}	8.27×10^{-4}	1.60×10^{-5}	6.42×10^{1}	2.56×10^{-3}	1.60×10^{-5}	1.24×10^{2}	5.50×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
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	6.31×10^{-2}	6.01×10^{-1}	0.00	6.31×10^{-2}	6.01×10^{-1}	2.48×10^{-10}	6.31×10^{-2}	8.78×10^{-1}	1.14×10^{-5}
Nitrate	4.19	7.49×10^{-2}	0.00	4.19	9.86×10^{-2}	0.00	4.19	1.93×10^{-1}	0.00
Total	4.26	6.75×10^{-1}	0.00	4.26	7.00×10^{-1}	2.48×10^{-10}	4.26	1.07	1.14×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–173. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	7.34×10^{-8}	8.58×10^{-3}	8.15×10^{-8}	7.34×10^{-8}	1.37×10^{-2}	1.43×10^{-7}	7.34×10^{-8}	2.51×10^{-2}	2.85×10^{-7}
Technetium-99	8.55×10^{-6}	1.50×10^{1}	5.15×10^{-4}	8.55×10^{-6}	3.85×10^{1}	1.69×10^{-3}	8.55×10^{-6}	7.84×10^{1}	3.69×10^{-3}
Iodine-129	1.62×10^{-8}	4.60	5.24×10^{-5}	1.62×10^{-8}	5.34	7.07×10^{-5}	1.62×10^{-8}	6.60	1.02×10^{-4}
Total	8.64×10^{-6}	1.96×10^{1}	5.68×10^{-4}	8.64×10^{-6}	4.38×10^{1}	1.76×10^{-3}	8.64×10^{-6}	8.50×10^{1}	3.79×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	9.09×10^{-2}	8.66×10^{-1}	0.00	9.09×10^{-2}	8.66×10^{-1}	3.57×10^{-10}	9.09×10^{-2}	1.27	1.64×10^{-5}
Nitrate	1.76×10^{1}	3.15×10^{-1}	0.00	1.76×10^{1}	4.15×10^{-1}	0.00	1.76×10^{1}	8.14×10^{-1}	0.00
Total	1.77×10^{1}	1.18	0.00	1.77×10^{1}	1.28	3.57×10^{-10}	1.77×10^{1}	2.08	1.64×10^{-5}
Year of peak impact	2049	2049	N/A	2049	2049	2049	2049	2049	2049

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–174. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.32×10^{-7}	2.71×10^{-2}	2.58×10^{-7}	2.32×10^{-7}	4.31×10^{-2}	4.51×10^{-7}	2.32×10^{-7}	7.93×10^{-2}	8.99×10^{-7}
Technetium-99	3.90×10^{-6}	6.83	2.35×10^{-4}	3.90×10^{-6}	1.75×10^{1}	7.70×10^{-4}	3.90×10^{-6}	3.57×10^{1}	1.68×10^{-3}
Iodine-129	7.62×10^{-9}	2.17	2.47×10^{-5}	7.62×10^{-9}	2.52	3.33×10^{-5}	7.62×10^{-9}	3.11	4.80×10^{-5}
Total	4.14×10^{-6}	9.02	2.60×10^{-4}	4.14×10^{-6}	2.01×10^{1}	8.04×10^{-4}	4.14×10^{-6}	3.89×10^{1}	1.73×10^{-3}
Year of peak impact	2030	2030	2030	2030	2030	2030	2030	2030	2030
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	4.07×10^{-1}	3.87	0.00	4.07×10^{-1}	3.88	1.60×10^{-9}	4.07×10^{-1}	5.67	7.33×10^{-5}
Nitrate	1.13×10^{1}	2.02×10^{-1}	0.00	1.13×10^{1}	2.67×10^{-1}	0.00	1.13×10^{1}	5.23×10^{-1}	0.00
Total	1.17×10^{1}	4.08	0.00	1.17×10^{1}	4.14	1.60×10^{-9}	1.17×10^{1}	6.19	7.33×10^{-5}
Year of peak impact	2029	2029	N/A	2029	2029	2029	2029	2029	2029

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–175. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks at the T Barrier Boundary

Radioactive 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)
Hydrogen-3 (tritium)	3.30×10^{-6}	3.85×10^{-1}	3.66×10^{-6}	3.30×10^{-6}	6.13×10^{-1}	6.41×10^{-6}	3.30×10^{-6}	1.13	1.28×10^{-5}
Technetium-99	2.35×10^{-5}	4.11×10^{1}	1.41×10^{-3}	2.35×10^{-5}	1.06×10^{2}	4.64×10^{-3}	2.35×10^{-5}	2.15×10^{2}	1.01×10^{-2}
Iodine-129	4.40×10^{-8}	1.25×10^{1}	1.42×10^{-4}	4.40×10^{-8}	1.45×10^{1}	1.92×10^{-4}	4.40×10^{-8}	1.79×10^{1}	2.77×10^{-4}
Total	2.68×10^{-5}	5.40×10^{1}	1.56×10^{-3}	2.68×10^{-5}	1.21×10^{2}	4.83×10^{-3}	2.68×10^{-5}	2.34×10^{2}	1.04×10^{-2}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	5.31×10^{-1}	5.06	0.00	5.30×10^{-1}	5.05	2.09×10^{-9}	5.30×10^{-1}	7.38	9.59×10^{-5}
Nitrate	3.87×10^{1}	6.92×10^{-1}	0.00	3.92×10^{1}	9.22×10^{-1}	0.00	3.92×10^{1}	1.81	0.00
Total	3.93×10^{1}	5.75	0.00	3.98×10^{1}	5.97	2.09×10^{-9}	3.98×10^{1}	9.19	9.59×10^{-5}
Year of peak impact	2028	2028	N/A	2029	2029	2027	2029	2029	2027

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–176. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	1.73×10^{-8}	2.02×10^{-3}	1.38×10^{-8}	1.25×10^{-8}	2.32×10^{-3}	2.42×10^{-8}	1.25×10^{-8}	4.26×10^{-3}	4.83×10^{-8}
Technetium-99	1.41×10^{-7}	2.46×10^{-1}	8.57×10^{-6}	1.42×10^{-7}	6.40×10^{-1}	2.81×10^{-5}	1.42×10^{-7}	1.30	6.13×10^{-5}
Iodine-129	2.64×10^{-10}	7.53×10^{-2}	8.15×10^{-7}	2.51×10^{-10}	8.31×10^{-2}	1.10×10^{-6}	2.51×10^{-10}	1.03×10^{-1}	1.58×10^{-6}
Total	1.58×10^{-7}	3.24×10^{-1}	9.40×10^{-6}	1.55×10^{-7}	7.25×10^{-1}	2.92×10^{-5}	1.55×10^{-7}	1.41	6.29×10^{-5}
Year of peak impact	2046	2046	2049	2049	2049	2049	2049	2049	2049
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	1.35×10^{-2}	1.29×10^{-1}	0.00	1.35×10^{-2}	1.29×10^{-1}	5.31×10^{-11}	1.35×10^{-2}	1.88×10^{-1}	2.44×10^{-6}
Nitrate	6.28×10^{-1}	1.12×10^{-2}	0.00	6.28×10^{-1}	1.48×10^{-2}	0.00	6.28×10^{-1}	2.90×10^{-2}	0.00
Total	6.41×10^{-1}	1.40×10^{-1}	0.00	6.41×10^{-1}	1.44×10^{-1}	5.31×10^{-11}	6.41×10^{-1}	2.17×10^{-1}	2.44×10^{-6}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–177. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.50×10^{-7}	1.75×10^{-2}	1.67×10^{-7}	1.50×10^{-7}	2.79×10^{-2}	2.91×10^{-7}	1.50×10^{-7}	5.13×10^{-2}	5.81×10^{-7}
Technetium-99	4.59×10^{-6}	8.05	2.77×10^{-4}	4.59×10^{-6}	2.07×10^{1}	9.07×10^{-4}	4.59×10^{-6}	4.21×10^{1}	1.98×10^{-3}
Iodine-129	7.69×10^{-9}	2.19	2.49×10^{-5}	7.69×10^{-9}	2.54	3.36×10^{-5}	7.69×10^{-9}	3.14	4.84×10^{-5}
Total	4.75×10^{-6}	1.03×10^{1}	3.02×10^{-4}	4.75×10^{-6}	2.32×10^{1}	9.41×10^{-4}	4.75×10^{-6}	4.53×10^{1}	2.03×10^{-3}
Year of peak impact	2034	2034	2034	2034	2034	2034	2034	2034	2034
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	4.17×10^{-1}	3.97	0.00	4.17×10^{-1}	3.97	1.64×10^{-9}	4.17×10^{-1}	5.80	7.51×10^{-5}
Nitrate	9.63	1.72×10^{-1}	0.00	9.63	2.26×10^{-1}	0.00	9.63	4.44×10^{-1}	0.00
Total	1.00×10^{1}	4.14	0.00	1.00×10^{1}	4.20	1.64×10^{-9}	1.00×10^{1}	6.25	7.51×10^{-5}
Year of peak impact	2224	2224	N/A	2224	2224	2224	2224	2224	2224

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–178. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	3.78×10^{-11}	4.42×10^{-6}	4.20×10^{-11}	3.78×10^{-11}	7.03×10^{-6}	7.35×10^{-11}	3.78×10^{-11}	1.29×10^{-5}	1.47×10^{-10}
Technetium-99	1.42×10^{-7}	2.48×10^{-1}	8.53×10^{-6}	1.42×10^{-7}	6.37×10^{-1}	2.80×10^{-5}	1.42×10^{-7}	1.30	6.10×10^{-5}
Iodine-129	1.10×10^{-10}	3.12×10^{-2}	3.55×10^{-7}	1.10×10^{-10}	3.62×10^{-2}	4.79×10^{-7}	1.10×10^{-10}	4.47×10^{-2}	6.90×10^{-7}
Total	1.42×10^{-7}	2.79×10^{-1}	8.88×10^{-6}	1.42×10^{-7}	6.73×10^{-1}	2.84×10^{-5}	1.42×10^{-7}	1.34	6.17×10^{-5}
Year of peak impact	2133	2133	2133	2133	2133	2133	2133	2133	2133
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	3.53×10^{-3}	3.36×10^{-2}	0.00	3.53×10^{-3}	3.36×10^{-2}	1.38×10^{-11}	3.53×10^{-3}	4.91×10^{-2}	6.35×10^{-7}
Nitrate	1.58×10^{-1}	2.82×10^{-3}	0.00	1.58×10^{-1}	3.71×10^{-3}	0.00	1.58×10^{-1}	7.27×10^{-3}	0.00
Total	1.61×10^{-1}	3.64×10^{-2}	0.00	1.61×10^{-1}	3.73×10^{-2}	1.38×10^{-11}	1.61×10^{-1}	5.64×10^{-2}	6.35×10^{-7}
Year of peak impact	2152	2152	N/A	2152	2152	2152	2152	2152	2152

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–179. Tank Closure Alternative 6B, Base Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.04×10^{-15}	1.93×10^{-10}	2.02×10^{-15}	1.04×10^{-15}	3.60×10^{-10}	4.08×10^{-15}	3.78×10^{-11}	1.19×10^{-5}	1.46×10^{-10}
Technetium-99	6.54×10^{-12}	2.94×10^{-5}	1.29×10^{-9}	6.54×10^{-12}	6.80×10^{-5}	3.22×10^{-9}	1.42×10^{-7}	1.58×10^{-3}	8.64×10^{-8}
Iodine-129	1.17×10^{-14}	3.89×10^{-6}	5.15×10^{-11}	1.17×10^{-14}	6.34×10^{-5}	1.53×10^{-9}	1.10×10^{-10}	3.11×10^{-4}	7.58×10^{-9}
Total	6.55×10^{-12}	3.33×10^{-5}	1.34×10^{-9}	6.55×10^{-12}	1.31×10^{-4}	4.75×10^{-9}	1.42×10^{-7}	1.90×10^{-3}	9.41×10^{-8}
Year of peak impact	2143	2143	2143	2143	2143	2143	2133	2133	2133
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	1.81×10^{-7}	1.73×10^{-6}	7.12×10^{-16}	1.53×10^{-7}	2.33×10^{-6}	3.26×10^{-11}	3.03×10^{-3}	6.69×10^{-3}	3.18×10^{-7}
Nitrate	9.96×10^{-6}	3.44×10^{-7}	0.00	1.06×10^{-5}	9.99×10^{-4}	0.00	1.94×10^{-1}	8.98×10^{-3}	0.00
Total	1.01×10^{-5}	2.07×10^{-6}	7.12×10^{-16}	1.08×10^{-5}	1.00×10^{-3}	3.26×10^{-11}	1.97×10^{-1}	1.57×10^{-2}	3.18×10^{-7}
Year of peak impact	2165	2165	2165	2150	2150	2165	2181	2181	2152

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

Table Q–180. Tank Closure Alternative 6B, Base Case, Human Health Impacts at the A Barrier 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)
Hydrogen-3 (tritium)	2.68×10^{-8}	3.13×10^{-3}	2.98×10^{-8}	2.68×10^{-8}	4.98×10^{-3}	5.21×10^{-8}	2.68×10^{-8}	9.16×10^{-3}	1.04×10^{-7}
Technetium-99	1.39×10^{-6}	2.43	8.35×10^{-5}	1.39×10^{-6}	6.24	2.74×10^{-4}	1.39×10^{-6}	1.27×10^{1}	5.97×10^{-4}
Iodine-129	2.75×10^{-9}	7.82×10^{-1}	8.91×10^{-6}	2.75×10^{-9}	9.08×10^{-1}	1.20×10^{-5}	2.75×10^{-9}	1.12	1.73×10^{-5}
Total	1.42×10^{-6}	3.21	9.24×10^{-5}	1.42×10^{-6}	7.15	2.86×10^{-4}	1.42×10^{-6}	1.38×10^{1}	6.15×10^{-4}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	7.24×10^{-3}	6.89×10^{-2}	0.00	7.24×10^{-3}	6.90×10^{-2}	2.84×10^{-11}	7.24×10^{-3}	1.01×10^{-1}	1.30×10^{-6}
Nitrate	4.43×10^{-1}	7.91×10^{-3}	0.00	4.43×10^{-1}	1.04×10^{-2}	0.00	4.43×10^{-1}	2.04×10^{-2}	0.00
Total	4.50×10^{-1}	7.68×10^{-2}	0.00	4.50×10^{-1}	7.94×10^{-2}	2.84×10^{-11}	4.50×10^{-1}	1.21×10^{-1}	1.30×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–181. Tank Closure Alternative 6B, Base Case, Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	4.07×10^{-7}	4.76×10^{-2}	4.52×10^{-7}	4.07×10^{-7}	7.57×10^{-2}	7.91×10^{-7}	4.07×10^{-7}	1.39×10^{-1}	1.58×10^{-6}
Technetium-99	2.93×10^{-5}	5.13×10^{1}	1.76×10^{-3}	2.93×10^{-5}	1.32×10^{2}	5.78×10^{-3}	2.93×10^{-5}	2.68×10^{2}	1.26×10^{-2}
Iodine-129	3.62×10^{-8}	1.03×10^{1}	1.17×10^{-4}	3.62×10^{-8}	1.20×10^{1}	1.58×10^{-4}	3.62×10^{-8}	1.48×10^{1}	2.28×10^{-4}
Total	2.97×10^{-5}	6.17×10^{1}	1.88×10^{-3}	2.97×10^{-5}	1.44×10^{2}	5.94×10^{-3}	2.97×10^{-5}	2.83×10^{2}	1.28×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	3.18	3.02×10^{1}	0.00	3.18	3.03×10^{1}	1.25×10^{-8}	3.18	4.42×10^{1}	5.72×10^{-4}
Nitrate	1.54×10^{3}	2.75×10^{1}	0.00	1.54×10^{3}	3.62×10^{1}	0.00	1.54×10^{3}	7.10×10^{1}	0.00
Total	1.54×10^{3}	5.78×10^{1}	0.00	1.54×10^{3}	6.65×10^{1}	1.25×10^{-8}	1.54×10^{3}	1.15×10^{2}	5.72×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2055	2050	2050	2055

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–182. Tank Closure Alternative 6B, Base Case, Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	4.62×10^{-8}	5.39×10^{-3}	5.13×10^{-8}	4.62×10^{-8}	8.58×10^{-3}	8.97×10^{-8}	4.62×10^{-8}	1.58×10^{-2}	1.79×10^{-7}
Technetium-99	2.56×10^{-6}	4.49	1.54×10^{-4}	2.56×10^{-6}	1.15×10^{1}	5.06×10^{-4}	2.56×10^{-6}	2.35×10^{1}	1.10×10^{-3}
Iodine-129	4.80×10^{-9}	1.37	1.56×10^{-5}	4.80×10^{-9}	1.59	2.10×10^{-5}	4.80×10^{-9}	1.96	3.02×10^{-5}
Total	2.61×10^{-6}	5.86	1.70×10^{-4}	2.61×10^{-6}	1.31×10^{1}	5.27×10^{-4}	2.61×10^{-6}	2.55×10^{1}	1.13×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.83×10^{-1}	2.70	0.00	2.83×10^{-1}	2.70	1.11×10^{-9}	2.83×10^{-1}	3.95	5.10×10^{-5}
Nitrate	8.65	1.55×10^{-1}	0.00	8.65	2.03×10^{-1}	0.00	8.65	3.99×10^{-1}	0.00
Total	8.94	2.85	0.00	8.94	2.90	1.11×10^{-9}	8.94	4.35	5.10×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–183. Tank Closure Alternative 6B, Base Case, Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	5.16×10^{-6}	6.02×10^{-1}	5.72×10^{-6}	5.16×10^{-6}	9.58×10^{-1}	1.00×10^{-5}	5.16×10^{-6}	1.76	2.00×10^{-5}
Technetium-99	1.55×10^{-5}	2.72×10^{1}	9.35×10^{-4}	1.55×10^{-5}	6.98×10^{1}	3.07×10^{-3}	1.55×10^{-5}	1.42×10^{2}	6.69×10^{-3}
Iodine-129	2.90×10^{-8}	8.26	9.40×10^{-5}	2.90×10^{-8}	9.59	1.27×10^{-4}	2.90×10^{-8}	1.18×10^{1}	1.83×10^{-4}
Uranium-238	1.62×10^{-10}	2.01×10^{-2}	2.27×10^{-7}	1.62×10^{-10}	2.08×10^{-2}	2.43×10^{-7}	1.62×10^{-10}	2.23×10^{-2}	2.75×10^{-7}
Total	2.07×10^{-5}	3.61×10^{1}	1.03×10^{-3}	2.07×10^{-5}	8.04×10^{1}	3.20×10^{-3}	2.07×10^{-5}	1.56×10^{2}	6.89×10^{-3}
Year of peak impact	2051	2051	2051	2051	2051	2051	2051	2051	2051
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	7.71×10^{-1}	7.35	0.00	7.71×10^{-1}	7.35	3.03×10^{-9}	7.71×10^{-1}	1.07×10^{1}	1.39×10^{-4}
Nitrate	1.29×10^{2}	2.31	0.00	1.29×10^{2}	3.04	0.00	1.29×10^{2}	5.96	0.00
Total uranium	1.85×10^{-4}	1.76×10^{-3}	0.00	1.85×10^{-4}	1.78×10^{-3}	0.00	1.85×10^{-4}	1.85×10^{-3}	0.00
Total	1.30×10^{2}	9.65	0.00	1.30×10^{2}	1.04×10^{1}	3.03×10^{-9}	1.30×10^{2}	1.67×10^{1}	1.39×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–184. Tank Closure Alternative 6B, Base Case, Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	6.84×10^{-9}	7.99×10^{-4}	7.60×10^{-9}	6.84×10^{-9}	1.27×10^{-3}	1.33×10^{-8}	6.84×10^{-9}	2.34×10^{-3}	2.65×10^{-8}
Technetium-99	1.40×10^{-7}	2.46×10^{-1}	8.45×10^{-6}	1.40×10^{-7}	6.31×10^{-1}	2.77×10^{-5}	1.40×10^{-7}	1.29	6.05×10^{-5}
Iodine-129	2.69×10^{-10}	7.66×10^{-2}	8.72×10^{-7}	2.69×10^{-10}	8.89×10^{-2}	1.18×10^{-6}	2.69×10^{-10}	1.10×10^{-1}	1.69×10^{-6}
Total	1.47×10^{-7}	3.23×10^{-1}	9.33×10^{-6}	1.47×10^{-7}	7.22×10^{-1}	2.89×10^{-5}	1.47×10^{-7}	1.40	6.22×10^{-5}
Year of peak impact	2060	2060	2060	2060	2060	2060	2060	2060	2060
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	9.25×10^{-3}	8.81×10^{-2}	0.00	9.25×10^{-3}	8.81×10^{-2}	3.63×10^{-11}	9.25×10^{-3}	1.29×10^{-1}	1.67×10^{-6}
Nitrate	6.06×10^{-1}	1.08×10^{-2}	0.00	6.06×10^{-1}	1.42×10^{-2}	0.00	6.06×10^{-1}	2.80×10^{-2}	0.00
Total	6.15×10^{-1}	9.89×10^{-2}	0.00	6.15×10^{-1}	1.02×10^{-1}	3.63×10^{-11}	6.15×10^{-1}	1.57×10^{-1}	1.67×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–185. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	2.08×10^{-6}	2.43×10^{-1}	2.31×10^{-6}	2.08×10^{-6}	3.87×10^{-1}	4.05×10^{-6}	2.08×10^{-6}	7.12×10^{-1}	8.07×10^{-6}
Technetium-99	2.48×10^{-5}	4.34×10^{1}	1.49×10^{-3}	2.48×10^{-5}	1.11×10^{2}	4.89×10^{-3}	2.48×10^{-5}	2.27×10^{2}	1.07×10^{-2}
Iodine-129	2.81×10^{-8}	7.99	9.09×10^{-5}	2.81×10^{-8}	9.27	1.23×10^{-4}	2.81×10^{-8}	1.15×10^{1}	1.77×10^{-4}
Total	2.69×10^{-5}	5.16×10^{1}	1.59×10^{-3}	2.69×10^{-5}	1.21×10^{2}	5.02×10^{-3}	2.69×10^{-5}	2.39×10^{2}	1.09×10^{-2}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	1.66	1.58×10^{1}	0.00	1.66	1.58×10^{1}	6.50×10^{-9}	1.66	2.31×10^{1}	2.98×10^{-4}
Nitrate	1.01×10^{3}	1.80×10^{1}	0.00	1.01×10^{3}	2.37×10^{1}	0.00	1.01×10^{3}	4.65×10^{1}	0.00
Total	1.01×10^{3}	3.38×10^{1}	0.00	1.01×10^{3}	3.95×10^{1}	6.50×10^{-9}	1.01×10^{3}	6.96×10^{1}	2.98×10^{-4}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–186. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	1.76×10^{-10}	2.06×10^{-5}	1.96×10^{-10}	1.76×10^{-10}	3.27×10^{-5}	3.42×10^{-10}	1.76×10^{-10}	6.02×10^{-5}	6.83×10^{-10}
Technetium-99	1.68×10^{-7}	2.95×10^{-1}	1.01×10^{-5}	1.68×10^{-7}	7.56×10^{-1}	3.32×10^{-5}	1.68×10^{-7}	1.54	7.25×10^{-5}
Iodine-129	1.52×10^{-10}	4.33×10^{-2}	4.93×10^{-7}	1.52×10^{-10}	5.03×10^{-2}	6.66×10^{-7}	1.52×10^{-10}	6.21×10^{-2}	9.58×10^{-7}
Total	1.68×10^{-7}	3.38×10^{-1}	1.06×10^{-5}	1.68×10^{-7}	8.07×10^{-1}	3.39×10^{-5}	1.68×10^{-7}	1.60	7.34×10^{-5}
Year of peak impact	2214	2214	2214	2214	2214	2214	2214	2214	2214
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.33×10^{-2}	3.17×10^{-1}	0.00	3.33×10^{-2}	3.17×10^{-1}	1.31×10^{-10}	3.33×10^{-2}	4.64×10^{-1}	6.00×10^{-6}
Nitrate	5.88	1.05×10^{-1}	0.00	5.88	1.38×10^{-1}	0.00	5.88	2.71×10^{-1}	0.00
Total	5.91	4.22×10^{-1}	0.00	5.91	4.56×10^{-1}	1.31×10^{-10}	5.91	7.35×10^{-1}	6.00×10^{-6}
Year of peak impact	2695	2695	N/A	2695	2695	2695	2695	2695	2695

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–187. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	6.29×10^{-14}	1.17×10^{-8}	1.22×10^{-13}	6.29×10^{-14}	2.17×10^{-8}	2.47×10^{-13}	1.78×10^{-7}	5.61×10^{-2}	6.88×10^{-7}
Technetium-99	8.09×10^{-12}	3.64×10^{-5}	1.60×10^{-9}	8.09×10^{-12}	8.41×10^{-5}	3.98×10^{-9}	4.73×10^{-8}	5.35×10^{-4}	2.91×10^{-8}
Iodine-129	1.34×10^{-14}	4.45×10^{-6}	5.90×10^{-11}	1.34×10^{-14}	7.26×10^{-5}	1.75×10^{-9}	7.28×10^{-11}	1.77×10^{-4}	4.33×10^{-9}
Total	8.17×10^{-12}	4.09×10^{-5}	1.66×10^{-9}	8.17×10^{-12}	1.57×10^{-4}	5.73×10^{-9}	2.25×10^{-7}	5.68×10^{-2}	7.22×10^{-7}
Year of peak impact	2143	2143	2143	2143	2143	2143	2050	2050	2050
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	9.39×10^{-7}	8.96×10^{-6}	3.98×10^{-15}	9.39×10^{-7}	1.43×10^{-5}	1.82×10^{-10}	2.30×10^{-2}	5.07×10^{-2}	3.00×10^{-6}
Nitrate	2.94×10^{-4}	1.01×10^{-5}	0.00	2.94×10^{-4}	2.76×10^{-2}	0.00	8.42	3.26×10^{-1}	0.00
Total uranium	0.00	0.00	0.00	0.00	0.00	0.00	4.20×10^{-12}	1.14×10^{-10}	0.00
Total	2.95×10^{-4}	1.91×10^{-5}	3.98×10^{-15}	2.95×10^{-4}	2.76×10^{-2}	1.82×10^{-10}	8.44	3.77×10^{-1}	3.00×10^{-6}
Year of peak impact	2067	2067	2066	2067	2067	2066	2450	2450	2695

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

Figure Q–9 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2034 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from the two sources occurs around the year 2050 and is dominated by technetium-99, and iodine-129. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

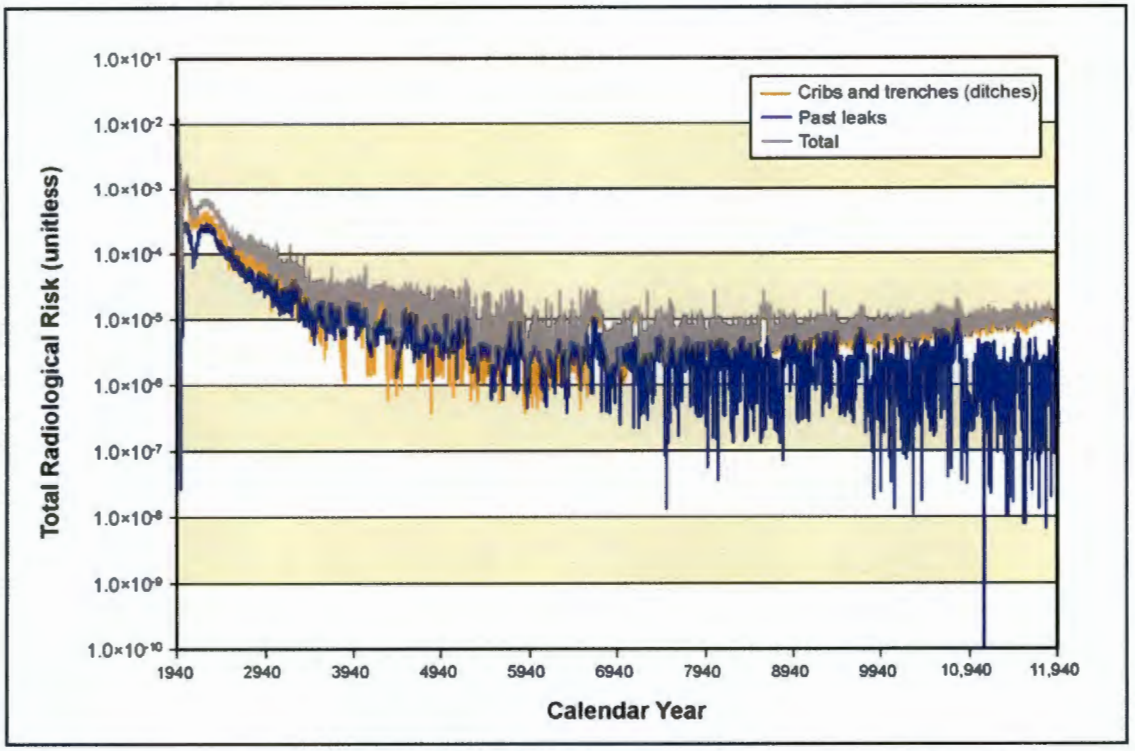

Figure Q–9. Tank Closure Alternative 6B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Potential human health impacts of Alternative 6B, Option Case, related to cribs and trenches (ditches) after year 1940 are summarized in Tables Q–188 through Q–192. Potential human health impacts of this alternative related to past leaks after year 1940 are summarized in Tables Q–193 through Q–200. Potential human health impacts of this alternative related to the combination of cribs and trenches (ditches), past leaks, and other sources (i.e., tank farms) after the year 2050 are summarized in Tables Q–201 through Q–208. Impacts would be slightly less than under Alternative 6B, Base Case, and standards would be exceeded, as under Alternative 6B, Base Case. Population dose was estimated as 2.00×10^{-1} person-rem per year for the year of maximum impact.

Table Q–188. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the B Barrier 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)
Hydrogen-3 (tritium)	2.84×10^{-3}	3.32×10^{2}	3.16×10^{-3}	2.84×10^{-3}	5.29×10^{2}	5.52×10^{-3}	2.84×10^{-3}	9.72×10^{2}	1.10×10^{-2}
Technetium-99	1.44×10^{-4}	2.52×10^{2}	8.66×10^{-3}	1.44×10^{-4}	6.47×10^{2}	2.84×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.20×10^{-2}
Iodine-129	1.87×10^{-7}	5.33×10^{1}	6.07×10^{-4}	1.87×10^{-7}	6.19×10^{1}	8.20×10^{-4}	1.87×10^{-7}	7.65×10^{1}	1.18×10^{-3}
Total	2.99×10^{-3}	6.37×10^{2}	1.24×10^{-2}	2.99×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.99×10^{-3}	2.37×10^{3}	7.42×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
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	5.12×10^{1}	4.88×10^{2}	0.00	5.12×10^{1}	4.88×10^{2}	2.01×10^{-7}	5.12×10^{1}	7.14×10^{2}	9.23×10^{-3}
Nitrate	1.78×10^{4}	3.18×10^{2}	0.00	1.78×10^{4}	4.19×10^{2}	0.00	1.78×10^{4}	8.21×10^{2}	0.00
Total Uranium	6.33×10^{-8}	6.03×10^{-7}	0.00	6.33×10^{-8}	6.10×10^{-7}	0.00	6.33×10^{-8}	6.31×10^{-7}	0.00
Total	1.79×10^{4}	8.06×10^{2}	0.00	1.79×10^{4}	9.07×10^{2}	2.01×10^{-7}	1.79×10^{4}	1.54×10^{3}	9.23×10^{-3}
Year of peak impact	1955	1955	N/A	1955	1955	1955	1955	1955	1955

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–189. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the T Barrier 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)
Hydrogen-3 (tritium)	1.24×10^{-2}	1.45×10^{3}	1.38×10^{-2}	1.24×10^{-2}	2.31×10^{3}	2.42×10^{-2}	1.24×10^{-2}	4.25×10^{3}	4.82×10^{-2}
Technetium-99	1.29×10^{-7}	2.26×10^{-1}	7.78×10^{-6}	1.29×10^{-7}	5.81×10^{-1}	2.55×10^{-5}	1.29×10^{-7}	1.18	5.56×10^{-5}
Iodine-129	1.05×10^{-9}	3.00×10^{-1}	3.42×10^{-6}	1.05×10^{-9}	3.49×10^{-1}	4.62×10^{-6}	1.05×10^{-9}	4.31×10^{-1}	6.64×10^{-6}
Uranium-238	3.68×10^{-11}	4.57×10^{-3}	5.16×10^{-8}	3.68×10^{-11}	4.74×10^{-3}	5.53×10^{-8}	3.68×10^{-11}	5.08×10^{-3}	6.25×10^{-8}
Total	1.24×10^{-2}	1.45×10^{3}	1.38×10^{-2}	1.24×10^{-2}	2.31×10^{3}	2.42×10^{-2}	1.24×10^{-2}	4.25×10^{3}	4.83×10^{-2}
Year of peak impact	1974	1974	1974	1974	1974	1974	1974	1974	1974
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	9.14	8.70×10^{1}	0.00	9.14	8.71×10^{1}	3.59×10^{-8}	9.14	1.27×10^{2}	1.65×10^{-3}
Nitrate	2.14×10^{3}	3.81×10^{1}	0.00	2.14×10^{3}	5.02×10^{1}	0.00	2.14×10^{3}	9.85×10^{1}	0.00
Total	2.14×10^{3}	1.25×10^{2}	0.00	2.14×10^{3}	1.37×10^{2}	3.59×10^{-8}	2.14×10^{3}	2.26×10^{2}	1.65×10^{-3}
Year of peak impact	1961	1961	N/A	1961	1961	1961	1961	1961	1961

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–190. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) at the Core Zone Boundary

	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Radiological Constituent	**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)**
Hydrogen-3 (tritium)	2.84×10^{-3}	3.32×10^{2}	3.16×10^{-3}	2.84×10^{-3}	5.29×10^{2}	5.52×10^{-3}	2.84×10^{-3}	9.72×10^{2}	1.10×10^{-2}
Technetium-99	1.44×10^{-4}	2.52×10^{2}	8.66×10^{-3}	1.44×10^{-4}	6.47×10^{2}	2.84×10^{-2}	1.44×10^{-4}	1.32×10^{3}	6.20×10^{-2}
Iodine-129	1.87×10^{-7}	5.33×10^{1}	6.07×10^{-4}	1.87×10^{-7}	6.19×10^{1}	8.20×10^{-4}	1.87×10^{-7}	7.65×10^{1}	1.18×10^{-3}
Total	2.99×10^{-3}	6.37×10^{2}	1.24×10^{-2}	2.99×10^{-3}	1.24×10^{3}	3.48×10^{-2}	2.99×10^{-3}	2.37×10^{3}	7.42×10^{-2}
Year of peak impact	1956	1956	1956	1956	1956	1956	1956	1956	1956
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	2.83×10^{1}	2.70×10^{2}	0.00	2.83×10^{1}	2.70×10^{2}	1.11×10^{-7}	2.83×10^{1}	3.95×10^{2}	5.10×10^{-3}
Nitrate	1.37×10^{4}	2.45×10^{2}	0.00	1.37×10^{4}	3.22×10^{2}	0.00	1.37×10^{4}	6.32×10^{2}	0.00
Total	1.37×10^{4}	5.15×10^{2}	0.00	1.37×10^{4}	5.92×10^{2}	1.11×10^{-7}	1.37×10^{4}	1.03×10^{3}	5.10×10^{-3}
Year of peak impact	1956	1956	N/A	1956	1956	1956	1956	1956	1956

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–191. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	1.61×10^{-6}	1.88×10^{-1}	3.87×10^{-7}	1.61×10^{-6}	2.99×10^{-1}	6.77×10^{-7}	3.49×10^{-7}	1.19×10^{-1}	1.35×10^{-6}
Technetium-99	1.03×10^{-8}	1.80×10^{-2}	3.55×10^{-6}	1.03×10^{-8}	4.62×10^{-2}	1.16×10^{-5}	5.89×10^{-8}	5.40×10^{-1}	2.54×10^{-5}
Iodine-129	2.65×10^{-11}	7.53×10^{-3}	2.09×10^{-7}	2.65×10^{-11}	8.75×10^{-3}	2.82×10^{-7}	6.44×10^{-11}	2.63×10^{-2}	4.06×10^{-7}
Total	1.62×10^{-6}	2.13×10^{-1}	4.14×10^{-6}	1.62×10^{-6}	3.54×10^{-1}	1.26×10^{-5}	4.08×10^{-7}	6.85×10^{-1}	2.71×10^{-5}
Year of peak impact	1997	1997	2019	1997	1997	2019	2019	2019	2019
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	2.57×10^{-2}	2.45×10^{-1}	0.00	2.57×10^{-2}	2.45×10^{-1}	1.01×10^{-10}	2.57×10^{-2}	3.58×10^{-1}	4.63×10^{-6}
Nitrate	6.25	1.12×10^{-1}	0.00	6.25	1.47×10^{-1}	0.00	6.25	2.88×10^{-1}	0.00
Total uranium	1.12×10^{-8}	1.06×10^{-7}	0.00	1.12×10^{-8}	1.08×10^{-7}	0.00	1.12×10^{-8}	1.11×10^{-7}	0.00
Total	6.27	3.56×10^{-1}	0.00	6.27	3.92×10^{-1}	1.01×10^{-10}	6.27	6.46×10^{-1}	4.63×10^{-6}
Year of peak impact	2166	2166	N/A	2166	2166	2166	2166	2166	2166

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–192. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Cribs and Trenches (Ditches) 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)
Hydrogen-3 (tritium)	3.62×10^{-10}	6.74×10^{-5}	7.04×10^{-10}	3.62×10^{-10}	1.25×10^{-4}	1.42×10^{-9}	1.61×10^{-6}	5.07×10^{-1}	6.22×10^{-6}
Technetium-99	2.54×10^{-11}	1.14×10^{-4}	5.01×10^{-9}	2.54×10^{-11}	2.64×10^{-4}	1.25×10^{-8}	1.03×10^{-8}	1.33×10^{-4}	7.02×10^{-9}
Iodine-129	3.15×10^{-14}	1.04×10^{-5}	1.38×10^{-10}	3.15×10^{-14}	1.70×10^{-4}	4.09×10^{-9}	2.65×10^{-11}	1.00×10^{-4}	2.44×10^{-9}
Total	3.88×10^{-10}	1.92×10^{-4}	5.86×10^{-9}	3.88×10^{-10}	5.59×10^{-4}	1.80×10^{-8}	1.62×10^{-6}	5.07×10^{-1}	6.23×10^{-6}
Year of peak impact	1962	1962	1962	1962	1962	1962	1997	1997	1997
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	8.90×10^{-6}	8.49×10^{-5}	3.50×10^{-14}	4.33×10^{-6}	6.61×10^{-5}	1.60×10^{-9}	1.60×10^{-2}	3.55×10^{-2}	2.31×10^{-6}
Nitrate	2.18×10^{-3}	7.54×10^{-5}	0.00	2.19×10^{-3}	2.06×10^{-1}	0.00	4.55	6.58×10^{-1}	0.00
Total	2.19×10^{-3}	1.60×10^{-4}	3.50×10^{-14}	2.20×10^{-3}	2.06×10^{-1}	1.60×10^{-9}	4.57	6.93×10^{-1}	2.31×10^{-6}
Year of peak impact	1984	1984	1984	1962	1962	1984	1984	1984	2166

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

Table Q–193. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks at the A Barrier 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)
Hydrogen-3 (tritium)	3.61×10^{-6}	4.22×10^{-1}	4.01×10^{-6}	3.61×10^{-6}	6.71×10^{-1}	7.01×10^{-6}	3.61×10^{-6}	1.23	1.40×10^{-5}
Technetium-99	1.24×10^{-5}	2.17×10^{1}	7.46×10^{-4}	1.24×10^{-5}	5.57×10^{1}	2.45×10^{-3}	1.24×10^{-5}	1.13×10^{2}	5.34×10^{-3}
Iodine-129	2.39×10^{-8}	6.79	7.73×10^{-5}	2.39×10^{-8}	7.88	1.04×10^{-4}	2.39×10^{-8}	9.74	1.50×10^{-4}
Total	1.60×10^{-5}	2.89×10^{1}	8.27×10^{-4}	1.60×10^{-5}	6.42×10^{1}	2.56×10^{-3}	1.60×10^{-5}	1.24×10^{2}	5.50×10^{-3}
Year of peak impact	1999	1999	1999	1999	1999	1999	1999	1999	1999
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	6.31×10^{-2}	6.01×10^{-1}	0.00	6.31×10^{-2}	6.01×10^{-1}	2.48×10^{-10}	6.31×10^{-2}	8.78×10^{-1}	1.14×10^{-5}
Nitrate	4.19	7.49×10^{-2}	0.00	4.19	9.86×10^{-2}	0.00	4.19	1.93×10^{-1}	0.00
Total	4.26	6.75×10^{-1}	0.00	4.26	7.00×10^{-1}	2.48×10^{-10}	4.26	1.07	1.14×10^{-5}
Year of peak impact	1999	1999	N/A	1999	1999	1999	1999	1999	1999

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–194. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks at the B Barrier 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)
Hydrogen-3 (tritium)	7.34×10^{-8}	8.58×10^{-3}	8.15×10^{-8}	7.34×10^{-8}	1.37×10^{-2}	1.43×10^{-7}	7.34×10^{-8}	2.51×10^{-2}	2.85×10^{-7}
Technetium-99	8.55×10^{-6}	1.50×10^{1}	5.15×10^{-4}	8.55×10^{-6}	3.85×10^{1}	1.69×10^{-3}	8.55×10^{-6}	7.84×10^{1}	3.69×10^{-3}
Iodine-129	1.62×10^{-8}	4.60	5.24×10^{-5}	1.62×10^{-8}	5.34	7.07×10^{-5}	1.62×10^{-8}	6.60	1.02×10^{-4}
Total	8.64×10^{-6}	1.96×10^{1}	5.68×10^{-4}	8.64×10^{-6}	4.38×10^{1}	1.76×10^{-3}	8.64×10^{-6}	8.50×10^{1}	3.79×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	9.09×10^{-2}	8.66×10^{-1}	0.00	9.09×10^{-2}	8.66×10^{-1}	3.57×10^{-10}	9.09×10^{-2}	1.27	1.64×10^{-5}
Nitrate	1.76×10^{1}	3.15×10^{-1}	0.00	1.76×10^{1}	4.15×10^{-1}	0.00	1.76×10^{1}	8.14×10^{-1}	0.00
Total	1.77×10^{1}	1.18	0.00	1.77×10^{1}	1.28	3.57×10^{-10}	1.77×10^{1}	2.08	1.64×10^{-5}
Year of peak impact	2049	2049	N/A	2049	2049	2049	2049	2049	2049

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–195. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks at the S Barrier 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)
Hydrogen-3 (tritium)	2.32×10^{-7}	2.71×10^{-2}	2.58×10^{-7}	2.32×10^{-7}	4.31×10^{-2}	4.51×10^{-7}	2.32×10^{-7}	7.93×10^{-2}	8.99×10^{-7}
Technetium-99	3.90×10^{-6}	6.83	2.35×10^{-4}	3.90×10^{-6}	1.75×10^{1}	7.70×10^{-4}	3.90×10^{-6}	3.57×10^{1}	1.68×10^{-3}
Iodine-129	7.62×10^{-9}	2.17	2.47×10^{-5}	7.62×10^{-9}	2.52	3.33×10^{-5}	7.62×10^{-9}	3.11	4.80×10^{-5}
Total	4.14×10^{-6}	9.02	2.60×10^{-4}	4.14×10^{-6}	2.01×10^{1}	8.04×10^{-4}	4.14×10^{-6}	3.89×10^{1}	1.73×10^{-3}
Year of peak impact	2030	2030	2030	2030	2030	2030	2030	2030	2030
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	4.07×10^{-1}	3.87	0.00	4.07×10^{-1}	3.88	1.60×10^{-9}	4.07×10^{-1}	5.67	7.33×10^{-5}
Nitrate	1.13×10^{1}	2.02×10^{-1}	0.00	1.13×10^{1}	2.67×10^{-1}	0.00	1.13×10^{1}	5.23×10^{-1}	0.00
Total	1.17×10^{1}	4.08	0.00	1.17×10^{1}	4.14	1.60×10^{-9}	1.17×10^{1}	6.19	7.33×10^{-5}
Year of peak impact	2029	2029	N/A	2029	2029	2029	2029	2029	2029

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–196. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks at the T Barrier 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)
Hydrogen-3 (tritium)	3.30×10^{-6}	3.85×10^{-1}	3.66×10^{-6}	3.30×10^{-6}	6.13×10^{-1}	6.41×10^{-6}	3.30×10^{-6}	1.13	1.28×10^{-5}
Technetium-99	2.35×10^{-5}	4.11×10^{1}	1.41×10^{-3}	2.35×10^{-5}	1.06×10^{2}	4.64×10^{-3}	2.35×10^{-5}	2.15×10^{2}	1.01×10^{-2}
Iodine-129	4.40×10^{-8}	1.25×10^{1}	1.42×10^{-4}	4.40×10^{-8}	1.45×10^{1}	1.92×10^{-4}	4.40×10^{-8}	1.79×10^{1}	2.77×10^{-4}
Total	2.68×10^{-5}	5.40×10^{1}	1.56×10^{-3}	2.68×10^{-5}	1.21×10^{2}	4.83×10^{-3}	2.68×10^{-5}	2.34×10^{2}	1.04×10^{-2}
Year of peak impact	2026	2026	2026	2026	2026	2026	2026	2026	2026
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	5.31×10^{-1}	5.06	0.00	5.30×10^{-1}	5.05	2.09×10^{-9}	5.30×10^{-1}	7.38	9.59×10^{-5}
Nitrate	3.87×10^{1}	6.92×10^{-1}	0.00	3.92×10^{1}	9.22×10^{-1}	0.00	3.92×10^{1}	1.81	0.00
Total	3.93×10^{1}	5.75	0.00	3.98×10^{1}	5.97	2.09×10^{-9}	3.98×10^{1}	9.19	9.59×10^{-5}
Year of peak impact	2028	2028	N/A	2029	2029	2027	2029	2029	2027

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–197. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks at the U Barrier 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)
Hydrogen-3 (tritium)	1.73×10^{-8}	2.02×10^{-3}	1.38×10^{-8}	1.25×10^{-8}	2.32×10^{-3}	2.42×10^{-8}	1.25×10^{-8}	4.26×10^{-3}	4.83×10^{-8}
Technetium-99	1.41×10^{-7}	2.46×10^{-1}	8.57×10^{-6}	1.42×10^{-7}	6.40×10^{-1}	2.81×10^{-5}	1.42×10^{-7}	1.30	6.13×10^{-5}
Iodine-129	2.64×10^{-10}	7.53×10^{-2}	8.15×10^{-7}	2.51×10^{-10}	8.31×10^{-2}	1.10×10^{-6}	2.51×10^{-10}	1.03×10^{-1}	1.58×10^{-6}
Total	1.58×10^{-7}	3.24×10^{-1}	9.40×10^{-6}	1.55×10^{-7}	7.25×10^{-1}	2.92×10^{-5}	1.55×10^{-7}	1.41	6.29×10^{-5}
Year of peak impact	2046	2046	2049	2049	2049	2049	2049	2049	2049
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	1.35×10^{-2}	1.29×10^{-1}	0.00	1.35×10^{-2}	1.29×10^{-1}	5.31×10^{-11}	1.35×10^{-2}	1.88×10^{-1}	2.44×10^{-6}
Nitrate	6.28×10^{-1}	1.12×10^{-2}	0.00	6.28×10^{-1}	1.48×10^{-2}	0.00	6.28×10^{-1}	2.90×10^{-2}	0.00
Total	6.41×10^{-1}	1.40×10^{-1}	0.00	6.41×10^{-1}	1.44×10^{-1}	5.31×10^{-11}	6.41×10^{-1}	2.17×10^{-1}	2.44×10^{-6}
Year of peak impact	2026	2026	N/A	2026	2026	2026	2026	2026	2026

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–198. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.50×10^{-7}	1.75×10^{-2}	1.67×10^{-7}	1.50×10^{-7}	2.79×10^{-2}	2.91×10^{-7}	1.50×10^{-7}	5.13×10^{-2}	5.81×10^{-7}
Technetium-99	4.59×10^{-6}	8.05	2.77×10^{-4}	4.59×10^{-6}	2.07×10^{1}	9.07×10^{-4}	4.59×10^{-6}	4.21×10^{1}	1.98×10^{-3}
Iodine-129	7.69×10^{-9}	2.19	2.49×10^{-5}	7.69×10^{-9}	2.54	3.36×10^{-5}	7.69×10^{-9}	3.14	4.84×10^{-5}
Total	4.75×10^{-6}	1.03×10^{1}	3.02×10^{-4}	4.75×10^{-6}	2.32×10^{1}	9.41×10^{-4}	4.75×10^{-6}	4.53×10^{1}	2.03×10^{-3}
Year of peak impact	2034	2034	2034	2034	2034	2034	2034	2034	2034
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	4.17×10^{-1}	3.97	0.00	4.17×10^{-1}	3.97	1.64×10^{-9}	4.17×10^{-1}	5.80	7.51×10^{-5}
Nitrate	9.63	1.72×10^{-1}	0.00	9.63	2.26×10^{-1}	0.00	9.63	4.44×10^{-1}	0.00
Total	1.00×10^{1}	4.14	0.00	1.00×10^{1}	4.20	1.64×10^{-9}	1.00×10^{1}	6.25	7.51×10^{-5}
Year of peak impact	2224	2224	N/A	2224	2224	2224	2224	2224	2224

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–199. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	3.78×10^{-11}	4.42×10^{-6}	4.20×10^{-11}	3.78×10^{-11}	7.03×10^{-6}	7.35×10^{-11}	3.78×10^{-11}	1.29×10^{-5}	1.47×10^{-10}
Technetium-99	1.42×10^{-7}	2.48×10^{-1}	8.53×10^{-6}	1.42×10^{-7}	6.37×10^{-1}	2.80×10^{-5}	1.42×10^{-7}	1.30	6.10×10^{-5}
Iodine-129	1.10×10^{-10}	3.12×10^{-2}	3.55×10^{-7}	1.10×10^{-10}	3.62×10^{-2}	4.79×10^{-7}	1.10×10^{-10}	4.47×10^{-2}	6.90×10^{-7}
Total	1.42×10^{-7}	2.79×10^{-1}	8.88×10^{-6}	1.42×10^{-7}	6.73×10^{-1}	2.84×10^{-5}	1.42×10^{-7}	1.34	6.17×10^{-5}
Year of peak impact	2133	2133	2133	2133	2133	2133	2133	2133	2133
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	3.53×10^{-3}	3.36×10^{-2}	0.00	3.53×10^{-3}	3.36×10^{-2}	1.38×10^{-11}	3.53×10^{-3}	4.91×10^{-2}	6.35×10^{-7}
Nitrate	1.58×10^{-1}	2.82×10^{-3}	0.00	1.58×10^{-1}	3.71×10^{-3}	0.00	1.58×10^{-1}	7.27×10^{-3}	0.00
Total	1.61×10^{-1}	3.64×10^{-2}	0.00	1.61×10^{-1}	3.73×10^{-2}	1.38×10^{-11}	1.61×10^{-1}	5.64×10^{-2}	6.35×10^{-7}
Year of peak impact	2152	2152	N/A	2152	2152	2152	2152	2152	2152

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–200. Tank Closure Alternative 6B, Option Case, Human Health Impacts Related to Past Leaks 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)
Hydrogen-3 (tritium)	1.04×10^{-15}	1.93×10^{-10}	2.02×10^{-15}	1.04×10^{-15}	3.60×10^{-10}	4.08×10^{-15}	3.78×10^{-11}	1.19×10^{-5}	1.46×10^{-10}
Technetium-99	6.54×10^{-12}	2.94×10^{-5}	1.29×10^{-9}	6.54×10^{-12}	6.80×10^{-5}	3.22×10^{-9}	1.42×10^{-7}	1.58×10^{-3}	8.64×10^{-8}
Iodine-129	1.17×10^{-14}	3.89×10^{-6}	5.15×10^{-11}	1.17×10^{-14}	6.34×10^{-5}	1.53×10^{-9}	1.10×10^{-10}	3.11×10^{-4}	7.58×10^{-9}
Total	6.55×10^{-12}	3.33×10^{-5}	1.34×10^{-9}	6.55×10^{-12}	1.31×10^{-4}	4.75×10^{-9}	1.42×10^{-7}	1.90×10^{-3}	9.41×10^{-8}
Year of peak impact	2143	2143	2143	2143	2143	2143	2133	2133	2133
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	1.81×10^{-7}	1.73×10^{-6}	7.12×10^{-16}	1.53×10^{-7}	2.33×10^{-6}	3.26×10^{-11}	3.03×10^{-3}	6.69×10^{-3}	3.18×10^{-7}
Nitrate	9.96×10^{-6}	3.44×10^{-7}	0.00	1.06×10^{-5}	9.99×10^{-4}	0.00	1.94×10^{-1}	8.98×10^{-3}	0.00
Total	1.01×10^{-5}	2.07×10^{-6}	7.12×10^{-16}	1.08×10^{-5}	1.00×10^{-3}	3.26×10^{-11}	1.97×10^{-1}	1.57×10^{-2}	3.18×10^{-7}
Year of peak impact	2165	2165	2165	2150	2150	2165	2181	2181	2152

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

Table Q–201. Tank Closure Alternative 6B, Option Case, Human Health Impacts at the A Barrier 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)
Hydrogen-3	2.68×10^{-8}	3.13×10^{-3}	2.98×10^{-8}	2.68×10^{-8}	4.98×10^{-3}	5.21×10^{-8}	2.68×10^{-8}	9.16×10^{-3}	1.04×10^{-7}
Technetium-99	1.39×10^{-6}	2.43	8.35×10^{-5}	1.39×10^{-6}	6.24	2.74×10^{-4}	1.39×10^{-6}	1.27×10^{1}	5.97×10^{-4}
Iodine-129	2.75×10^{-9}	7.82×10^{-1}	8.91×10^{-6}	2.75×10^{-9}	9.08×10^{-1}	1.20×10^{-5}	2.75×10^{-9}	1.12	1.73×10^{-5}
Total	1.42×10^{-6}	3.21	9.24×10^{-5}	1.42×10^{-6}	7.15	2.86×10^{-4}	1.42×10^{-6}	1.38×10^{1}	6.15×10^{-4}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	7.24×10^{-3}	6.89×10^{-2}	0.00	7.24×10^{-3}	6.90×10^{-2}	2.84×10^{-11}	7.24×10^{-3}	1.01×10^{-1}	1.30×10^{-6}
Nitrate	4.43×10^{-1}	7.91×10^{-3}	0.00	4.43×10^{-1}	1.04×10^{-2}	0.00	4.43×10^{-1}	2.04×10^{-2}	0.00
Total	4.50×10^{-1}	7.68×10^{-2}	0.00	4.50×10^{-1}	7.94×10^{-2}	2.84×10^{-11}	4.50×10^{-1}	1.21×10^{-1}	1.30×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–202. Tank Closure Alternative 6B, Option Case, Human Health Impacts at the B Barrier 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)
Hydrogen-3 (tritium)	2.64×10^{-6}	3.08×10^{-1}	2.93×10^{-6}	2.64×10^{-6}	4.90×10^{-1}	5.12×10^{-6}	2.64×10^{-6}	9.01×10^{-1}	1.02×10^{-5}
Technetium-99	2.70×10^{-5}	4.74×10^{1}	1.63×10^{-3}	2.70×10^{-5}	1.22×10^{2}	5.34×10^{-3}	2.70×10^{-5}	2.48×10^{2}	1.17×10^{-2}
Iodine-129	3.58×10^{-8}	1.02×10^{1}	1.16×10^{-4}	3.58×10^{-8}	1.18×10^{1}	1.57×10^{-4}	3.58×10^{-8}	1.46×10^{1}	2.26×10^{-4}
Uranium-238	6.17×10^{-12}	7.65×10^{-4}	8.64×10^{-9}	6.17×10^{-12}	7.94×10^{-4}	9.25×10^{-9}	6.17×10^{-12}	8.51×10^{-4}	1.05×10^{-8}
Total	2.97×10^{-5}	5.79×10^{1}	1.75×10^{-3}	2.97×10^{-5}	1.34×10^{2}	5.50×10^{-3}	2.97×10^{-5}	2.63×10^{2}	1.19×10^{-2}
Year of peak impact	2058	2058	2058	2058	2058	2058	2058	2058	2058
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	3.77	3.59×10^{1}	0.00	3.77	3.59×10^{1}	1.48×10^{-8}	3.77	5.25×10^{1}	6.79×10^{-4}
Nitrate	1.56×10^{3}	2.78×10^{1}	0.00	1.56×10^{3}	3.66×10^{1}	0.00	1.56×10^{3}	7.18×10^{1}	0.00
Total uranium	8.49×10^{-6}	8.09×10^{-5}	0.00	8.49×10^{-6}	8.18×10^{-5}	0.00	8.49×10^{-6}	8.47×10^{-5}	0.00
Total	1.56×10^{3}	6.37×10^{1}	0.00	1.56×10^{3}	7.25×10^{1}	1.48×10^{-8}	1.56×10^{3}	1.24×10^{2}	6.79×10^{-4}
Year of peak impact	2087	2087	N/A	2087	2087	2087	2087	2087	2087

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–203. Tank Closure Alternative 6B, Option Case, Human Health Impacts at the S Barrier 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)
Hydrogen-3 (tritium)	4.62×10^{-8}	5.39×10^{-3}	5.13×10^{-8}	4.62×10^{-8}	8.58×10^{-3}	8.97×10^{-8}	4.62×10^{-8}	1.58×10^{-2}	1.79×10^{-7}
Technetium-99	2.56×10^{-6}	4.49	1.54×10^{-4}	2.56×10^{-6}	1.15×10^{1}	5.06×10^{-4}	2.56×10^{-6}	2.35×10^{1}	1.10×10^{-3}
Iodine-129	4.80×10^{-9}	1.37	1.56×10^{-5}	4.80×10^{-9}	1.59	2.10×10^{-5}	4.80×10^{-9}	1.96	3.02×10^{-5}
Total	2.61×10^{-6}	5.86	1.70×10^{-4}	2.61×10^{-6}	1.31×10^{1}	5.27×10^{-4}	2.61×10^{-6}	2.55×10^{1}	1.13×10^{-3}
Year of peak impact	2050	2050	2050	2050	2050	2050	2050	2050	2050
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	2.83×10^{-1}	2.70	0.00	2.83×10^{-1}	2.70	1.11×10^{-9}	2.83×10^{-1}	3.95	5.10×10^{-5}
Nitrate	8.65	1.55×10^{-1}	0.00	8.65	2.03×10^{-1}	0.00	8.65	3.99×10^{-1}	0.00
Total	8.94	2.85	0.00	8.94	2.90	1.11×10^{-9}	8.94	4.35	5.10×10^{-5}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–204. Tank Closure Alternative 6B, Option Case, Human Health Impacts at the T Barrier 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)
Hydrogen-3 (tritium)	5.60×10^{-6}	6.55×10^{-1}	6.22×10^{-6}	5.60×10^{-6}	1.04	1.09×10^{-5}	5.60×10^{-6}	1.92	2.17×10^{-5}
Technetium-99	1.55×10^{-5}	2.72×10^{1}	9.35×10^{-4}	1.55×10^{-5}	6.98×10^{1}	3.07×10^{-3}	1.55×10^{-5}	1.42×10^{2}	6.69×10^{-3}
Iodine-129	2.90×10^{-8}	8.26	9.41×10^{-5}	2.90×10^{-8}	9.59	1.27×10^{-4}	2.90×10^{-8}	1.18×10^{1}	1.83×10^{-4}
Uranium-238	1.25×10^{-10}	1.55×10^{-2}	1.76×10^{-7}	1.25×10^{-10}	1.61×10^{-2}	1.88×10^{-7}	1.25×10^{-10}	1.73×10^{-2}	2.13×10^{-7}
Total	2.12×10^{-5}	3.61×10^{1}	1.04×10^{-3}	2.12×10^{-5}	8.05×10^{1}	3.20×10^{-3}	2.12×10^{-5}	1.56×10^{2}	6.89×10^{-3}
Year of peak impact	2051	2051	2051	2051	2051	2051	2051	2051	2051
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	7.68×10^{-1}	7.31	0.00	7.68×10^{-1}	7.32	3.05×10^{-9}	7.68×10^{-1}	1.07×10^{1}	1.40×10^{-4}
Nitrate	1.27×10^{2}	2.26	0.00	1.27×10^{2}	2.98	0.00	1.27×10^{2}	5.85	0.00
Total uranium	1.99×10^{-4}	1.90×10^{-3}	0.00	1.99×10^{-4}	1.92×10^{-3}	0.00	1.99×10^{-4}	1.99×10^{-3}	0.00
Total	1.28×10^{2}	9.58	0.00	1.28×10^{2}	1.03×10^{1}	3.05×10^{-9}	1.28×10^{2}	1.65×10^{1}	1.40×10^{-4}
Year of peak impact	2051	2051	N/A	2051	2051	2050	2051	2051	2050

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–205. Tank Closure Alternative 6B, Option Case, Human Health Impacts at the U Barrier 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)
Hydrogen-3 (tritium)	6.84×10^{-9}	7.99×10^{-4}	7.60×10^{-9}	6.84×10^{-9}	1.27×10^{-3}	1.33×10^{-8}	6.84×10^{-9}	2.34×10^{-3}	2.65×10^{-8}
Technetium-99	1.40×10^{-7}	2.46×10^{-1}	8.45×10^{-6}	1.40×10^{-7}	6.31×10^{-1}	2.77×10^{-5}	1.40×10^{-7}	1.29	6.05×10^{-5}
Iodine-129	2.69×10^{-10}	7.66×10^{-2}	8.72×10^{-7}	2.69×10^{-10}	8.89×10^{-2}	1.18×10^{-6}	2.69×10^{-10}	1.10×10^{-1}	1.69×10^{-6}
Total	1.47×10^{-7}	3.23×10^{-1}	9.33×10^{-6}	1.47×10^{-7}	7.22×10^{-1}	2.89×10^{-5}	1.47×10^{-7}	1.40	6.22×10^{-5}
Year of peak impact	2060	2060	2060	2060	2060	2060	2060	2060	2060
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	9.25×10^{-3}	8.81×10^{-2}	0.00	9.25×10^{-3}	8.81×10^{-2}	3.63×10^{-11}	9.25×10^{-3}	1.29×10^{-1}	1.67×10^{-6}
Nitrate	6.06×10^{-1}	1.08×10^{-2}	0.00	6.06×10^{-1}	1.42×10^{-2}	0.00	6.06×10^{-1}	2.80×10^{-2}	0.00
Total	6.15×10^{-1}	9.89×10^{-2}	0.00	6.15×10^{-1}	1.02×10^{-1}	3.63×10^{-11}	6.15×10^{-1}	1.57×10^{-1}	1.67×10^{-6}
Year of peak impact	2050	2050	N/A	2050	2050	2050	2050	2050	2050

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–206. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	3.16×10^{-6}	3.69×10^{-1}	3.51×10^{-6}	3.16×10^{-6}	5.88×10^{-1}	6.14×10^{-6}	3.16×10^{-6}	1.08	1.23×10^{-5}
Technetium-99	2.27×10^{-5}	3.98×10^{1}	1.37×10^{-3}	2.27×10^{-5}	1.02×10^{2}	4.48×10^{-3}	2.27×10^{-5}	2.08×10^{2}	9.78×10^{-3}
Iodine-129	2.73×10^{-8}	7.77	8.85×10^{-5}	2.73×10^{-8}	9.02	1.19×10^{-4}	2.73×10^{-8}	1.11×10^{1}	1.72×10^{-4}
Uranium-238	6.17×10^{-12}	7.65×10^{-4}	8.64×10^{-9}	6.17×10^{-12}	7.94×10^{-4}	9.25×10^{-9}	6.17×10^{-12}	8.51×10^{-4}	1.05×10^{-8}
Total	2.59×10^{-5}	4.79×10^{1}	1.46×10^{-3}	2.59×10^{-5}	1.12×10^{2}	4.61×10^{-3}	2.59×10^{-5}	2.20×10^{2}	9.96×10^{-3}
Year of peak impact	2058	2058	2058	2058	2058	2058	2058	2058	2058
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	1.39	1.33×10^{1}	0.00	1.39	1.33×10^{1}	6.92×10^{-9}	1.39	1.94×10^{1}	3.17×10^{-4}
Nitrate	1.23×10^{3}	2.19×10^{1}	0.00	1.23×10^{3}	2.89×10^{1}	0.00	1.23×10^{3}	5.66×10^{1}	0.00
Total uranium	1.01×10^{-5}	9.60×10^{-5}	0.00	1.01×10^{-5}	9.71×10^{-5}	0.00	1.01×10^{-5}	1.01×10^{-4}	0.00
Total	1.23×10^{3}	3.52×10^{1}	0.00	1.23×10^{3}	4.21×10^{1}	6.92×10^{-9}	1.23×10^{3}	7.60×10^{1}	3.17×10^{-4}
Year of peak impact	2053	2053	N/A	2053	2053	2061	2053	2053	2061

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–207. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	9.21×10^{-14}	1.08×10^{-8}	1.02×10^{-13}	9.21×10^{-14}	1.71×10^{-8}	1.79×10^{-13}	9.21×10^{-14}	3.15×10^{-8}	3.57×10^{-13}
Technetium-99	1.62×10^{-7}	2.83×10^{-1}	9.73×10^{-6}	1.62×10^{-7}	7.27×10^{-1}	3.19×10^{-5}	1.62×10^{-7}	1.48	6.96×10^{-5}
Iodine-129	1.93×10^{-10}	5.50×10^{-2}	6.26×10^{-7}	1.93×10^{-10}	6.38×10^{-2}	8.45×10^{-7}	1.93×10^{-10}	7.88×10^{-2}	1.22×10^{-6}
Uranium-238	5.72×10^{-15}	7.10×10^{-7}	8.01×10^{-12}	5.72×10^{-15}	7.36×10^{-7}	8.58×10^{-12}	5.72×10^{-15}	7.89×10^{-7}	9.71×10^{-12}
Total	1.62×10^{-7}	3.38×10^{-1}	1.04×10^{-5}	1.62×10^{-7}	7.91×10^{-1}	3.28×10^{-5}	1.62×10^{-7}	1.56	7.09×10^{-5}
Year of peak impact	2304	2304	2304	2304	2304	2304	2304	2304	2304
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	2.78×10^{-2}	2.65×10^{-1}	0.00	2.78×10^{-2}	2.65×10^{-1}	1.09×10^{-10}	2.78×10^{-2}	3.88×10^{-1}	5.01×10^{-6}
Nitrate	6.40	1.14×10^{-1}	0.00	6.40	1.50×10^{-1}	0.00	6.40	2.95×10^{-1}	0.00
Total uranium	1.12×10^{-8}	1.06×10^{-7}	0.00	1.12×10^{-8}	1.08×10^{-7}	0.00	1.12×10^{-8}	1.11×10^{-7}	0.00
Total	6.42	3.79×10^{-1}	0.00	6.42	4.16×10^{-1}	1.09×10^{-10}	6.42	6.83×10^{-1}	5.01×10^{-6}
Year of peak impact	2166	2166	N/A	2166	2166	2166	2166	2166	2166

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–208. Tank Closure Alternative 6B, 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)
Hydrogen-3 (tritium)	1.18×10^{-13}	2.20×10^{-8}	2.30×10^{-13}	1.19×10^{-13}	4.11×10^{-8}	4.64×10^{-13}	1.72×10^{-7}	5.44×10^{-2}	6.67×10^{-7}
Technetium-99	7.89×10^{-12}	3.55×10^{-5}	1.56×10^{-9}	7.85×10^{-12}	8.16×10^{-5}	3.88×10^{-9}	5.68×10^{-8}	6.61×10^{-4}	3.58×10^{-8}
Iodine-129	1.34×10^{-14}	4.42×10^{-6}	5.86×10^{-11}	1.35×10^{-14}	7.29×10^{-5}	1.74×10^{-9}	9.29×10^{-11}	2.79×10^{-4}	6.79×10^{-9}
Uranium-238	5.98×10^{-20}	7.70×10^{-12}	8.97×10^{-17}	8.59×10^{-20}	3.05×10^{-11}	3.00×10^{-16}	1.12×10^{-14}	1.12×10^{-7}	1.41×10^{-12}
Total	8.02×10^{-12}	3.99×10^{-5}	1.62×10^{-9}	7.98×10^{-12}	1.54×10^{-4}	5.62×10^{-9}	2.29×10^{-7}	5.53×10^{-2}	7.10×10^{-7}
Year of peak impact	2140	2140	2140	2143	2143	2140	2088	2088	2088
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	9.94×10^{-7}	9.48×10^{-6}	4.02×10^{-15}	9.94×10^{-7}	1.52×10^{-5}	1.84×10^{-10}	1.55×10^{-2}	3.43×10^{-2}	2.51×10^{-6}
Nitrate	2.86×10^{-4}	9.86×10^{-6}	0.00	2.86×10^{-4}	2.68×10^{-2}	0.00	7.11	3.11×10^{-1}	0.00
Total uranium	3.14×10^{-13}	3.02×10^{-12}	0.00	3.14×10^{-13}	4.17×10^{-12}	0.00	1.11×10^{-8}	4.95×10^{-9}	0.00
Total	2.87×10^{-4}	1.93×10^{-5}	4.02×10^{-15}	2.87×10^{-4}	2.69×10^{-2}	1.84×10^{-10}	7.12	3.45×10^{-1}	2.51×10^{-6}
Year of peak impact	2052	2052	2059	2052	2052	2059	2056	2056	2166

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

Figure Q–10 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time for cribs and trenches (ditches), past leaks, and the total of all three sources. The peak radiological risk resulting from cribs and trenches (ditches) occurs around the year 1956 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from past leaks occurs around the year 2034 for the Core Zone Boundary and is dominated by tritium, technetium-99, and iodine-129. The peak radiological risk resulting from the two sources occurs around the year 2058 and is dominated by technetium-99, and iodine-129. Tritium, technetium-99, and iodine-129 move at the same velocity as groundwater.

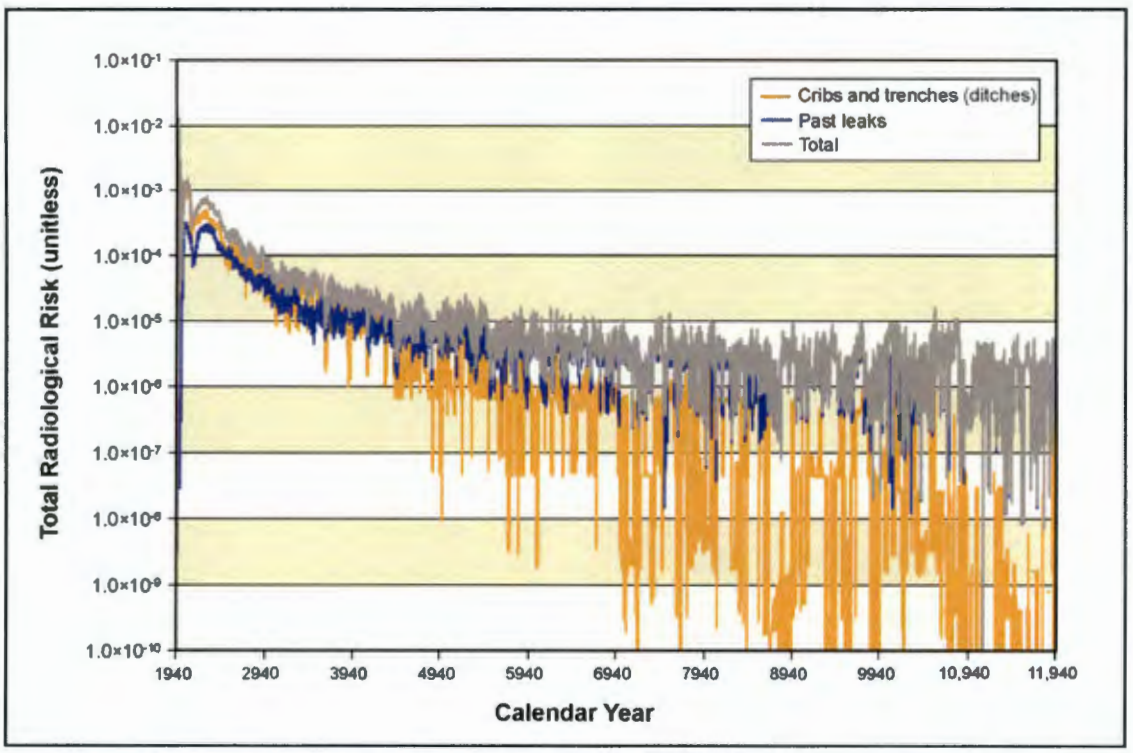

Figure Q–10. Tank Closure Alternative 6B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.1.1.8 Tank Closure Intruder Scenario

Intruders are individuals who enter a tank farm area and engage in activity that could cause direct contact with residual contamination in the stabilized or closed tanks. Two types of receptors and two types of scenarios were considered. The receptor types were the American Indian resident farmer and the resident farmer, and the scenario types were home construction and well drilling. Because the majority of the waste at the tank farms 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. Screening analysis also determined that impacts of intrusion were dominated by contact with short-lived radionuclides, strontium-90 and cesium-137. Consequently, impacts of intrusion at the tank farms 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. Because complete removal of tanks is proposed under Tank Closure Alternatives 6A, Base and Option Cases, and 6B, Base and Option Cases, no tank farm intruder impacts would occur for these alternatives. Estimates of impact under this intrusion scenario for the eighteen tank farms and remaining nine Tank Closure alternatives are summarized in

Table Q–209 for American Indian resident farmer intruders. For all tank farms and alternatives, resident farmer impacts are dominated by exposure to strontium-90 and cesium-137. 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 resident farmer and American Indian receptors. Estimates of impact on the drilling worker are presented in Table Q–210. For all tank farms and alternatives, drilling worker doses are dominated by external exposure from cesium-137 and inhalation exposure of plutonium-239. For both the resident farmer and drilling worker, impacts are presented as dose for the year of peak dose. Because doses are dominated by radionuclides with short half-lives, the year of peak dose occurs immediately after loss of institutional control. Due to high concentrations of strontium-90 and cesium-137, the DOE intruder dose guideline of 500 millirem (DOE Guide 453.1-1) is exceeded for single shell tank farms under Alternative 1 and 5.

Table Q–209. Doses to an American Indian Engaged in Residential Agriculture Following Well Drilling at the Tank Farms

Tank Farm	Dose (rem per year) Tank Closure Alternative					
	1	2	3	4	5	6C
A	48.2	0.482	0.482	0.048	4.82	0.482
AX	36.6	0.366	0.366	0.0366	3.66	0.366
B	6.8	0.068	0.068	0.0068	0.68	0.068
BX	5.69	0.0569	0.0569	0.0057	0.569	0.0569
BY	27.8	0.278	0.278	0.0278	2.78	0.0278
C	24.9	0.249	0.249	0.0249	2.49	0.249
S	33.1	0.331	0.331	0.0331	3.31	0.331
SX	30.7	0.307	0.307	0.0307	3.07	0.0307
T	2.37	0.0237	0.0237	0.0024	0.237	0.0237
TX	19.5	0.195	0.195	0.0195	1.95	0.195
TY	2.21	0.0221	0.0221	0.0022	0.221	0.0221
U	26.8	0.268	0.268	0.0268	2.68	0.268
AN	166	1.66	1.66	0.166	16.6	1.66
AP	90.3	0.903	0.903	0.0903	9.03	0.903
AW	74.1	0.741	0.741	0.0741	7.41	0.741
AY	81.8	0.818	0.818	0.0818	8.18	0.818
AZ	737	7.37	7.37	0.737	73.7	7.37
SY	117	1.17	1.17	0.117	11.7	1.17

Table Q–210. Doses to a Well-Drilling Worker at the Tank Farms

Tank Farm	Dose (rem) Tank Closure Alternative					
	1	2	3	4	5	6B
A	9.77×10^{-2}	7.51×10^{-4}	7.51×10^{-4}	7.51×10^{-5}	7.51×10^{-3}	7.51×10^{-4}
AX	6.40×10^{-2}	5.44×10^{-4}	5.44×10^{-4}	5.44×10^{-5}	5.44×10^{-3}	5.44×10^{-4}
B	1.56×10^{-2}	1.13×10^{-4}	1.13×10^{-4}	1.13×10^{-5}	1.13×10^{-3}	1.13×10^{-4}
BX	1.84×10^{-2}	1.19×10^{-4}	1.19×10^{-4}	1.19×10^{-5}	1.19×10^{-3}	1.19×10^{-4}
BY	5.96×10^{-2}	5.55×10^{-4}	5.55×10^{-4}	5.55×10^{-5}	5.55×10^{-3}	5.55×10^{-4}
C	1.29×10^{-1}	6.46×10^{-4}	6.46×10^{-4}	6.46×10^{-5}	6.46×10^{-3}	6.46×10^{-4}

Table Q–210. Doses to a Well-Drilling Worker at the Tank Farms *(continued)*

Tank Farm	Dose (rem)					
	Tank Closure Alternative					
	1	2	3	4	5	6B
S	8.67×10^{-2}	7.14×10^{-4}	7.13×10^{-4}	7.13×10^{-5}	7.13×10^{-3}	7.13×10^{-4}
SX	7.94×10^{-2}	6.21×10^{-4}	6.21×10^{-4}	6.21×10^{-5}	6.21×10^{-3}	6.21×10^{-4}
T	1.08×10^{-2}	6.50×10^{-5}	6.50×10^{-5}	6.50×10^{-6}	6.50×10^{-4}	6.50×10^{-5}
TX	9.83×10^{-2}	6.12×10^{-4}	6.12×10^{-4}	6.12×10^{-5}	6.12×10^{-3}	6.12×10^{-4}
TY	6.67×10^{-3}	4.16×10^{-5}	4.16×10^{-5}	4.16×10^{-6}	4.16×10^{-4}	4.16×10^{-5}
U	7.42×10^{-2}	6.07×10^{-4}	6.07×10^{-4}	6.07×10^{-5}	6.07×10^{-3}	6.07×10^{-4}
AN	3.46×10^{-1}	3.44×10^{-3}	3.44×10^{-3}	3.44×10^{-4}	3.44×10^{-2}	3.44×10^{-3}
AP	1.90×10^{-1}	1.90×10^{-3}	1.90×10^{-3}	1.90×10^{-4}	1.90×10^{-2}	1.90×10^{-3}
AW	1.84×10^{-1}	1.65×10^{-3}	1.65×10^{-3}	1.65×10^{-4}	1.65×10^{-2}	1.65×10^{-3}
AY	1.32×10^{-1}	8.10×10^{-4}	8.10×10^{-4}	8.10×10^{-5}	8.10×10^{-3}	8.10×10^{-4}
AZ	1.51	1.44×10^{-2}	1.44×10^{-2}	1.44×10^{-3}	1.44×10^{-1}	1.44×10^{-2}
SY	3.40×10^{-1}	2.80×10^{-3}	2.80×10^{-3}	2.80×10^{-4}	2.80×10^{-2}	2.80×10^{-3}

Q.3.2 Long-Term Human Health Impacts of FFTF Decommissioning Alternatives

Impacts on human health over the long time period following decommissioning of the FFTF would be due primarily to the materials left in place following no action, entombment, or removal. These releases would involve both radiological and chemical constituents. The results of this analysis of impacts on human health for onsite, offsite, and intruder receptors are summarized in the following sections.

Q.3.2.1 Impacts on Onsite and Offsite Receptors of Expected Conditions for FFTF Decommissioning Alternatives

Implementation of activities defined for the FFTF Decommissioning alternatives could lead to releases of radiological and chemical constituents to the environment over long periods of time. In the case of FFTF Decommissioning Alternative 1, these releases would not be controlled by final decommissioning activities. In the case of FFTF Decommissioning Alternative 2, these releases would be controlled by removal of all aboveground structures and minimal removal of below-grade structures, equipment, and materials. An RCRA-compliant barrier would be constructed over the Reactor Containment Building and any other remaining below-grade structures (including the reactor vessel). For FFTF Decommissioning Alternative 3, these releases would be further controlled by removal of all aboveground structures, as well as contaminated below-grade structures (including the reactor vessel), equipment and materials.

Potential human health impacts of the release of radiological constituents are estimated as dose and as lifetime risk of incidence of cancer. Potential human health effects due to release of chemical constituents include both carcinogenic effects and other forms of toxicity. Impacts of carcinogenic chemicals are estimated as lifetime risk of incidence of cancer. Noncarcinogenic effects are estimated as Hazard Quotient, the ratio of the long-term intake of a single chemical to intake that produces no observable effect, and as Hazard Index, the sum of the Hazard Quotients of a group of chemicals. Further information on the nature of human health effects in response to exposure to radiological and chemical constituents is provided in Appendix K, Section K.1. Impacts due to exposure to these constituents are presented in this appendix.

The four measures of human health impacts considered in this analysis—lifetime risks of developing cancer from radiological and chemical constituents, dose from radionuclides, and Hazard Index from chemical constituents—are calculated for each year for 10,000 years for each receptor at three locations (i.e., FFTF barrier, Columbia River nearshore, and Columbia River surface water). This is a large amount

of information that must be summarized to allow interpretation of results. The method chosen is to present dose for the year of maximum dose, risk for the year of maximum risk, and Hazard Index for the year of maximum Hazard Index. This choice is based on regulation of radiological impacts as dose and the observation that peak risk and peak noncarcinogenic impacts expressed as Hazard Index may occur at times other than that of peak dose. The significance of dose impacts is evaluated by comparison against the 100-millirem-per-year all-exposure-modes standard specified for protection of the public and the environment in DOE Order 5400.5. Population doses are compared with total effective dose equivalents from background sources of 365 millirem per year for a member of the population of the United States (NCRP 1987). The significance of noncarcinogenic chemical impacts is evaluated by comparison against a guideline value of unity for Hazard Index. The level of protection provided for the drinking water pathway is evaluated by comparison against the MCLs of 40 CFR 141 and other benchmarks presented in Appendix O. In addition, only those radiological and chemical constituents that resulted in a lifetime risk or Hazard Index greater than 1×10^{-10} are presented in the tables in order to reduce the size of the tables.

The results of the analysis for drinking-water well user are summarized in Tables Q–211 and Q–212 for radiological and chemical constituents, respectively. Impacts due to ingestion of drinking water under FFTF Decommissioning Alternatives 1 and 2 would not be higher than the 100-millirem-per-year dose standard at the FFTF barrier. Under both FFTF Decommissioning Alternatives 1 and 2, doses estimated for drinking water ingestion are less than 10 millirem per year at the Columbia River nearshore location. The peak radiological impacts would be due to technetium-99 and chemical impacts would be due to chromium. As a result of removal of all contaminated material under FFTF Decommissioning Alternative 3, there would be no impacts on groundwater and no impacts on human health.

Table Q–211. Summary of Radiological Human Health Impacts on Drinking-Water Well User

Location	Alternative 1		Alternative 2	
	Radiological Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Radiological Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)
Fast Flux Test Facility Barrier	7.29×10^{-1} (2425)	2.51×10^{-5} (2425)	7.13×10^{-1} (2819)	2.45×10^{-5} (2819)
Columbia River nearshore	2.16×10^{-2} (2702)	7.42×10^{-7} (2702)	2.16×10^{-2} (2965)	7.42×10^{-7} (2965)

Note: Calendar year of peak impact presented in parentheses.

Table Q–212. Summary of Chemical Human Health Impacts on Drinking-Water Well User

Location	Alternative 1		Alternative 2	
	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Fast Flux Test Facility Barrier	3.19×10^{-6} (7484)	Not applicable	Not applicable	Not applicable
Columbia River nearshore	1.01×10^{-7} (7088)	Not applicable	Not applicable	Not applicable

Note: Calendar year of peak impact presented in parentheses.

Q.3.2.1.1 FFTF Decommissioning Alternative 1: No Action

Under FFTF Decommissioning Alternative 1, only those actions consistent with previous U.S. Department of Energy actions under the National Environmental Policy Act would be completed. Final decommissioning of FFTF would not occur. For purpose of analysis, the remaining waste would be available for release to the environment after an institutional control period of 100 years. Potential human health impacts of this alternative are summarized in Tables Q–213 through Q–215. For radionuclides, the key constituent contributors to human health risk are tritium and technetium-99. Dose standards would not be exceeded at any location and the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 9.80×10^{-3} person-rem per year for the year of maximum impact.

Table Q–213. FFTF Decommissioning Alternative 1 Human Health Impacts at the Fast Flux Test Facility Barrier

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)
Hydrogen-3 (tritium)	5.45×10^{-11}	6.36×10^{-6}	6.05×10^{-11}	5.45×10^{-11}	1.01×10^{-5}	1.06×10^{-10}	5.45×10^{-11}	1.86×10^{-5}	2.11×10^{-10}
Technetium-99	4.16×10^{-7}	7.29×10^{-1}	2.51×10^{-5}	4.16×10^{-7}	1.87	8.23×10^{-5}	4.16×10^{-7}	3.82	1.79×10^{-4}
Total	**4.16×10^{-7}**	**7.29×10^{-1}**	**2.51×10^{-5}**	**4.16×10^{-7}**	**1.87**	**8.23×10^{-5}**	**4.16×10^{-7}**	**3.82**	**1.79×10^{-4}**
Year of peak impact	2425	2425	2425	2425	2425	2425	2425	2425	2425
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	0.00	0.00	0.00	0.00	0.00	3.48×10^{-16}	0.00	0.00	1.60×10^{-11}
Total uranium	**3.35×10^{-7}**	**3.19×10^{-6}**	**0.00**	**3.35×10^{-7}**	**3.22×10^{-6}**	**0.00**	**3.35×10^{-7}**	**3.33×10^{-6}**	**0.00**
Total	**3.35×10^{-7}**	**3.19×10^{-6}**	**0.00**	**3.35×10^{-7}**	**3.22×10^{-6}**	**3.48×10^{-16}**	**3.35×10^{-7}**	**3.33×10^{-6}**	**1.60×10^{-11}**
Year of peak impact	7484	7484	N/A	7484	7484	2465	7484	7484	2465

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

Key: FFTF=Fast Flux Test Facility; N/A=not applicable.

Table Q–214. FFTF Decommissioning Alternative 1 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)
Hydrogen-3 (tritium)	8.89×10^{-14}	1.04×10^{-8}	9.88×10^{-14}	8.89×10^{-14}	1.65×10^{-8}	1.73×10^{-13}	8.89×10^{-14}	3.04×10^{-8}	3.45×10^{-13}
Technetium-99	1.23×10^{-8}	2.16×10^{-2}	7.42×10^{-7}	1.23×10^{-8}	5.54×10^{-2}	2.43×10^{-6}	1.23×10^{-8}	1.13×10^{-1}	5.31×10^{-6}
Total	**1.23×10^{-8}**	**2.16×10^{-2}**	**7.42×10^{-7}**	**1.23×10^{-8}**	**5.54×10^{-2}**	**2.43×10^{-6}**	**1.23×10^{-8}**	**1.13×10^{-1}**	**5.31×10^{-6}**
Year of peak impact	2702	2702	2702	2702	2702	2702	2702	2702	2702
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	0.00	0.00	0.00	0.00	0.00	1.02×10^{-17}	0.00	0.00	4.67×10^{-13}
Total uranium	**1.06×10^{-8}**	**1.01×10^{-7}**	**0.00**	**1.06×10^{-8}**	**1.02×10^{-7}**	**0.00**	**1.06×10^{-8}**	**1.06×10^{-7}**	**0.00**
Total	**1.06×10^{-8}**	**1.01×10^{-7}**	**0.00**	**1.06×10^{-8}**	**1.02×10^{-7}**	**1.02×10^{-17}**	**1.06×10^{-8}**	**1.06×10^{-7}**	**4.67×10^{-13}**
Year of peak impact	7088	7088	N/A	7088	7088	2810	7088	7088	2810

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

Key: FFTF=Fast Flux Test Facility; N/A=not applicable.

Table Q–215. FFTF Decommissioning Alternative 1 Human Health Impacts 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)
Hydrogen-3 (tritium)	2.32×10^{-18}	4.32×10^{-13}	4.51×10^{-18}	2.32×10^{-18}	8.04×10^{-13}	9.12×10^{-18}	8.89×10^{-14}	2.81×10^{-8}	3.44×10^{-13}
Technetium-99	4.35×10^{-13}	1.96×10^{-6}	8.60×10^{-11}	4.35×10^{-13}	4.53×10^{-6}	2.14×10^{-10}	1.23×10^{-8}	1.36×10^{-4}	7.43×10^{-9}
Total	**4.35×10^{-13}**	**1.96×10^{-6}**	**8.60×10^{-11}**	**4.35×10^{-13}**	**4.53×10^{-6}**	**2.14×10^{-10}**	**1.23×10^{-8}**	**1.36×10^{-4}**	**7.43×10^{-9}**
Year of peak impact	2542	2542	2542	2542	2542	2542	2702	2702	2702
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	8.88×10^{-14}	8.47×10^{-13}	3.49×10^{-22}	8.88×10^{-14}	1.36×10^{-12}	1.60×10^{-17}	2.59×10^{-9}	5.72×10^{-9}	2.34×10^{-13}
Total	**1.52×10^{-13}**	**8.56×10^{-13}**	**3.49×10^{-22}**	**1.52×10^{-13}**	**1.37×10^{-12}**	**1.60×10^{-17}**	**4.15×10^{-9}**	**5.74×10^{-9}**	**2.34×10^{-13}**
Year of peak impact	2543	2543	2543	2543	2543	2543	2602	2602	2602

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

Key: FFTF=Fast Flux Test Facility.

Figure Q–11 depicts the cumulative radiological lifetime risk of incidence of cancer at the FFTF barrier for the drinking-water well user over time. The peak radiological risk occurs around the year 2400 for the FFTF barrier and is dominated by technetium-99. Technetium-99 is a relatively mobile radionuclide that moves at the same velocity as groundwater.

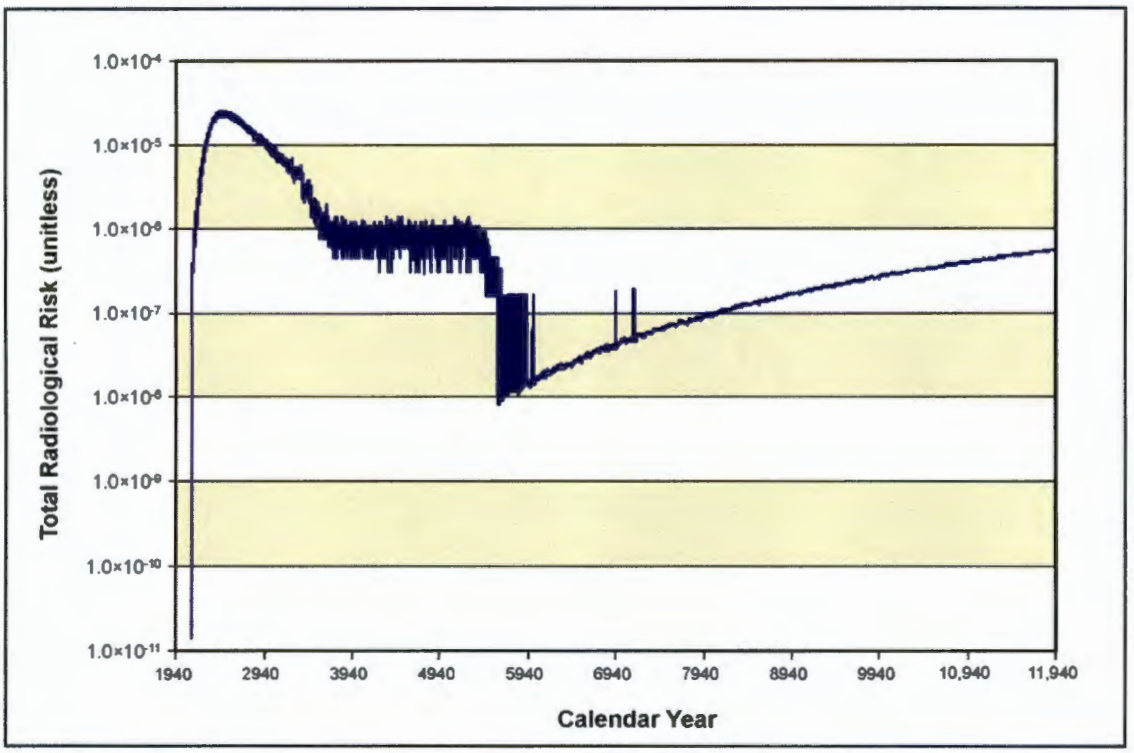

Figure Q–11. FFTF Decommissioning Alternative 1 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Fast Flux Test Facility Barrier

Q.3.2.1.2 FFTF Decommissioning Alternative 2: Entombment

Under FFTF Decommissioning Alternative 2, all aboveground structures and minimal below-grade structures, equipment, and materials would be removed. An RCRA-compliant barrier would be constructed over the Reactor Containment Building and any other remaining below-grade structures (including the reactor vessel). Potential human health impacts of this alternative are summarized in Tables Q–216 through Q–218. The key constituent contributor to human health risk is technetium-99. The chemical risk and hazard drivers are essentially negligible. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 8.90×10^{-3} person-rem per year for the year of maximum impact.

Table Q–216. FFTF Decommissioning Alternative 2 Human Health Impacts at the Fast Flux Test Facility Barrier

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	4.07×10^{-7}	7.13×10^{-1}	2.45×10^{-5}	4.07×10^{-7}	1.83	8.04×10^{-5}	4.07×10^{-7}	3.73	1.75×10^{-4}
Total	4.07×10^{-7}	7.13×10^{-1}	2.45×10^{-5}	4.07×10^{-7}	1.83	8.04×10^{-5}	4.07×10^{-7}	3.73	1.75×10^{-4}
Year of peak impact	2819	2819	2819	2819	2819	2819	2819	2819	2819

Table Q–217. FFTF Decommissioning Alternative 2 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	1.23×10^{-8}	2.16×10^{-2}	7.42×10^{-7}	1.23×10^{-8}	5.55×10^{-2}	2.44×10^{-6}	1.23×10^{-8}	1.13×10^{-1}	5.31×10^{-6}
Total	1.23×10^{-8}	2.16×10^{-2}	7.42×10^{-7}	1.23×10^{-8}	5.55×10^{-2}	2.44×10^{-6}	1.23×10^{-8}	1.13×10^{-1}	5.31×10^{-6}
Year of peak impact	2965	2965	2965	2965	2965	2965	2965	2965	2965

Table Q–218. FFTF Decommissioning Alternative 2 Human Health Impacts at Point of Access to 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	3.96×10^{-13}	1.78×10^{-6}	7.81×10^{-11}	3.96×10^{-13}	4.11×10^{-6}	1.95×10^{-10}	1.23×10^{-8}	1.36×10^{-4}	7.46×10^{-9}
Total	3.96×10^{-13}	1.78×10^{-6}	7.81×10^{-11}	3.96×10^{-13}	4.11×10^{-6}	1.95×10^{-10}	1.23×10^{-8}	1.36×10^{-4}	7.46×10^{-9}
Year of peak impact	2873	2873	2873	2873	2873	2873	2965	2965	2965

Figure Q–12 depicts the cumulative radiological lifetime risk of incidence of cancer at the FFTF barrier for the drinking-water well user over time. The peak radiological risk occurs around the year 2800 for the FFTF barrier and is dominated by technetium-99. Technetium-99 is a relatively mobile radionuclide that moves at the same velocity as groundwater.

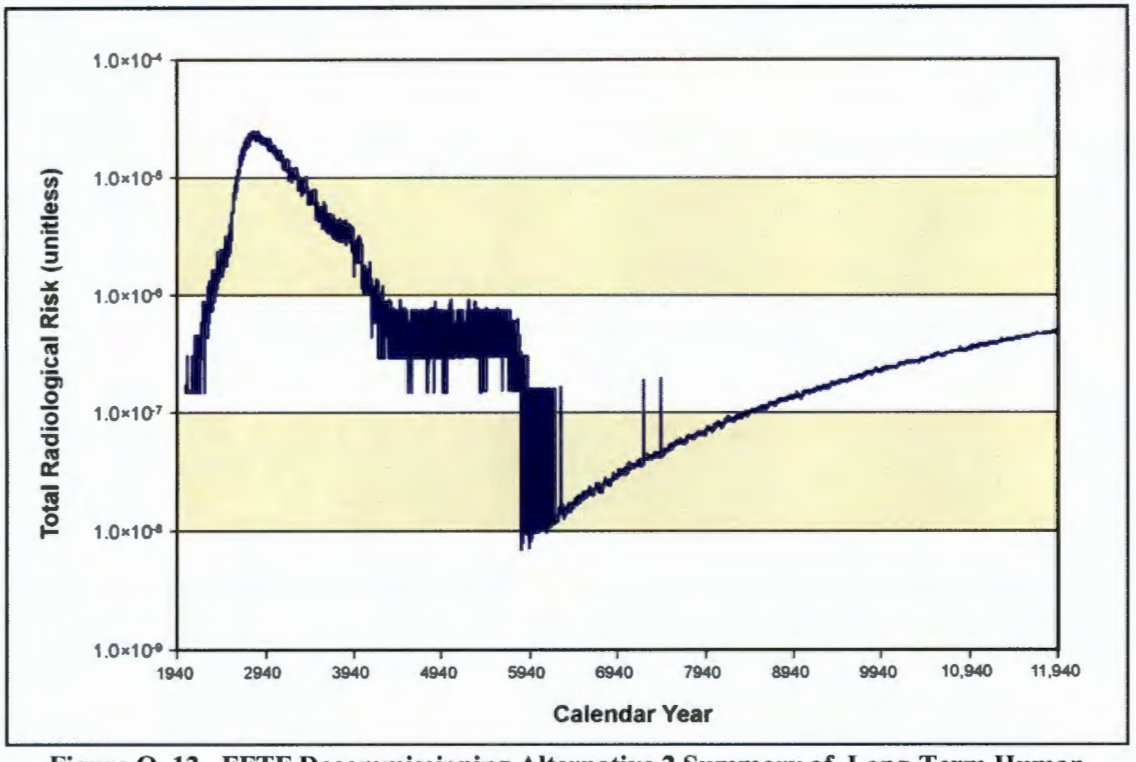

Figure Q–12. FFTF Decommissioning Alternative 2 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Fast Flux Test Facility Barrier

Q.3.2.1.3 FFTF Decommissioning Alternative 3: Removal

Under FFTF Decommissioning Alternative 3, all aboveground structures, as well as contaminated below-grade structures, equipment and materials would be removed. As a result of removal of all contaminated material, there are no impacts on the groundwater or on human health.

Q.3.2.1.4 FFTF Decommissioning Intruder Scenario

Intruders are individuals who enter the FFTF area and engage in activity that could cause direct contact with residual contamination in the abandoned or stabilized structures. As in the case of Tank Closure alternatives, two types of receptors and two types of scenarios were considered. The receptor types were the American Indian resident farmer and the resident farmer, and the scenario types were home construction and well drilling. Because the majority of radionuclides at the FFTF areas are in hardware 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. For the FFTF, estimates of inventory indicate that the greatest hazard is due to quantities of the long-lived radionuclides carbon-14 and technetium-99 remaining at the site. Relatively small amounts of short-lived radionuclides are estimated to remain at the site. Consequently, impacts of intrusion at the FFTF area 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 contacts residual contamination brought to the surface during development of the well. The impacts under this intrusion scenario for the three FFTF Decommissioning alternatives are summarized in Table Q–219 for the drilling worker and American Indian resident farmer intruders. Resident farmer impacts are dominated by exposure to carbon-14 while for the worker both carbon-14 and technetium-99 contribute to dose through the direct external and inhalation pathways. For both the resident farmer and drilling worker, impacts are presented as dose for the year of peak dose. Because doses are dominated by radionuclides with short half-lives, the year of peak dose occurs immediately after loss of institutional control. The DOE intruder dose guideline of 500 millirem is not exceeded for any alternative.

Table Q–219. Doses to a Well-Drilling Worker and an American Indian Engaged in Residential Agriculture Following Well Drilling at the FFTF Area

	Dose (rem per year)		
	FFTF Decommissioning Alternative		
Receptor	1	2	3
Worker	1.92×10^{-8}	1.90×10^{-8}	1.34×10^{-13}
Resident farmer	2.80×10^{-3}	2.81×10^{-3}	4.71×10^{-8}

Key: FFTF–Fast Flux Test Facility.

Q.3.3 Long-Term Human Health Impacts of Waste Management Alternatives

Impacts on human health over the long time period following stabilization and closure of the waste management disposal facilities would be due primarily to naturally occurring release mechanisms and the degradation of waste forms over time. These releases would involve both radiological and chemical constituents. Because a large number of constituents, sources, and scenarios have been considered, screening analysis was used to identify a reduced number of controlling scenarios. The results of this analysis of impacts on human health for onsite, offsite, and intruder receptors are summarized in the following sections.

Q.3.3.1 Impacts on Onsite and Offsite Receptors of Expected Conditions for Waste Management Alternatives

Implementation of activities defined for the Waste Management alternatives could lead to releases of radiological and chemical constituents to the environment over long periods of time. In the case of Waste Management Alternative 1, these releases would come from low-level radioactive waste burial ground (LLBG) 218-W-5, trenches 31 and 34. In the case of Waste Management Alternative 2, these releases would come from IDF-East and the RPPDF. For Waste Management Alternative 3, these releases would come from IDF-East, IDF-West, and the RPPDF. Potential human health impacts due to release of radionuclides are estimated as dose and as lifetime risk of incidence of cancer. Potential human health effects due to release of chemical constituents include both carcinogenic effects and other forms of toxicity. Impacts of carcinogenic chemicals are estimated as lifetime risk of incidence of cancer. Noncarcinogenic effects are estimated as Hazard Quotient, the ratio of the long-term intake of a single chemical to intake that produces no observable effect, and as Hazard Index, the sum of the Hazard Quotients of a group of chemicals. Further information on the nature of human health effects in response to exposure to radiological and chemical constituents is provided in Appendix K, Section K.1. As previously discussed in Section Q.1 of this appendix, the screening analysis identified 14 radiological and 27 chemical constituents as contributing the greatest risk of adverse impacts. Impacts due to exposure to these constituents are presented in this appendix.

The four measures of human health impacts considered in this analysis—lifetime risks of developing cancer from radiological and chemical constituents, dose from radionuclides, and Hazard Index from chemical constituents—are calculated for each year for 10,000 years for each receptor at six locations (i.e., IDF-East, IDF-West, RPPDF, Core Zone Boundary, Columbia River nearshore, and Columbia River surface water). This is a large amount of information that must be summarized to allow interpretation of results. The method chosen is to present dose for the year of maximum dose, risk for the year of maximum risk, and Hazard Index for the year of maximum Hazard Index. This choice is based on regulation of radiological impacts as dose and the observations that peak risks and noncarcinogenic impacts expressed as Hazard Index may occur at times other than that of peak dose. The significance of dose impacts is evaluated by comparison against the 100-millirem-per-year all-exposure-modes standard specified for protection of the public and the environment in DOE Order 5400.5. Population doses are compared against total effective dose equivalent from background sources of 365 millirem per year for a member of the population of the United States (NCRP 1987). The significance of noncarcinogenic chemical impacts is evaluated by comparison to a Hazard Index guidelines value or unity. The level of protection provided for the drinking water pathway is evaluated by comparison against the MCLs of 40 CFR 141 presented in Appendix O. In addition, only those radiological and chemical constituents that resulted in a lifetime risk greater than 1×10^{-10} are presented in the tables in order to reduce the size of the tables.

The results of the analysis for drinking-water well users are summarized in Tables Q–220 through Q–226 for radiological and chemical constituents. Under all the Waste Management alternatives and disposal groups, doses would not be greater than the 100-millirem-per-year standard at any location. Under all Waste Management alternatives except for Waste Management Alternative 2, Disposal Group 1, Subgroup 1-D, and Waste Management Alternative 3, Disposal Group 1, Subgroup 1-D, doses estimated for drinking water ingestion are less than 10 millirem per year at the Columbia River nearshore location. Peak radiological impacts would be due to technetium-99 and iodine-129 and chemical impacts would be due to boron and boron compounds, chromium, fluoride, and nitrate. For peak impacts occurring after calendar year 5000, radiological impacts would be due to uranium isotopes and chemical impacts would be due to total uranium.

Table Q–220. Waste Management Alternative 1 Summary of Human Health Impacts on Drinking-Water Well User

Location	Radiological Dose at Year of Peak Dose (millirem per year)	Radiological Risk at Year of Peak Radiological Risk (unitless)	Hazard Index at Year of Peak Hazard Index (unitless)	Nonradiological Risk at Year of Peak Nonradiological Risk (unitless)
Trenches 31 and 34	4.48×10^{-2} (3499)	1.39×10^{-6} (3499)	3.08×10^{-2} (3526)	0.00 N/A
Core Zone Boundary	7.96×10^{-3} (3471)	2.53×10^{-7} (3474)	5.92×10^{-3} (3615)	0.00 N/A
Columbia River nearshore	1.29×10^{-3} (3974)	4.12×10^{-8} (3974)	9.93×10^{-4} (4147)	0.00 N/A

Note: Calendar year of peak impact presented in parentheses.

Key: N/A= not applicable.

Table Q–221. Waste Management Alternative 2 Summary of Radiological Dose at Year of Peak Dose (millirem per year) for Drinking-Water Well User

	Waste Management Alternative 2											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
Location	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	7.49 (8276)	8.81 (8739)	1.22×10^{1} (9509)	5.65×10^{1} (9032)	1.38×10^{1} (8944)	1.02×10^{1} (8276)	7.59 (8739)	1.12×10^{1} (8706)	1.14×10^{1} (8706)	1.14×10^{1} (8706)	1.08×10^{1} (8290)	1.08×10^{1} (8290)
RPPDF	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	2.15×10^{-1} (3822)	N/A	6.92×10^{-2} (3804)	N/A	5.92×10^{-1} (3889)	6.96×10^{-1} (4213)	6.35×10^{-1} (3987)	7.87×10^{-1} (4013)
Core Zone Boundary	3.13 (8438)	3.68 (8079)	1.59×10^{1} (9163)	4.42×10^{1} (9067)	5.91 (9576)	3.89 (8885)	3.07 (8858)	3.98 (9188)	3.96 (9188)	3.96 (9188)	3.59 (8393)	4.10 (8393)
Columbia River nearshore	2.58 (8700)	2.77 (8700)	4.15 (8927)	1.48×10^{1} (9207)	4.36 (8117)	2.97 (8700)	2.61 (8700)	1.92 (9652)	1.92 (9652)	1.94 (9652)	2.31 (9282)	2.34 (9284)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Table Q–222. Waste Management Alternative 2 Summary of Radiological Risk at Year of Peak Radiological Risk (unitless) for Drinking-Water Well User

	Waste Management Alternative 2											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
Location	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	1.63×10^{-4} (8276)	2.12×10^{-4} (8827)	3.64×10^{-4} (9048)	1.86×10^{-3} (9032)	4.10×10^{-4} (9035)	2.57×10^{-4} (8276)	1.60×10^{-4} (8276)	2.32×10^{-4} (8706)	2.34×10^{-4} (8706)	2.34×10^{-4} (8706)	2.29×10^{-4} (8290)	2.29×10^{-4} (8290)
RPPDF	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	6.59×10^{-6} (3822)	N/A	2.11×10^{-6} (3825)	N/A	1.82×10^{-5} (3889)	2.16×10^{-5} (4213)	1.94×10^{-5} (3987)	2.45×10^{-5} (4013)
Core Zone Boundary	8.02×10^{-5} (9155)	8.47×10^{-5} (7998)	5.09×10^{-4} (9163)	1.50×10^{-3} (9067)	1.92×10^{-4} (9499)	9.97×10^{-5} (9155)	7.86×10^{-5} (9155)	8.27×10^{-5} (8365)	8.23×10^{-5} (8365)	8.33×10^{-5} (4466)	7.77×10^{-5} (8173)	8.54×10^{-5} (8393)
Columbia River nearshore	4.99×10^{-5} (9451)	5.54×10^{-5} (8611)	1.15×10^{-4} (8927)	4.73×10^{-4} (9209)	1.31×10^{-4} (8117)	6.15×10^{-5} (8854)	4.98×10^{-5} (9451)	4.52×10^{-5} (8478)	4.73×10^{-5} (8477)	4.81×10^{-5} (8477)	6.03×10^{-5} (9284)	6.13×10^{-5} (9284)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Table Q–223. Waste Management Alternative 2 Summary of Hazard Index at Year of Peak Hazard Index (unitless) for Drinking-Water Well User

Location	Waste Management Alternative 2											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	2.73×10^{-1} (8522)	2.66×10^{-1} (7821)	4.86 (8940)	4.30 (8442)	2.48 (9318)	3.51 (8735)	2.68×10^{-1} (8168)	2.98×10^{-1} (8216)	3.21×10^{-1} (8414)	3.21×10^{-1} (8414)	3.07×10^{-1} (8236)	3.07×10^{-1} (8236)
RPPDF	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	5.86×10^{-2} (3804)	N/A	2.19×10^{-2} (3856)	N/A	5.96×10^{-2} (3868)	3.91×10^{-1} (4260)	5.89×10^{-2} (4109)	4.29×10^{-1} (4387)
Core Zone Boundary	1.04×10^{-1} (9653)	1.06×10^{-1} (8905)	2.73 (8760)	1.69 (8397)	1.02 (9599)	1.47 (8764)	1.04×10^{-1} (9653)	1.05×10^{-1} (7905)	1.16×10^{-1} (3995)	1.38 (4564)	1.21×10^{-1} (9877)	1.35 (4628)
Columbia River nearshore	4.78×10^{-2} (8044)	6.74×10^{-2} (8144)	1.24 (9310)	1.12 (9878)	6.59×10^{-1} (8069)	1.09 (8819)	4.79×10^{-2} (8821)	7.46×10^{-2} (8055)	6.48×10^{-2} (7829)	2.29×10^{-1} (5180)	6.81×10^{-2} (7710)	2.29×10^{-1} (4954)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Table Q–224. Waste Management Alternative 3 Summary of Radiological Dose at Year of Peak Dose (millirem per year) for Drinking-Water Well User

Location	Waste Management Alternative 3											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	1.04 (11,257)	3.00 (8486)	8.88 (9048)	5.28×10^{1} (9032)	1.01×10^{1} (9826)	4.34 (9701)	9.07×10^{-1} (10,032)	8.64×10^{-1} (9988)	8.97×10^{-1} (11,141)	8.97×10^{-1} (11,141)	8.62×10^{-1} (11,896)	8.62×10^{-1} (11,896)
IDF-West	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)	8.08×10^{1} (3723)
RPPDF	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	6.92×10^{-2} (3804)	2.15×10^{-1} (3822)	N/A	6.92×10^{-2} (3804)	N/A	5.92×10^{-1} (3889)	6.96×10^{-1} (4213)	6.35×10^{-1} (3987)	7.87×10^{-1} (4013)
Core Zone Boundary	2.73×10^{1} (3709)	2.73×10^{1} (3709)	2.73×10^{1} (3709)	4.39×10^{1} (9067)	2.73×10^{1} (3709)	2.72×10^{1} (3709)	2.73×10^{1} (3709)	2.72×10^{1} (3709)	2.76×10^{1} (3709)	2.77×10^{1} (3709)	2.75×10^{1} (3709)	2.76×10^{1} (3709)
Columbia River nearshore	3.37 (4388)	3.37 (4388)	3.37 (8939)	1.40×10^{1} (7821)	3.98 (8117)	3.36 (4388)	3.37 (4388)	3.36 (4388)	3.53 (4389)	3.49 (4388)	3.45 (4389)	3.58 (4388)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; IDF-West=200-West Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Table Q–225. Waste Management Alternative 3 Summary of Radiological Risk at Year of Peak Radiological Risk (unitless) for Drinking-Water Well User

Location	Waste Management Alternative 3											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	3.05×10^{-5} (8991)	9.88×10^{-5} (8486)	3.03×10^{-4} (9048)	1.78×10^{-3} (9032)	3.42×10^{-4} (9826)	1.46×10^{-4} (9701)	2.70×10^{-5} (10,032)	2.25×10^{-5} (9823)	2.38×10^{-5} (11,141)	2.38×10^{-5} (11,141)	2.50×10^{-5} (9324)	2.50×10^{-5} (9324)
IDF-West	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)	1.70×10^{-3} (3713)
RPPDF	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	2.11×10^{-6} (3825)	6.59×10^{-6} (3822)	N/A	2.11×10^{-6} (3825)	N/A	1.82×10^{-5} (3889)	2.16×10^{-5} (4213)	1.94×10^{-5} (3987)	2.45×10^{-5} (4013)
Core Zone Boundary	5.79×10^{-4} (3690)	5.79×10^{-4} (3690)	5.79×10^{-4} (3690)	1.49×10^{-3} (9067)	5.82×10^{-4} (3690)	5.78×10^{-4} (3690)	5.79×10^{-4} (3690)	5.78×10^{-4} (3690)	5.92×10^{-4} (3751)	5.88×10^{-4} (3895)	6.01×10^{-4} (3895)	6.03×10^{-4} (3690)
Columbia River nearshore	8.13×10^{-5} (4191)	8.13×10^{-5} (4191)	1.06×10^{-4} (8939)	4.60×10^{-4} (7821)	1.27×10^{-4} (8117)	8.11×10^{-5} (4191)	8.13×10^{-5} (4191)	8.11×10^{-5} (4191)	8.35×10^{-5} (4191)	8.53×10^{-5} (4189)	8.36×10^{-5} (4191)	8.69×10^{-5} (4066)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; IDF-West=200-West Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Table Q–226. Waste Management Alternative 3 Summary of Hazard Index at Year of Peak Hazard Index (unitless) for Drinking-Water Well User

Location	Waste Management Alternative 2											
	Disposal Group 1							Disposal Group 2			Disposal Group 3	
	Subgroup							Subgroup				
	1-A	1-B	1-C	1-D	1-E	1-F	1-G	2-A	2-B, Base Case	2-B, Option Case	Base Case	Option Case
IDF-East	2.71×10^{-1} (8522)	2.64×10^{-1} (7821)	4.86 (8940)	4.30 (8442)	2.48 (9318)	3.51 (8735)	2.66×10^{-1} (8168)	2.96×10^{-1} (8216)	3.18×10^{-1} (8414)	3.18×10^{-1} (8414)	3.06×10^{-1} (8236)	3.06×10^{-1} (8236)
IDF-West	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)	1.95×10^{-2} (3756)
RPPDF	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	2.19×10^{-2} (3856)	5.86×10^{-2} (3804)	N/A	2.19×10^{-2} (3856)	N/A	5.96×10^{-2} (3868)	3.91×10^{-1} (4260)	5.89×10^{-2} (4109)	4.29×10^{-1} (4387)
Core Zone Boundary	1.04×10^{-1} (9653)	1.06×10^{-1} (8905)	2.73 (8760)	1.69 (8397)	1.02 (9599)	1.47 (8764)	1.04×10^{-1} (9653)	1.05×10^{-1} (7905)	1.25×10^{-1} (4042)	1.38 (4564)	1.20×10^{-1} (9877)	1.36 (4628)
Columbia River nearshore	4.76×10^{-2} (8044)	6.71×10^{-2} (8144)	1.24 (9310)	1.12 (9878)	6.59×10^{-1} (8069)	1.09 (8819)	4.78×10^{-2} (8821)	7.45×10^{-2} (8055)	6.48×10^{-2} (7831)	2.30×10^{-1} (5180)	6.80×10^{-2} (7710)	2.30×10^{-1} (4954)

Note: Calendar year of peak impact presented in parentheses.

Key: IDF-East=200-East Area Integrated Disposal Facility; IDF-West=200-West Area Integrated Disposal Facility; N/A=not applicable; RPPDF=River Protection Project Disposal Facility.

Q.3.3.1.1 Waste Management Alternative 1: No Action

Under Waste Management Alternative 1, only those wastes currently generated onsite at Hanford from non–Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) actions would continue to be disposed of in LLBG 218-W-5, trenches 31 and 34. Although the short-term impacts do not address the impacts associated with closure activities for this site, for purposes of analysis for long-term impacts it is assumed that these trenches will be closed using an RCRA-compliant barrier consistent with the closure plans for these burial grounds. As a result, the non-CERCLA waste disposed of in these trenches from 2008 to 2035 would become available for release to the environment. Potential human health impacts of this alternative at the disposal area boundary, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–227 through Q–230, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 3.18×10^{-4} person-rem per year for the year of maximum impact.

Table Q–227. Waste Management Alternative 1 Human Health Impacts at Low-Level Radioactive Waste Burial Ground 218-W-5, Trenches 31 and 34

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	2.18×10^{-8}	3.82×10^{-2}	1.31×10^{-6}	2.18×10^{-8}	9.80×10^{-2}	4.30×10^{-6}	2.18×10^{-8}	2.00×10^{-1}	9.39×10^{-6}
Iodine-129	2.32×10^{-11}	6.60×10^{-3}	7.51×10^{-8}	2.32×10^{-11}	7.66×10^{-3}	1.01×10^{-7}	2.32×10^{-11}	9.46×10^{-3}	1.46×10^{-7}
Total	2.18×10^{-8}	4.48×10^{-2}	1.39×10^{-6}	2.18×10^{-8}	1.06×10^{-1}	4.40×10^{-6}	2.18×10^{-8}	2.09×10^{-1}	9.53×10^{-6}
Year of Peak Impact	3499	3499	3499	3499	3499	3499	3499	3499	3499
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	4.84×10^{-5}	6.92×10^{-6}	0.00	4.84×10^{-5}	7.01×10^{-6}	0.00	4.84×10^{-5}	7.45×10^{-6}	0.00
Chromium	2.96×10^{-3}	2.82×10^{-2}	0.00	2.96×10^{-3}	2.82×10^{-2}	1.16×10^{-11}	2.96×10^{-3}	4.13×10^{-2}	5.33×10^{-7}
Fluoride	3.89×10^{-3}	1.85×10^{-3}	0.00	3.89×10^{-3}	1.90×10^{-3}	0.00	3.89×10^{-3}	2.05×10^{-3}	0.00
Nitrate	3.89×10^{-2}	6.95×10^{-4}	0.00	3.89×10^{-2}	9.15×10^{-4}	0.00	3.89×10^{-2}	1.79×10^{-3}	0.00
Total	4.58×10^{-2}	3.08×10^{-2}	0.00	4.58×10^{-2}	3.11×10^{-2}	1.16×10^{-11}	4.58×10^{-2}	4.51×10^{-2}	5.33×10^{-7}
Year of Peak Impact	3526	3526	N/A	3526	3526	3526	3526	3526	3526

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–228. Waste Management Alternative 1 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	3.78×10^{-9}	6.61×10^{-3}	2.44×10^{-7}	4.05×10^{-9}	1.82×10^{-2}	8.00×10^{-7}	4.05×10^{-9}	3.71×10^{-2}	1.74×10^{-6}
Iodine-129	4.72×10^{-12}	1.34×10^{-3}	9.46×10^{-9}	2.92×10^{-12}	9.65×10^{-4}	1.28×10^{-8}	2.92×10^{-12}	1.19×10^{-3}	1.84×10^{-8}
Total	3.78×10^{-9}	7.96×10^{-3}	2.53×10^{-7}	4.05×10^{-9}	1.92×10^{-2}	8.13×10^{-7}	4.05×10^{-9}	3.83×10^{-2}	1.76×10^{-6}
Year of Peak Impact	3471	3471	3474	3474	3474	3474	3474	3474	3474
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	8.93×10^{-6}	1.28×10^{-6}	0.00	8.93×10^{-6}	1.29×10^{-6}	0.00	8.93×10^{-6}	1.37×10^{-6}	0.00
Chromium	5.78×10^{-4}	5.50×10^{-3}	0.00	5.78×10^{-4}	5.51×10^{-3}	2.27×10^{-12}	5.78×10^{-4}	8.05×10^{-3}	1.04×10^{-7}
Fluoride	6.07×10^{-4}	2.89×10^{-4}	0.00	6.07×10^{-4}	2.97×10^{-4}	0.00	6.07×10^{-4}	3.20×10^{-4}	0.00
Nitrate	6.87×10^{-3}	1.23×10^{-4}	0.00	6.87×10^{-3}	1.62×10^{-4}	0.00	6.87×10^{-3}	3.17×10^{-4}	0.00
Total	8.06×10^{-3}	5.92×10^{-3}	0.00	8.06×10^{-3}	5.97×10^{-3}	2.27×10^{-12}	8.06×10^{-3}	8.69×10^{-3}	1.04×10^{-7}
Year of Peak Impact	3615	3615	N/A	3615	3615	3615	3615	3615	3615

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–229. Waste Management Alternative 1 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	6.58×10^{-10}	1.15×10^{-3}	3.96×10^{-8}	6.58×10^{-10}	2.96×10^{-3}	1.30×10^{-7}	6.58×10^{-10}	6.03×10^{-3}	2.83×10^{-7}
Iodine-129	4.78×10^{-13}	1.36×10^{-4}	1.55×10^{-9}	4.78×10^{-13}	1.58×10^{-4}	2.09×10^{-9}	4.78×10^{-13}	1.95×10^{-4}	3.01×10^{-9}
Total	6.58×10^{-10}	1.29×10^{-3}	4.12×10^{-8}	6.58×10^{-10}	3.12×10^{-3}	1.32×10^{-7}	6.58×10^{-10}	6.22×10^{-3}	2.86×10^{-7}
Year of Peak Impact	3974	3974	3974	3974	3974	3974	3974	3974	3974
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	1.16×10^{-6}	1.66×10^{-7}	0.00	1.16×10^{-6}	1.68×10^{-7}	0.00	1.16×10^{-6}	1.79×10^{-7}	0.00
Chromium	9.77×10^{-5}	9.31×10^{-4}	0.00	9.77×10^{-5}	9.32×10^{-4}	3.84×10^{-13}	9.77×10^{-5}	1.36×10^{-3}	1.76×10^{-8}
Fluoride	9.94×10^{-5}	4.73×10^{-5}	0.00	9.94×10^{-5}	4.87×10^{-5}	0.00	9.94×10^{-5}	5.24×10^{-5}	0.00
Nitrate	8.11×10^{-4}	1.45×10^{-5}	0.00	8.11×10^{-4}	1.91×10^{-5}	0.00	8.11×10^{-4}	3.74×10^{-5}	0.00
Total-	1.01×10^{-3}	9.93×10^{-4}	0.00	1.01×10^{-3}	1.00×10^{-3}	3.84×10^{-13}	1.01×10^{-3}	1.45×10^{-3}	1.76×10^{-8}
Year of Peak Impact	4147	4147	N/A	4147	4147	4353	4147	4147	4353

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–230. Waste Management Alternative 1 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	1.34×10^{-14}	6.02×10^{-8}	2.64×10^{-12}	1.27×10^{-14}	1.32×10^{-7}	6.24×10^{-12}	6.58×10^{-10}	7.21×10^{-6}	3.96×10^{-10}
Iodine-129	9.82×10^{-18}	3.25×10^{-9}	4.31×10^{-14}	1.51×10^{-17}	8.14×10^{-8}	1.96×10^{-12}	4.78×10^{-13}	8.09×10^{-7}	1.98×10^{-11}
Total	1.34×10^{-14}	6.35×10^{-8}	2.69×10^{-12}	1.27×10^{-14}	2.13×10^{-7}	8.20×10^{-12}	6.58×10^{-10}	8.02×10^{-6}	4.16×10^{-10}
Year of Peak Impact	3749	3749	3749	3667	3667	3667	3974	3974	3974
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	3.56×10^{-11}	5.15×10^{-12}	0.00	3.98×10^{-11}	6.32×10^{-12}	0.00	1.16×10^{-6}	1.16×10^{-8}	0.00
Chromium	1.90×10^{-9}	1.82×10^{-8}	7.48×10^{-18}	1.55×10^{-9}	2.37×10^{-8}	3.43×10^{-13}	9.77×10^{-5}	2.16×10^{-4}	8.81×10^{-9}
Fluoride	2.27×10^{-9}	1.11×10^{-9}	0.00	2.67×10^{-9}	1.85×10^{-9}	0.00	9.94×10^{-5}	1.45×10^{-5}	0.00
Nitrate	2.71×10^{-8}	9.37×10^{-10}	0.00	3.06×10^{-8}	2.88×10^{-6}	0.00	8.11×10^{-4}	3.18×10^{-5}	0.00
Total	3.14×10^{-8}	2.02×10^{-8}	7.48×10^{-18}	3.49×10^{-8}	2.90×10^{-6}	3.43×10^{-13}	1.01×10^{-3}	2.62×10^{-4}	8.81×10^{-9}
Year of Peak Impact	3741	3741	3741	3685	3685	3741	4147	4147	4353

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

Figure Q–13 depicts the cumulative radiological lifetime risk of incidence of cancer at the Core Zone Boundary for the drinking-water well user over time. The peak radiological risk occurs around the year 3470 and is dominated by technetium-99 and iodine-129 from the naturally occurring release mechanisms and degradation of waste forms disposed of in LLBG 218-W-5, trenches 31 and 34. These are relatively mobile radionuclides that move at the same velocity as groundwater.

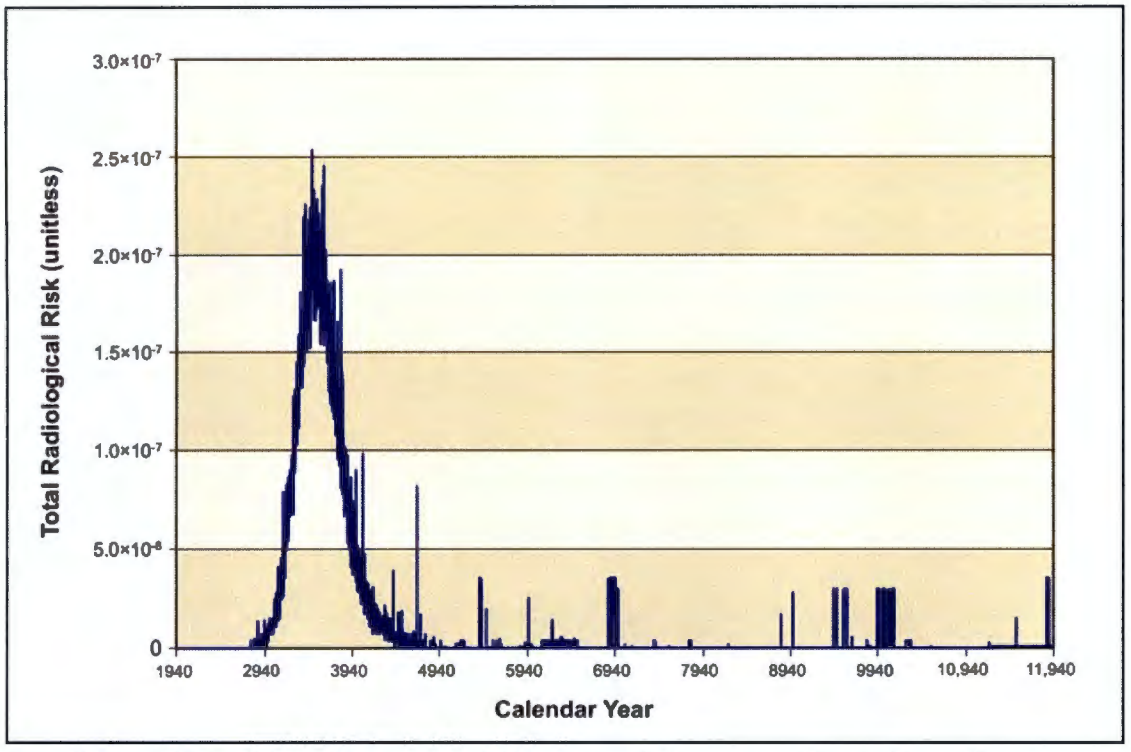

Figure Q–13. Waste Management Alternative 1 Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2 Waste Management Alternative 2: Disposal in IDF, 200-East Area Only

Under Waste Management Alternative 2, waste from tank treatment operations, onsite non-CERCLA sources, FFTF decommissioning, waste management, and other DOE sites would be disposed of in IDF-East. Waste from tank farm cleanup activities would be disposed of in the RPPDF. As a result, the waste disposed of in these two facilities would become available for release to the environment. Because different waste types would 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.3.3.1.2.1 Waste Management Alternative 2; 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:

- Immobilized low-activity waste (ILAW) glass
- LAW melters

- Tank closure secondary waste
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia nearshore, and the Columbia River surface-water locations are summarized in Tables Q–231 through Q–235, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 3.05×10^{-1} person-rem per year for the year] of maximum impact.

Table Q–231. Waste Management Alternative 2, 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	1.92×10^{-6}	3.36	1.15×10^{-4}	1.92×10^{-6}	8.63	3.79×10^{-4}	1.92×10^{-6}	1.76×10^{1}	8.80×10^{-4}
Iodine-129	1.45×10^{-8}	4.13	4.70×10^{-5}	1.45×10^{-8}	4.80	6.35×10^{-5}	1.45×10^{-8}	5.92	4.68×10^{-5}
Total	1.93×10^{-6}	7.49	1.63×10^{-4}	1.93×10^{-6}	1.34×10^{1}	4.42×10^{-4}	1.93×10^{-6}	2.35×10^{1}	9.26×10^{-4}
Year of Peak Impact	8276	8276	8276	8276	8276	8276	8276	8276	9004
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	2.97×10^{-6}	4.25×10^{-7}	0.00	2.97×10^{-6}	4.30×10^{-7}	0.00	2.97×10^{-6}	4.57×10^{-7}	0.00
Chromium	1.92×10^{-3}	1.83×10^{-2}	0.00	1.92×10^{-3}	1.83×10^{-2}	1.69×10^{-11}	1.92×10^{-3}	2.68×10^{-2}	7.77×10^{-7}
Fluoride	1.98×10^{-4}	9.42×10^{-5}	0.00	1.98×10^{-4}	9.69×10^{-5}	0.00	1.98×10^{-4}	1.04×10^{-4}	0.00
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}	2.73×10^{-1}	0.00	1.42×10^{1}	3.53×10^{-1}	1.69×10^{-11}	1.42×10^{1}	6.84×10^{-1}	7.77×10^{-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–232. Waste Management Alternative 2, 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^{1}	4.32×10^{-1}	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^{1}	3.40×10^{-1}	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–233. Waste Management Alternative 2, 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	8.73×10^{-7}	1.53	7.09×10^{-5}	1.18×10^{-6}	5.30	2.33×10^{-4}	1.18×10^{-6}	1.08×10^{1}	5.07×10^{-4}
Iodine-129	5.61×10^{-9}	1.60	9.26×10^{-6}	2.86×10^{-9}	9.45×10^{-1}	1.25×10^{-5}	2.86×10^{-9}	1.17	1.80×10^{-5}
Total	8.79×10^{-7}	3.13	8.02×10^{-5}	1.18×10^{-6}	6.24	2.45×10^{-4}	1.18×10^{-6}	1.20×10^{1}	5.25×10^{-4}
Year of Peak Impact	8438	8438	9155	9155	9155	9155	9155	9155	9155
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	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
Chromium	3.95×10^{-4}	3.76×10^{-3}	0.00	3.95×10^{-4}	3.76×10^{-3}	8.42×10^{-12}	3.95×10^{-4}	5.50×10^{-3}	3.86×10^{-7}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-5}	0.00
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}	8.42×10^{-12}	5.63	2.65×10^{-1}	3.86×10^{-7}
Year of Peak Impact	9653	9653	N/A	9653	9653	3889	9653	9653	3889

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–234. Waste Management Alternative 2, Disposal Group 1, Subgroup1-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	3.33×10^{-7}	5.83×10^{-1}	4.07×10^{-5}	6.75×10^{-7}	3.04	1.33×10^{-4}	6.75×10^{-7}	6.19	2.91×10^{-4}
Iodine-129	7.00×10^{-9}	1.99	9.26×10^{-6}	2.86×10^{-9}	9.44×10^{-1}	1.25×10^{-5}	2.86×10^{-9}	1.17	1.80×10^{-5}
Total	3.40×10^{-7}	2.58	4.99×10^{-5}	6.78×10^{-7}	3.98	1.46×10^{-4}	6.78×10^{-7}	7.36	3.09×10^{-4}
Year of Peak Impact	8700	8700	9451	9451	9451	9451	9451	9451	9451
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	6.60×10^{-7}	9.43×10^{-8}	0.00	6.60×10^{-7}	9.56×10^{-8}	0.00	6.60×10^{-7}	1.01×10^{-7}	0.00
Chromium	4.36×10^{-4}	4.15×10^{-3}	0.00	4.36×10^{-4}	4.16×10^{-3}	2.93×10^{-12}	4.36×10^{-4}	6.07×10^{-3}	1.34×10^{-7}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-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}	2.93×10^{-12}	2.44	1.19×10^{-1}	1.34×10^{-7}
Year of Peak Impact	8044	8044	N/A	8044	8044	8898	8044	8044	8898

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–235. Waste Management Alternative 2, Disposal Group 1, Subgroup1-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	9.21×10^{-12}	4.14×10^{-5}	1.88×10^{-9}	5.36×10^{-12}	5.57×10^{-5}	2.64×10^{-9}	3.33×10^{-7}	3.66×10^{-3}	4.05×10^{-7}
Iodine-129	5.92×10^{-14}	1.96×10^{-5}	2.15×10^{-10}	8.32×10^{-14}	4.49×10^{-4}	1.08×10^{-8}	7.00×10^{-9}	1.11×10^{-2}	1.17×10^{-7}
Total	9.27×10^{-12}	6.10×10^{-5}	2.09×10^{-9}	5.44×10^{-12}	5.05×10^{-4}	1.35×10^{-8}	3.40×10^{-7}	1.47×10^{-2}	5.22×10^{-7}
Year of Peak Impact	8704	8704	8979	9273	9273	9273	8700	8700	9451
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	1.08×10^{-11}	1.56×10^{-12}	0.00	1.08×10^{-11}	1.72×10^{-12}	0.00	9.91×10^{-7}	9.88×10^{-9}	0.00
Chromium	7.07×10^{-9}	6.74×10^{-8}	4.26×10^{-17}	7.07×10^{-9}	1.08×10^{-7}	1.95×10^{-12}	2.62×10^{-4}	5.78×10^{-4}	6.72×10^{-8}
Fluoride	8.86×10^{-10}	4.34×10^{-10}	0.00	8.86×10^{-10}	6.15×10^{-10}	0.00	2.47×10^{-5}	3.62×10^{-6}	0.00
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}	4.26×10^{-17}	4.48×10^{-5}	4.21×10^{-3}	1.95×10^{-12}	2.44	9.57×10^{-2}	6.72×10^{-8}
Year of Peak Impact	8016	8016	8736	8016	8016	8736	8085	8085	8898

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

Figures Q–14 and Q–15, respectively, depict 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. 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.

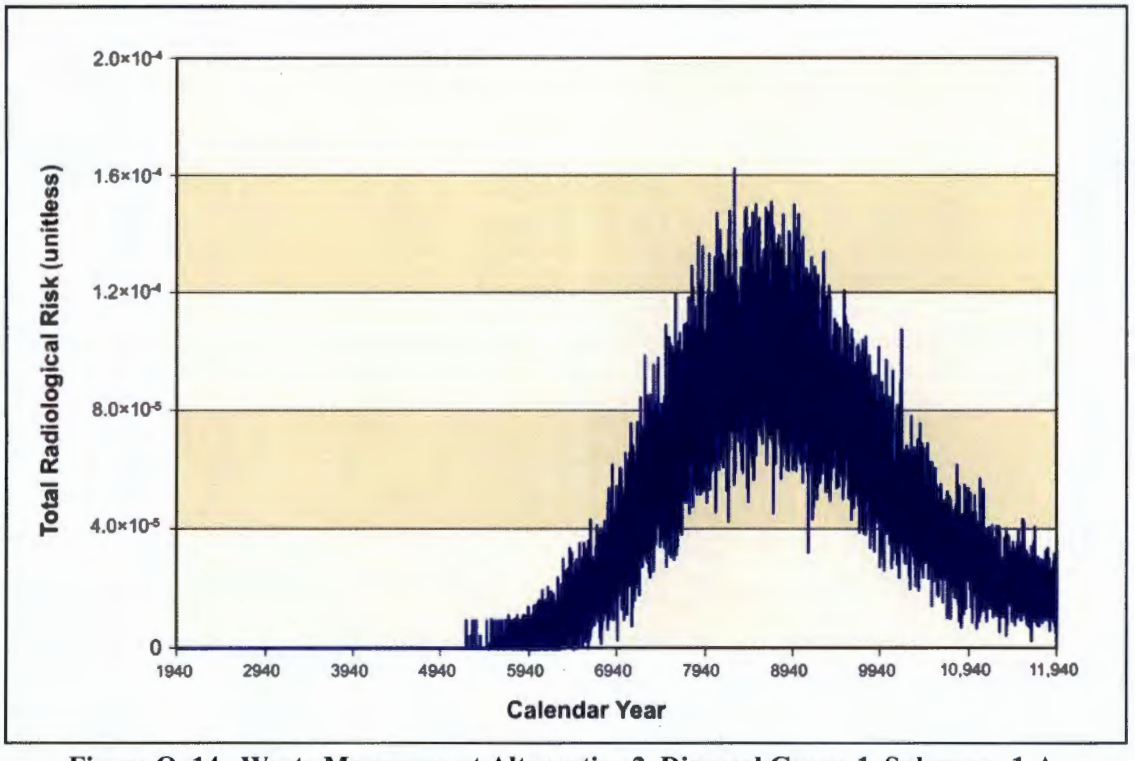

Figure Q–14. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

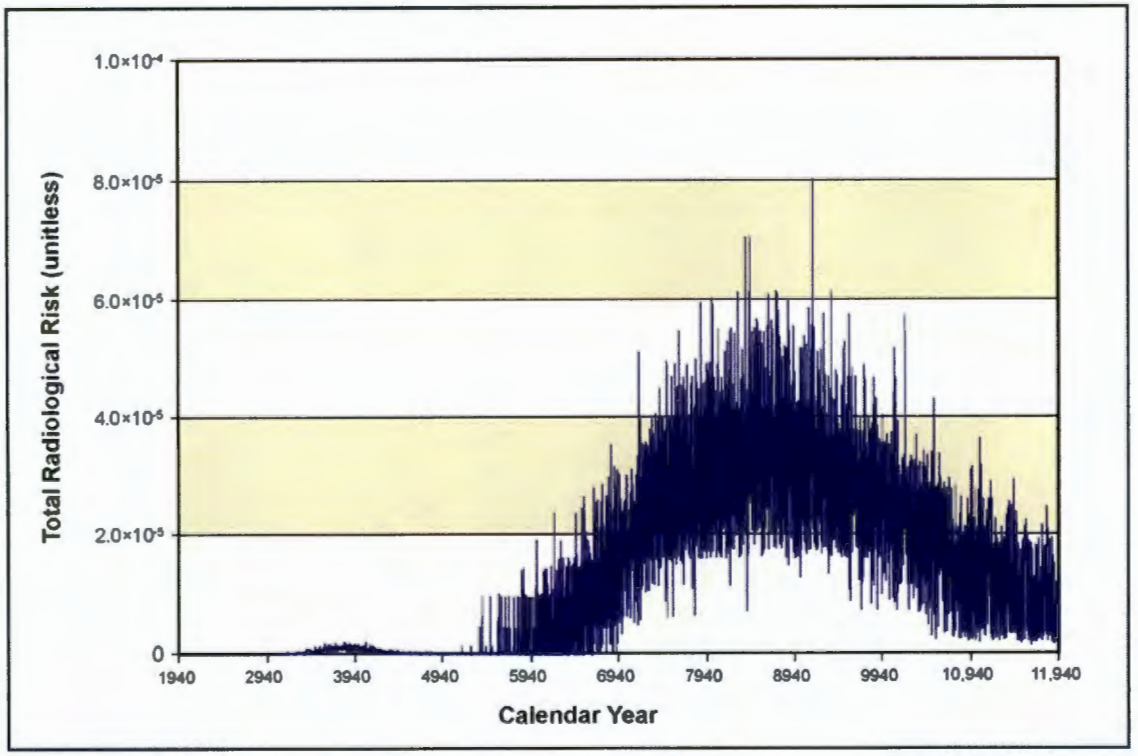

Figure Q–15. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.2 Waste Management Alternative 2; 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
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–236 through Q–240, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 3.88×10^{-1} person-rem per year for the year of maximum impact.

Table Q–236. Waste Management Alternative 2, 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	2.08×10^{-6}	3.64	1.73×10^{-4}	2.87×10^{-6}	1.29×10^{1}	5.66×10^{-4}	2.87×10^{-6}	2.63×10^{1}	1.24×10^{-3}
Iodine-129	1.81×10^{-8}	5.16	3.89×10^{-5}	1.20×10^{-8}	3.97	5.25×10^{-5}	1.20×10^{-8}	4.90	7.56×10^{-5}
Total	2.10×10^{-6}	8.81	2.12×10^{-4}	2.88×10^{-6}	1.69×10^{1}	6.19×10^{-4}	2.88×10^{-6}	3.12×10^{1}	1.31×10^{-3}
Year of Peak Impact	8739	8739	8827	8827	8827	8827	8827	8827	8827
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	2.64×10^{-6}	3.77×10^{-7}	0.00	2.64×10^{-6}	3.82×10^{-7}	0.00	2.64×10^{-6}	4.06×10^{-7}	0.00
Chromium	9.89×10^{-4}	9.42×10^{-3}	0.00	9.89×10^{-4}	9.43×10^{-3}	6.93×10^{-12}	9.89×10^{-4}	1.38×10^{-2}	3.18×10^{-7}
Fluoride	1.48×10^{-4}	7.06×10^{-5}	0.00	1.48×10^{-4}	7.27×10^{-5}	0.00	1.48×10^{-4}	7.82×10^{-5}	0.00
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}	2.66×10^{-1}	0.00	1.44×10^{1}	3.48×10^{-1}	6.93×10^{-12}	1.44×10^{1}	6.77×10^{-1}	3.18×10^{-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–237. Waste Management Alternative 2, 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–238. Waste Management Alternative 2, 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	9.65×10^{-7}	1.69	7.54×10^{-5}	9.65×10^{-7}	4.34	2.47×10^{-4}	1.25×10^{-6}	1.15×10^{1}	5.40×10^{-4}
Iodine-129	7.00×10^{-9}	1.99	9.29×10^{-6}	7.00×10^{-9}	2.31	1.25×10^{-5}	2.87×10^{-9}	1.17	1.81×10^{-5}
Total	9.72×10^{-7}	3.68	8.47×10^{-5}	9.72×10^{-7}	6.65	2.60×10^{-4}	1.26×10^{-6}	1.27×10^{1}	5.58×10^{-4}
Year of Peak Impact	8079	8079	7998	8079	8079	7998	7998	7998	7998
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 Compounds	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
Chromium	1.93×10^{-4}	1.84×10^{-3}	0.00	1.93×10^{-4}	1.84×10^{-3}	8.42×10^{-12}	1.93×10^{-4}	2.68×10^{-3}	3.86×10^{-7}
Fluoride	7.42×10^{-5}	3.53×10^{-5}	0.00	7.42×10^{-5}	3.63×10^{-5}	0.00	7.42×10^{-5}	3.91×10^{-5}	0.00
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	1.40×10^{-1}	8.42×10^{-12}	5.86	2.73×10^{-1}	3.86×10^{-7}
Year of Peak Impact	8905	8905	N/A	8905	8905	3889	8905	8905	3889

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–239. Waste Management Alternative 2, 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	4.45×10^{-7}	7.80×10^{-1}	4.61×10^{-5}	7.66×10^{-7}	3.44	1.61×10^{-4}	7.66×10^{-7}	7.02	3.51×10^{-4}
Iodine-129	7.00×10^{-9}	1.99	9.28×10^{-6}	2.86×10^{-9}	9.47×10^{-1}	6.50×10^{-6}	2.86×10^{-9}	1.17	9.36×10^{-6}
Total	4.52×10^{-7}	2.77	5.54×10^{-5}	7.69×10^{-7}	4.39	1.68×10^{-4}	7.69×10^{-7}	8.19	3.61×10^{-4}
Year of Peak Impact	8700	8700	8611	8611	8611	8273	8611	8611	8273
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 Compounds	6.60×10^{-7}	9.43×10^{-8}	0.00	6.60×10^{-7}	9.56×10^{-8}	0.00	6.60×10^{-7}	1.01×10^{-7}	0.00
Chromium	1.73×10^{-4}	1.65×10^{-3}	0.00	1.73×10^{-4}	1.65×10^{-3}	1.48×10^{-12}	1.73×10^{-4}	2.41×10^{-3}	6.77×10^{-8}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-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	6.74×10^{-2}	0.00	3.68	8.82×10^{-2}	1.48×10^{-12}	3.68	1.72×10^{-1}	6.77×10^{-8}
Year of Peak Impact	8144	8144	N/A	8144	8144	4826	8144	8144	4826

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–240. Waste Management Alternative 2, 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	1.22×10^{-11}	5.48×10^{-5}	2.55×10^{-9}	8.92×10^{-12}	9.27×10^{-5}	4.39×10^{-9}	4.45×10^{-7}	4.90×10^{-3}	4.61×10^{-7}
Iodine-129	6.83×10^{-14}	2.26×10^{-5}	2.13×10^{-10}	8.25×10^{-14}	4.46×10^{-4}	1.07×10^{-8}	7.00×10^{-9}	1.11×10^{-2}	1.19×10^{-7}
Total	1.23×10^{-11}	7.75×10^{-5}	2.76×10^{-9}	9.00×10^{-12}	5.38×10^{-4}	1.51×10^{-8}	4.52×10^{-7}	1.60×10^{-2}	5.80×10^{-7}
Year of Peak Impact	8794	8794	8979	9273	9273	9273	8700	8700	8611
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 Compounds	1.10×10^{-11}	1.59×10^{-12}	0.00	1.10×10^{-11}	1.74×10^{-12}	0.00	6.60×10^{-7}	6.59×10^{-9}	0.00
Chromium	3.54×10^{-9}	3.38×10^{-8}	2.10×10^{-17}	3.54×10^{-9}	5.41×10^{-8}	9.65×10^{-13}	1.73×10^{-4}	3.82×10^{-4}	3.38×10^{-8}
Fluoride	7.67×10^{-10}	3.76×10^{-10}	0.00	7.67×10^{-10}	5.33×10^{-10}	0.00	4.94×10^{-5}	7.23×10^{-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}	1.52×10^{-6}	2.10×10^{-17}	4.29×10^{-5}	4.03×10^{-3}	9.65×10^{-13}	3.68	1.36×10^{-1}	3.38×10^{-8}
Year of Peak Impact	8558	8558	3934	8558	8558	3934	8144	8144	4826

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

Figures Q–16 and Q–17 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively, for the drinking-water well user over time. The peak radiological risk occurs around the year 8000 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.

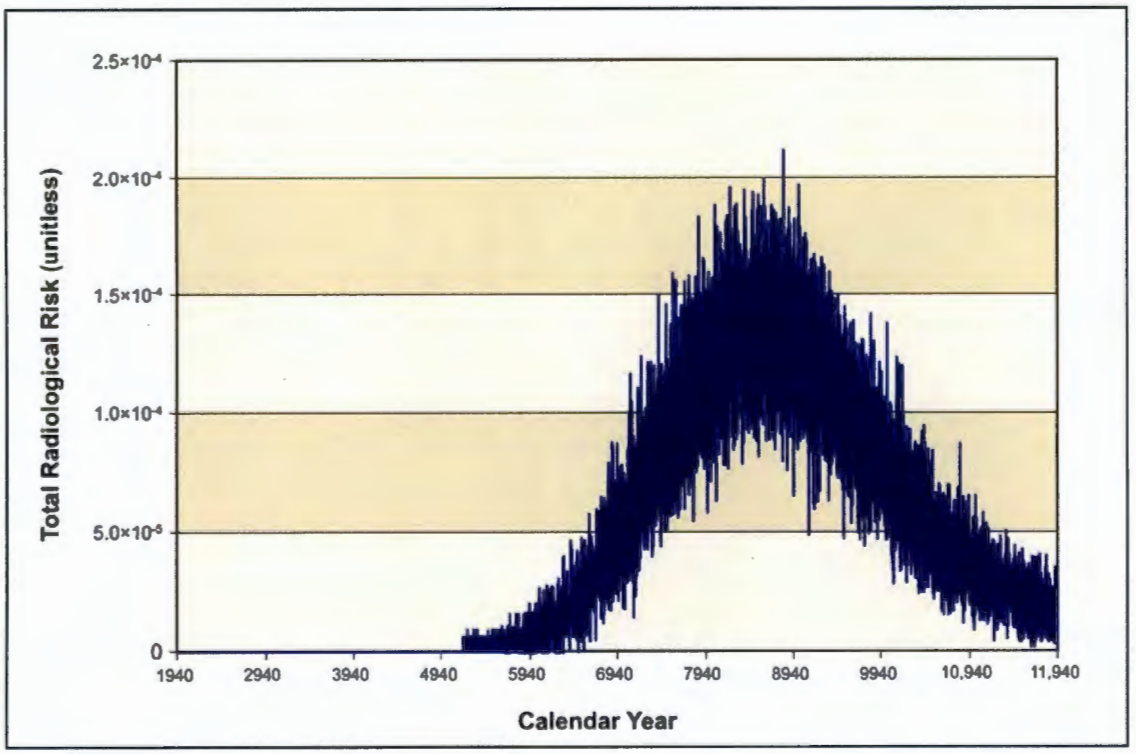

Figure Q–16. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-B, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

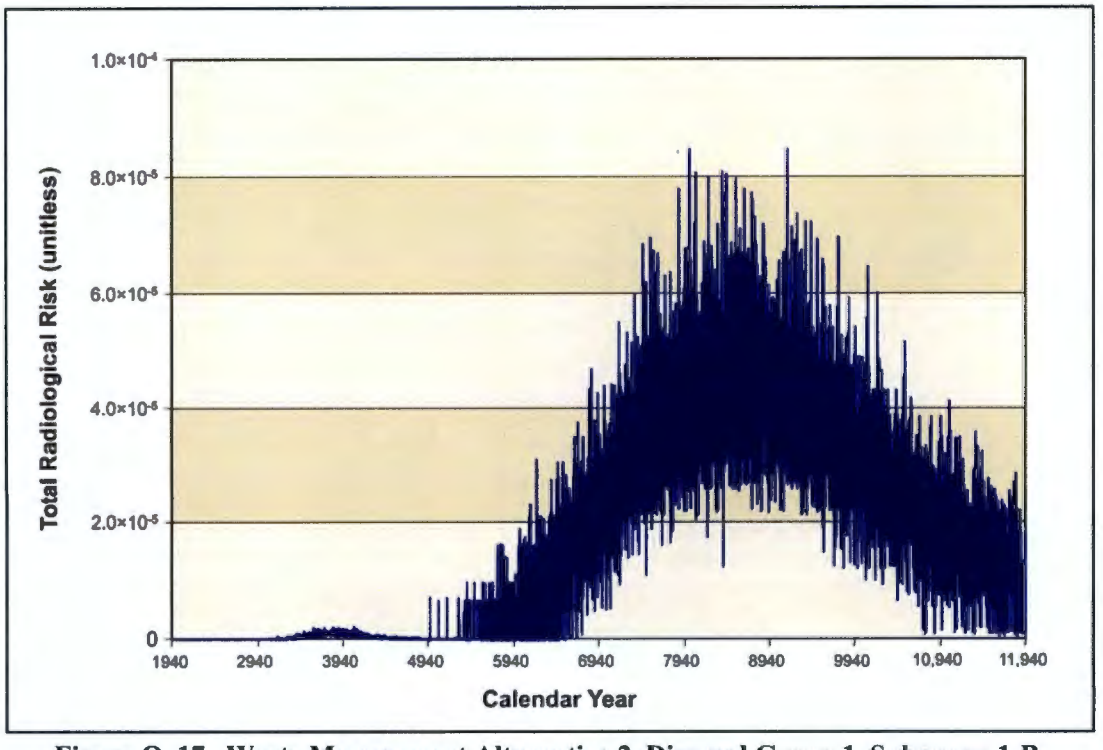

Figure Q–17. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-B, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.3 Waste Management Alternative 2; 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
- 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 are summarized in Tables Q–241 through Q–245, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. However, 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 location for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose was estimated as 5.55×10^{-1} person-rem per year for the year of maximum impact.

Table Q–241. Waste Management Alternative 2, 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	5.56×10^{-6}	9.75	3.41×10^{-4}	5.56×10^{-6}	2.50×10^{1}	1.12×10^{-3}	5.66×10^{-6}	5.19×10^{1}	2.44×10^{-3}
Iodine-129	8.56×10^{-9}	2.44	2.33×10^{-5}	8.56×10^{-9}	2.83	3.14×10^{-5}	7.18×10^{-9}	2.93	4.53×10^{-5}
Total	5.57×10^{-6}	1.22×10^{1}	3.64×10^{-4}	5.57×10^{-6}	2.79×10^{1}	1.15×10^{-3}	5.67×10^{-6}	5.48×10^{1}	2.48×10^{-3}
Year of Peak Impact	9509	9509	9048	9509	9509	9048	9048	9048	9048
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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
Boron Compounds	3.30×10^{-6}	4.72×10^{-7}	0.00	3.30×10^{-6}	4.78×10^{-7}	0.00	3.30×10^{-6}	5.07×10^{-7}	0.00
Chromium	4.37×10^{-1}	4.16	0.00	4.37×10^{-1}	4.16	1.71×10^{-9}	4.37×10^{-1}	6.08	7.86×10^{-5}
Fluoride	1.24×10^{-4}	5.89×10^{-5}	0.00	1.24×10^{-4}	6.06×10^{-5}	0.00	1.24×10^{-4}	6.52×10^{-5}	0.00
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–242. Waste Management Alternative 2, 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–243. Waste Management Alternative 2, 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	8.16×10^{-6}	1.43×10^{1}	4.91×10^{-4}	8.16×10^{-6}	3.67×10^{1}	1.61×10^{-3}	8.16×10^{-6}	7.47×10^{1}	3.51×10^{-3}
Iodine-129	5.61×10^{-9}	1.60	1.82×10^{-5}	5.61×10^{-9}	1.85	2.45×10^{-5}	5.61×10^{-9}	2.29	3.53×10^{-5}
Total	8.16×10^{-6}	1.59×10^{1}	5.09×10^{-4}	8.16×10^{-6}	3.85×10^{1}	1.64×10^{-3}	8.16×10^{-6}	7.70×10^{1}	3.55×10^{-3}
Year of Peak Impact	9163	9163	9163	9163	9163	9163	9163	9163	9163
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
Boron and Compounds	6.60×10^{-7}	9.43×10^{-8}	0.00	6.60×10^{-7}	9.56×10^{-8}	0.00	6.60×10^{-7}	1.01×10^{-7}	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}
Fluoride	7.42×10^{-5}	3.53×10^{-5}	0.00	7.42×10^{-5}	3.63×10^{-5}	0.00	7.42×10^{-5}	3.91×10^{-5}	0.00
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–244. Waste Management Alternative 2, 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}	2.95	1.02×10^{-4}	1.69×10^{-6}	7.59	3.33×10^{-4}	1.69×10^{-6}	1.55×10^{1}	7.27×10^{-4}
Iodine-129	4.20×10^{-9}	1.19	1.36×10^{-5}	4.20×10^{-9}	1.39	1.84×10^{-5}	4.20×10^{-9}	1.71	2.64×10^{-5}
Total	1.69×10^{-6}	4.15	1.15×10^{-4}	1.69×10^{-6}	8.97	3.51×10^{-4}	1.69×10^{-6}	1.72×10^{1}	7.53×10^{-4}
Year of Peak Impact	8927	8927	8927	8927	8927	8927	8927	8927	8927
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	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-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	2.47×10^{-5}	1.18×10^{-5}	0.00	2.47×10^{-5}	1.21×10^{-5}	0.00	2.47×10^{-5}	1.30×10^{-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–245. Waste Management Alternative 2, 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	2.03×10^{-11}	9.15×10^{-5}	4.02×10^{-9}	1.36×10^{-11}	1.41×10^{-4}	8.94×10^{-9}	1.69×10^{-6}	1.85×10^{-2}	1.01×10^{-6}
Iodine-129	5.87×10^{-14}	1.94×10^{-5}	2.58×10^{-10}	8.23×10^{-14}	4.44×10^{-4}	9.03×10^{-9}	4.20×10^{-9}	6.93×10^{-3}	1.70×10^{-7}
Total	2.04×10^{-11}	1.11×10^{-4}	4.28×10^{-9}	1.36×10^{-11}	5.85×10^{-4}	1.80×10^{-8}	1.69×10^{-6}	2.54×10^{-2}	1.18×10^{-6}
Year of Peak Impact	9040	9040	9040	9273	9273	8839	8927	8927	8927
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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
Boron and Compounds	1.01×10^{-11}	1.46×10^{-12}	0.00	7.87×10^{-12}	1.25×10^{-12}	0.00	3.30×10^{-7}	3.30×10^{-9}	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}
Fluoride	7.57×10^{-10}	3.71×10^{-10}	0.00	5.87×10^{-10}	4.07×10^{-10}	0.00	2.47×10^{-5}	3.62×10^{-6}	0.00
Nitrate	1.53×10^{-4}	5.28×10^{-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}	6.60×10^{-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–18 and Q–19 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively for the drinking-water well user over time. The peak radiological risk occurs around the year 9100 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.

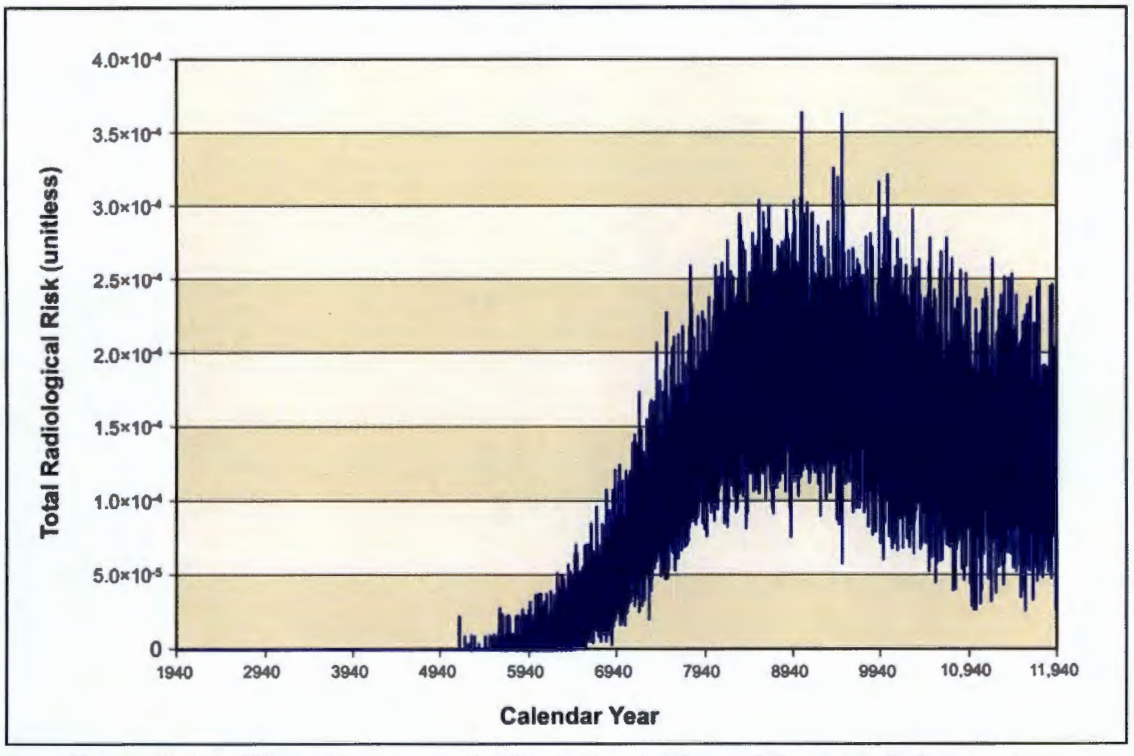

Figure Q–18. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-C, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

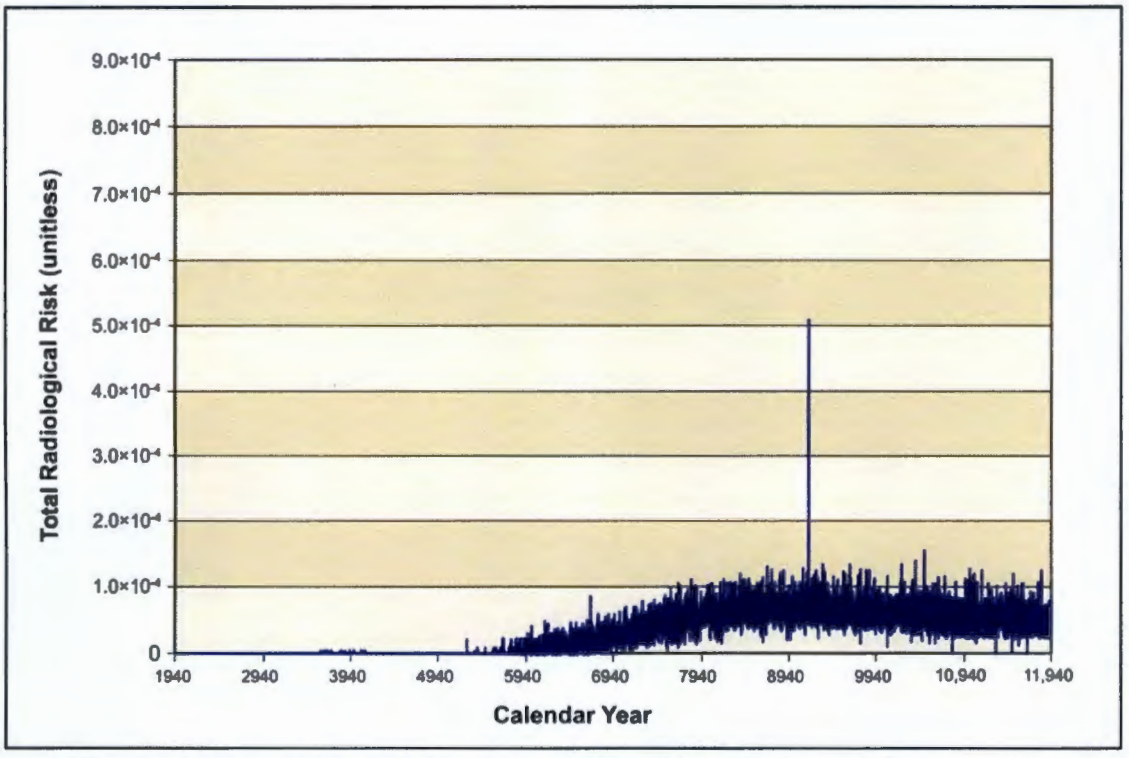

Figure Q–19. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-C, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.4 Waste Management Alternative 2; 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
- 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 are summarized in Tables Q–246 through Q–250, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would be exceeded at the IDF-East 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 and nitrate at the IDF-East barrier, the Core Zone Boundary, and the Columbia River nearshore location for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose was estimated as 2.40 person-rem per year for the year of maximum impact.

Table Q–246. Waste Management Alternative 2, 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	3.01×10^{-5}	5.28×10^{1}	1.81×10^{-3}	3.01×10^{-5}	1.36×10^{2}	5.95×10^{-3}	3.01×10^{-5}	2.76×10^{2}	1.30×10^{-2}
Iodine-129	1.29×10^{-8}	3.67	4.18×10^{-5}	1.29×10^{-8}	4.26	5.64×10^{-5}	1.29×10^{-8}	5.27	8.13×10^{-5}
Total	3.01×10^{-5}	5.65×10^{1}	1.86×10^{-3}	3.01×10^{-5}	1.40×10^{2}	6.01×10^{-3}	3.01×10^{-5}	2.81×10^{2}	1.31×10^{-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)
Boron and Compounds	2.97×10^{-6}	4.25×10^{-7}	0.00	2.97×10^{-6}	4.30×10^{-7}	0.00	2.97×10^{-6}	4.57×10^{-7}	0.00
Chromium	4.35×10^{-1}	4.15	0.00	4.35×10^{-1}	4.15	1.71×10^{-9}	4.35×10^{-1}	6.06	7.85×10^{-5}
Fluoride	2.97×10^{-4}	1.41×10^{-4}	0.00	2.97×10^{-4}	1.45×10^{-4}	0.00	2.97×10^{-4}	1.56×10^{-4}	0.00
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–247. Waste Management Alternative 2, 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–248. Waste Management Alternative 2, 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	2.48×10^{-5}	4.34×10^{1}	1.49×10^{-3}	2.48×10^{-5}	1.11×10^{2}	4.90×10^{-3}	2.48×10^{-5}	2.27×10^{2}	1.07×10^{-2}
Iodine-129	2.71×10^{-9}	7.70×10^{-1}	8.77×10^{-6}	2.71×10^{-9}	8.94×10^{-1}	1.18×10^{-5}	2.71×10^{-9}	1.10	1.70×10^{-5}
Total	2.48×10^{-5}	4.42×10^{1}	1.50×10^{-3}	2.48×10^{-5}	1.12×10^{2}	4.91×10^{-3}	2.48×10^{-5}	2.28×10^{2}	1.07×10^{-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)
Boron and Compounds	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
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}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-5}	0.00
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–249. Waste Management Alternative 2, 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	7.45×10^{-6}	1.30×10^{1}	4.58×10^{-4}	7.61×10^{-6}	3.42×10^{1}	1.50×10^{-3}	7.61×10^{-6}	6.97×10^{1}	3.28×10^{-3}
Iodine-129	6.06×10^{-9}	1.73	1.52×10^{-5}	4.69×10^{-9}	1.55	2.05×10^{-5}	4.69×10^{-9}	1.91	2.95×10^{-5}
Total	7.45×10^{-6}	1.48×10^{1}	4.73×10^{-4}	7.61×10^{-6}	3.58×10^{1}	1.52×10^{-3}	7.61×10^{-6}	7.16×10^{1}	3.31×10^{-3}
Year of Peak Impact	9207	9207	9209	9209	9209	9209	9209	9209	9209
	Drinking-Water Well User			Resident Farmer			American Indian Resident Farmer		
Chemical Constituent	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	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
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}
Fluoride	2.47×10^{-5}	1.18×10^{-5}	0.00	2.47×10^{-5}	1.21×10^{-5}	0.00	2.47×10^{-5}	1.30×10^{-5}	0.00
Nitrate	8.29×10^{-1}	1.48×10^{-2}	0.00	8.29×10^{-1}	1.95×10^{-2}	0.00	8.29×10^{-1}	3.82×10^{-2}	0.00
Total	9.45×10^{-1}	1.12	0.00	9.45×10^{-1}	1.13	4.56×10^{-10}	9.45×10^{-1}	1.66	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–250. Waste Management Alternative 2, 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	1.01×10^{-10}	4.56×10^{-4}	2.00×10^{-8}	9.97×10^{-11}	1.04×10^{-3}	4.91×10^{-8}	7.45×10^{-6}	8.15×10^{-2}	4.57×10^{-6}
Iodine-129	6.88×10^{-14}	2.28×10^{-5}	3.02×10^{-10}	7.91×10^{-14}	4.27×10^{-4}	1.03×10^{-8}	6.06×10^{-9}	9.68×10^{-3}	1.89×10^{-7}
Total	1.01×10^{-10}	4.79×10^{-4}	2.03×10^{-8}	9.98×10^{-11}	1.46×10^{-3}	5.94×10^{-8}	7.45×10^{-6}	9.11×10^{-2}	4.75×10^{-6}
Year of Peak Impact	9193	9193	9193	9275	9275	9275	9207	9207	9209
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	8.99×10^{-12}	1.30×10^{-12}	0.00	9.58×10^{-12}	1.52×10^{-12}	0.00	3.30×10^{-7}	3.29×10^{-9}	0.00
Chromium	1.66×10^{-6}	1.58×10^{-5}	6.52×10^{-15}	7.11×10^{-7}	1.09×10^{-5}	2.99×10^{-10}	1.16×10^{-1}	2.56×10^{-1}	1.05×10^{-5}
Fluoride	8.52×10^{-10}	4.18×10^{-10}	0.00	8.35×10^{-10}	5.79×10^{-10}	0.00	2.47×10^{-5}	3.61×10^{-6}	0.00
Nitrate	3.01×10^{-5}	1.04×10^{-6}	0.00	5.04×10^{-5}	4.73×10^{-3}	0.00	8.29×10^{-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}	9.45×10^{-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–20 and Q–21 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively 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.

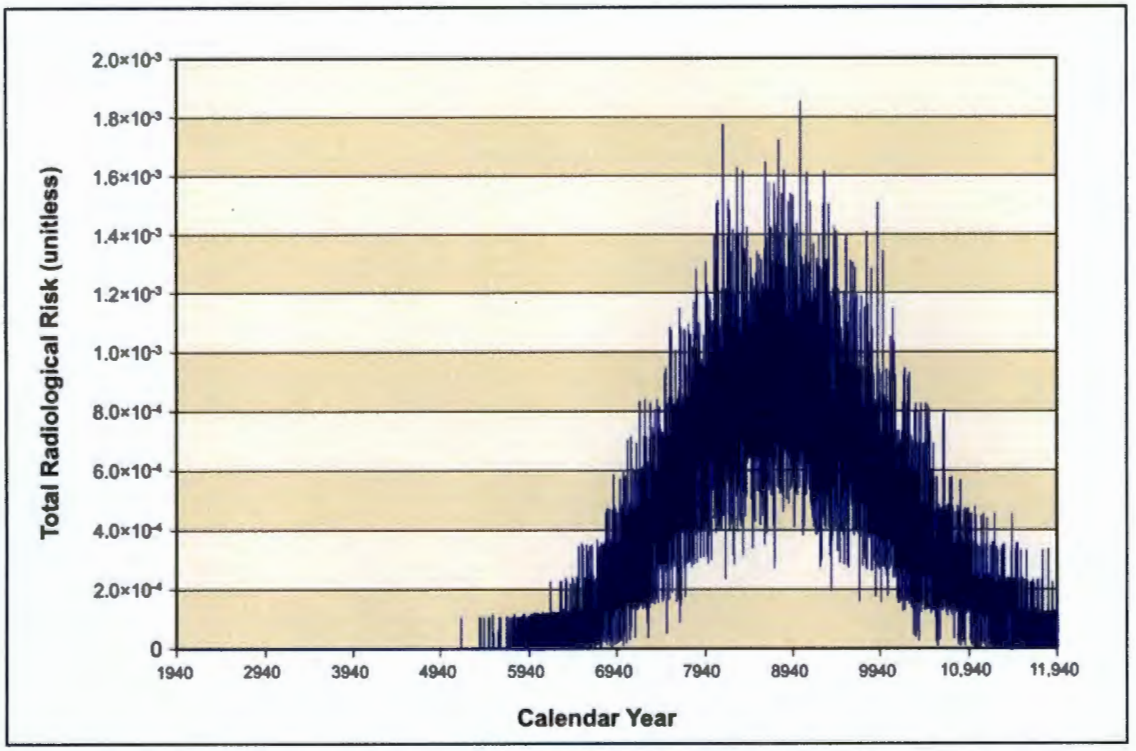

Figure Q–20. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-D, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

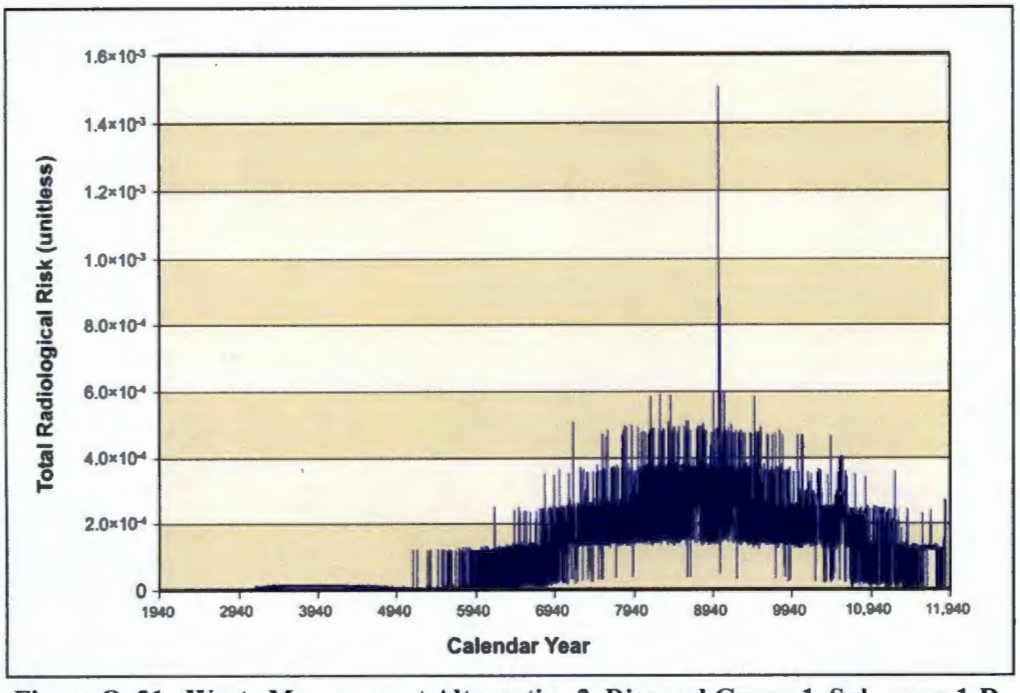

Figure Q–21. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-D, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.5 Waste Management Alternative 2; 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
- Tank closure secondary waste
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–251 through Q–255, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. The Hazard Index guideline would be exceeded primarily due to chromium and nitrate at the IDF-East barrier and the Core Zone Boundary for the drinking-water well user, the resident farmer, and the American Indian resident farmer, and would be exceeded primarily due to fluoride and total uranium at the

Columbia River nearshore for the American Indian resident farmer. Population dose was estimated as 6.25×10^{-1} person-rem per year for the year of maximum impact.

Table Q–251. Waste Management Alternative 2, 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	5.58×10^{-6}	9.78	3.91×10^{-4}	6.49×10^{-6}	2.92×10^{1}	1.28×10^{-3}	6.49×10^{-6}	5.95×10^{1}	2.80×10^{-3}
Iodine-129	1.42×10^{-8}	4.05	1.87×10^{-5}	5.77×10^{-9}	1.91	2.53×10^{-5}	5.77×10^{-9}	2.36	3.64×10^{-5}
Total	5.59×10^{-6}	1.38×10^{1}	4.10×10^{-4}	6.50×10^{-6}	3.11×10^{1}	1.31×10^{-3}	6.50×10^{-6}	6.19×10^{1}	2.84×10^{-3}
Year of Peak Impact	8944	8944	9035	9035	9035	9035	9035	9035	9035
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
Boron and Compounds	1.65×10^{-6}	2.36×10^{-7}	0.00	1.65×10^{-6}	2.39×10^{-7}	0.00	1.65×10^{-6}	2.54×10^{-7}	0.00
Chromium	2.24×10^{-1}	2.13	0.00	2.24×10^{-1}	2.13	8.78×10^{-10}	2.24×10^{-1}	3.11	4.03×10^{-5}
Fluoride	7.42×10^{-5}	3.53×10^{-5}	0.00	7.42×10^{-5}	3.63×10^{-5}	0.00	7.42×10^{-5}	3.91×10^{-5}	0.00
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}	4.01	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–252. Waste Management Alternative 2, 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–253. Waste Management Alternative 2, 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	2.68×10^{-6}	4.69	1.86×10^{-4}	3.09×10^{-6}	1.39×10^{1}	6.11×10^{-4}	3.09×10^{-6}	2.84×10^{1}	1.33×10^{-3}
Iodine-129	4.29×10^{-9}	1.22	5.22×10^{-6}	1.61×10^{-9}	5.33×10^{-1}	7.05×10^{-6}	1.61×10^{-9}	6.58×10^{-1}	1.02×10^{-5}
Total	2.68×10^{-6}	5.91	1.92×10^{-4}	3.10×10^{-6}	1.45×10^{1}	6.18×10^{-4}	3.10×10^{-6}	2.90×10^{1}	1.34×10^{-3}
Year of Peak Impact	9576	9576	9499	9499	9499	9499	9499	9499	9499
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	9.57×10^{-2}	9.11×10^{-1}	0.00	9.57×10^{-2}	9.12×10^{-1}	3.76×10^{-10}	9.57×10^{-2}	1.33	1.72×10^{-5}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-5}	0.00
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–254. Waste Management Alternative 2, 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}	9.13	4.01×10^{-4}	2.03×10^{-6}	1.86×10^{1}	8.75×10^{-4}
Iodine-129	2.84×10^{-9}	8.08×10^{-1}	9.20×10^{-6}	2.84×10^{-9}	9.38×10^{-1}	1.24×10^{-5}	2.84×10^{-9}	1.16	1.79×10^{-5}
Total	2.03×10^{-6}	4.36	1.31×10^{-4}	2.03×10^{-6}	1.01×10^{1}	4.13×10^{-4}	2.03×10^{-6}	1.98×10^{1}	8.93×10^{-4}
Year of Peak Impact	8117	8117	8117	8117	8117	8117	8117	8117	8117
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	6.60×10^{-7}	9.43×10^{-8}	0.00	6.60×10^{-7}	9.56×10^{-8}	0.00	6.60×10^{-7}	1.01×10^{-7}	0.00
Fluoride	6.38×10^{-2}	6.07×10^{-1}	0.00	6.38×10^{-2}	6.08×10^{-1}	2.50×10^{-10}	6.38×10^{-2}	8.88×10^{-1}	1.15×10^{-5}
Nitrate	2.47×10^{-5}	1.18×10^{-5}	0.00	2.47×10^{-5}	1.21×10^{-5}	0.00	2.47×10^{-5}	1.30×10^{-5}	0.00
Total Uranium	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–255. Waste Management Alternative 2, 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	2.46×10^{-11}	1.11×10^{-4}	4.86×10^{-9}	1.60×10^{-11}	1.67×10^{-4}	1.13×10^{-8}	2.03×10^{-6}	2.22×10^{-2}	1.22×10^{-6}
Iodine-129	4.32×10^{-14}	1.43×10^{-5}	1.90×10^{-10}	8.40×10^{-14}	4.54×10^{-4}	8.16×10^{-9}	2.84×10^{-9}	4.77×10^{-3}	1.17×10^{-7}
Total	2.46×10^{-11}	1.25×10^{-4}	5.05×10^{-9}	1.61×10^{-11}	6.20×10^{-4}	1.94×10^{-8}	2.03×10^{-6}	2.69×10^{-2}	1.33×10^{-6}
Year of Peak Impact	9835	9835	9835	9273	9273	9223	8117	8117	8117
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	1.06×10^{-11}	1.54×10^{-12}	0.00	1.08×10^{-11}	1.71×10^{-12}	0.00	3.30×10^{-7}	3.30×10^{-9}	0.00
Fluoride	9.29×10^{-7}	8.86×10^{-6}	3.65×10^{-15}	5.38×10^{-7}	8.21×10^{-6}	1.67×10^{-10}	4.80×10^{-2}	1.06×10^{-1}	5.74×10^{-6}
Nitrate	8.95×10^{-10}	4.39×10^{-10}	0.00	8.85×10^{-10}	6.14×10^{-10}	0.00	2.47×10^{-5}	3.61×10^{-6}	0.00
Total Uranium	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	7.19×10^{-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–22 and Q–23 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively, for the drinking-water well user over time. The peak radiological risk occurs around the year 9500 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.

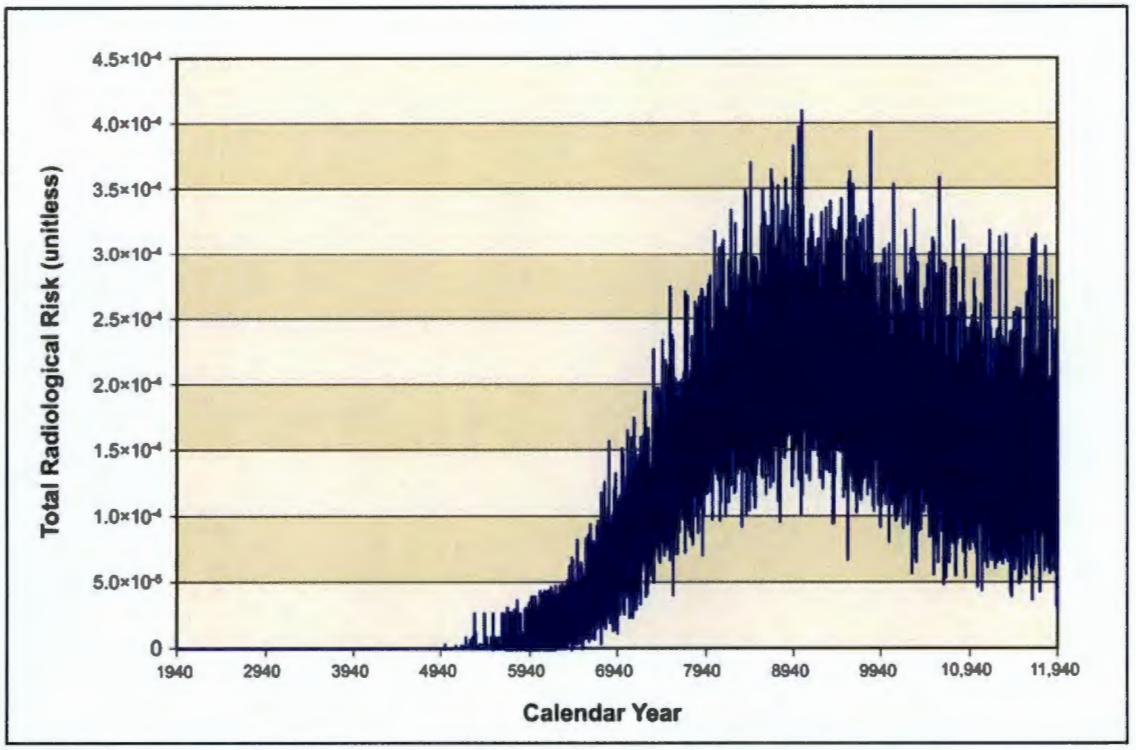

Figure Q–22. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-E, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

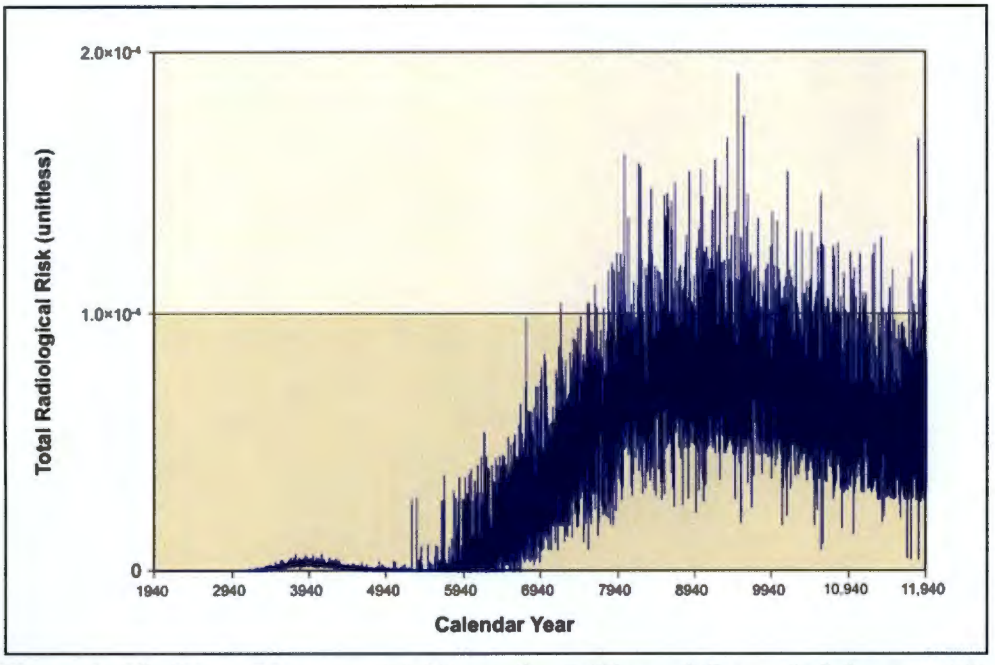

Figure Q–23. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-E, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.6 Waste Management Alternative 2; 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
- 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 Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–256 through Q–259, 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 not be exceeded at any location. 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, the resident farmer, and the American Indian resident farmer. Population dose was estimated as 4.18×10^{-1} person-rem per year for the year of maximum impact.

Table Q–256. Waste Management Alternative 2, 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	3.51×10^{-6}	6.16	2.12×10^{-4}	3.51×10^{-6}	1.58×10^{1}	6.94×10^{-4}	3.51×10^{-6}	3.22×10^{1}	1.51×10^{-3}
Iodine-129	1.41×10^{-8}	4.01	4.57×10^{-5}	1.41×10^{-8}	4.66	6.17×10^{-5}	1.41×10^{-8}	5.75	8.88×10^{-5}
Total	3.53×10^{-6}	1.02×10^{1}	2.57×10^{-4}	3.53×10^{-6}	2.05×10^{1}	7.56×10^{-4}	3.53×10^{-6}	3.80×10^{1}	1.60×10^{-3}
Year of Peak Impact	8276	8276	8276	8276	8276	8276	8276	8276	8276
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	3.63×10^{-6}	5.19×10^{-7}	0.00	3.63×10^{-6}	5.26×10^{-7}	0.00	3.63×10^{-6}	5.58×10^{-7}	0.00
Fluoride	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	2.47×10^{-4}	1.18×10^{-4}	0.00	2.47×10^{-4}	1.21×10^{-4}	0.00	2.47×10^{-4}	1.30×10^{-4}	0.00
Total Uranium	1.73×10^{1}	3.08×10^{-1}	0.00	1.73×10^{1}	4.06×10^{-1}	0.00	1.73×10^{1}	7.97×10^{-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}	5.50	6.04×10^{-5}
Year of Peak Impact	8735	8735	1940	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.

Table Q–257. Waste Management Alternative 2, 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	1.06×10^{-6}	1.86	9.01×10^{-5}	1.50×10^{-6}	6.73	2.96×10^{-4}	1.50×10^{-6}	1.37×10^{1}	6.45×10^{-4}
Iodine-129	7.15×10^{-9}	2.04	9.51×10^{-6}	2.93×10^{-9}	9.70×10^{-1}	1.28×10^{-5}	2.93×10^{-9}	1.20	1.85×10^{-5}
Total	1.07×10^{-6}	3.89	9.97×10^{-5}	1.50×10^{-6}	7.70	3.09×10^{-4}	1.50×10^{-6}	1.49×10^{1}	6.64×10^{-4}
Year of Peak Impact	8885	8885	9155	9155	9155	9155	9155	9155	9155
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
Boron and Compounds	6.60×10^{-7}	9.43×10^{-8}	0.00	6.60×10^{-7}	9.56×10^{-8}	0.00	6.60×10^{-7}	1.01×10^{-7}	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}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-5}	0.00
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	1940	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.

Table Q–258. Waste Management Alternative 2, 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	5.77×10^{-7}	1.01	5.20×10^{-5}	6.77×10^{-7}	3.05	1.71×10^{-4}	8.64×10^{-7}	7.92	3.84×10^{-4}
Iodine-129	6.90×10^{-9}	1.96	9.48×10^{-6}	5.59×10^{-9}	1.85	1.28×10^{-5}	2.92×10^{-9}	1.19	9.24×10^{-6}
Total	5.84×10^{-7}	2.97	6.15×10^{-5}	6.83×10^{-7}	4.89	1.83×10^{-4}	8.67×10^{-7}	9.11	3.93×10^{-4}
Year of Peak Impact	8700	8700	8854	8377	8377	8854	8854	8854	8090
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
Boron and Compounds	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	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	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-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	1940	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.

Table Q–259. Waste Management Alternative 2, 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	1.36×10^{-11}	6.12×10^{-5}	2.87×10^{-9}	1.06×10^{-11}	1.10×10^{-4}	5.20×10^{-9}	5.77×10^{-7}	6.35×10^{-3}	5.20×10^{-7}
Iodine-129	6.76×10^{-14}	2.24×10^{-5}	2.33×10^{-10}	8.26×10^{-14}	4.46×10^{-4}	1.07×10^{-8}	6.90×10^{-9}	1.09×10^{-2}	1.21×10^{-7}
Total	1.37×10^{-11}	8.36×10^{-5}	3.10×10^{-9}	1.06×10^{-11}	5.56×10^{-4}	1.59×10^{-8}	5.84×10^{-7}	1.73×10^{-2}	6.40×10^{-7}
Year of Peak Impact	9251	9251	9151	9273	9273	9273	8700	8700	8854
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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
Boron and Compounds	8.22×10^{-12}	1.19×10^{-12}	0.00	1.11×10^{-11}	1.76×10^{-2}	0.00	3.30×10^{-7}	3.30×10^{-9}	0.00
Chromium	1.17×10^{-6}	1.12×10^{-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}
Fluoride	6.36×10^{-10}	3.11×10^{-10}	0.00	8.47×10^{-10}	5.88×10^{-10}	0.00	4.94×10^{-5}	7.23×10^{-6}	0.00
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–24 and Q–25, respectively, depict 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. 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.

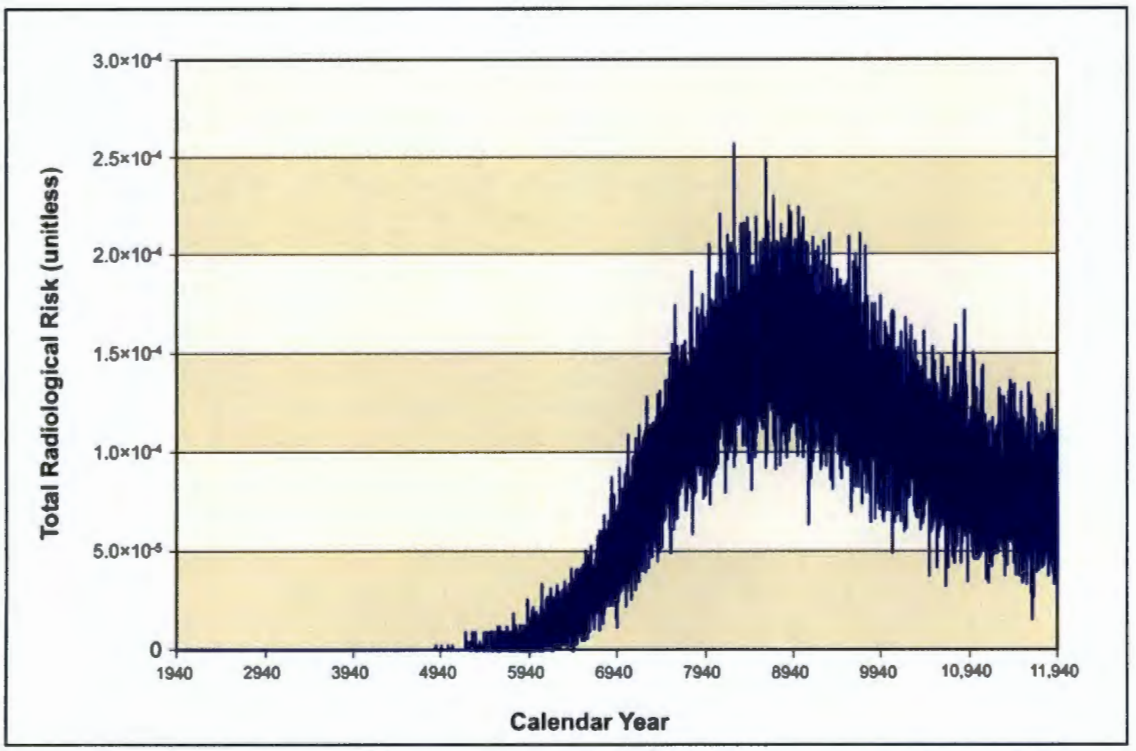

Figure Q–24. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-F, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

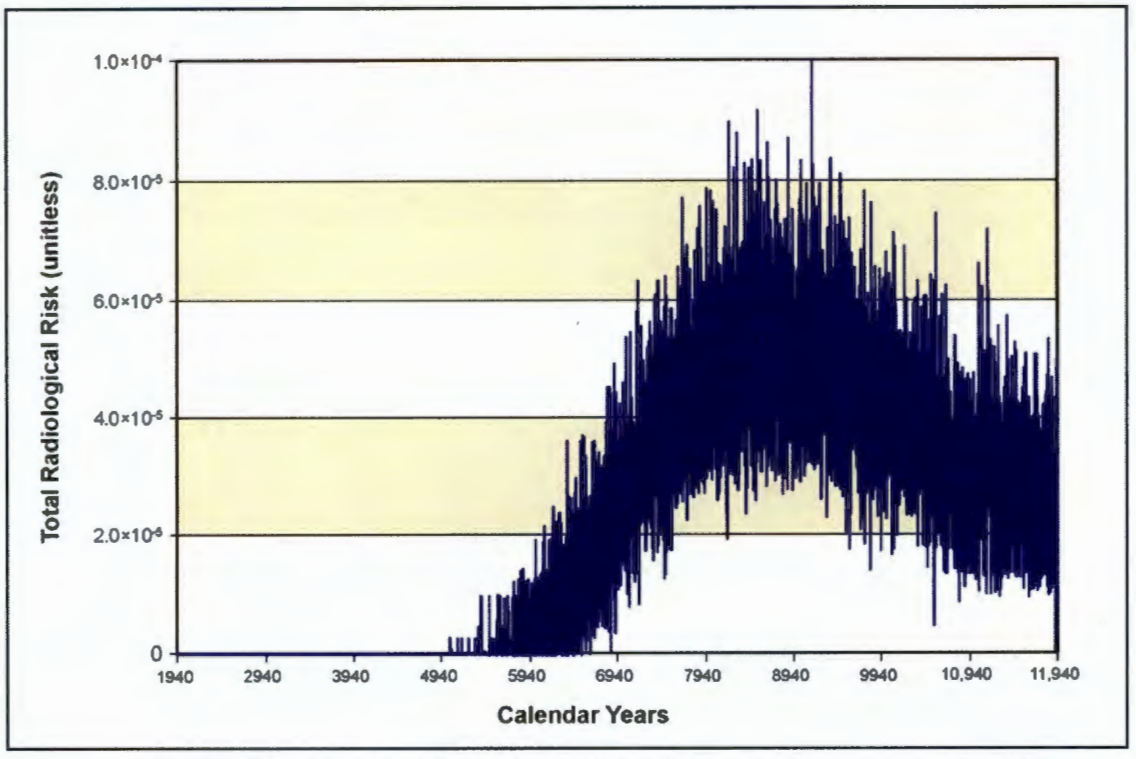

Figure Q–25. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-F, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.7 Waste Management Alternative 2; 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
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–260 through Q–264, respectively. The key constituent contributors to human health risk are technetium-99, iodine-129 for radionuclides and acetonitrile, boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 3.06×10^{-1} person-rem per year for the year of maximum impact.

Table Q–260. Waste Management Alternative 2, 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	1.29×10^{-6}	2.26	1.13×10^{-4}	1.88×10^{-6}	8.46	4.32×10^{-4}	1.88×10^{-6}	1.72×10^{1}	9.42×10^{-4}
Iodine-129	1.87×10^{-8}	5.34	4.70×10^{-5}	1.45×10^{-8}	4.79	3.24×10^{-5}	1.45×10^{-8}	5.92	4.67×10^{-5}
Total	1.31×10^{-6}	7.59	1.60×10^{-4}	1.90×10^{-6}	1.33×10^{1}	4.64×10^{-4}	1.90×10^{-6}	2.32×10^{1}	9.88×10^{-4}
Year of Peak Impact	8739	8739	8276	8276	8276	9004	8276	8276	9004
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	2.97×10^{-6}	4.25×10^{-7}	0.00	2.97×10^{-6}	4.30×10^{-7}	0.00	2.97×10^{-6}	4.57×10^{-7}	0.00
Chromium	2.99×10^{-3}	2.85×10^{-2}	0.00	1.02×10^{-3}	9.73×10^{-3}	1.52×10^{-11}	1.02×10^{-3}	1.42×10^{-2}	6.96×10^{-7}
Fluoride	2.47×10^{-4}	1.18×10^{-4}	0.00	1.98×10^{-4}	9.69×10^{-5}	0.00	1.98×10^{-4}	1.04×10^{-4}	0.00
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}	2.68×10^{-1}	0.00	1.42×10^{1}	3.45×10^{-1}	1.52×10^{-11}	1.42×10^{1}	6.71×10^{-1}	6.96×10^{-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–261. Waste Management Alternative 2, 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–262. Waste Management Alternative 2, 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	3.76×10^{-7}	6.58×10^{-1}	6.94×10^{-5}	1.15×10^{-6}	5.18	2.28×10^{-4}	1.15×10^{-6}	1.06×10^{1}	4.96×10^{-4}
Iodine-129	8.47×10^{-9}	2.41	9.26×10^{-6}	2.86×10^{-9}	9.45×10^{-1}	1.25×10^{-5}	2.86×10^{-9}	1.17	1.80×10^{-5}
Total	3.84×10^{-7}	3.07	7.86×10^{-5}	1.15×10^{-6}	6.13	2.40×10^{-4}	1.15×10^{-6}	1.17×10^{1}	5.14×10^{-4}
Year of Peak Impact	8858	8858	9155	9155	9155	9155	9155	9155	9155
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	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
Chromium	3.85×10^{-4}	3.67×10^{-3}	0.00	3.85×10^{-4}	3.67×10^{-3}	8.42×10^{-12}	3.85×10^{-4}	5.37×10^{-3}	3.86×10^{-7}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-5}	0.00
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}	8.42×10^{-12}	5.63	2.65×10^{-1}	3.86×10^{-7}
Year of Peak Impact	9653	9653	N/A	9653	9653	3889	9653	9653	3889

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–263. Waste Management Alternative 2, 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	3.54×10^{-7}	6.21×10^{-1}	4.06×10^{-5}	6.74×10^{-7}	3.03	1.33×10^{-4}	6.74×10^{-7}	6.17	2.90×10^{-4}
Iodine-129	6.99×10^{-9}	1.99	9.26×10^{-6}	2.86×10^{-9}	9.44×10^{-1}	1.25×10^{-5}	2.86×10^{-9}	1.17	1.80×10^{-5}
Total	3.61×10^{-7}	2.61	4.98×10^{-5}	6.77×10^{-7}	3.98	1.46×10^{-4}	6.77×10^{-7}	7.34	3.08×10^{-4}
Year of Peak Impact	8700	8700	9451	9451	9451	9451	9451	9451	9451
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	3.30×10^{-7}	4.72×10^{-8}	0.00	3.30×10^{-7}	4.78×10^{-8}	0.00	3.30×10^{-7}	5.07×10^{-8}	0.00
Chromium	4.48×10^{-4}	4.27×10^{-3}	0.00	4.48×10^{-4}	4.27×10^{-3}	3.16×10^{-12}	4.48×10^{-4}	6.24×10^{-3}	1.45×10^{-7}
Fluoride	4.94×10^{-5}	2.35×10^{-5}	0.00	4.94×10^{-5}	2.42×10^{-5}	0.00	4.94×10^{-5}	2.61×10^{-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	4.79×10^{-2}	0.00	2.44	6.17×10^{-2}	3.16×10^{-12}	2.44	1.19×10^{-1}	1.45×10^{-7}
Year of Peak Impact	8821	8821	N/A	8821	8821	8528	8821	8821	8528

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–264. Waste Management Alternative 2, Disposal Group 1, Subgroup 2-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	8.71×10^{-12}	3.92×10^{-5}	1.88×10^{-9}	5.35×10^{-12}	5.56×10^{-5}	2.63×10^{-9}	3.54×10^{-7}	3.89×10^{-3}	4.04×10^{-7}
Iodine-129	6.65×10^{-14}	2.20×10^{-5}	2.15×10^{-10}	8.32×10^{-14}	4.49×10^{-4}	1.08×10^{-8}	6.99×10^{-9}	1.11×10^{-2}	1.17×10^{-7}
Total	8.78×10^{-12}	6.12×10^{-5}	2.10×10^{-9}	5.43×10^{-12}	5.05×10^{-4}	1.34×10^{-8}	3.61×10^{-7}	1.49×10^{-2}	5.21×10^{-7}
Year of Peak Impact	8794	8794	8979	9273	9273	9273	8700	8700	9451
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	1.08×10^{-11}	1.56×10^{-12}	0.00	1.08×10^{-11}	1.72×10^{-12}	0.00	9.91×10^{-7}	9.88×10^{-9}	0.00
Chromium	6.96×10^{-9}	6.64×10^{-8}	4.03×10^{-17}	6.96×10^{-9}	1.06×10^{-7}	1.85×10^{-12}	4.31×10^{-4}	9.52×10^{-4}	7.25×10^{-8}
Fluoride	8.86×10^{-10}	4.34×10^{-10}	0.00	8.86×10^{-10}	6.15×10^{-10}	0.00	2.47×10^{-5}	3.62×10^{-6}	0.00
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}	4.03×10^{-17}	4.48×10^{-5}	4.21×10^{-3}	1.85×10^{-12}	2.44	9.61×10^{-2}	7.25×10^{-8}
Year of Peak Impact	8016	8016	8400	8016	8016	8400	8085	8085	8528

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

Figures Q–26 and Q–27 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively, for the drinking-water well user over time. The peak radiological risk occurs around the year 9100 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.

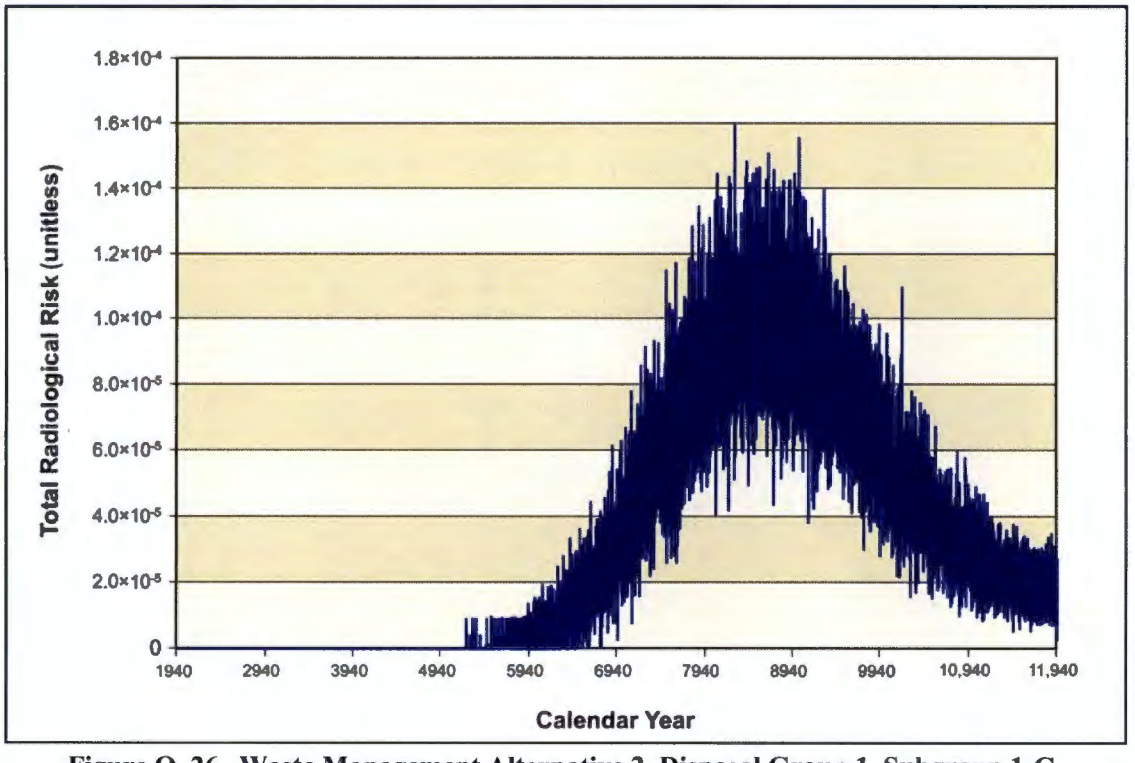

Figure Q–26. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-G, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

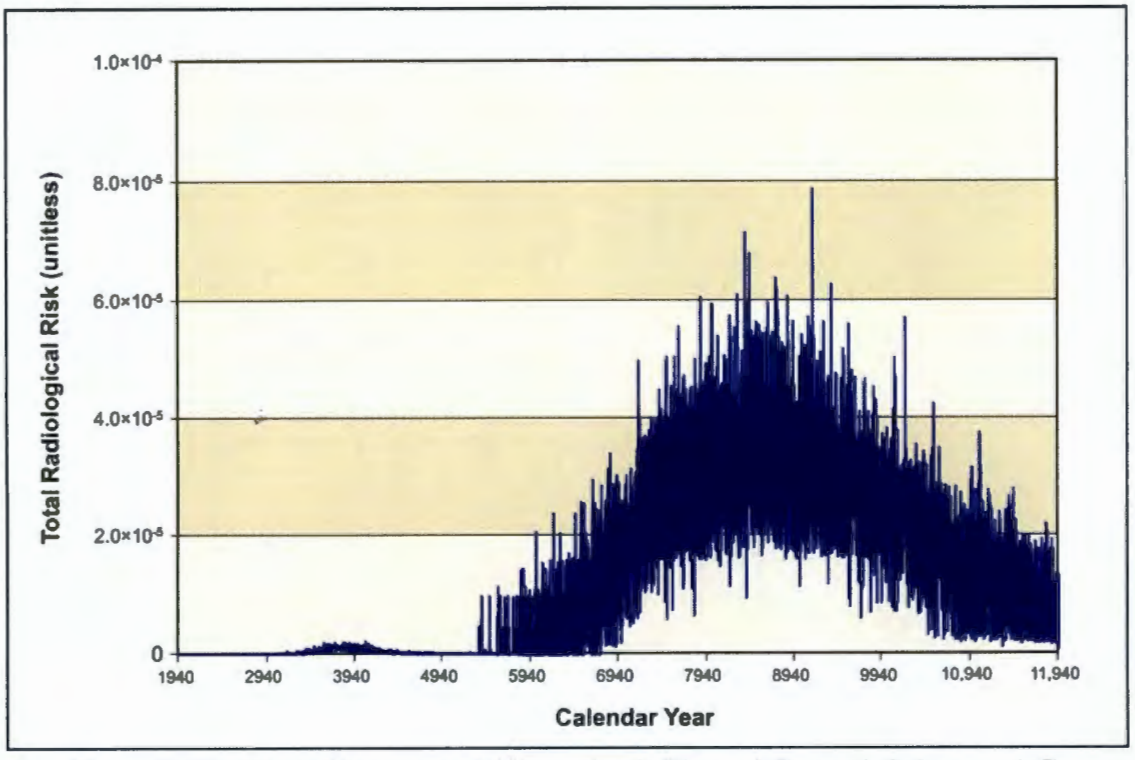

Figure Q–27. Waste Management Alternative 2, Disposal Group 1, Subgroup 1-G, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.8 Waste Management Alternative 2; 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
- 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 Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–265 through Q–268, respectively. The key constituent contributors to human health risk are technetium-99 and iodine-129 for radionuclides and boron and boron compounds, chromium, fluoride, and nitrate for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location. Population dose was estimated as 3.18×10^{-1} person-rem per year for the year of maximum impact.

Table Q–265. Waste Management Alternative 2, 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	2.58×10^{-6}	4.53	1.56×10^{-4}	2.58×10^{-6}	1.16×10^{1}	5.58×10^{-4}	2.58×10^{-6}	2.37×10^{1}	1.22×10^{-3}
Iodine-129	2.36×10^{-8}	6.72	7.65×10^{-5}	2.36×10^{-8}	7.80	6.57×10^{-5}	2.36×10^{-8}	9.63	9.46×10^{-5}
Total	2.61×10^{-6}	1.12×10^{1}	2.32×10^{-4}	2.61×10^{-6}	1.94×10^{1}	6.24×10^{-4}	2.61×10^{-6}	3.33×10^{1}	1.31×10^{-3}
Year of Peak Impact	8706	8706	8706	8706	8706	8580	8706	8706	8580
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	2.36×10^{-6}	3.38×10^{-7}	0.00	2.36×10^{-6}	3.42×10^{-7}	0.00	2.36×10^{-6}	3.63×10^{-7}	0.00
Chromium	2.22×10^{-3}	2.12×10^{-2}	0.00	2.22×10^{-3}	2.12×10^{-2}	1.25×10^{-11}	2.22×10^{-3}	3.09×10^{-2}	5.75×10^{-7}
Fluoride	2.05×10^{-4}	9.75×10^{-5}	0.00	2.05×10^{-4}	1.00×10^{-4}	0.00	2.05×10^{-4}	1.08×10^{-4}	0.00
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}	2.98×10^{-1}	0.00	1.55×10^{1}	3.86×10^{-1}	1.25×10^{-11}	1.55×10^{1}	7.47×10^{-1}	5.75×10^{-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–266. Waste Management Alternative 2, 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	6.92×10^{-7}	1.21	6.90×10^{-5}	1.15×10^{-6}	5.15	2.26×10^{-4}	1.15×10^{-6}	1.05×10^{1}	4.94×10^{-4}
Iodine-129	9.73×10^{-9}	2.77	1.37×10^{-5}	4.24×10^{-9}	1.40	1.85×10^{-5}	4.24×10^{-9}	1.73	2.67×10^{-5}
Total	7.02×10^{-7}	3.98	8.27×10^{-5}	1.15×10^{-6}	6.55	2.45×10^{-4}	1.15×10^{-6}	1.22×10^{1}	5.20×10^{-4}
Year of Peak Impact	9188	9188	8365	8365	8365	8365	8365	8365	8365
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	6.56×10^{-7}	9.37×10^{-8}	0.00	6.56×10^{-7}	9.49×10^{-8}	0.00	6.56×10^{-7}	1.01×10^{-7}	0.00
Chromium	3.92×10^{-4}	3.73×10^{-3}	0.00	3.92×10^{-4}	3.74×10^{-3}	6.51×10^{-12}	3.92×10^{-4}	5.46×10^{-3}	2.99×10^{-7}
Fluoride	4.91×10^{-5}	2.34×10^{-5}	0.00	4.91×10^{-5}	2.41×10^{-5}	0.00	4.91×10^{-5}	2.59×10^{-5}	0.00
Nitrate	5.70	1.02×10^{-1}	0.00	5.70	1.34×10^{-1}	0.00	5.70	2.63×10^{-1}	0.00
Total	5.70	1.05×10^{-1}	0.00	5.70	1.38×10^{-1}	6.51×10^{-12}	5.70	2.68×10^{-1}	2.99×10^{-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–267. Waste Management Alternative 2, 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	1.87×10^{-7}	3.27×10^{-1}	4.04×10^{-5}	6.71×10^{-7}	3.02	1.33×10^{-4}	6.71×10^{-7}	6.15	2.89×10^{-4}
Iodine-129	5.61×10^{-9}	1.60	4.80×10^{-6}	1.48×10^{-9}	4.89×10^{-1}	6.47×10^{-6}	1.48×10^{-9}	6.04×10^{-1}	9.32×10^{-6}
Total	1.92×10^{-7}	1.92	4.52×10^{-5}	6.72×10^{-7}	3.51	1.39×10^{-4}	6.72×10^{-7}	6.75	2.98×10^{-4}
Year of Peak Impact	9652	9652	8478	8478	8478	8478	8478	8478	8478
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	3.28×10^{-7}	4.68×10^{-8}	0.00	3.28×10^{-7}	4.74×10^{-8}	0.00	3.28×10^{-7}	5.04×10^{-8}	0.00
Chromium	2.08×10^{-4}	1.98×10^{-3}	0.00	2.08×10^{-4}	1.98×10^{-3}	2.96×10^{-12}	2.08×10^{-4}	2.89×10^{-3}	1.36×10^{-7}
Fluoride	2.45×10^{-5}	1.17×10^{-5}	0.00	2.45×10^{-5}	1.20×10^{-5}	0.00	2.45×10^{-5}	1.29×10^{-5}	0.00
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	7.46×10^{-2}	0.00	4.07	9.76×10^{-2}	2.96×10^{-12}	4.07	1.91×10^{-1}	1.36×10^{-7}
Year of Peak Impact	8055	8055	N/A	8055	8055	8354	8055	8055	8354

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–268. Waste Management Alternative 2, 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	9.27×10^{-12}	4.17×10^{-5}	1.83×10^{-9}	7.99×10^{-12}	8.31×10^{-5}	3.94×10^{-9}	1.87×10^{-7}	2.07×10^{-3}	4.03×10^{-7}
Iodine-129	6.61×10^{-14}	2.19×10^{-5}	2.90×10^{-10}	7.52×10^{-14}	4.06×10^{-4}	9.78×10^{-9}	5.61×10^{-9}	8.83×10^{-3}	6.83×10^{-8}
Total	9.33×10^{-12}	6.36×10^{-5}	2.12×10^{-9}	8.07×10^{-12}	4.89×10^{-4}	1.37×10^{-8}	1.92×10^{-7}	1.09×10^{-2}	4.71×10^{-7}
Year of Peak Impact	9014	9014	9014	8774	8774	8774	9652	9652	8478
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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	1.07×10^{-11}	1.55×10^{-12}	0.00	1.07×10^{-11}	1.70×10^{-12}	0.00	6.56×10^{-7}	6.54×10^{-9}	0.00
Chromium	5.56×10^{-9}	5.30×10^{-8}	4.07×10^{-17}	5.56×10^{-9}	8.48×10^{-8}	1.87×10^{-12}	3.32×10^{-5}	7.35×10^{-5}	6.79×10^{-8}
Fluoride	6.46×10^{-10}	3.17×10^{-10}	0.00	6.46×10^{-10}	4.48×10^{-10}	0.00	2.45×10^{-5}	3.59×10^{-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}	1.64×10^{-6}	4.07×10^{-17}	4.58×10^{-5}	4.31×10^{-3}	1.87×10^{-12}	4.07	1.52×10^{-1}	6.79×10^{-8}
Year of Peak Impact	8326	8326	8489	8326	8326	8489	8056	8056	8354

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

Figures Q–28 and Q–29 depict the cumulative radiological lifetime risk of incidence of cancer at the IDF-East barrier and the Core Zone Boundary, respectively, for the drinking-water well user over time. The peak radiological risk occurs around the year 8500 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.

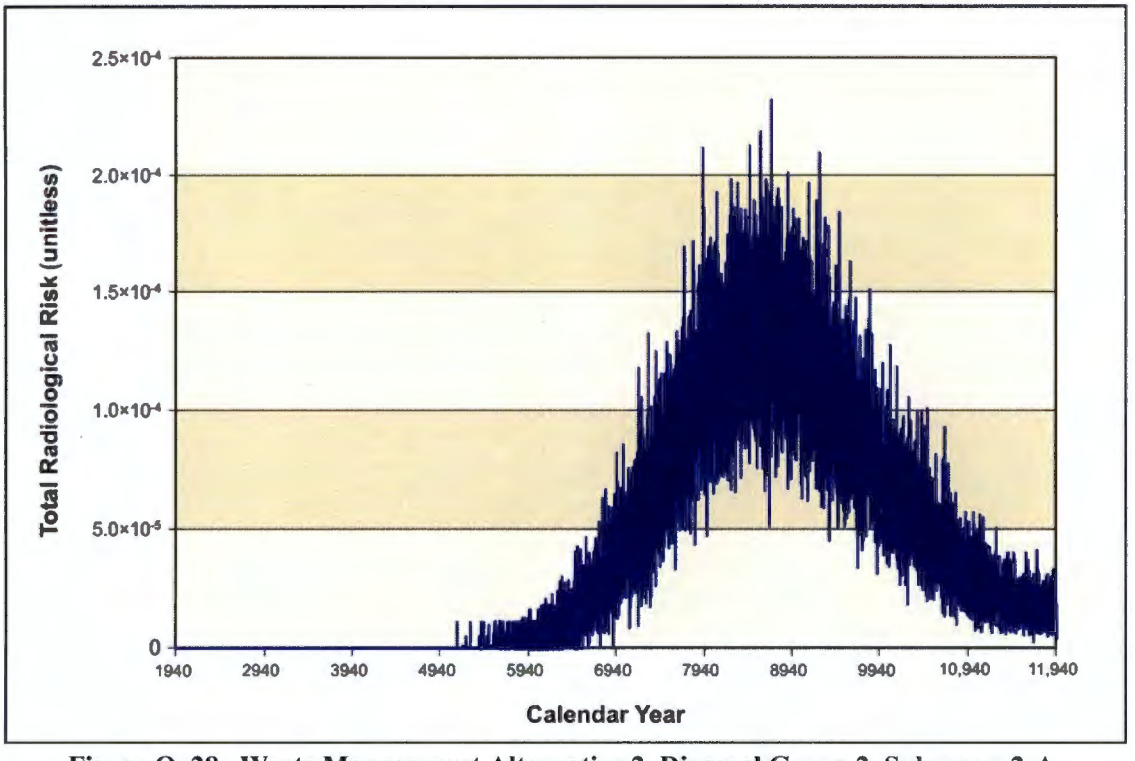

Figure Q–28. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

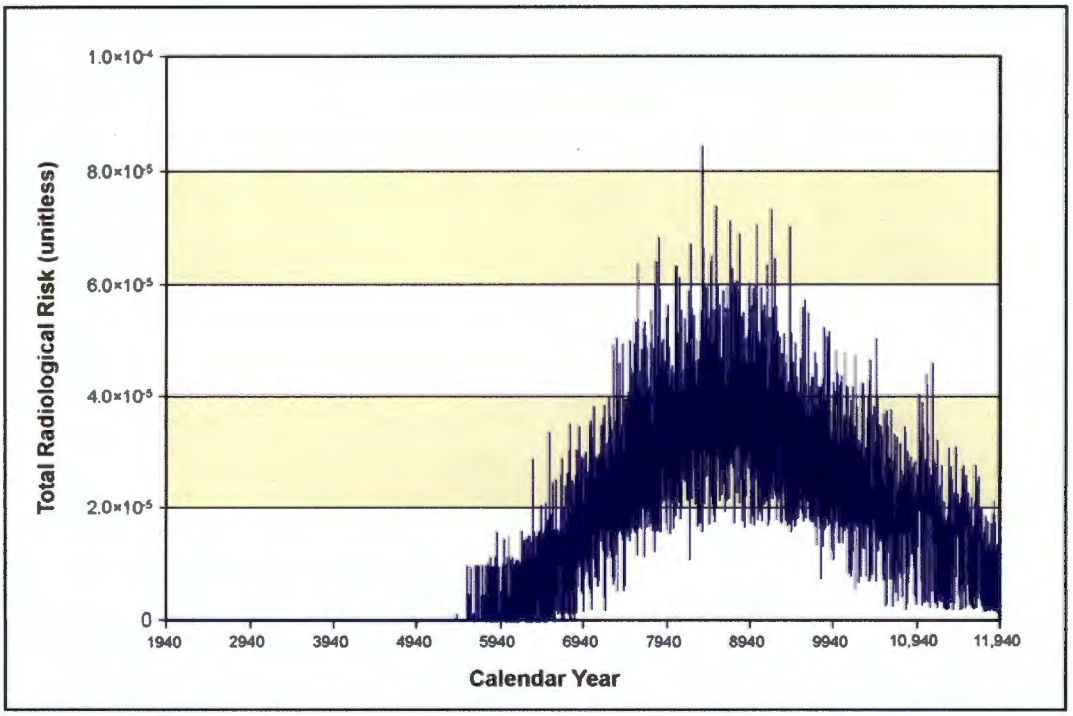

Figure Q–29. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-A, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.9 Waste Management Alternative 2; 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:

- Preprocessing Facility (PPF) glass
- PPF melters
- Tank closure secondary waste
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–269 through Q–278, 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, nitrate, and total uranium for chemicals. For radionuclides, the dose standard would not be exceeded at any location. In addition, the Hazard Index guideline would not be exceeded at any location for the Base Case. For the Option Case, the Hazard Index guideline would be exceeded primarily due to chromium at the Core Zone Boundary for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose was estimated for Subgroup 2-B, Base

Case, as 3.22×10^{-1} person-rem per year for the year of maximum impact and for Subgroup 2-B, Option Case, as 3.23×10^{-1} person-rem per year for the year of maximum impact.

Table Q–269. Waste Management Alternative 2, 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	2.61×10^{-6}	4.57	1.57×10^{-4}	2.61×10^{-6}	1.17×10^{1}	5.72×10^{-4}	2.61×10^{-6}	2.39×10^{1}	1.25×10^{-3}
Iodine-129	2.38×10^{-8}	6.78	7.72×10^{-5}	2.38×10^{-8}	7.87	6.63×10^{-5}	2.38×10^{-8}	9.72	9.54×10^{-5}
Total	2.63×10^{-6}	1.14×10^{1}	2.34×10^{-4}	2.63×10^{-6}	1.96×10^{1}	6.38×10^{-4}	2.63×10^{-6}	3.36×10^{1}	1.34×10^{-3}
Year of Peak Impact	8706	8706	8706	8706	8706	8580	8706	8706	8580
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	1.69×10^{-6}	2.41×10^{-7}	0.00	1.69×10^{-6}	2.44×10^{-7}	0.00	1.69×10^{-6}	2.60×10^{-7}	0.00
Chromium	2.45×10^{-3}	2.34×10^{-2}	0.00	2.45×10^{-3}	2.34×10^{-2}	1.27×10^{-11}	2.45×10^{3}	3.42×10^{-2}	5.81×10^{-7}
Fluoride	1.46×10^{-4}	6.96×10^{-5}	0.00	1.46×10^{-4}	7.17×10^{-5}	0.00	1.46×10^{-4}	7.71×10^{-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}	3.21×10^{-1}	0.00	1.66×10^{1}	4.15×10^{-1}	1.27×10^{-11}	1.66×10^{1}	8.02×10^{-1}	5.81×10^{-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–270. Waste Management Alternative 2, 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–271. Waste Management Alternative 2, 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	6.92×10^{-7}	1.21	6.85×10^{-5}	1.14×10^{-6}	5.12	2.25×10^{-4}	1.14×10^{-6}	1.04×10^{1}	4.90×10^{-4}
Iodine-129	9.64×10^{-9}	2.75	1.38×10^{-5}	4.25×10^{-9}	1.40	1.86×10^{-5}	4.25×10^{-9}	1.73	2.67×10^{-5}
Total	7.02×10^{-7}	3.96	8.23×10^{-5}	1.14×10^{-6}	6.52	2.43×10^{-4}	1.14×10^{-6}	1.22×10^{1}	5.17×10^{-4}
Year of Peak Impact	9188	9188	8365	8365	8365	8365	8365	8365	8365
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	1.37×10^{-6}	6.51×10^{-6}	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron and Compounds	0.00	0.00	0.00	9.83×10^{-7}	1.42×10^{-7}	0.00	9.83×10^{-7}	1.51×10^{-7}	0.00
Chromium	1.12×10^{-2}	1.06×10^{-1}	0.00	4.63×10^{-4}	4.41×10^{-3}	4.41×10^{-11}	4.63×10^{-4}	6.45×10^{-3}	2.02×10^{-6}
Fluoride	0.00	0.00	0.00	7.36×10^{-5}	3.61×10^{-5}	0.00	7.36×10^{-5}	3.88×10^{-5}	0.00
Nitrate	5.46×10^{-1}	9.75×10^{-3}	0.00	5.75	1.35×10^{-1}	0.00	5.75	2.65×10^{-1}	0.00
Total	5.57×10^{-1}	1.16×10^{-1}	0.00	5.75	1.40×10^{-1}	4.41×10^{-11}	5.75	2.72×10^{-1}	2.02×10^{-6}
Year of Peak Impact	3995	3995	N/A	8245	8245	11,232	8245	8245	11,232

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–272. Waste Management Alternative 2, 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	1.87×10^{-7}	3.28×10^{-1}	4.24×10^{-5}	7.03×10^{-7}	3.16	1.39×10^{-4}	7.03×10^{-7}	6.45	3.03×10^{-4}
Iodine-129	5.61×10^{-9}	1.60	4.90×10^{-6}	1.51×10^{-9}	5.00×10^{-1}	6.62×10^{-6}	1.51×10^{-9}	6.17×10^{-1}	9.53×10^{-6}
Total	1.93×10^{-7}	1.92	4.73×10^{-5}	7.05×10^{-7}	3.66	1.46×10^{-4}	7.05×10^{-7}	7.06	3.13×10^{-4}
Year of Peak Impact	9652	9652	8477	8477	8477	8477	8477	8477	8477
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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	3.28×10^{-7}	4.68×10^{-8}	0.00	3.28×10^{-7}	4.74×10^{-8}	0.00	3.28×10^{-7}	5.04×10^{-8}	0.00
Chromium	5.94×10^{-4}	5.66×10^{-3}	0.00	5.94×10^{-4}	5.66×10^{-3}	9.08×10^{-12}	5.94×10^{-4}	8.27×10^{-3}	4.17×10^{-7}
Fluoride	4.91×10^{-5}	2.34×10^{-5}	0.00	4.91×10^{-5}	2.41×10^{-5}	0.00	4.91×10^{-5}	2.59×10^{-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	8.36×10^{-2}	9.08×10^{-12}	3.31	1.61×10^{-1}	4.17×10^{-7}
Year of Peak Impact	7829	7829	N/A	7829	7829	5035	7829	7829	5035

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–273. Waste Management Alternative 2, 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	9.36×10^{-12}	4.21×10^{-5}	1.85×10^{-9}	8.06×10^{-12}	8.37×10^{-5}	3.97×10^{-9}	1.87×10^{-7}	2.07×10^{-3}	4.22×10^{-7}
Iodine-129	6.69×10^{-14}	2.22×10^{-5}	2.94×10^{-10}	7.53×10^{-14}	4.07×10^{-4}	9.79×10^{-9}	5.61×10^{-9}	8.83×10^{-3}	7.02×10^{-8}
Total	9.43×10^{-12}	6.43×10^{-5}	2.14×10^{-9}	8.13×10^{-12}	4.90×10^{-4}	1.38×10^{-8}	1.93×10^{-7}	1.09×10^{-2}	4.93×10^{-7}
Year of Peak Impact	9014	9014	9014	8774	8774	8774	9652	9652	8477
	Resident Farmer			**American Indian Resident Farmer**			**American Indian Hunter-Gatherer**		
Chemical Constituent	**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
Chromium	7.87×10^{-9}	7.50×10^{-8}	1.23×10^{-16}	7.87×10^{-9}	1.20×10^{-7}	5.63×10^{-12}	5.85×10^{-4}	1.29×10^{-3}	2.08×10^{-7}
Fluoride	7.01×10^{-10}	3.43×10^{-10}	0.00	7.01×10^{-10}	4.86×10^{-10}	0.00	7.36×10^{-5}	1.08×10^{-5}	0.00
Nitrate	4.79×10^{-5}	1.65×10^{-6}	0.00	4.79×10^{-5}	4.50×10^{-3}	0.00	3.31	1.24×10^{-1}	0.00
Total	4.79×10^{-5}	1.73×10^{-6}	1.23×10^{-16}	4.79×10^{-5}	4.50×10^{-3}	5.63×10^{-12}	3.31	1.26×10^{-1}	2.08×10^{-7}
Year of Peak Impact	8304	8304	4172	8304	8304	4172	7837	7837	5035

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

Table Q–274. Waste Management Alternative 2, 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	2.61×10^{-6}	4.57	1.57×10^{-4}	2.61×10^{-6}	1.17×10^{1}	5.72×10^{-4}	2.61×10^{-6}	2.39×10^{1}	1.25×10^{-3}
Iodine-129	2.38×10^{-8}	6.78	7.72×10^{-5}	2.38×10^{-8}	7.87	6.63×10^{-5}	2.38×10^{-8}	9.72	9.54×10^{-5}
Total	2.63×10^{-6}	1.14×10^{1}	2.34×10^{-4}	2.63×10^{-6}	1.96×10^{1}	6.38×10^{-4}	2.63×10^{-6}	3.36×10^{1}	1.34×10^{-3}
Year of Peak Impact	8706	8706	8706	8706	8706	8580	8706	8706	8580
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	1.69×10^{-6}	2.41×10^{-7}	0.00	1.69×10^{-6}	2.44×10^{-7}	0.00	1.69×10^{-6}	2.60×10^{-7}	0.00
Chromium	2.46×10^{-3}	2.34×10^{-2}	0.00	2.46×10^{-3}	2.34×10^{-2}	1.27×10^{-11}	2.46×10^{-3}	3.42×10^{-2}	5.82×10^{-7}
Fluoride	1.46×10^{-4}	6.96×10^{-5}	0.00	1.46×10^{-4}	7.17×10^{-5}	0.00	1.46×10^{-4}	7.71×10^{-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}	3.21×10^{-1}	0.00	1.66×10^{1}	4.15×10^{-1}	1.27×10^{-11}	1.66×10^{1}	8.02×10^{-1}	5.82×10^{-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–275. Waste Management Alternative 2, 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–276. Waste Management Alternative 2, 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	6.92×10^{-7}	1.21	8.13×10^{-5}	1.14×10^{-6}	5.12	2.67×10^{-4}	1.35×10^{-6}	1.24×10^{1}	5.82×10^{-4}
Iodine-129	9.64×10^{-9}	2.75	2.00×10^{-6}	4.25×10^{-9}	1.40	2.70×10^{-6}	6.18×10^{-10}	2.52×10^{-1}	3.89×10^{-6}
Total	7.02×10^{-7}	3.96	8.33×10^{-5}	1.14×10^{-6}	6.52	2.70×10^{-4}	1.35×10^{-6}	1.26×10^{1}	5.86×10^{-4}
Year of Peak Impact	9188	9188	4466	8365	8365	4466	4466	4466	4466
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
Chromium	9.51×10^{-2}	9.06×10^{-1}	0.00	9.51×10^{-2}	9.07×10^{-1}	3.82×10^{-10}	9.51×10^{-2}	1.32	1.75×10^{-5}
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	3.82×10^{-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–277. Waste Management Alternative 2, 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	1.87×10^{-7}	3.28×10^{-1}	4.32×10^{-5}	7.17×10^{-7}	3.22	1.42×10^{-4}	7.17×10^{-7}	6.57	3.09×10^{-4}
Iodine-129	5.67×10^{-9}	1.61	4.97×10^{-6}	1.53×10^{-9}	5.07×10^{-1}	6.71×10^{-6}	1.53×10^{-9}	6.26×10^{-1}	9.66×10^{-6}
Total	1.93×10^{-7}	1.94	4.81×10^{-5}	7.18×10^{-7}	3.73	1.48×10^{-4}	7.18×10^{-7}	7.19	3.18×10^{-4}
Year of Peak Impact	9652	9652	8477	8477	8477	8477	8477	8477	8477
	Drinking-Water Well User			**Resident Farmer**			**American Indian Resident Farmer**		
Chemical Constituent	**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}	6.67×10^{-11}	1.69×10^{-2}	2.36×10^{-1}	3.06×10^{-6}
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	2.29×10^{-1}	0.00	3.83	2.51×10^{-1}	6.67×10^{-11}	3.83	4.12×10^{-1}	3.06×10^{-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–278. Waste Management Alternative 2, 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	9.45×10^{-12}	4.25×10^{-5}	1.87×10^{-9}	8.19×10^{-12}	8.51×10^{-5}	4.03×10^{-9}	1.87×10^{-7}	2.07×10^{-3}	4.30×10^{-7}
Iodine-129	6.69×10^{-14}	2.22×10^{-5}	2.94×10^{-10}	7.56×10^{-14}	4.08×10^{-4}	9.82×10^{-9}	5.67×10^{-9}	8.92×10^{-3}	7.10×10^{-8}
Total	9.51×10^{-12}	6.46×10^{-5}	2.16×10^{-9}	8.27×10^{-12}	4.93×10^{-4}	1.39×10^{-8}	1.93×10^{-7}	1.10×10^{-2}	5.01×10^{-7}
Year of Peak Impact	9014	9014	9014	8774	8774	8774	9652	9652	8477
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
Chromium	1.75×10^{-7}	1.67×10^{-6}	8.31×10^{-16}	8.77×10^{-8}	1.34×10^{-6}	3.81×10^{-11}	6.75×10^{-3}	1.49×10^{-2}	1.53×10^{-6}
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}	3.44×10^{-6}	8.31×10^{-16}	5.41×10^{-5}	5.08×10^{-3}	3.81×10^{-11}	5.70	2.21×10^{-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–30 through Q–33 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 8300 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 4500 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 the RPPDF. These are relatively mobile radionuclides that move at the same velocity as groundwater.

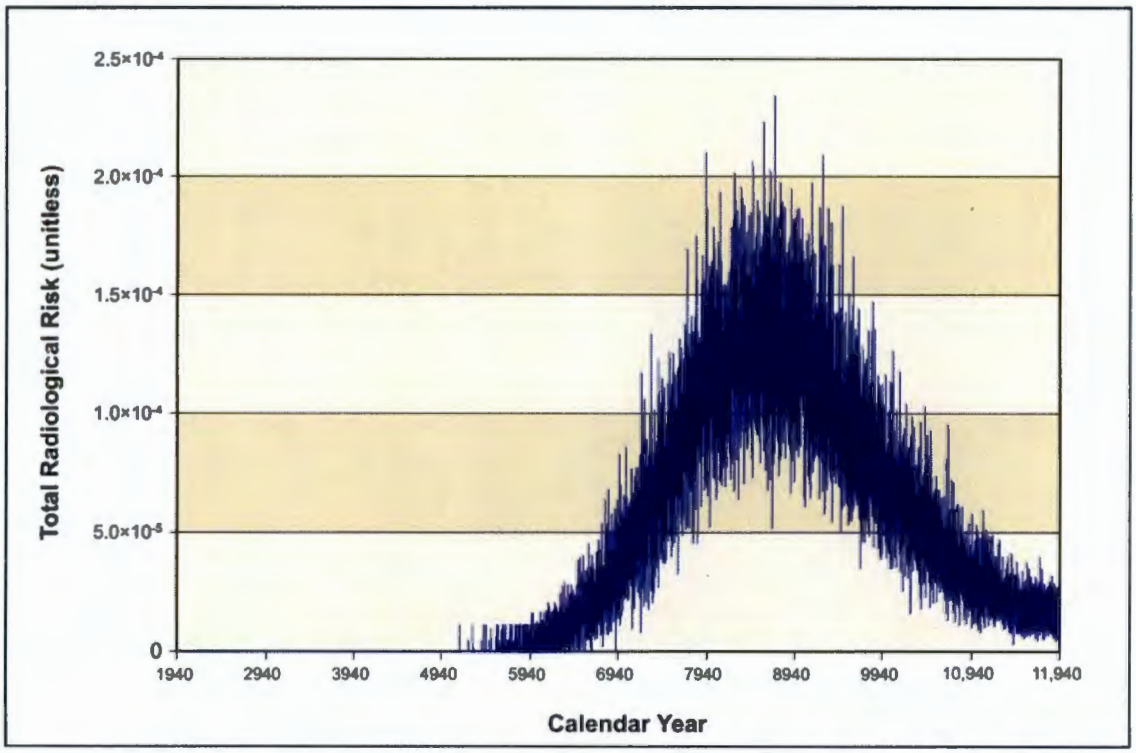

Figure Q–30. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

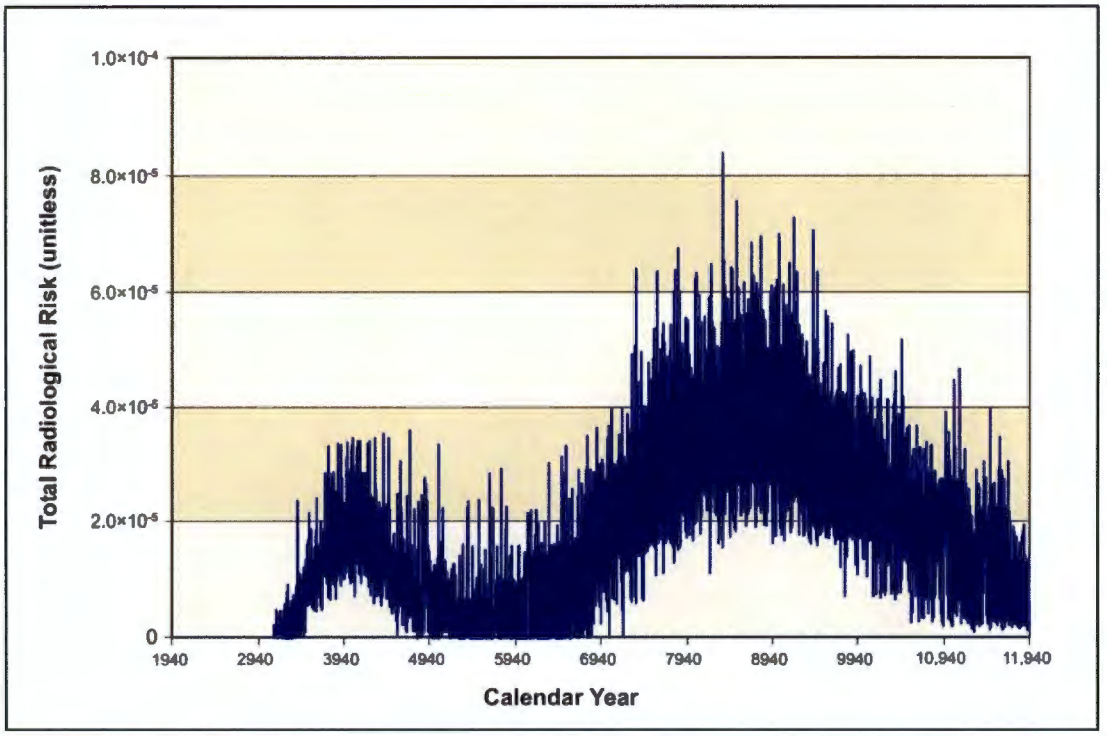

Figure Q–31. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-B, Base Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

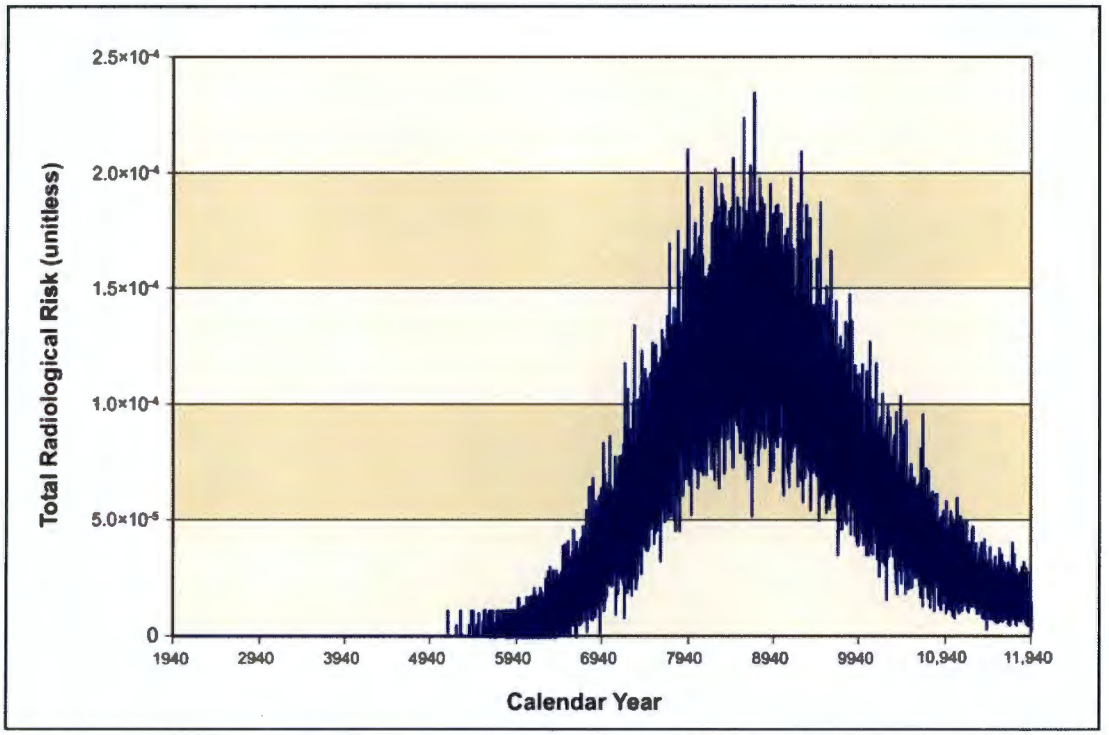

Figure Q–32. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the 200-East Area Integrated Disposal Facility

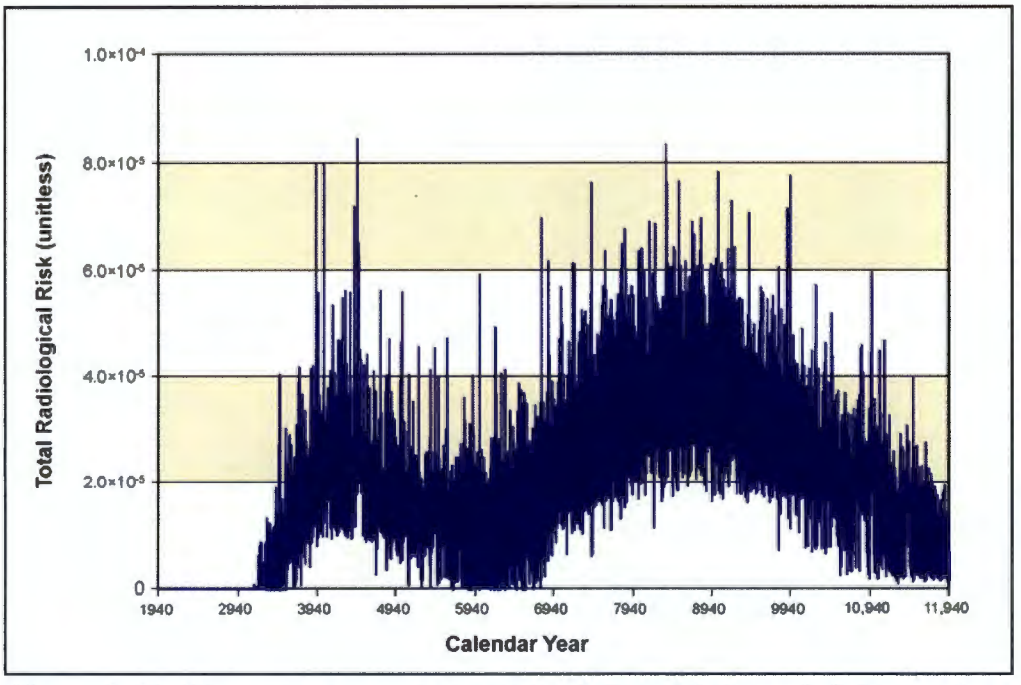

Figure Q–33. Waste Management Alternative 2, Disposal Group 2, Subgroup 2-B, Option Case, Summary of Long-Term Human Health Impacts on Drinking-Water Well User at the Core Zone Boundary

Q.3.3.1.2.10 Waste Management Alternative 2; 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
- 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 RPPDF barrier, the Core Zone Boundary, the Columbia River nearshore, and the Columbia River surface-water locations are summarized in Tables Q–279 through Q–288, 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, nitrate, and total uranium for chemicals. For radionuclides, the dose standard would not be exceeded at any location for both the Base and Option Cases. In addition, the Hazard Index guideline would not be exceeded at any location for the Base Case. However, the Hazard Index guideline would be exceeded primarily due to chromium and nitrate at the Core Zone Boundary for the Option Case for the drinking-water well user, the resident farmer, and the American Indian resident farmer. Population dose was estimated for Disposal Group 3, Base Case, as 3.12×10^{-1} person-rem per year for the year of maximum impact and for Disposal Group 3, Option Case, as 3.13×10^{-1} person-rem per year for the year of maximum impact.

Table Q–279. Waste Management Alternative 2, 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	2.64×10^{-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	1.04×10^{-3}	9.95×10^{-3}	0.00	1.04×10^{-3}	9.96×10^{-3}	1.20×10^{-11}	1.04×10^{-3}	1.46×10^{-2}	5.52×10^{-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}	1.20×10^{-11}	1.66×10^{1}	7.82×10^{-1}	5.52×10^{-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.